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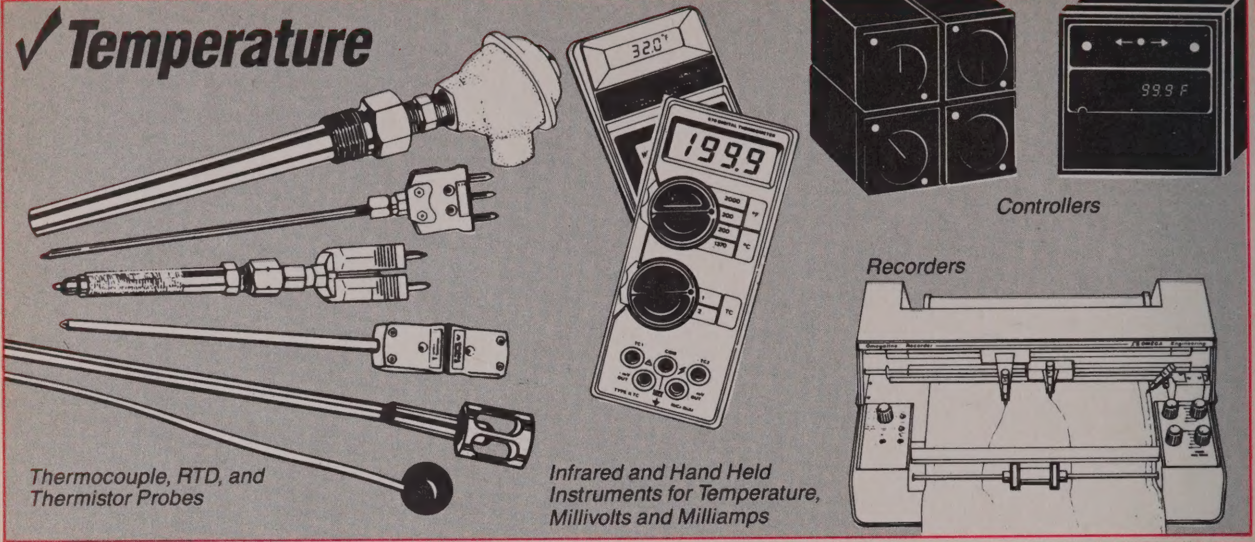
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199.9
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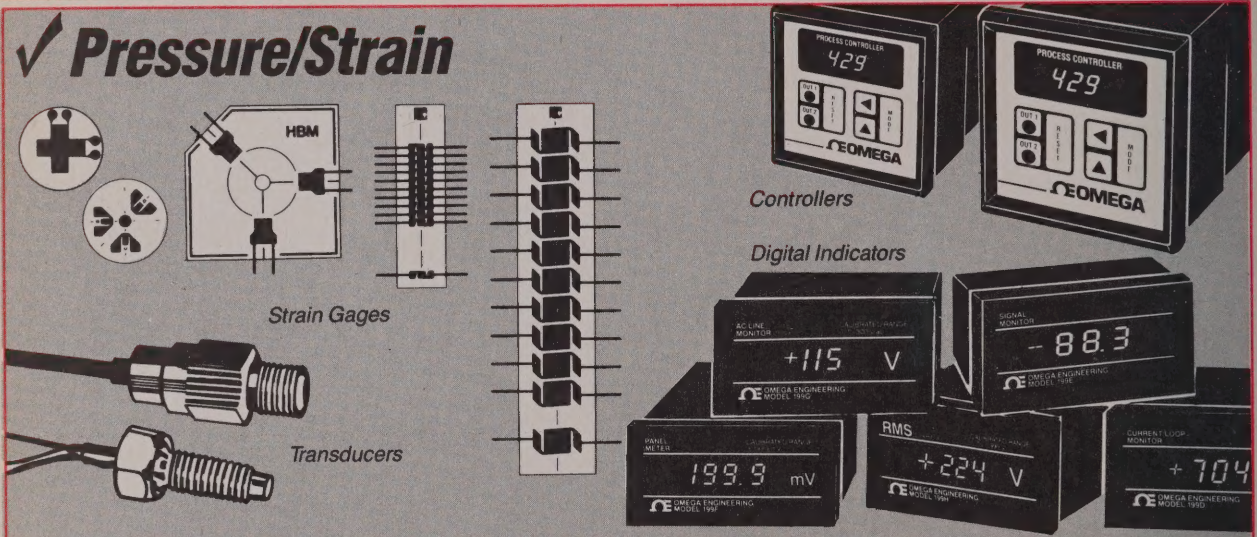
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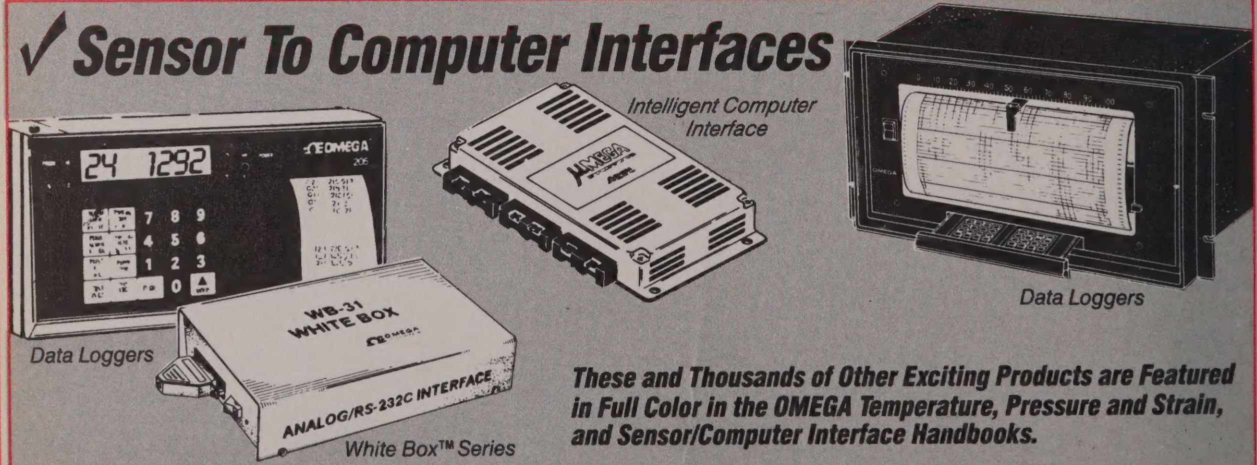
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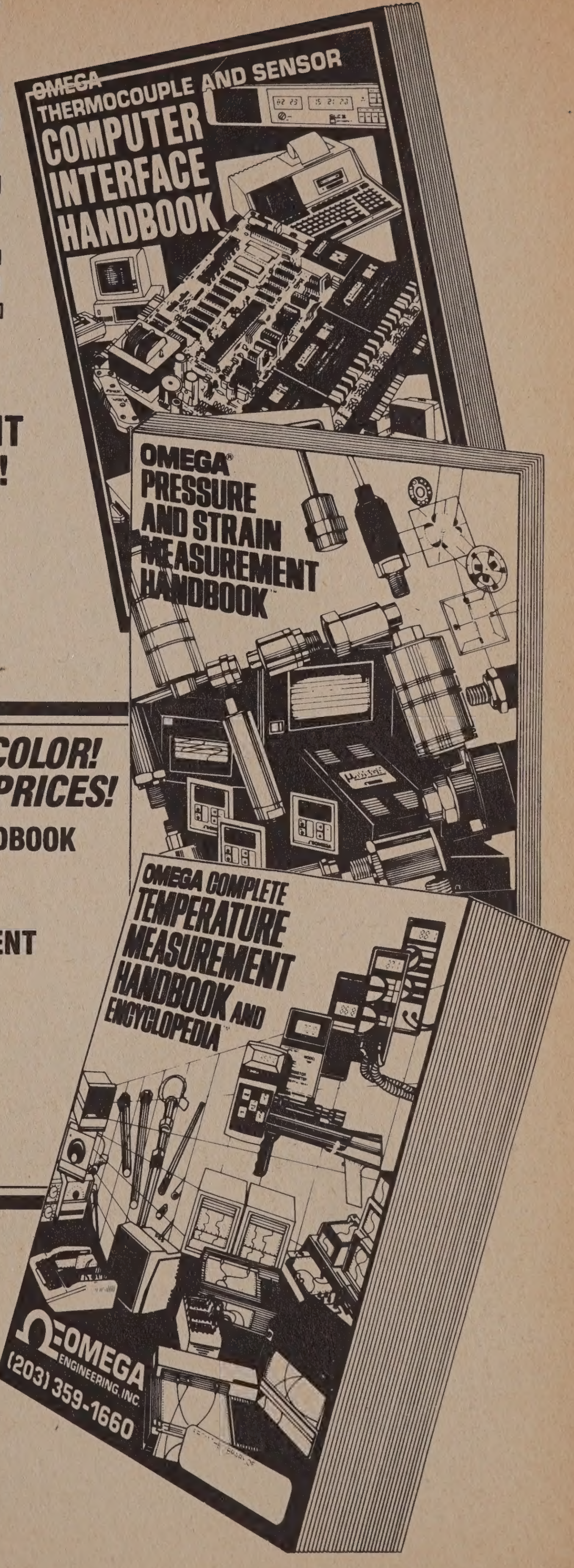
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5150 Keyboards & Keypads .... 1B•1758
5300 Thermal Components .... 1B•1793
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how to use eem

The 27th edition of EEM has been further arranged, beyond the well-known EEM Product Sections, into four volumes, each composed of related Product Sections. And, for user convenience, each volume contains its own Product Index and Directory (green pages) and its own Manufacturers and Sales Offices Directory (yellow pages). Every Product Heading and every Manufacturer of electronic products is listed in each volume. Where, however, the Product Section is assigned to a volume other than that in use, a cross reference is made to the appropriate volume for further information.

To locate a specific product. Start by choosing the volume whose title describes the class of electronic product you are seeking. If you are not sure which volume is appropriate, pick up the first one at hand and find the product heading in the green pages. There you will find either a list of that product's manufacturers or you will be referred to the proper volume. All products are identified by their generic terms. Please read the detailed instructions on the first page of this section. Manufacturers with catalog data in this edition of EEM appear in bold face type and page numbers are shown. Manufacturers appearing in light face type have submitted verifying evidence that they supply the products shown. When you have located a product of interest, turn to the page(s) shown for further information. You will find these pages in each volume in the appropriate sections.

product selection guides

There are 33 Product Selection Guides included in this edition of EEM! They are located on the first pages of the Product Section to which they apply. Use these guides for basic selection parameters and then go to the EEM pages shown in the guide for more detailed information.

product selection index

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1500*	Capacitors	1A•1002			
1600	Chemical Compounds (Adhesives, Cleaners, Coatings)			2•1080	
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1800*	Coils, Chokes, & Inductors	1A•1218			
1900	Communications & Telemetry Equipment				3•1064
2000	Computer Peripheral Equipment				3•1068
2025	Computers (Mini/Micro)				3•1105
2050	Computer Software				3•1119
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2200	Control Systems & Components				3•1120
2300*	Crystals, Oscillators, Crystal & Piezoelectric Filters	1A•1308			
2325	Data Acquisition/Handling Systems & Accessories				3•1140
2350*	Delay Lines	1A•1444			
2400*	Panel Hardware (Bezels, Dials, Knobs, etc.)			2•1756	
2440*	Military Components		1B•1002		
2450*	Displays, Readouts, Lamps, & Lights		1B•1020		
2475	Fiber Optic Equipment & Accessories		1B•1109		
2500	Mechanical Components (Bearings, Cores, Magnets, etc.)			2•1787	
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4300*	Protective Components (Fuses, Circuit Breakers, etc.)		1B•1254		
4500*	Relays		1B•1288		
4525	Shields & Shielding			2•1902	
4550*	Solenoids		1B•1480		
4600	Soldering & Desoldering Equipment			2•1924	
4700*	Resistors	1A•1788			
4750*	Potentiometers, Trimmers, Controls, & Rheostats	1A•2016			
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4900	Servomechanisms & Robotic Equipment				3•1929
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5150*	Keyboards & Keypads		1B•1758		
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5400	Tools (Manual & Power)			2•1931	
5500*	Transducers & Encoders		1B•1826		
5600*	Transformers	1A•2114			
5700	Electron Tubes (Including CRT)	1A•2366			
6000*	Wire & Cable			2•1934	

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*Product Selection Guide

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advertisers' index

To find a specific manufacturer's data pages, an alphabetical index of EEM participants appears in EEM starting on page 1A•4 of Volume 1A and on pages 1B•4, 2•4 and 3•4 of the other volumes.

trademark and logofinder directories

A comprehensive trademark directory is included at the end of the EEM green pages in Volume 1B. NEW in this edition, the EEM logofinder shows the symbols and graphics used by manufacturers as identifiers on their products. Use these pages to locate manufacturers of specific trademarks and logos.

manufacturers' index

In the EEM yellow pages you will find pertinent details on all manufacturers listed in EEM including local sales offices and/or distributors. Please refer to the detailed instructions on the first page of the EEM yellow pages for additional information.

to order a product found in eem

When you have located the product that suits your needs, call the manufacturer or the local sales rep or distributor as shown in the EEM yellow pages. Give the EEM data page number and specs from that page. You and the supplier will be talking on the same wave length which should simplify your ordering and buying.

to file manufacturers' catalogs and data

The EEM File System has been revised and updated. The new EEM File System contains a complete Product Index. This Index tells you where to file which catalog. It also contains a cross-reference so you'll know where catalogs are filed.

In order to use the new EEM File System all you need is a supply of standard letter size, third-cut, manila file folders which are available locally. You then use the pressure sensitive labels which are supplied with the File System to go into as much detail as you want (or need).

Each label fits the third-cut file folder exactly. There are 308 of these labels in one System: 1 for the Index, 1 each for the 61 EEM Product Sections, 24 for the alphabetical file of multiproduct catalogs, plus 222 additional labels for System expansion.

The System also includes 61 Cross Reference Cards so you can quickly and easily find multiproduct catalogs. The EEM File System is complete and can save you countless hours of time and thousands of dollars. The price? Only $25.00. Send a check to: EEM File System, 645 Stewart Ave., Garden City, NY 11530 and we'll absorb postage and handling. Send a purchase order and add $2.00 for postage and handling. NY and CA residents, please add sales tax.

technical information: codes . . . miniglossaries . . . charts . . .

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A.L. Design Inc., 2070 Niagara Falls Blvd., Tonawanda, NY 14150 .. 716-692-6272

§ Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021

Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 213-796-9381

Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611

§† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433

§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147

† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100

† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464

§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181

† Genisco Technlg. Corp., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065 805-581-3985

§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511

Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351

† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 .... 714-642-2400;800-854-4066

† Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186

§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282

† Humphrey, Inc., 9212 Balboa Ave., San Diego, GA 92123 619-565-6631

Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107 818-795-2220

† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000

§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131

PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001

† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000

Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615

† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723

Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720 617-263-1400

§ Shure Bros., 222 Hartrey Ave., Evanston, IL 60204 312-866-2200

Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000

† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711

§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161

Terra Technlg. Corp., 3860 148th Ave. N.E., Redmond, WA 98052 . 206-883-7300

Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721

Unholtz-Dickie Corp., 6 Brookside Dr., Wallingford, CT 06492 203-265-3929

§† Vibra-Metrics, 385 Putnam Ave., Hamden, CT 06517 203-288-6158

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Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 .... 1B•1119

General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400

Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151

Adapters, Wall Plug-in — See Power Supplies, Plug-in (Vol. 3)

Adapters, Waveguide-3450 — *See Vol. 1A*

Adapters, RF (MIL)-2440

Brady Co., 574A Somerset St., N. Plainfield, NJ 07060 201-753-7988

Adhesives, Conducting-1600 — ***See Vol. 2***

Adhesives, General Purpose-1600 — ***See Vol. 2***

Adhesives, Insulating-1600 — ***See Vol. 2***

Adhesives, Liquid Spray-1600 — ***See Vol. 2***

Adhesives, Optical-1600 — ***See Vol. 2***

Adhesives, UV Curing-1600 — ***See Vol. 2***

Adhesives, Wire Tacking-1600 — ***See Vol. 2***

Air Cleaners & Filters (Shielded & Unshielded)-2600 — ***See Vol. 2***

Air Conditioners (For Equipment)-2600 — ***See Vol. 2***

Alarms & Alarm Systems-2200 — ***See Vol. 3***

Alarms, Controls, Photoelectric-3700

AES Corp., 285 Newbury St., P.O. Box 2093, Peabody, MA 01960 .617-531-8886

† Alarm Controls, 19 Brandywine Dr., Deer Park, NY 11729 516-586-4220

Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454

† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570

Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054 201-233-7200

Cherry Semiconductor Corp, 2000 S. County Trail, East Greenwich, RI 02818 401-885-3600

† Electron-Machine Corp., Box M, Umatilla, FL 32784 904-669-3101

Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422

§ Heath Co., Benton Harbor, MI 49022 616-982-3886

§ WALTER KIDDE, Div. of Kidde, Inc.;Fire Sys. Operations, P.O. Box 1147, Wake Forest, NC 27587 919-556-6811

Lark Electronics, Inc., Box 390, New York, NY 10040 212-569-0430

§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600

Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961

Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854 201-572-9512

Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453

Alloys, Brazing-5400 — ***See Vol. 2***

Alloys, Metal/Ceramic-1600 — ***See Vol. 2***

Alphanumeric Readouts — See Tubes, Readout (Vol. 1A)

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Amplifiers, Logarithmic-1100 — ***See Vol. 3***

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Amplifiers, Travelling Wave Tube-1100 — ***See Vol. 3***

Amplifiers, Ultrasonic-1100 — ***See Vol. 3***

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Analyzers, Frequency Stability — See Meters, Frequency Deviation (Vol. 3)

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Analyzers, Interference-2900 — ***See Vol. 3***

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Analyzers, Network-2900 — *See Vol. 3*

Analyzers, Noise-2900 — *See Vol. 3*

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Antennas, Loop-1900 — *See Vol. 3*

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Antennas, Phased Array-1900 — *See Vol. 3*

Antennas, Rhombic-1900 — *See Vol. 3*

Antennas, Spiral-1900 — *See Vol. 3*

Antennas, Telescopic-1900 — *See Vol. 3*

Antennas, Whip & Accessories (Incl. Marine & Mobile Types-1900 — *See Vol. 3*

Antennas (MIL)-2440

American Elctrn. Labs., Inc., Antenna Div., P.O. Box 552, Lansdale, PA 19446 ....
† Cincinnati Elctrns., 2630 Glendale Milford Rd., Cincinnati, OH 45241 513-563-6000
† Collins Avionics Divisions, Rockwell Intl., 400 Collins Rd. NE, Cedar Rapids, IA 52498 319-395-1000
† Electro-Magnetic Processes, Inc., 9616 Owensmouth Ave., Chatsworth, CA 91311 818-882-6333
§† Electro-Metrics, 100 Church St., Amsterdam, NY 12010 518-843-2600
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
† Hazeltine Corp., 500 Commack Rd., Commack, NY 11725 516-462-5100
† Microwave Applications Grp., 3030 Industrial Pkwy., Santa Maria, CA 93455 805-928-5711
† Radio Resch. Instr. Co., Inc., Two Lake Ave. Extension, Danbury, CT 06811-5295 203-792-6666
† Sabre Comms. Corp., 117 Main St., Soiux City, IA 51102 712-258-6690
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
† Teledyne Micronetics, 7155 Mission Gorge Rd., San Diego, CA 92120 619-583-3525
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141

Antennas (MIL), DF-3475 — *See Vol. 3*

Antennas (MIL), ECM-3475 — *See Vol. 3*

Antennas (MIL), EW-3475 — *See Vol. 3*

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Array Processors-2025 — *See Vol. 3*

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Arresters, Electrical Surge/Lightning (MIL)-2440

MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 .... 1B•1277-1279
§ **PolyPhaser Corporation, P.O. Box 1237, Gardnerville, NV 89410, 702-782-2511 ....1B•1285**
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 ..617-448-5485
§† General Semiconductor Inds., Inc., 2001 W. 10 Pl., Tempe, AZ 85281 602-968-3101
§ LEA, Inc., A Dynatech Co., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 818-944-0916
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
§ RMS Electronics Inc., 50 Antin Pl., Bronx, NY 10462 212-892-6700

Artificial Loads — See Dummy Loads (Vol. 3)

Assembly & Fabrication Services (Incl. R & D) — See Services, Assembly & Fabrication (Vol. 3)

Attenuators, Audio-1300 — *See Vol. 3*

Attenuators, Audio (T, L, LL Pads)-4750 — *See Vol. 1A*

Attenuators, Coaxial-3450 — *See Vol. 1A*

Attenuators, Fiber Optic-2475

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ....1B•1229
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ....1B•1118
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Attenuators, Fixed-3450 — *See Vol. 1A*

Attenuators, IF-1900 — *See Vol. 3*

Attenuators, Impedance Matching-3450 — *See Vol. 1A*

Attenuators, Logarithmic-3450 — *See Vol. 1A*

Attenuators, Microwave-3450 — *See Vol. 1A*

Attenuators, Programmable-3450 — *See Vol. 1A*

Attenuators, RF-1900 — *See Vol. 3*

Attenuators, Turret-3450 — *See Vol. 1A*

Attenuators, Variable-3450 — *See Vol. 1A*

Attenuators, Voltage Controlled-3450 — *See Vol. 1A*

Attenuators (MIL)-2440

Arra Inc., 15 Harold Ct., Bay Shore, NY 11706, 516-231-8400 ....1A•1689
† **General Microwave Corp., 155 Marine St., Farmingdale, NY 11735, 516-694-3600 ....1A•1704**
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1632
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
† Daico Inds., Inc., Box 5225, Compton, CA 90224 213-631-1143

† Elcom Systems, Inc., 4032 Clint Moore Rd., Boca Raton, FL 33431 305-994-1774
† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
Kelvin, 5919 Noble Ave., Van Nuys, CA 91411 818-782-6662
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ....301-948-3434; 800-638-2048

Attenuators (MIL), Inductive-2440
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875

Audible Alarms & Transducers-1300 (Also see Piezoelectric Ceramics; Transducers, Audio) — ***See Vol. 3***

Audio Equipment — See Amplifiers (Vol. 3), Microphones (Vol. 3), Speakers (Vol. 3), etc.

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Bargraphs — See Meters, Bargraph (Vol. 3)

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Batteries, Lead Dioxide-3900 — *See Vol. 3*

Batteries, Lithium-3900 — *See Vol. 3*

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Batteries, Silver Cadmium-3900 — *See Vol. 3*

Batteries, Silver Oxide-3900 — *See Vol. 3*

Batteries, Silver Zinc-3900 — *See Vol. 3*

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Batteries, Thermal-3900 — *See Vol. 3*

Batteries, Zinc Air-3900 — *See Vol. 3*

Batteries, Zinc Carbon-3900 — *See Vol. 3*

Batteries, Zinc Chloride-3900 — *See Vol. 3*

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Battery Holders — See Connectors, Battery (Vol. 2), Retainers, Battery (Vol. 2),

Battery Plugs — See Connectors, Battery (Vol. 2)

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Belts, Drive-2500 — *See Vol. 2*

Benches, Consoles, Tables (Work Stations, Lab & Shop)-1400 (Also See Enclosures, Equipment and Panel Mounting) — ***See Vol. 2***

Bends & Twists, Microwave-3450 — *See Vol. 1A*

Bezels, Shielded & Unshielded-2400 — *See Vol. 2*

Bimetals, Thermostatic-5300
American Etching & Mfg., 13730 Desmond St., Pacoima,, CA 91331 213-896-1187
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
Inter-Technical Grp., Box 23, Irvington, NY 10533 914-591-8822
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800

Bins, Part Storage-3800 — *See Vol. 2*

Blackbody Radiation Sources-2900 — *See Vol. 3*

Blowers, Centrifugal-2600 — *See Vol. 2*

Board Computers & Subassemblies, Multibus Compatible-2025 — *See Vol. 3*

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Board Computers & Subassemblies, S100 Bus Compatible-2025 — *See Vol. 3*

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Boards, Circuit, Clad-1700 — *See Vol. 2*

Boards, Circuit, Unclad-1700 — *See Vol. 2*

Boards, Display, Graphic-2450
Amtek Digital Systems, Inc., 12740 28th N.E., Seattle, WA 98125 206-363-0217
§† Analog Technology Corp., 15859 E. Edna Pl., Irwindale, CA 91706 213-960-4004
Applied Micro Technlg., A Burr Brown Co., 2430 N. Hauchuca, Ste. A, Tucson, AZ 85745 602-622-8605
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
§ Cromemco, 280 Bernardo Ave., Mountain View, CA 94043 415-964-7400
Digital Equip., One Iron Way, Marlborough, MA 01752 ....
Dynamic Measurements, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
† Eastern Electronics Mfg. Corp., 180 Roberts St., East Hartford, CT 06108 203-528-9821
G B Instruments Inc., 2030 Coolidge St., Hollywood, FL 33020 305-920-0225
General Digital, 700 Burnside Ave., E. Hartford, CT 06108 203-528-9041
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
Heurikon Corp., 3001 Latham Dr., Madison, WI 53713 608-271-8700
KMC Systems Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
Kole Ind., 3553 N.W. 50th St., Miami, FL 33102-0152 ....305-633-2556; 800-327-6085
K-Systems, Inc., 3902 Lilac, Las Cruces, NM 88005 505-526-3209
Matrox Elctrn. Sys., 5800 Andover Ave., Montreal, QU H4T 1H4 Canada 514-735-1182
† Methods Research, 54D Asbury Ave., Farmingdale, NJ 07727 201-938-6000
Raster Graphics, PO Box 23334, Tigard, OR 97223 503-620-2241
Tegam, 7230 N. Ridge Rd., Madison, OH 44057 216-428-7505
§ Trilog, 17391 Murphy Ave., Irvine, CA 92714 714-549-4079
Xycom, 750 N. Maple Rd., Saline, MI 48176 313-429-4971

Boards, Integrated Circuit — See Boards, Plug-in (Vol. 2)

Boards, Plug-in-3200 — *See Vol. 2*

Boards, Plug-in, Extender-3200 — *See Vol. 2*

Boards, Plug-in, Interface-3200 — *See Vol. 2*

Boards, Plug-in, Memory-3200 — *See Vol. 2*

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Boards, Plug-in, Prototype-4200 — *See Vol. 2*

Boards, Prewired, High Density-3200 — *See Vol. 2*

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Bolometers, Microwave-2900 — ***See Vol. 3***

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Boxes, Shipping (Reusable) — See Enclosures, Shipping (Vol. 2)

Brackets, Antenna — See Mounts, Antenna (Vol. 3)

Braid, Cable-6000 (Also See Wire Shielding) — ***See Vol. 2***

Brakes, Magnetic-3500

† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ......1A•2066,2067, 1B•1019,1207,1883,3•1934**
Ambi-Tech Inds., 319 Knickerbocker Ave., Hillsdale, NJ 07642 201-666-0504
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ....201-HE7-0720
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 716-876-9685
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
§ Perfect Gear & Instr., 55 S. Denton Ave., New Hyde Park, NY 11040 516-328-3300
† PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513 312-485-5152
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300

Brakes, Mechanical-3500

† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 3•1934**
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 716-876-9685
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200

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Brushes & Brush Assemblies-3500

§ **Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ....1B•1127,1129**
† **Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, 818-443-3247 ....1B•1151**
Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, 914-968-8400 ....1B•1156
† **Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 ..1B•1162**
Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ....201-DE4-0700
Carbone USA Corp., Carbone Lorraine Inds. Corp., 402 Myrtle Ave., Boonton, NJ 07005 201-334-0700
§ Chapman Corp., P.O. Box 10700, Portland, ME 04104 207-773-4726
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ....818-882-7979/5280
† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
§† Eraser Co., Box 4961, Syracuse, NY 13221 315-454-3237
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
ITT Thermotech, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343 ..612-933-9400
Jonard Inds. Corp., 134 Marbledale Rd., Tuckahoe, NY 10707 914-793-0700
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Stackpole, Carbon Div., St. Marys, PA 15857 814-781-1234
§† Superior Carbon Prods. Inc., 9115 George Ave., Cleveland, OH 44105 216-883-4880
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990
† Unit Inds., 1140 E. Valencia Dr., Fullerton, CA 92631 714-871-4161

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Cable, FEP Insulated-6000 — ***See Vol. 2***

Cable, Fiber Optic-2475

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
§ Augat Fiberoptics, 40 Perry Ave., Attleboro, MA 02703 617-222-2202
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420

Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 317-983-5200
Belden, Fiber Optics, 2000 S. Batavia Ave., Geneva, IL 60134 312-232-8900
§† BIW Cable Sys., Inc., 65 Bay St., Dorchester, MA 02125 617-265-2102
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 412-746-5500
§ Brand-Rex, Electronic & Indl. Cable Div., Box 498, Willimantic, CT 06226 203-423-7771
Breeze-Illinois, TransTechnology Corp., Main & Agard Sts., P.O. Box 368, Wyoming, IL 61491 309-695-2511
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
† Electro Weave, 38 Harlow St., Worcester, MA 01605 617-752-8932
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Fiberguide Industries Inc., 33 Poplar Dr., Stirling, NJ 07980 201-647-6601
Fiberoptics Technlg., Inc., Quassett Rd., Pomfret, CT 06258 203-928-0443
† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
† Galite, 2 Tower Dr., Wallingford, CT 06492 203-265-7126
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
† General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08817 201-225-4780
General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 .... 413-598-8204;592-3834
§ Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
† Optelecom, 15940 Lauanne Dr., Gaithersburg, MD 20760 301-948-4232
Phalo Corp., Transitron Elctrn. Corp., 530 Boston Tpke., Shrewsbury, MA 01545 617-845-5000
Philadelphia Insulated Wire Co. Inc., 333 New Albany Rd., Moorestown, NJ 08057 609-235-6700
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 .... 203-265-5533;800-243-3959
Plainview Elctrns., 28 Cain Dr., Plainview, NY 11803 516-249-6677
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Siecor Corp., Box 489, Hickory, NC 28603 704-328-2171
§ SpecTran Corp., Hall Rd., P.O. Box 650, Sturbridge, MA 01566 617-347-2261
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
Uniform Tubes, Collegeville, PA 19426 215-539-0700
† United Wire & Cable, 425 Shrewsbury St., Worcester, MA 01604 617-757-3872
† Valtec, Sub. of U.S. Philips, 99 Hartwell St., West Boylston, MA 01583 617-835-6082
§† Whitmor Wire & Cable, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605 818-764-6296

Cable, Flame Retardant-6000 — *See Vol. 2*

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Cable, Heater-6000 — *See Vol. 2*

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Cable, Twisted Pair-6000 — *See Vol. 2*

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Cable & Assemblies (MIL)-2440

Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375, 317-983-5200 .... 2•1972-1978
Breeze-Illinois, TransTechnology Corp., Main & Agard Sts., P.O. Box 368, Wyoming, IL 61491, 309-695-2511 .... 2•1986
§† **Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 .... 2•1988,1989,1991, 1992**
§† **Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648, 201-768-5400 .. 2•2087, 2089**
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018, 312-696-1000 .... 2•2097
† **GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093, 301-252-1768 .... 2•2102**
§† **Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 .... 2•2104,2105**
Judd Wire, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, 619-744-7720 .... 2•2104,2105
† **National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223, 503-620-9400 .... 2•2114,2115**
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, CA 90031-1780, 213-225-5611 .... 2•2119-2126
Rowe Industries, Inc., 6225 Benore Rd., P.O. Box 6877, Toledo, OH 43612, 419-729-9761 .... 2•1558
† Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
† Arco Cable, 7361 Ethel Ave., North Hollywood, CA 91605 818-982-2832
Atlantic Research, 5390 Cherokee Ave., Alexandria, VA 22312 703-642-4000
† Aura Mfg., 50 McDermott Rd., New Haven, CT 06473 203-777-2541
Buggie H. H./Caton Connector Corp., 20 Wapping Rd., Kingston, MA 02364 617-585-4315
† Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
† Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
Consolidated Electronic Wire & Cable Corp., 11044 King St., Franklin Park, IL 60131 312-455-8830
Cooner Wire Co., 9186 Independence Ave., Chatsworth, CA 91311 818-882-8311
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 .. 617-448-5485
† Excel Specialty Corp., 6335 N. Broadway, Chicago, IL 60660 312-262-4781
† Flexco Microwave, Inc., P.O. Box 174, Karrville Rd., Port Murray, NJ 07865 201-689-3020
† Gavitt Wire & Cable, Brookfield, MA 01506 617-867-6476
† Gore, W. L., & Assocs., Inc., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† Gore, W. L., & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Hollex, Inc., 81 W. Wyoming Ave., Melrose, MA 02176 617-665-2413
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571
† Lynn Elctrns., 915 Pennsylvania Blvd., Feasterville, PA 19047 215-677-6700
† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
Markel Corp., P.O. Box 752, Norristown, PA 19404 215-272-8960
† Parlex Corp., 145 Milk St., Methuen, MA 01844 617-685-4341
§† Precision Tube, Church Rd. & Wissahickon, N. Wales, PA 19454 215-699-5801
† Reactel, Inc., 687-D Lofstrand La., Rockville, MD 20850 301-279-5535
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
§ Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925
† Victor Elec. Wire & Cable, 618 Main St., W. Warwick, RI 02893 .... 401-821-1700; SALES 401-821-7800
V.I.P. Inds. Inc., 246 Knickerbocker Ave., Paterson, NJ 07503 201-345-5800
† Western Reserve Elctrns., 2150 Highland Rd., Twinsburg, OH 44087 216-425-4951
Whitmor Wire & Cable, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605 818-764-6296
† Zippertubing Co., P.O. Box 61129, Los Angeles, CA 90061 213-321-3901

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Cable (MIL), Flat-2440

† Advanced Circuit Technlg., 118 N. Eastern Blvd., Nashua, NH 03062 603-880-6000
Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† Gore, W. L., & Assocs., Inc., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† Gore, W. L., & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093 301-252-1768
§† King Wire & Cable Corp., 179-45 110 Ave., Jamaica, NY 11433 .... 212-657-4422; 800-221-0144
§† 3M-Electronic Products Division, 3M Center, Bldg. 225-1N-06, St. Paul, MN 55144 612-733-7408
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
Phalo Corp., Transitron Elctrn. Corp., 530 Boston Tpke., Shrewsbury, MA 01545 617-845-5000
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 . 714-892-3361
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925

Cable (MIL), RF-2440

§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 .... 2•1991
Carol Cable Co., Inc., Columbia Elctrn. Cables Div., 249 Roosevelt Ave., Pawtucket, RI 02862, 401-724-9605 .... 2•2012,2013
Brady Co., 574A Somerset St., N. Plainfield, NJ 07060 201-753-7988
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† Flexco Microwave, Inc., P.O. Box 174, Karrville Rd., Port Murray, NJ 07865 201-689-3020
† Gore, W. L., & Assocs., Inc., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002 602-526-1290
† Gore, W. L., & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 .... 203-265-5533;800-243-3959
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Remee Prods. Corp., 41 Bridge St., Florida, NY 10921 914-651-4451
† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
† Whittaker Corp., Electronic Resources Div., 100 E. Tujunga Ave., Burbank, CA 91502 818-843-5770

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Capacitors, Fixed, AC (Incl. Motor Start)-1500 — *See Vol. 1A*

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Capacitors, Fixed, Aluminum Electrolytic-1500 — *See Vol. 1A*

Capacitors, Fixed, Ceramic, Disc & Tubular-1500 — *See Vol. 1A*

Capacitors, Fixed, Ceramic, Monolithic-1500 — *See Vol. 1A*

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Capacitors, Variable, Padders & Trimmers-1500 — *See Vol. 1A*

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American Tech. Ceramics, 1 Norden La., Huntington Sta., NY 11746, 516-271-9600 .... 1A•1007-1009
† **AVX Corporation, Box 867, Myrtle Bch., SC 29577, 803-448-9411 ....1A•1002,1013, 1014,1B•1008,1009**
§ **Capar Components Corp., Div. of Diplomat Electronics, 25 Dubon Ct., Farmingdale, NY 11735, 516-454-6390 .... 1A•1018,1019,1B•1102**
§† **Component Research Co. Inc., 1655-26 St., Santa Monica, CA 90404, 213-829-3615 .... 1A•1022-1063**
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069, 619-747-4000 .... 1A•1021
Electronic Concepts, Inc., Box 627 E, Eatontown, NJ 07724, 201-542-7880 .... 1A•1068
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093, 516-822-9601 .... 1A•1082
Johanson Dielectrics, 2220 Screenland Dr., Burbank, CA 91505, 213-848-4465 .... 1A•1094
Johanson Mfg. Corp., 400 Rockaway Valley Rd., Boonton, NJ 07005, 201-334-2676 .... 1A•1095
Kemet, Union Carbide Corporation, Elctrns. Div., Components Dept., Box 5928, Greenville, SC 29606, 803-963-6348 .... 1A•1096-1118
† **Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201, 317-636-5353 .... 1A•1124,1128-1130**
§† **Mepco/Electra, Inc., North American Philips Corp., 5900 Australian Ave., West Palm Beach, FL 33407, 305-842-3201 .... 1B•1013**
Mepco/Electra, Inc., North American Philips Corp., 6071 St. Andrews Rd., Columbia, SC 29210, 803-772-2500 .... 1B•1013
† **Metuchen Capacitors, Inc., 420 Park Ave., Perth Amboy, NJ 08861, 201-442-0500 .... 1A•1138-1146**
Microcap, 11120 Roselle St., San Diego, CA 92121, 619-452-9812 .... 1A•1186-1188
Nytronics Comps. Group Inc., Orange St., Darlington, SC 29532, 803-393-5421 .... 1A•1169-1172
Republic Elctrns. Corp., 176 E. 7th St., Paterson, NJ 07524, 201-279-0300 .... 1A•1182
§† **Tusonix, Inc., 7741 N. Business Park Drive, P.O. Box 37144, Tucson, AZ 85740-7144, 602-744-0400 .... 1A•1206,1207**
Union Carbide Corp., Elctrns. Div., Component Dept., Box 5928, Greenville, SC 29606, 803-963-6348 .... 1A•1096-1117
U S Microtek Components Corporation, 11144 Penrose St., Sun Valley, CA 91352, 818-767-6770 .... 1A•1211
Wesco Electrical Co., 201 Munson St., Greenfield, MA 01301, 413-774-4358 .... 1A•1212-1217
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-9000
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
§† Electron Products, 2084 Central Ave., Duarte, CA 91010 818-359-8281
† Elmag, 54 Clark St., Newark, NJ 07104 201-481-1600
† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Maida Development Co., 20 Libby St., Hampton, VA 23663 804-723-0785
§† Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067 404-952-9777
Presidio Comps., Inc., 7185 Construction Ct., San Diego, CA 92121 619-578-9390
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Southern Electronics, F-Dyne, 726 So. Flower St., Burbank, CA 91502 213-845-2458
† Spectrum Control, Inc., 2185 W. 8th St., Erie, PA 16505 814-455-0966
Sprague Elec. Co., 481 Marshall St., No. Adams, MA 01247 413-664-4411
§† Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473
† TRW Capacitor Div., 301 West "O" St., Ogallala, NE 69153 308-284-3611
§† Voltronics, West St., P.O. Box 366, E. Hanover, NJ 07936 201-887-1517

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§ **Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 .... 1B•1028**
§† **Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039**
§ **Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 .... 1B•1070,1071**
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 .... 1B•1088
§† **Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 .... 1B•1062**
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1703,1704,1713**
§ **Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 .... 1B•1100**
§ **Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244, 603-464-5533 .... 1B•1060,1061**
§ **Visual Communications Co., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 .... 1B•1106-1108**
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 . 617-685-4371
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Atlantic Optical Moulding, Ellis St., P.O. Box 309, Dudley, MA 01570 617-943-1746
Control Inds. Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§† Electrical Inds., 691 Central Ave., Murray Hill, NJ 07974 201-464-3200
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
NOBEX Div., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010 415-342-8170
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Schott Elctrns., Hershey Dr., Ansonia, CT 06401 203-736-2677
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§† Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700

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Caps (MIL)-2440

Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
Presidio Comps., Inc., 7185 Construction Ct., San Diego, CA 92121 619-578-9390

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Cavities, Microwave-3450 — *See Vol. 1A*

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Cells, Load-5500

Data Instruments Inc., 4 Hartwell Pl., Lexington, MA 02173, 617-861-7450 .... 1B•1840
Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 ... 1B•1878
† A.L. Design Inc., 2070 Niagara Falls Blvd., Tonawanda, NY 14150 .. 716-692-6272
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 .... 215-337-5500;800-441-8245
BLH Elctrns., 42 Fourth Ave., Waltham, MA 02254 617-890-6700
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§† Dillon, W. C., & Co., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002

§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 312-289-8820
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 .203-269-7701
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721

Cells, Photoconductive-3700

† **Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749, 818-968-6581 ....1B•1211**
† **Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ....1B•1212, 1213**
§ **Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ....1B•1214, 1215**
§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ....1B•1253**
† **Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ....1B•1233**
A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
† Artech Corp., 2901 Telestar Ct., Falls Church, VA 22042 703-560-3292
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
§ Raytheon Co., 465 Centre St., Quincy, MA 02169 617-479-5300
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

Cells, Photoemissive-3700

Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ....1B•1215
EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ....1B•1253
TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ....1B•1234-1237,1240,1244,1245
A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† Artech Corp., 2901 Telestar Ct., Falls Church, VA 22042 703-560-3292
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Remee Prods. Corp., 41 Bridge St., Florida, NY 10921 914-651-4451
Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901 518-561-3160
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900

Cells, Photovoltaic-3700

† **Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ....1B•1212**
§ **Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ....1B•1215**
§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ....1B•1253**
Franek, John, Co., Inc., P.O. Box 11752, Santa Ana, CA 92711-1752, 14-832-0290;800-854-9420 ....3•1868,1869
General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021, 315-253-7321 ....1A•2094
† **Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ....1B•1233**
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ....1A•2109
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ GNB Batteries Inc., Ind'l. Battery Div., 2010 Cabot Blvd. W., Langhorne, PA 19047 215-752-0555
Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
§ Johnson Controls, Globe Battery Div., 5757 N. Green Bay Ave., Milwaukee, WI 53201 414-228-1200
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§† Solarex Corp., 1335 Piccard Dr., Rockville, MD 20850 301-948-0202
Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 213-365-4611
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

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Chassis (MIL), Electrical-2440

Prototek, Inc., 25 Standen Dr., Hamilton, OH 45015, 513-874-5094 ....2•1893
Ango Electronics Corp., Post Office Box 112, Harrison, NJ 07029 .212-685-6336; 201-483-7116
† CO-ORD Switch Div., LVC Inds., Inc., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
† Optima Enclosures, 2166 Mountain Indl. Blvd., Tucker, GA 30084 ..404-939-6340
† STRONGBOX, P.O. Box 84508, Los Angeles, CA 90073 213-204-0472

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Chokes (MIL)-2440

§† **Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, 213-537-5200 ....1A•1224,1226,1228**
§† **Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301 ....1A•1234,1236-1239**
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ....1A•1274
Renco Elctrns., 60 Jefryn Blvd., E., Deer Park, NY 11729, 516-586-5566 ...1A•1279
§† **TRW Inductive Products Div., 150 Varick St., New York, NY 10013, 212-255-3500 ....1A•2339-2343,2356**
† Atlas Engrg. Corp., 10 Cheney St., Dorchester, MA 02121 617-445-7100
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
§† Delevan Div., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052 716-652-3600
† Elnetic Elctrns., 1730 21st St., Santa Monica, CA 90404 213-828-9541
§† Jeffers Elctrns., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621 .602-287-5851
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11582 ..516-561-6050
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746 213-532-1790
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030 816-761-6314
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800

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Choppers (MIL)-2440

† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Philamon, Inc., 33 Dubon Ct., Farmingdale, NY 11735 516-249-2700

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Circuit Board Holders, Jig Type — See Holders, Circuit Board (Vol. 3)

Circuit Breakers-4300

† **Airpax Corporation, Woods Rd., Cambridge, MD 21613, 301-228-4600 .....1B•1256**
Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ....1B•1548
§† **Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800, 609-882-4800 ....1B•1266,1267**
† **Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ....1B•1472**
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
Brown Boveri Elec., Norristown Rd., Spring House, PA 19477 215-628-7400
§ Bryant Circuit Devices Div., Westinghouse Elec. Corp., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
§ Curtis Inds., 8000 West Tower Ave., Milwaukee, WI 53223 414-354-1500
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
† E-T-A Circuit Breakers, 7400 N. Croname Rd., Chicago, IL 60648 ..312-647-8303
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ Inmark Corp., 147 West Cedar St., Norwalk, CT 06854 203-866-8474
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† Mechanical Products, Amstar, 1824 Kiver St., P.O. Box 729, Jackson, MI 49204 517-782-0391
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SGL Waber, 300 Harvard Ave., Westville, NJ 08093 .609-456-5400;800-257-8384
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
§ Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Underwriters Safety Device, An Allied Co., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
§ Wadsworth Elec., 20 W. 11th St., Covington, KY 41011 606-431-0900
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Circuit Breakers, Boxes, Panel Boards, Enclosures (MIL)-2440

Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800, 609-882-4800 ....1B•1266
§ Mechanical Products, Amstar, 1824 Kiver St., P.O. Box 729, Jackson, MI 49204 517-782-0391

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Clamps (MIL), Cable-2440

§† **Heyco Molded Products, Box 160, Kenilworth, NJ 07033, 201-245-0033; 800-526-4182 .... 2•1861**
TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 .... 2•1641
§ Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510 .516-546-1751
§† All-States, Inc., 1801 W. Foster Ave., Chicago, IL 60640 312-728-0525
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
† Instru-Lec, 520 Homestead Ave., Mt. Vernon, NY 10550 914-668-3754
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 ...312-532-1800
§† Tyton Corp., Box 23055, 7930 N. Faulkner Rd., Milwaukee, WI 53223 414-355-1130

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Clips & Holders, Fuse-4300 (Also See Panels, Fuse)

§ **Atlee Inc., One Gill St., Woburn, MA 01801, 617-933-3510 ....1B•1259**
Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ....1B•1262
Connector Corp., 6025 N. Keystone Ave., Chicago, IL 60646, 312-539-3108 .... 2•1244,1245
§† **FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ....1B•1265**
§† **Keystone Elctrns. Corp., 49 Bleecker St., New York, NY 10012, 212-475-4600 .... 2•1493**
§† **Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 .... 1B•1271-1274**
§ **National Tel-Tronics, State Road Hill, Meadville, PA 16335, 814-724-6440 .... 2•1530**
§ **Power Dynamics, 177 Valley, S. Orange, NJ 07079, 201-762-6886 ....1B•1286**
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 .... 2•1564
Weidmuller Terminations, 821 Southlake Blvd., Richmond, VA 23236, 804-794-2877 .... 2•1748
§ Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510 .516-546-1751
Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
§ Acme Model Engrg. Co., 654 Bergen Blvd., Ridgefield, NJ 07657 ...201-943-7650
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
§ Birtcher Corp., 4501 N. Arden Dr., El Monte, CA 91731 818-575-8144
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877

Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ....201-428-8400; 800-526-9067
Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ....201-DE4-0700
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Components Corp., 6 Kinsey Pl., Denville, NJ 07834 201-627-0290
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
Goldwell Comps., 1815 W. 205th St. Ste. 201, Torrance, CA 90501 213-533-1228
§ Gould Inc., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950 ....617-462-6662/3131
§ Heyco Molded Products, Box 160, Kenilworth, NJ 07033 ....201-245-0033; 800-526-4182
§ Holub Industries, 1701 W. Bethany Rd., Sycamore, IL 60178 815-895-6501
§ Ideal Industries, 4450 Becker Pl., Sycamore, IL 60178 815-895-5181
§ Marathon Special Prods., 13300 Van Camp Rd., Bowling Green, OH 43402 419-352-8441
† Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406 707-523-0600
RDI/Reed Devices Inc., 525 Randy Rd., Carol Stream, IL 60188 312-682-4100
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Seastrom Mfg. Co., Inc., 701 Sonora Ave., Glendale, CA 91201 818-245-9121
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
† Tech-Etch Inc., 45 Aldrin Rd., Plymouth, MA 02360 617-747-0300
§ Underwriters Safety Device, An Allied Co., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
§† Zierick Mfg. Corp., 44 Radio Circle, Mt. Kisco, NY 10549 914-666-2911

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Clips (MIL), Electrical-2440

Mueller Elec. Co., 1583 E 31st St., Dept. 20, Cleveland, OH 44114, 216-771-5225 ....3•1264,1265
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 212-429-0500
Electronics Stamping Corp., Sub. of Buckbee-Mears Co., 19920 S. Alameda St., Rancho Dominguez, CA 90220 213-639-2120
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ....301-881-8124; 800-638-6594
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571
Midland-Ross Corp., Cambion Div., One Airwife Place, Cambridge, MA 02140 617-491-5400

Clocks, Time Keeping — Also See Oscillators, Clock-2200 — *See Vol. 3*

Clutches, Friction-3500

Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, 914-968-8400 ....1B•1156
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101, 212-361-0800 ....2•1763
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ....201-HE7-0720
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 716-876-9685
§ Perfect Gear & Instr., 55 S. Denton Ave., New Hyde Park, NY 11040 516-328-3300
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ....516-ED3-5955
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
§ Vemaline Prods. Div., 487 Jefferson Blvd., Warwick, RI 02886 401-739-7600
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100

Clutches, Magnetic-3500

† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ....1A•2066,2067, 1B•1019,1207,1883,3•1934
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ....201-HE7-0720
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
General Electro-Mechanical Corp., 785 Hertel Ave., Buffalo, NY 14207 716-876-9685
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
§ Perfect Gear & Instr., 55 S. Denton Ave., New Hyde Park, NY 11040 516-328-3300
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200

Clutches, Positive-3500

Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 213-241-5121
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Dial Prods. Co., 19-21 Cottage St., Bayonne, NJ 07002 ....201-HE7-0720
§† Facet Enterprises, Inc., Elmira, NY 14903 607-737-8011
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§ Perfect Gear & Instr., 55 S. Denton Ave., New Hyde Park, NY 11040 516-328-3300
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100

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Automatic Coil Corp., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, 305-883-5311 ....1A•1222,1223
§† Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, 213-537-5200 ....1A•1224,1226,1228
§† Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301 ....1A•1234
§† Delevan Div., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052, 716-652-3600 ....1A•1243
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ....1A•2168
† Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ....1A•2175
† North Hills Elctrns., Alexander Pl., Glen Cove, NY 11542, 516-671-5700 ..1A•1247
Nytronics Comps. Group Inc., Orange St., Darlington, SC 29532, 803-393-5421 ....1A•1248-1267
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ....1A•1271-1273,1275
Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030, 816-761-6314 ....1A•1283-1297
§† TRW Inductive Products Div., 150 Varick St., New York, NY 10013, 212-255-3500 ....1A•2338
Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248, 213-323-4100 ....1A•1276
Amecon, Inc., 1900 S. Chris La., Anaheim, CA 92805 ....714-634-2220; 800-392-2292
Atlantic Magnetics, Inc., P.O. Box 4127, Margate, FL 33063 305-492-5196
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530 516-294-5445
† Midland-Ross Corp., Cambion Div., One Airwife Place, Cambridge, MA 02140 617-491-5400
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
† Syntronic Instruments, Inc., 100 Industrial Rd., Addison, IL 60101 ..312-543-6444
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880

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Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ....1B•1755
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
† Aydin Vector Div., Box 328, Newtown, PA 18940 215-968-4271
† Base Ten Sys., One Electronics Dr., Box 3151, Trenton, NJ 08619 .609-586-7010
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ....818-882-7979/5280
Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702 914-968-8400
† Omnitek, Inc., P.O. Box 102, 820 Pennsylvania Blvd., Feasterville, PA 19047 215-355-4443
§ Phoenix Data, 3384 W. Osborn Rd., Phoenix, AZ 85017 602-278-8528
Serial Lab Prods., Inc., 50 Brigham St., P.O. Box 766, Marlboro, MA 01752 617-481-1684

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Connectors, Fiber Optic-2475

§ **AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 .... 1B•1109-1111**

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 .... 1B•1229

Interoptics, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010, 415-347-7727 .... 1B•1115

ITT Cannon, 10550 Talbert Avenue, P.O. Box 8040, Fountain Valley, CA 92708, 714-964-7400 .... 2•1340,1353

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**

Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355, 805-257-4830 .... 2•1567

TRW Fiber Optic Prods., Connector Div., TRW Elctrn. Comps. Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-922-8900 .... 2•1693,1694

§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304

American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950

§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000

AT&T, 475 South St., Morristown, NJ 07960 201-631-6790

§ Augat Fiberoptics, 40 Perry Ave., Attleboro, MA 02703 617-222-2202

§ Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000

§ Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 317-983-5200

§ Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324

Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300

Component Mfg. Svc., Inc., 1 Component Park, W. Bridgewater, MA 02379 617-580-0111

† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911

Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400

§ Ercona, 2492 Merrick Rd., Bellmore, NY 11710 516-781-2770

General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08817 201-225-4780

§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321

General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400

† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.

Hughes Aircraft Co., Connecting Devices Div., 17150 Von Karman Ave., Irvine, CA 92714 714-660-5701

§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371

Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800

Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373

§ Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800

Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600

Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550

† Optelecom, 15940 Lauanne Dr., Gaithersburg, MD 20760 301-948-4232

Optical Fiber Technologies, Inc., P.O. Box 148, Nutting Lake, MA 01865 617-663-6629

Phalo Corp., Transitron Elctrn. Corp., 530 Boston Tpke., Shrewsbury, MA 01545 617-845-5000

Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860

Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961

Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350

Security Plastics Inc., 14427 N.W. 60th Ave., Miami Lakes, FL 33014 305-823-5440

Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777

SpecTran Corp., Hall Rd., P.O. Box 650, Sturbridge, MA 01566 617-347-2261

Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700

Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750

† TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000

Uniform Tubes, Collegeville, PA 19426 215-539-0700

Connectors, Filtered-2100 — *See Vol. 2*

Connectors, Flat Cable (Incl. Flexible)-2100 — *See Vol. 2*

Connectors, Fused-2100 — *See Vol. 2*

Connectors, Heavy Duty, Power-2100 — *See Vol. 2*

Connectors, Hermetically Sealed, Pressurized, or Waterproof-2100 — *See Vol. 2*

Connectors, High Voltage (1,000 Volts & Over)-2100 — *See Vol. 2*

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Connectors, Magnetron-2100 — *See Vol. 2*

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Connectors, Thermocouple-2100 — *See Vol. 2*

Connectors, Wirewrap (Z-3 Level)-2100 — *See Vol. 2*

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Connectors, Zero & Low Insertion Force-2100 — *See Vol. 2*

Connectors & Terminals, Push-on, Quick Disconnect-2100 — *See Vol. 2*

Connectors (MIL), Flat Cable-2440

† **AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 .... 2•1124,1125**

§ **Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154, 215-969-4200 .... 2•1257**

Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026, 314-392-7174 .... 2•1475,1476

Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355, 805-257-4830 .... 2•1566,1567

Thomas & Betts, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869, 201-469-4000 .... 2•1594,1595

§† Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000

† AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000

Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 212-429-0500

Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401

§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
§† H&T Components Inc., H&T Components Ltd., 87 Sand Pit Rd., Danbury, CT 06810 203-794-1798
§† 3M-Electronic Products Division, 3M Center, Bldg. 225-1N-06, St. Paul, MN 55144 612-733-7408
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 312-532-1800
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§ Robinson-Nugent, Inc., 800 East 8th St., New Albany, IN 47150 812-945-0211
§† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077 216-354-0925
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068

Connectors (MIL), Power-2440

ITT Cannon, 10550 Talbert Avenue, P.O. Box 8040, Fountain Valley, CA 92708, 714-964-7400 ....2•1341-1350
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355, 805-257-4830 ....2•1566
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§† Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Hypertronics Corp., 16 Brent Dr., Hudson, MA 01749 ....617-568-0451; 800-225-9228
§ Ideal Industries, 4450 Becker Pl., Sycamore, IL 60178 815-895-5181
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350
TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428 612-537-1010
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068

Connectors (MIL), Printed Circuit-2440

† AirBorn, Inc., 4321 AirBorn Dr., Addison, TX 75001, 214-931-3200 ....2•1105-1112
† AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ....2•1128,1129
Buggie H. H./Caton Connector Corp., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ....2•1167
Caton Connector Corp., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ....2•1167
Contact Electronics Inc., 30 Plymouth St., Fairfield, NJ 07006, 201-575-7660; 800-221-1451 ....2•1169
† CTS Fabri-Tek, Inc., Connector Div., 9210 Science Center Dr., Minneapolis, MN 55428, 612-533-3533 ....2•1246-1248
§† Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, 605-665-9301 ....2•1250,1252
Edac Inc., 20 Railside Rd., Toronto, ON M3A 1A4 Canada, 416-445-2292 ..2•1261
§† H&T Components Inc., H&T Components Ltd., 87 Sand Pit Rd., Danbury, CT 06810, 203-794-1798 ....2•1325,1326
Industrial Elctrn. Hardware Corp., 109 Prince St., New York, NY 10012, 212-677-1881 ....2•1329
ITT Cannon, 10550 Talbert Avenue, P.O. Box 8040, Fountain Valley, CA 92708, 714-964-7400 ....2•1341,1342
Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026, 314-392-7174 ....2•1475,1476
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ....2•1521
Souriau, Inc., 25158 Avenue Stanford, Valencia, CA 91355, 805-257-4830 ....2•1566,1567
Symbex Corp., 72 Corwin Dr., Box 938, Painesville, OH 44077, 216-354-0925 ....2•1586,1895
Thomas & Betts, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869, 201-469-4000 ....2•1594,1595,1598
§† TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 ....2•1650,1653,1655,1656,1659,1660
§† Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
† AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
Aries Elctrns., Box 130, Frenchtown, NJ 08825 201-996-6841
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 212-429-0500
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
Berg Elctrns., Du Pont Co., 30 Hunter La., Camp Hill, PA 17011 ....800-237-BERG
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 805-969-5805
† CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
† CTS Fabri-Tek, Inc., 6900 Shady Oak Rd., Eden Prairie, MN 55344 612-941-9100
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Dynatech Corp., 1225 E. Wakeham Ave., P.O. Box 1019, Dept. E, Santa Ana, CA 92702 714-558-8755
Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154 215-969-4200
† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311
† Hypertronics Corp., 16 Brent Dr., Hudson, MA 01749 ....617-568-0451; 800-225-9228
§† 3M-Electronic Products Division, 3M Center, Bldg. 225-1N-06, St. Paul, MN 55144 612-733-7408
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
Oxley Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 213-463-5120
§† Panduit Corp., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981 312-532-1800
§† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
Urban Elctrns., P. O. Box 456, Dover, MA 02030 617-329-4068

Connectors (MIL), RF-2440

Buggie H. H./Caton Connector Corp., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ....2•1167
Caton Connector Corp., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, 617-585-4315 ....2•1167
Fischer-America Inc., 13756 Glenoaks Blvd., Sylmar, CA 91342, 818-362-9393 ....2•1275
ITT Pomona Electronics, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766, 714-623-3463 ....2•1388-1390
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936, 215-699-5373 ....2•1522
National Tel-Tronics, State Road Hill, Meadville, PA 16335, 814-724-6440 ....2•1530
§† TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428, 612-537-1010 ....2•1734,1735
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
† AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
Applied Engrg. Prods., P.O. Box A-D, Amity Sta., New Haven, CT 06525 203-387-5282
§† Bendix Corp., Electrical Comps. Div., Sidney, NY 13838 607-563-5324
† Compac, 279 Skidmore Rd., Deer Park, NY 11729 516-667-3933
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
† Sabritec, 16631 Noyes Ave., Irvine, CA 92714 714-549-7350
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
Whittaker Corp., Electronic Resources Div., 100 E. Tujunga Ave., Burbank, CA 91502 818-843-5770

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Contact Cleaners — See Cleaners & Solvents (Vol. 2), Burnishers, Contact (Vol. 2),

Contact Strips, Finger-4525 — *See Vol. 2*

Contactors (MIL)-2440

† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
§† Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000

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Contacts (MIL), Assemblies & Holders-2440

§† Appleton Elctrns., 2205 12th Ave., So. Milwaukee, WI 53172 414-764-7200
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 212-429-0500
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ....818-882-7979/5280
† Dataware Sys. Lease, Inc., 30 Bay St., Staten Island, NY 10301 212-447-4911
† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311
Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 401-769-3800
§† Flight Connector Corp., Dubilier America, 233 E. Manville St., Rancho Dominguez, CA 90220 213-631-1133
† TRW Cylindrical Connector Div., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428 612-537-1010

Containers, Shielded (All Types) — See Enclosures, Shielded (Vol. 2)

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Controllers, Energy Conservation-2200 — *See Vol. 3*

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Controllers, Magnetic Tape Drive, Standalone-2000 — *See Vol. 3*

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Controllers, Memory Device, Standalone-2000 — *See Vol. 3*

Controllers, Paper Tape Reader/Punch, Add-in-2000 — *See Vol. 3*

Controllers, Paper Tape Reader/Punch, Standalone-2000 — *See Vol. 3*

Controllers, Plotter, Add-in-2000 — *See Vol. 3*

Controllers, Plotter, Standalone-2000 — *See Vol. 3*

Controllers, Printer, Add-in-2000 — *See Vol. 3*

Controllers, Printer, Standalone-2000 — *See Vol. 3*

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Controls, Computer Input, Joysticks, Mouse Devices, etc.-2000 — *See Vol. 3*

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Cooling/Heating Modules, Thermoelectric-5300

† **Melcor/Materials Elctrn. Prods., 994 Spruce St., Trenton, NJ 08648, 609-393-4178 .... 2•1828,1829**
TECA, ThermoElectric Cooling America Corp., 448 N. Halsted St., Chicago, IL 60622, 312-666-1600 .... 2•1805
§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 818-765-8300
§ Casso-Solar, 3 Pearl Ct., Allendale, NJ 07401 201-825-4600
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
† Marlow Inds., 10451 Vista Park Rd., Dallas, TX 75238 214-340-4900
Midland-Ross Corp., Cambion Div., One Airwife Place, Cambridge, MA 02140 617-491-5400
Products for Resch., 88 Holten St., Danvers, MA 01923 617-774-3250
† Sensortek, Inc., 154 Huron Ave., Clifton, NJ 07013 201-779-5577
§ Temptronic, 55 Chapel St., Newton, MA 02158 617-969-2501
Thomson-CSF Comps. Corp., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070 201-438-2300
† Varo, Inc., Electron Devices Div., 2203 W. Walnut St., Garland, TX 75040 214-272-3561

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Couplers, Fiber Optic-2475

Aetna Telecommunications Labs., P.O. Box 723, 131 Flanders Rd., Westborough, MA 01581 617-366-0400
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
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§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
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Plainview Elctrns., 28 Cain Dr., Plainview, NY 11803 516-249-6677
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

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Couplers (MIL), Directional-2440

Technical Research & Mfg., Inc., R.F.D. 0, Manchester, NH 03103, 603-627-6000 ....1B•1014
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ....207-655-4555;800-341-9678
† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
Junction Devices, Inc., 2488-A Townsgate Rd., Westlake Village, CA 91361-2594 ....213-889-4030;805-497-4421
† M/A-COM Millimeter Prods., Inc., South Ave., Burlington, MA 01803 617-272-3000
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800

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Crystals, Semiconductor(Ingots & Wafers)-2300 — *See Vol. 1A*

Crystals, YIG-2300 — *See Vol. 1A*

Crystals (MIL)-2440

† Bliley Elec. Co., 2545 W. Grandview Blvd., Erie, PA 16506, 814-838-3571 ....A•1316,1318,1320
Croven Crystals, 500 Beech St., Whitby, ON L1N 5S5 Canada, 416-668-3324 ....1A•1346
CTS Knights, 400 Reimann Ave., Sandwich, IL 60548, 815-786-8411 ....1A•1336, 1338,1339
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377, 212-458-5811 ....1A•1356
McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, 717-486-3411 ....1A•1374-1376
Monitor Prods. Co., Inc., 502 Via Del Monte, Oceanside, CA 92054, 619-433-4510 ....1A•1389
M-Tron Inds., P.O. Box 630, E. Hwy. 50, Yankton, SD 57078, 605-665-9321 ....1A•1393
§ Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ....1A•1394
Reeves-Hoffman Div., 400 W. North St., Carlisle, PA 17013, 717-243-5929 ....1A•1414
Sokol Crystal Prods. Inc., 121 Water St., Mineral Point, WI 53565, 608-987-3363 ....1A•1422,1425
† Valpey-Fisher, 75 South St, Hopkinton, MA 01748, 617-435-6831 ....1A•1435
† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944
§ Midland-Ross Corp., NEL Unit, 357 Beloit St., Burlington, WI 53105 414-763-3591
† Piezo Crystal, 100 "K" St., Box 619, Carlisle, PA 17013 717-249-2151

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Current Limiters (MIL)-2440

† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300

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Data Display Systems — See Displays, CRT (Vol. 1A), Terminals, Data Display (Vol. 3),

Data Links, Fiber Optic-2475

Amplifier Research, 160 School House Rd., Souderton, PA 18964-9990, 215-723-8181 .... 3•1003
Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901, 305-725-8000 ....1B•1257
Interoptics, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010, 415-347-7727 ....1B•1114
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Augat Fiberoptics, 40 Perry Ave., Attleboro, MA 02703 617-222-2202
§ Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 317-983-5200
Canoga Data Sys., 6740 Eton Ave., Canoga Park, CA 91303 213-888-2003
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-9000
§ Dynamic Measurements, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
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† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
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§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 .914-425-2000
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
3M-Electronic Products Division, 3M Center, Bldg. 225-1N-06, St. Paul, MN 55144 612-733-7408
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 415-577-7236
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ......CA 415-965-0910;800-221-7060
Signatron, 12 Hartwell Ave., Lexington, MA 02173 617-861-1500
Telemet, 185 Dixon Ave., Amityville, NY 11701 516-842-2300

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Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ......1B•1117
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† Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749 818-968-6581
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BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
† Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054 201-233-7200
Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
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† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ......Call Local Sls. Off.
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M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
Photon Technlg., 14125 Capri Dr. , Los Gatos, CA 95030 408-866-0566
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ......CA 415-965-0910;800-221-7060
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Spiricon Inc., 2600 North Main, Logan, UT 84321 801-753-3729
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

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† Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750, 305-339-4356/4355 ..... 3•1004
† Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ..... 1B•1212
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021, 315-253-7321 ..... 1A•2094
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386, 612-443-2500 ..... 1B•1219
TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ..... 1B•1234-1237,1240,1244,1245
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165
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Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
† Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
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† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
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Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
Sanders Assocs., Flexprint Prods. Div,, Grenier Fld., Manchester, NH 03103 603-669-4615
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
† Scientech, Inc., 5649 Arapahoe Ave., Boulder, CO 80303 ..... 303-444-1361; 800-525-0522
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View; CA 94043 ..... CA 415-965-0910;800-221-7060
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
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Spiricon Inc., 2600 North Main, Logan, UT 84321 801-753-3729
† Thermometrics, Inc., 808 U.S. Hwy. , Edison, NJ 08817-4695 201-287-2870
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516
§ Victory Engrg. Corp., Victory Rd., Springfield, NJ 07081 201-379-5900

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Diode Arrays (Incl. Photo)-3700

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K & M Elctrns., 123 Interstate Dr., W. Springfield, MA 01089, 413-781-1350 ..... 1A•1883
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ..... 1B•1233
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† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
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§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ..... Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Hughes Aircraft Co., 6155 El Camino Real, Carlsbad, CA 92008 619-438-9191
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565

McGuirk Electronics Co. Inc., York St. P.O. Box 101 S.V., Andover, MA 01810 617-933-3500
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
† Micro Semiconductor, 2830 S. Fairview St., Santa Ana, CA 92704 ..714-979-8220
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
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Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
Rohm Corp., 8 Whatney, Irvine, CA 92714 714-855-2131
§ Semtech, 652 Mitchell Rd., Newbury Park, CA 91320 213-628-5392
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
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† Solid State Devices, 14830 Valley View Ave., La Mirada, CA 90638 213-921-9660
Spiricon Inc., 2600 North Main, Logan, UT 84321 801-753-3729
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254 617-890-6107
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516
† Voltage Multipliers, Inc., 8711 W. Roosevelt Ave., Visalia, CA 93291 209-651-1402

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Diodes, Light Emitting (LEDs)-3700

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1029
§ AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 ....1B•1025
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ....1B•1027
Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 .....1B•1212, 1213
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1038
Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ....1B•1608
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 .....1B•1253
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 ....1B•1056
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, 714-538-9752/9753 ....1B•1058
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ....1B•1223,1224
Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 .. 1B•1020,1064-1070, 1072,1073,1083
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1084
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ....1B•1088
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093, 516-822-9601 ....1A•2098
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 212-392-8800 .1B•1089
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ....1B•1062
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1092
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069, 214-542-9461 ....1B•1232
† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 .....1B•1094
§ Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ....1B•1098-1101
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ....1A•2109
§† A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
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† Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
Data Display Products, Box 91072, Los Angeles, CA 90009 213-674-5940
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
§† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
§ Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801 617-935-4442
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HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ....Call Local Sls. Off.
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§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
§† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 ...201-249-7000
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§ Liberty Intl. Corp., First Resistor & Condenser Co., Ltd., 2539 237th St., Suite F, Torrance, CA 90505 213-539-6452
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565
§† M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
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Micropac Inds., Inc., General Sensors Div., 905 E. Walnut St., Garland, TX 75040 214-272-3571
National Semiconductor Optoelectronics, 365 Jordan Road, Troy, NY 12180-8396 518-271-2100
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 ..201-748-5089
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan 03-471-8548
§† Paccom, 3928 148th NE, Redmond, WA 98052 ....206-883-9200;800-426-6254
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§ Rohm Corp., 8 Whatney, Irvine, CA 92714 714-855-2131
§ Sanken Elec. Co., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan 03-986-6151
Sanken Elec. U.S.A. Corp., 3848 Carson St., Ste. 105, Torrance, CA 90503 213-540-2209
§ Sanyo Semiconductor Corp., 7 Pearl Ct., Allendale, NJ 07401 201-825-8080
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, HP2 4SG England 0442-40471/6
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ Stanley/AC Interface, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626 714-979-9830
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Teknational Inds., Inc., 430 S. Clinton Ave., Rochester, NY 14620 ..716-232-1291
Visual Communications Co., P.O. Box 986, El Segundo, CA 90245 .213-822-4727
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
Zexco, 7661 Densmore, , Van Nuys, CA 91406 818-997-7895

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Diodes, Liquid Crystal (LCDs)-3700

Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ Stanley/AC Interface, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626 714-979-9830

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Diodes, Microwave Mixer-4800 — *See Vol. 1A*

Diodes, Noise-4800 — *See Vol. 1A*

Diodes, Photoelectric-3700

† **Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749, 818-968-6581 .... 1B•1211**
† **Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ..... 1B•1212, 1213**
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§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ..... 1B•1253**
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§† **Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 .... 1B•1225,1229,1230**
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§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
Cherry Semiconductor Corp, 2000 S. County Trail, East Greenwich, RI 02818 401-885-3600
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Ferranti Elec., 87 Modula Ave., Commack, NY 11725 516-543-0200
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§ Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
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Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 .. 201-748-5089
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optoelectronics, Inc., 1309 Dynamic St., Petaluma, CA 94952 707-763-4181
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Santa Barbara Resch. Ctr., 75 Coromar Dr., Goleta, CA 93117 805-968-3511
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§† Solarex Corp., 1335 Piccard Dr., Rockville, MD 20850 301-948-0202
§† Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

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Diodes (MIL)-2440

† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015
† Standard Reference Labs, Inc., Coan Pl., Metuchen, NJ 08840 201-549-9280
§† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880

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§ **AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 .... 1B•1023,1024**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... 1B•1769
Crystaloid Elctrns., Box 628, Hudson, OH 44236, 216-655-2429 .... 1B•1031
Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 .... 1B•1032-1034
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 .... 1B•1036,1037
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 .... 1B•1040-1043
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... 1B•1085,1781
§ **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ..... 1B•1094**
§ **Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 .... 1B•1095**
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 .... 1B•1105
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 .... 3•1355
Astec USA, Ltd., A BSR Intl. Co., 2880 San Tomas Expwy., 00, Santa Clara, CA 95051 408-748-1200
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
§ Chrono-log Corp., 2 W. Park Rd., Havertown, PA 19083 215-853-1130
Computerwise, 4006 E 137th Terr., Grandview, MO 64030 816-765-3330
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Digital Equip., One Iron Way, Marlborough, MA 01752 ....
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
Durgin & Browne, 80 Allen Rd., So. Burlington, VT 05401 802-863-6873
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 .. 201-238-1223
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Hazeltine Corp., 500 Commack Rd., Commack, NY 11725 516-462-5100
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
International Instrumentation, 31131-602 Via Colinas, Westlake Vlg., CA 91362 213-991-9614
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427

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† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

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Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ....1B•1046,1047
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1710
Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
Crystaloid Elctrns., Box 628, Hudson, OH 44236 216-655-2429
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Panelgraphic Corp., 10 Henderson Dr., W. Caldwell, NJ 07006 201-227-1500
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Displays, Electroluminescent-2450

Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 ...603-889-2500
Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086 408-744-0100
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

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Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 ....1B•1105

Displays, Electromechanical-2450

Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 ....1B•1105
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809 219-747-3121
Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Electrodynamics, Inc., A Talley Inds. Co., 1200 Hicks Rd., Rolling Meadows, IL 60008 312-259-0740
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211

Displays, Fiber Optic-2450

ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Radiometrics, Inc., 12021 South Memorial Pkwy., Huntsville, AL 35803 205-881-1272

Displays, Graphic-2450

§ AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 ....1B•1023,1024
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ....1B•1769
Crystaloid Elctrns., Box 628, Hudson, OH 44236, 216-655-2429 ....1B•1031
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ....1B•1036
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ....1B•1046,1047
Dixson, Inc., Instrument Div., Box 1449, Grand Junction, CO 81502, 303-242-8863 ....3•1325
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, 714-538-9752/9753 ....1B•1058
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1781
Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 ....1B•1095
Telpar, Inc., P.O. Box 796, 4132 Billy Mitchell Rd., Addison, TX 75001, 214-233-6631 ....3•1096
Wavetek Indiana, Inc., 5808 Churchman, Beech Grove, IN 46107, 317-787-3332 ....3•1318
† Alden Elctrns. Inc., Washington St., Westboro, MA 01581 617-366-8851
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
§ Auto-trol Tech., 12500 N. Washington St., Denver, CO 80233 303-452-4919
† Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
§† Aydin Controls, 414 Commerce Dr., Ft. Washington, PA 19034 215-542-7800
† Conrac Corp., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010 213-359-9141
CPS Inc., 110 Wolfe Rd., Sunnyvale, CA 94086 408-738-0530
§ Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601 402-564-3131
Data Ray Corp., 8401 Baseline Rd., Boulder, CO 80303 303-494-4444
Digital Elctrns., 26142 Eden Landing Rd., Ste, 2, Hayward, CA 94545 415-786-0520
Digital Equip., One Iron Way, Marlborough, MA 01752 ....
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
Evans & Sutherland Computer Corp., P.O. Box 8700, 580 Arapeen Dr., Salt Lake City, UT 84108 801-582-5847
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 ..201-238-1223
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
Genstar Rental Elctrns., 2445 Faber Pl., Palo Alto, CA 94303 415-856-7600
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Image Technology Methods Corp., 103 Moody St., Waltham, MA 02154 617-894-1720
KMC Systems Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
Lexidata Corp., 755 Middlesex Tpke., Billerica, MA 01865 ....617-663-8550; 800-472-4747
Lundy Elctrns. and Systems, Inc., 1 Robert La., Glen Head, NY 11545 516-671-9000
§ Megatek Corp., 9605 Scranton Rd., San Diego, CA 92121 619-455-5590
Metra Instrs., 2056 Bering Dr., San Jose, CA 95131 408-297-8530
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
Noritake Elctrns., Inc., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., Torrance, CA 90505 213-373-6704
Peritek Corp., 5550 Redwood Rd., Oakland, CA 94619 415-531-6500
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 .213-603-0400
§ Ramtek, 2211 Lawson Lane, Santa Clara, CA 95050 408-988-2211
Raster Graphics, PO Box 23334, Tigard, OR 97223 503-620-2241
† SAI Technlg. Co., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121 619-452-9150
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§ Summit CAD Corp., 5222 FM 1960 W100, Houston, TX 77069 713-440-1468
† Systems Resch. Labs., Inc., 2800 Indian Ripple Rd., Dayton, OH 45440 513-426-6000
† Tektronix, Inc., P.O. Box 500, V3-314, Beaverton, OR 97077 ....800-547-1512; Oregon only 800-452-1877

Displays, Indicator Lights-2450

General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 ....1B•1056
† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ....1B•1094
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
§† Digitech Inds., Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ....312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ....Call Local Sls. Off.
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Displays, Graphic Systems-2000 — *See Vol. 3*

Displays, Laser-2450

Laser Concepts, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040 206-232-6256
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541

Displays, Light-emitting Diode (LED)-2450

§ AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 ....1B•1025
Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 .1B•1030
§ Chrono-log Corp., 2 W. Park Rd., Havertown, PA 19083, 215-853-1130 ....3•1074
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ....1B•1575
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 ....3•1126,1127
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ....1B•1040-1044

§ **General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 .... 1B•1056**
Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, 714-538-9752/9753 .... 1B•1058
§† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... 1B•1084**
Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 .... 1B•1650
Newport Electronics, 630 E. Young St., Santa Ana, CA 92705, 714-540-4914 .... 3•1343
§† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 .... 1B•1094**
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 .... 3•1355
§ A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
American Elctrn. Labs., Inc., Hybrid/MIC Div., P.O. Box 552, Lansdale, PA 19446
Artisan Elctrns., 5 Eastmans Rd., Parsippany, NJ 07054 201-887-7100
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054 201-233-7200
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 .513-254-6251
§† Digitech Inds., Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§ Electro Industries, Div. E.I. Elctrns. Inc., 316 Westbury Ave., Carle Place, NY 11514 516-334-0870
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 .617-890-7440
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Innovatek Microsystems, Inc., Smithfield Rd., Millerton, NY 12546 ..914-373-9003
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
§ International Microtronics Corp., 4016 E. Tennessee St., Tucson, AZ 85714 602-748-7900
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Matrix Corp., 1639 Green St., Raleigh, NC 27603 919-833-2837
§ National Semiconductor Optoelectronics, 365 Jordan Road, Troy, NY 12180-8396 518-271-2100
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 408-745-6520
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 312-289-8820
§ Paccom, 3928 148th NE, Redmond, WA 98052 .... 206-883-9200;800-426-6254
Pho-Tronics, 8701 W. Bradley Rd., Milwaukee, WI 53224 414-355-6704
Rohm Corp., 8 Whatney, Irvine, CA 92714 714-855-2131
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 .... CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§ Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
Siemens Corp., 186 Wood Ave., S., Iselin, NJ 08830 201-494-1000
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
Southern Computer Corp., 3720 N, Stratford Rd. N.E., Atlanta, GA 30342 404-231-5363
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Telesis Laboratory, Box 1972, Chillocothe, OH 45601 614-642-5000
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Displays, Lighted Segment-2450

§ **AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 .... 1B•1024**
Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 .1B•1030
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... 1B•1769
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... 1B•1575**
Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 .... 1B•1032,1033
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 .... 1B•1036,1037
§ **Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039**
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 .... 1B•1040-1044
§† **General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 .... 1B•1056**
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... 1B•1063
† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... 1B•1084**
Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 .... 1B•1650
§ **NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 .... 1B•1091**
† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 .... 1B•1094**
Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706, 516-666-8000 .... 1B•1105
§ A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
† Day-light Display Corp., 4 Barnet Rd., P.O. Box 694, Pine Brook, NJ 07058 201-575-1045
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Durgin & Browne, 80 Allen Rd., So. Burlington, VT 05401 802-863-6873
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 ..201-238-1223
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700

Displays, Liquid Crystal (LCD)-2450

§ **AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 .... 1B•1023,1024**
Crystaloid Elctrns., Box 628, Hudson, OH 44236, 216-655-2429 .... 1B•1031
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 .... 3•1126,1127
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 .... 1B•1037
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502, 201-874-4747 .... 1B•1053-1055
§ **Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... 1B•1063**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... 1B•1084,1085
Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500; 800-631-2165 .... 3•1132
NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 .... 3•1339
§† **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 .... 1B•1094**
§ **Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505, 213-530-8777 .... 1B•1095**
§ **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096**
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 .... 3•1355
§ A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
Amperex Elctrn. Corp., Slatersville Div., Providence Pike, Slatersville, RI 02876 401-762-3800
Arstan Products Intl. Ltd., 99 Jericho Tpke., Jericho, NY 11753 516-333-8100
Computerwise, 4006 E 137th Terr., Grandview, MO 64030 816-765-3330
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 .617-890-7440
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
† Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 ..201-238-1223
§ General Electric Co., Liquid Xtal Displays Oper., 24000 Mercantile Rd., Beachwood, OH 44122 216-831-8100
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
International Instrumentation, 31131-602 Via Colinas, Westlake Vlg., CA 91362 213-991-9614
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086 408-744-0100
§ Thor Elctrns., 321 Pennsylvania Ave., Linden, NJ 07036 201-486-3300
† UCE, Inc., 24 Fitch St., Norwalk, CT 06855 203-838-7509

Displays, Planar Gas Discharge-2450

Canyon Elctrns., 2001 W. North Lane, Phoenix, AZ 85021, 602-944-4421 .1B•1030
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ....1B•1769
§ **Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ....1B•1032**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1085,1781
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
Displays, Inc., Mifflin Countey Indl. Pk., Rte. 4, Box 6AAA, Lewistown, PA 17044 717-242-2541
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 .516-694-3600
§† Interstate Electronics Corp., Box 3117, 1001 E. Ball Rd., Anaheim, CA 92803 714-635-7210
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
§ PlasmaGraphics Corp., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060 201-757-5000
† SAI Technlg. Co., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121 619-452-9150

Displays, Plasma-2450

§ **Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, 402-564-3131 ....1B•1032-1034**
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ....1B•1036
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1085
§ PlasmaGraphics Corp., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060 201-757-5000
Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541

Displays, Projection Type (CRT; Electromechanical; ilm; Light Valve)-2450

† **Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1781**
† **Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 ....1B•1791**
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
§ Data General, 4400 Computer Dr., Westboro, MA 01581 617-366-8911
Data Ray Corp., 8401 Baseline Rd., Boulder, CO 80303 303-494-4444
§ Datatron, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
Densitron Corp., 20775 Western Ave., Torrance, CA 90501 213-618-9647
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ....201-CA8-0321
Dotronix, 160 First St. SE, New Brighton, MN 55112 612-633-1742
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† E-Systems, Garland Div., Box 226118, Dallas, TX 75266 214-272-0515
General Instr., Govt. Sys., 600 W. John St., Hicksville, NY 11802 516-733-3000
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Lexidata Corp., 755 Middlesex Tpke., Billerica, MA 01865 ....617-663-8550; 800-472-4747
Memorex Corp., San Thomas at Central Expwy., Santa Clara, CA 95052 408-987-1000
Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
† Orbit Instrument of Cal., 6431 Global Dr., Cypress, CA 90630 714-527-0561
Sanders Assocs., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103 603-669-4615
§† Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541
† Systems Resch. Labs., Inc., 2800 Indian Ripple Rd., Dayton, OH 45440 513-426-6000
Tektronix, Inc., P.O. Box 500, V3-314, Beaverton, OR 97077 ....800-547-1512; Oregon only 800-452-1877
† Terminal Data Corp., 11878 Coakley Circle, Rockville, MD 20852 301-881-7655
Wavetek Rockland Scientific, Inc., 10 Volvo Dr., Rockleigh Indl. Pk., Rockleigh, NJ 07647 201-767-7900

Displays, Status-2450

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ....1B•1769
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880, 617-246-1720 ....3•1126,1127
† **Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ....1B•1046,1047**
§ **NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 ....3•1088, 1136,1167,1341**
§† **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096**
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 201-722-9800
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 513-831-4347
§ Datatron, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
Datum Inc., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806 714-533-6333
† Day-light Display Corp., 4 Barnet Rd., P.O. Box 694, Pine Brook, NJ 07058 201-575-1045
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 212-497-7600
§† Digitech Inds., Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§† E-Systems, Garland Div., Box 226118, Dallas, TX 75266 214-272-0515
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
† Infodex, Inc., 395 W. Main St., Waterbury, CT 06702 203-757-9291
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
KMC Systems Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
§ Mitsubishi Elctrns., Industrial Electronics Div., 991 Knox Street, Torrance, CA 90502 213-515-3993
† Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 .213-603-0400
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Show 'N Tell Products, AMG, Inc., 155 Franklin Street, Dayton, OH 45402 513-223-8211
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Telesis Laboratory, Box 1972, Chillocothe, OH 45601 614-642-5000

Displays, Storage Tube — See Displays, CRT (Vol. 1A)

Displays, Touch Sensitive (Infrared & Membrane)-2450

Carroll Touch Technology, P.O. Box 1309, Round Rock, TX 78680, 512-244-3500 ....3•1072,1073
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1781
Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 ....1B•1791
§ **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ....1B•1094**
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809 219-747-3121
General Digital, 700 Burnside Ave., E. Hartford, CT 06108 203-528-9041
§ GMR Inc., Computer Elctrns., 1048 E. Burgrove St., Carson, CA 90746 213-639-4663
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Sun-Flex Co., Inc., 20 Pimentel Ct., Novato, CA 94947 415-883-1221
Zenith Components & Sys. Grp., Zenith Radio Corp., 1000 Milwaukee Ave., Glenview, IL 60025 312-391-7733
† Zenith CRT & Components Operations, 1000 Milwaukee Ave., Glenview, IL 60025 312-391-7733

Displays, Tube — See Tubes, Readout (Vol. 1A)

Displays, Vacuum Fluorescent-2450

Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1085
Digital Elctrns., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545 415-786-0520
Noritake Elctrns., Inc., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., , Torrance, CA 90505 213-373-6704

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Drawers, Sliding-1400 — *See Vol. 2*

Drills & Accessories, Manual & Power-5400 — *See Vol. 2*

Drives, Disc, Flexible and Rigid-2000 — *See Vol. 3*

Drivers & Decoders For Readouts-2450

Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 .... 1B•1791
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 212-497-7600
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Exar Integrated Sys., P.O.B. 62229, Sunnyvale, CA 94088 408-732-7970
§ Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
§† Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92663 714-759-2411
§ LSI Computer Sys., 1235 Walt Whitman Rd., Melville, NY 11747 516-271-0400
§ Paccom, 3928 148th NE, Redmond, WA 98052 .... 206-883-9200;800-426-6254
§† RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
§† RCA Solid State Div., CMOS IC Mktg., Rte. 202, Somerville, NJ 08876 201-685-6000
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
§ Signetics, 811 E. Arques Ave., Sunnyvale, CA 94086 408-739-7700
§† Sprague Elec. Co., Semiconductor Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086 408-744-0100
Sylvania Electronic Components, Philips ECG Inc.; A North American Philips Co., 100 First Ave., Waltham, MA 02254 617-890-6107
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§† Teledyne Semiconductor, 1300 Terra Bella Ave., Mountain View, CA 94040 415-968-9241
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700

Drivers, Chopper-1100 — *See Vol. 3*

Drivers, Nut-5400 — *See Vol. 2*

Drivers, Solenoid-4550

† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 .... 1B•1472
† Circuit Techn., 160 Smith St., Farmingdale, NY 11735 516-293-8686
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Voltex, 3460 Great Neck Rd., Amityville, NY 11701 516-842-2772

Drivers, Speaker-1300 — *See Vol. 3*

Drivers, Switch-3450 — *See Vol. 1A*

Drivers, Tube — See Drivers & Decoders for Readouts (Vol. 1B)

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Dummy Loads (MIL), RF-2440

† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
† Compac, 279 Skidmore Rd., Deer Park, NY 11729 516-667-3933
Continental Electronics Mfg. Co., P.O. Box 270879, Dallas, TX 75227 214-381-7161
† Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
† M/A-COM Millimeter Prods., Inc., South Ave., Burlington, MA 01803 617-272-3000

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ECM Sets (MIL), Shipboard-3475 — *See Vol. 3*

ECM Systems (MIL)-3475 — *See Vol. 3*

ECM Systems (MIL), Deceptive-3475 — *See Vol. 3*

Electronic Intelligence (Elint) (MIL)-3475 — *See Vol. 3*

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ESM Systems (MIL), Automated-3475 — *See Vol. 3*

ESM Systems (MIL), IFM Receiver-3475 — *See Vol. 3*

Electronic Warfare (EW) Sets (MIL)-3475 — *See Vol. 3*

EW Sets (MIL), Ground Multitarget-3475 — *See Vol. 3*

EW Sets (MIL), Portable-3475 — *See Vol. 3*

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EW Systems (MIL), Advanced Airborne Multitarget-3475 — *See Vol. 3*

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Electrostatic Discharge (MIL)-2440

Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 617-448-5485
† KeyTek Instr. Corp., 12 Cambridge St., Burlington, MA 01803 617-272-5170
Schaffner EMC Inc., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083 201-851-0644
Simco Co., 2257 North Penn Rd., Hatfield, PA 19440 215-822-2171

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Emitter Location & Identification System (MIL), Automatic Ground Transportable-3475 — *See Vol. 3*

Emitters, Fiber Optic-2475 (Also See Diodes, Laser)

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 .... 1B•1230
§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 .... 1B•1117
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Deutsch Co., Deutsch Fiber Optics Div., 7001 W. Imperial Hwy., Los Angeles, CA 90045 213-649-1400
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
General Fiber Optics, Inc.,, P.O. Box 82, Caldwell, NJ 07006 201-228-4400
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
RCA Solid State Div., Route 202, Somerville, NJ 08876 201-685-6000
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Thomson-CSF Comps. Corp., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070 201-438-2300
Zexco, 7661 Densmore, , Van Nuys, CA 91406 818-997-7895

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Encoders, Displacement, Linear-5500

Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 .... 3•1138
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 3•1934
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6000
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9316 Deering Ave., Chatsworth, CA 91311 818-882-0424
Disc Instrs., 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
Elm Systems, 1101 Brown St., Wauconda, IL 60084 312-526-5003
§ Encoder Prods., 1601B Dover Rd., Sandpoint, ID 83864 208-263-8541
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Farrand Controls, Div. of Farrand Inds., 99 Wall St., Valhalla, NY 10595 .... 914-RO1-2600
§ Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161 617-969-7300
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
§ Perfect Gear & Instr., 55 S. Denton Ave., New Hyde Park, NY 11040 516-328-3300
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, 131 East Ames Ct, Plainview, NY 11803 516-349-1950
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100

Encoders, Fiber Optic-2475

Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000

Encoders, Magnetic Strip-5500

Xico, Inc., 120 Ocean Way, Santa Monica, CA 90402, 213-454-0302 .... 3•1104
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Elcom Industries, Inc., 10268 Bach Blvd., St. Louis, MO 63132 314-429-3100
Vertel Inc., P.O. Box 535, 125 Ellsworth St., Clifton, NJ 07012 201-472-1331

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Encoders, Shaft Angle, Contacting-5500

Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 .... 1B•1124
BEI Motion Systems Co., Corporate Off., 681 Market St., Ste. 741, San Francisco, CA 94105, 415-974-1275 .... 1B•1832¢5561;5562;5563;5564;5565
Computer Prod. Div., BEI Motion Sys. Co., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, 619-471-2600 .... 1B•1832
BEI Motion Sys. Co., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238, 412-963-0515 .... 1B•1832
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, 805-968-0782 .... 1B•1832
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, 805-966-1538 .... 1B•1832
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 .... 3•1145
ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 .... 3•1161
§ Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 .... 1B•1848
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. F2, Vista, CA 92083, 619-727-7430 .... 1B•1166
Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 .... 3•1138
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 .... 1B•1177
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 1A•2066,2067, 1B•1019,1207,1883,3•1934
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086 408-744-0100
Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351

Encoders, Shaft Angle, Magnetic-5500

ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 .... 3•1161
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500; 800-631-2165 .... 3•1132
Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 .... 3•1138

Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... 1B•1177
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
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† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Farrand Controls, Div. of Farrand Inds., 99 Wall St., Valhalla, NY 10595 ..... 914-RO1-2600
Innovatek Microsystems, Inc., Smithfield Rd., Millerton, NY 12546 914-373-9003
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
Real Time Sys., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550 914-667-0425
† Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541
§ Temposonics, 131 East Ames Ct, Plainview, NY 11803 516-349-1950
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100

Encoders, Shaft Angle, Optical-5500

† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... 1B•1139
Datametrics Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ..... 1B•1841
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... 1B•1143
† Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161, 617-969-7300 ..... 1B•1845
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500; 800-631-2165 ..... 3•1132
§ Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 ..... 1B•1848
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ..... 1B•1163
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ..... 1B•1849
Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 ..... 3•1138
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 ..... 1B•1172
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 ..... 1B•1172,1873
Renco, 26 Coromar Dr., Goleta, CA 93017-3094, 805-968-1525 ..... 1B•1874,1875
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 ..... 1B•1177
U.S. Digital, 12371 Kensington Rd., Los Alamitos, CA 90720, 213-594-0094 ..... 1B•1881
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... 1A•2066,2067, 1B•1019,1207,1883,3•1934
B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117 805-968-0782
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103 805-966-1538
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§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
Elm Systems, 1101 Brown St., Wauconda, IL 60084 312-526-5003
§ Encoder Prods., 1601B Dover Rd., Sandpoint, ID 83864 208-263-8541
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Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ..... Call Local Sls. Off.
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
† Measurement Sys., Inc., 121 Water St., Norwalk, CT 06854 203-838-5561
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Oriel Corp., 250 Long Beach Blvd., Stratford, CT 06497-0872 203-377-8282
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 213-882-4100
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
Wide Range Elctrns. Corp., 2119 Schultz Rd., St. Louis, MO 63141 314-567-5366

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Fiber Optics (MIL)-2440

Artel Communications Corp., 93 Grand St., Worcester, MA 01602 617-752-5690
† Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
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† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ..... 312-231-3511; 312-932-9380
Galileo Electro-Optics Corp., Galileo Pk., Sturbridge, MA 01518 617-347-9191
Gandalf Data, Inc., 1019 S. Noel Ave., Wheeling, IL 60090 312-541-6060
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ..... Call Local Sls. Off.
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§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
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† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998 213-828-7496
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
Orionics, Inc., 34368E Frontage Rd., Bozeman, MT 59715 406-586-8256
Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ....203-265-5533;800-243-3959
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
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† Times Fiber Communications, Inc., 358 Hall Ave., Wallingford, CT 06492 203-265-8500
† TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000
† Valtec, Sub. of U.S. Philips, 99 Hartwell St., West Boylston, MA 01583 617-835-6082

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† JMJ Technical Prods., P.O. Box 26, Kendall Park, NJ 08824, 201-589-4257 .... 2•1780
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 .... 2•1785
† AME Corp., 101 E. Main St., Little Falls, NJ 07424 201-256-3939
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† Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 .... 212-HI5-0400
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 ..213-603-0400
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SGL Homalite, Div. of SGL Inds., 11 Brookside Dr., Wilmington, DE 19804 302-652-3686

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Filters, Display-2450

† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
† Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 .... 212-HI5-0400
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§ Sun-Flex Co., Inc., 20 Pimentel Ct., Novato, CA 94947 415-883-1221

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Elctrn. Precision Comps., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, 914-664-2333 ....1A•1593
† ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., NJ 07650, 201-947-0400 ....1A•1594
Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530, 516-294-5445 ....1A•1595
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ....1A•2167
Frequency Selective Networks, Inc., 69-20 Garfield Ave., Woodside, NY 11377, 212-424-7500 ....1A•1361
Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ....1A•1599,2175
† Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92663, 714-759-2411 ....1A•1363
§† Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ....1A•1394,1604
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ....1A•1275
† Piconics, Cummings Rd., Tyngsboro, MA 01879, 617-649-7501 ....1A•1611
Sokol Crystal Prods. Inc., 121 Water St., Mineral Point, WI 53565, 608-987-3363 ....1A•1422,1424
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† Cirtech, 15237 Cherry St., Stanley, KS 66223 913-681-2801
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† Filtron Co., Inc., Div. of Aeroflex Labs., Inc., 148 Sweet Hollow Rd., Old Bethpage, NY 11804 516-752-1144
† Hertz Filter, 3 Aerial Way, Syosset, NY 11791 516-822-4770
† K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944
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† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
Microsonics Inc., 60 Winter St., Weymouth, MA 02188 617-337-4200
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† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034 215-643-6950
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Microwave Development Labs., 10 Michigan Dr., Natick, MA 01760 617-655-0060

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† Logitek Inc., 101 Christopher St., Ronkonkoma, NY 11779, 516-467-4200 ...... 1B•1467
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ... 213-452-1336
Modular Devices, 50 Orville Dr., Bohemia, NY 11716 516-567-9620
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ...... CA 415-965-0910;800-221-7060

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§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ...... 1B•1265
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ...... 201-428-8400; 800-526-9067
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§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ SemiKron Intl., Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 603-883-8102

Fuses-4300

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§† Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ...... 1B•1254,1268-1271
† Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406, 707-523-0600 ...... 1B•1282,1283
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079, 201-762-6886 ...... 1B•1287
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§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
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Mepco/Electra, Inc., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121 619-453-0332
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§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
† Rush/Houston, Inc., 600 Kealrick, Ste C-40, Houston, TX 77060 713-682-5151
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
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§ SemiKron Intl., Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 603-883-8102
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Fuses, Failure Indicating-4300

Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302, 201-432-0463 ...... 1B•1262
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ...... 1B•1271
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ...... 201-428-8400; 800-526-9067
§ Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 ...... 201-DE4-0700
§ Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
Economy Fuse, Reliance Electric, 2070 Maple St., Des Plaines, IL 60016 312-299-2211
§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ...... 301-881-8124; 800-638-6594
§ Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
§† Gould Inc., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950 ...... 617-462-6662/3131
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, GA 94952 707-778-6311

Fuses, Fuseholders, Boxes & Panels (MIL)-2440

§† FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ...... 1B•1265
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
§ Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ...... 201-428-8400; 800-526-9067
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
Fusecom, 14864 NE 95th St., Redmond, WA 98052 206-881-2442
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§† Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311

Fuses, Thermal-4300

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .... 1B•1806
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 ...... 1B•1823
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 ...... 1B•1823
Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
Bel Fuse, 198 Van Vorst St., Jersey City, NJ 07302 201-432-0463
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ...... 201-428-8400; 800-526-9067
§ Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852 ...... 301-881-8124; 800-638-6594
§ Inmark Corp., 147 West Cedar St., Norwalk, CT 06854 203-866-8474
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602

Fuses, Thermal-4300 (Cont'd)

§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862

Gauges, Displacement, Linear-5400 — *See Vol. 2*

Gauges, Humidity-2900 — *See Vol. 3*

Gauges, Ionization-2900 — *See Vol. 3*

Gauges, Pressure-2900 (Also See Transducers, Pressure) — ***See Vol. 3***

Gauges, Strain-5500

BLH Elctrns., 42 Fourth Ave., Waltham, MA 02254 617-890-6700
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
§† Kistler-Morse, 10201 Willows Road NE, Redmond, WA 98052 206-881-8000
† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Measurements Group, Inc., Box 27777, Raleigh, NC 27611 919-365-3800
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 312-289-8820
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

Gauges, Temperature-2900 — *See Vol. 3*

Galvanometers — See Meters, Galvanometer (Vol. 3)

Gaskets — See Seals (Vol. 2)

Gaskets, Shielding, RF-4525 (Also See Shields, RF) — ***See Vol. 2***

Gates, Computer Circuit (AND, OR, NOR, etc.) — See Cards, Logic (Vol. 3)

Gearheads & Speed Reducers-3500

§ Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101, 212-361-0800 .... 2•1762
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 .... 1B•1163
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 .... 1B•1164,3•1135
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1172
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 .... 1B•1172
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
† Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809 219-747-3121
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042 516-488-6700
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 516-334-7070
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 .... 516-ED3-5955
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100

Gears & Gear Mechanisms (Precision)-2500 — *See Vol. 2*

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Generators, Arbitrary Waveform-2900 — *See Vol. 3*

Generators, Audio-2900 — *See Vol. 3*

Generators, Bar, Dot & Crosshatch-2900 — *See Vol. 3*

Generators, Baud Rate-1900 — *See Vol. 3*

Generators, Character-2325 — *See Vol. 3*

Generators, Color Bar-2900 — *See Vol. 3*

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Generators, FM-2900 — *See Vol. 3*

Generators, FM/Stereo-2900 — *See Vol. 3*

Generators, Function-2900 — *See Vol. 3*

Generators, Gating/Timing-2900 — *See Vol. 3*

Generators, Hall-5500

§† Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807, 305-678-6900 .... 3•1196
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735 516-694-5100
LDJ Incorporated, 2200 Stephenson Hwy., P.O. Box 219, Troy, MI 48099-0219 313-528-2202
Magnetic Instrumentation, 8350 E. 48TH ST., Indianapolis, IN 46226 317-545-2102
† Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212 614-486-9561
RFL Inds., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481

Generators, Harmonic-2900 — *See Vol. 3*

Generators, Infrared — See Lamps, Infrared (Vol. 1B)

Generators, Low Frequency-2900 — *See Vol. 3*

Generators, Light Pulse-2900 — *See Vol. 3*

Generators, Marker-2900 — *See Vol. 3*

Generators, Microwave-3400 — *See Vol. 3*

Generators, Noise, Random (Electrical)-2900 — *See Vol. 3*

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Generators, Programmable, Function-2900 — *See Vol. 3*

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Generators, UHF/VHF-2900 — *See Vol. 3*

Generators, Ultrasonic-2900 — *See Vol. 3*

Generators, White Noise-2900 — *See Vol. 3*

Generators, Word-2900 — *See Vol. 3*

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Germanium — See Crystals, Semiconductor (Vol. 1A)

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Graphite Parts-2500 — *See Vol. 2*

Grilles & Accessories, Speaker-1300 — *See Vol. 3*

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Gyros (All Types)-2200 — *See Vol. 3*

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Handsets, Chestsets, Headsets, etc.-1300 — *See Vol. 3*

Hardware — See Fasteners (Vol. 2), Clamps (Vol. 2), Terminals (Vol. 2), etc.

Hardware (MIL), Connector-2440

§† **TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, 312-981-6000 .... 2•1642**
§† Appleton Elctrns., 2205 12th Ave., So. Milwaukee, WI 53172 414-764-7200
Autosplice, Inc., 59-12, 37th Ave, Woodside, NY 11377 212-429-0500
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 212-777-6571
† Fema Elctrns. Corp., 12-6 Edgeboro Rd., E. Brunswick, NJ 08816 201-238-1223
ITT Cannon, 10550 Talbert Avenue, P.O. Box 8040, Fountain Valley, CA 92708 714-964-7400
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571
§† Lyn-Tron, Inc., 3150 Damon Way, Burbank, CA 91505 .... 213-849-6211; 800-423-2734
§ National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
† Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600

Harnesses, Wire — See Cable Assemblies & Harnesses (Vol. 2)

Headers, Connector — See Connectors, Cable (Vol. 2), Connectors, Flat Cable (Vol. 2), etc.

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Headers, Transistor & Diode-2500 — *See Vol. 2*

Headphones-1300 — *See Vol. 3*

Heads, Magnetic Recording-1300 — *See Vol. 3*

Heads, Reflective-3700

Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080

Headsets (MIL)-2440

§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§† Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 914-698-0080
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
† Telephonics, 770 Park Ave., Huntington, NY 11743 516-549-6000
Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700

Heat Dissipators — See Heat Sinks, Semiconductor (Vol. 2), Heat Sinks, Soldering (Vol. 2),

Heaters, Immersion-4100 — *See Vol. 3*

Heaters & Heating Elements (For Components & Equipment)-5300 (Also See Ovens)

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .... 1B•1806
Micro Technical Inds., Micro-Ohm Corp., 23666 Birtcher Dr., B, Lake Forest, CA 92630, 714-855-4326 .... 3•1176,1177
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 .... 1B•1811,1814**
Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 .... 1A•1904
Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
† Armstrong World Inds., W. Liberty St., Lancaster, PA 17604 717-397-0611
† Blue M, A Unit of General Signal, 138th & Chatham Sts., Blue Island, IL 60406 312-385-9000
† BTU Engrg. Corp., Bruce Sys., Esquire Rd., N. Billerica, MA 01862 617-667-4111
Capitol Temptrol, 5 Coulton Rd., Old Lyme, CT 06371 203-739-4421
§† Casso-Solar, 3 Pearl Ct., Allendale, NJ 07401 201-825-4600
§† Despatch Inds., P.O. Box 1320, Minneapolis, MN 55440 612-331-1873
Easy Heat-Wirekraft, 555 North Michigan St., Lakeville, IN 46536 219-784-3011
† Electrofilm, 27727 Avenue Scott, Valencia, CA 91355 805-257-2240
Eraser Co., Box 4961, Syracuse, NY 13221 315-454-3237
§ GTE Corp., Sylvania Emissive Prods./Process Heat, Portsmouth Ave., Exeter, NH 03833 603-772-4331
Midland-Ross Corp., Cambion Div., One Airwife Place, Cambridge, MA 02140 617-491-5400
† Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
Molecu-Wire, P.O. Box 495, Farmingdale, NJ 07727 201-938-9473
† NANMAC Corp., 9 Mayhew St., Framingham, MA 01701 617-872-4811
OAL Assocs., P.O. Box J, Escondido, CA 92025 619-743-7143
§ Pamran, 1101 Cedar Creek, Racine, WI 53402 414-639-9076
§† Philips Elmet, 1560 Lisbon Rd., Lewiston, ME 04240 207-784-3591
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300
§† Safeway Products, 440 Middlefield St., Middletown, CT 06457 203-346-6601
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sierracin/Thermal Sys., 13920 S. Broadway, Los Angeles, CA 90061 213-321-4350
† Thermolab, 13345 Saticoy St., N. Hollywood, CA 91605 213-875-0105
† Trent, Inc., 201 Leverington Ave., Philadelphia, PA 19127 215-482-5000
Ultra Carbon, Box X-747, Bay City, MI 48707 517-894-2911
§ Wellman Thermal Sys., 1 Progress Rd, Shelbyville, IN 46176 317-398-4411

Heat Exchangers & Systems-2600 — *See Vol. 2*

Heat Guns, Production-5400 — *See Vol. 2*

Heating Elements, Infrared-5300

Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
Midland-Ross Corp., Cambion Div., One Airwife Place, Cambridge, MA 02140 617-491-5400
§ Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300
§ Wellman Thermal Sys., 1 Progress Rd, Shelbyville, IN 46176 317-398-4411

Heat Pumps — See Cooling/Heating Modules, Thermoelectric (Vol. 1B)

Heat Shrinkable Elastomers, Plastics — See Caps, Forms & Tapes, Heat Shrinkable (Vol. 2), Tubing, Heat Shrinkable (Vol. 2),

Heat Sinks, Semiconductor-2600 — *See Vol. 2*

Heat Sinks, Soldering-4600 — *See Vol. 2*

Heat Sinks (MIL)-2440

UNITRACK Div., Calabro Inds., Inc., Goshen Corp. Pk., P.O. Box 1927, 1372 Enterprise Dr., West Chester, PA 19380, 215-692-0800 .... 2•1068
§† Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510 516-546-1751
§† Calmark Corp., 4915 Walnut Grove Ave., San Gabriel, CA 91776 213-287-0451
Dow Corning Corp., Box 1767, Midland, MI 48640-0994 517-496-4000
§† IERC, 135 W. Magnolia Blvd., Burbank, CA 91502 818-849-2481
† Thermal Prods. Group, IMC Magnetics Corp., 100 Jericho Quad., Ste. 221, Jericho, NY 11753 516-938-0800
Mann, Henry, Inc., 3983 Mann Road, Huntingdon Valley, PA 19006 215-355-7200
Precision Extrusions, Inc., Box 120, Bensenville, IL 60106 312-766-0340
† Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
WEI Corp., 1405 S. Village Way, Santa Ana, CA 92705 714-834-9333

Hermetic Sealing — See Machines, Hermetic Sealing (Vol. 3), Seals, Hermetic (Vol. 2), Services, Hermetic Sealing (Vol. 3),

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Holders, Lamp — See Sockets, Lamp & Lamp Assemblies (Vol. 1B)

Holders, Test Lead-2900 — *See Vol. 3*

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Honeycomb Sheets, Panels, etc.-2500 — *See Vol. 2*

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Incremental Magnetic Recorders — See Recorders, Computer Data (Vol. 3)

Indicator Lights — See Lights, Indicator (Vol. 1B)

Indicators, Angle-5500 (Also See Encoders, Shaft Position)

BEI Motion Systems Co., Corporate Off., 681 Market St., Ste. 741, San Francisco, CA 94105, 415-974-1275 ......1B•1832¢5561;5562;5563;5564;5565
Computer Prod. Div., BEI Motion Sys. Co., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, 619-471-2600 ......1B•1832
BEI Motion Sys. Co., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238, 412-963-0515 ......1B•1832
BEI Motion Sys. Co., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, 805-968-0782 ......1B•1832
BEI Motion Sys. Co., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, 805-966-1538 ......1B•1832
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ......3•1144,1145
Control Sciences, Inc., 9509 Vassar Ave., Chatsworth, CA 91311, 818-709-5510 ......3•1147
† Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 212-361-2133 ......3•1931
† Interface Engrg., 386 Lindelof Ave., Stoughton, MA 02072, 617-344-7383 . 3•1164, 1165
† North Atlantic Inds., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788, 516-582-6500 ......3•1277
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ......1B•1880
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735, 516-293-3100 ......3•1170,1171
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 1A•2067,1B•1019, 1883
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Disc Instrs., 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
† Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ......215-SA6-7723
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
† ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716 516-567-5600
† Industrial Control Co., 3100 Pineda Ave., Rockledge, FL 32955 305-259-7105
Innovatek Microsystems, Inc., Smithfield Rd., Millerton, NY 12546 914-373-9003
Itek Measurement Sys., Div. Litton Inds., 27 Christina St., Newton, MA 02161 617-969-7300
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
† Metric Sys., 645 Anchors St., Ft. Walton Beach, FL 32548 904-244-9600
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Singer Co., Librascope Div., 833 Sonora Ave., Glendale, CA 91201 818-244-6541
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
§† Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
† Warren-Knight Instr. Co., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116 215-464-9300

Indicators, Azimuth-5500

† Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 212-361-2133 ......3•1931
† Interface Engrg., 386 Lindelof Ave., Stoughton, MA 02072, 617-344-7383 . 3•1164, 1165
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
† GAP Instr., 110 Marcus Blvd., Hauppauge, NY 11787 516-273-0909
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
† Industrial Control Co., 3100 Pineda Ave., Rockledge, FL 32955 305-259-7105
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108 603-669-6400
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
† Metric Sys., 645 Anchors St., Ft. Walton Beach, FL 32548 904-244-9600
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
North Atlantic Inds., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788 516-582-6500
† Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 201-227-1700
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100
§† Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212
† Warren-Knight Instr. Co., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116 215-464-9300

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Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ......3•1121
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ......1B•1609
EMICO Inc., Box 368, Dublin, PA 18917, 215-249-9330 ......3•1330
§ FIC Corp., 12216 Parklawn Dr., Rockville, MD 20852, 301-881-8124;800-638-6594 ......1B•1265
§ Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ......312-662-7667; 800-323-9605
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640. 312-784-1020
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
§ Industrial Devices, Inc., Edgewater, NJ 07020 201-224-4700
International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-321-3260
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Lark Electronics, Inc., Box 390, New York, NY 10040 212-569-0430
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565

§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854 201-572-9512
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990
§† Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212
Xycom, 750 N. Maple Rd., Saline, MI 48176 313-429-4971

Indicators, Computer Type & Data Display — See Lamps, Dial, Panel, Pilot Incandescent & Accessories (Vol. 1B)

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Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 3•1121
EMICO Inc., Box 368, Dublin, PA 18917, 215-249-9330 .... 3•1330
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108, 603-669-6400 .... 3•1333
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
§† Analytical Meas., 31 Willow St., Chatham, NJ 07928 201-273-7500
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Hickok Elec. Instr., 10514 DuPont Ave., Cleveland, OH 44108 216-541-8060
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 212-383-6904
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
International Instruments, 88 Marsh Hill Rd., Orange, CT 06477 203-795-4711
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
† Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
§ Ragen Data Systems, Inc., 3 Oval Dr., Central Islip, NY 11722 516-234-3800
† Rodale Elctrns. Corp., 603 Chestnut St., Garden City, NY 11530 516-222-0050
Sensitive Research Instrs., 25 Dock St., Mt. Vernon, NY 10550 914-699-9717
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Staver Co., Inc., 47 Saxon Ave., Bay Shore, NY 11706 516-666-8000
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212

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Indicators, Null-2900 — *See Vol. 3*

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Indicators, Sound Level — See Meters, Audio Level (Vol. 3)

Indicators, Speed-3500

Control Technology Co., 41-16 29th St., Long Island City, NY 11101, 212-361-2133 .... 3•1931
§ AEMC, 99 Chauncy, Boston, MA 02111 ....617-451-0227;800-343-1391
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 ....617-777-4500; 17-246-0300;800-451-1816
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† ATEC, Box 19426, 8219 Kempwood Dr., Houston, TX 77055 713-468-7971
Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 .513-254-6251
Disc Instrs., 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
† Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ..215-SA6-7723
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
† Engler Instrs., Sangamo Weston, Inc., 250 Culver Ave., Jersey City, NJ 07305 201-332-5353
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611
Esterline Angus, Box 24000, Indianapolis, IN 46224 317-244-7611
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
Faria, Thomas G., Corp., 19 Faria Lane, Uncasville, CT 06382 203-848-9271
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
§ IVO Inds., Inc., P.O. Box 603, 201 Industrial Way W., Eatontown, NJ 07724 201-542-5151
Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108 603-669-6400
§ Kurz Instrs., 20 Village Sq., Carmel Valley, CA 93924 408-659-3421
Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
§ LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 312-289-8820
North Hills Elctrns., Alexander Pl., Glen Cove, NY 11542 516-671-5700
† Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, IL 60076 312-676-2300
PPM, Inc., 23945 Mercantile Rd., Cleveland, OH 44122 216-292-6006
§ Ragen Data Systems, Inc., 3 Oval Dr., Central Islip, NY 11722 516-234-3800
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Torq Corp., 32 W. Monroe St., Bedford, OH 44146 216-232-4100
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ Westberg Mfg., Inc., 3400 Westach Way, Sonoma, CA 95476 707-938-2121
Westronics Inc. of Texas, 2441 Northeast Pkwy., Box 4619, Ft. Worth, TX 76106 817-625-2311

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Indicators, Temperature (Not Meter Type)-5300

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ....1B•1735
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Acurex-Autodata, 555 Clyde, Mountain View, CA 94039 415-964-3200
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† ATEC, Box 19426, 8219 Kempwood Dr., Houston, TX 77055 713-468-7971
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181

Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
Chessell Corp., Penns Trail, Newtown, PA 18940 215-968-0660
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Everest Interscience, P.O. Box 345, Tustin, CA 92680 ....714-992-4461; 714-730-0747
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
Frank, B.H., Co., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315
Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
† Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
† Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
§ Kurz Instrs., 20 Village Sq., Carmel Valley, CA 93924 408-659-3421
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
§ National Controls Corp., 931 N. DuPage Ave., Lombard, IL 60148 312-932-6900
Pace Inc., 9893 Brewers Ct., Laurel, MD 20707 301-490-9860
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134
PPM, Inc., 23945 Mercantile Rd., Cleveland, OH 44122 216-292-6006
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
Sensortek, Inc., 154 Huron Ave., Clifton, NJ 07013 201-779-5577
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Tempil Div., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080 201-757-8300
Thermographics Measurements Ltd., 3733 W. 139th St., Hawthorne, CA 90250 213-675-9182
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ....617-WA6-1000
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
§ West Instrs, Gulton Inds, M. C. S. Div., Gulton Indl Pk, E. Greenwich, RI 02818 401-884-6800

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Automatic Coil Corp., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, 305-883-5311 ....1A•1221
§† Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, 213-537-5200 ....1A•1224,1228
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ....1A•2168
Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ....1A•2175
Magnetico Inc., 182 Morris Ave., Holtsville, NY 11742, 516-654-1166 ....1A•2185
† North Hills Elctrns., Alexander Pl., Glen Cove, NY 11542, 516-671-5700 ....1A•1247
Nytronics Comps. Group Inc., Orange St., Darlington, SC 29532, 803-393-5421 ....1A•1248-1267
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865, 201-454-2600 ....1A•1268,1269
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ....1A•1271-1274
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 ....1A•1929
Renco Elctrns., 60 Jefryn Blvd., E., Deer Park, NY 11729, 516-586-5566 ....1A•1279
TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076, 312-679-8200 ....1A•1281
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030, 816-761-6314 ....1A•1283-1297
Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248, 213-323-4100 ....1A•1276
† AIE Magnetics, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210 615-244-9024
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Caddell-Burns Mfg., 40 E. 2nd St., Mineola, NY 11501 516-746-2310
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 805-544-4019
§† Inductive Prods. Inc., 11733 Markon Dr., Garden Grove, CA 92641 714-891-2572
§† Jeffers Elctrns., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621 .602-287-5851
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11582 516-561-6050
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 215-794-7411
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
† Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746 213-532-1790
† Piconics, Cummings Rd., Tyngsboro, MA 01879 617-649-7501
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 516-654-1880
§† TRW Inductive Products Div., 150 Varick St., New York, NY 10013 .212-255-3500
§ Zambre Co., Inc., 2134 Old Middlefield Way, Mountain View, CA 94043 415-968-9176

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Inks for Thick Film Microcircuits-1700 — *See Vol. 2*

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Interrupters, Ground Fault-4300

- **Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648, 312-647-9414 ... 2•1863**
- Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 ... 216-951-8000

Interrupters, Power-4300

- § Electronic Specialists, 171 South Main St., Natick, MA 01760 ... 617-655-1532; 800-225-4876
- Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 ... 408-377-4621
- Schaffner EMC Inc., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083 ... 201-851-0644

Interrupters, Vacuum-4300

- † Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 ... 408-377-4621

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Isolators, Optoelectronic-3700

- **Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ... 1B•1212, 1213**
- **§ Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ... 1B•1216**
- **§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ... 1B•1253**
- **† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**
- **§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ... 1B•1117**
- **† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ... 1B•1233**
- **Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 ... 1A•2109**
- **TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ... 1B•1238,1239**
- § A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 ... 201-722-9800
- Amperex Elctrn. Corp., Slatersville Div., Providence Pike, Slatersville, RI 02876 ... 401-762-3800
- Amtek Digital Systems, Inc., 12740 28th N.E., Seattle, WA 98125 ... 206-363-0217
- § Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 ... 214-233-1589
- † Dionics, 65 Rushmore St., Westbury, NY 11590 ... 516-997-7474
- EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 ... 203-934-7961
- Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 ... 415-962-5011
- § General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 ... 315-253-7321
- § General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 ... 415-493-0400
- § Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 ... 501-636-5000
- Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan ... 0534-34-3311
- § Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ... Call Local Sls. Off.
- § Hobart Engrg., 4143 Cheshire Dr., Cypress, CA 90630 ... 714-827-2135
- Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 ... 214-234-4271
- IXYS Corp., 3685 Enochs, Santa Clara, CA 95051 ... 408-733-4045
- Micropac Inds., 905 E. Walnut St., Garland, TX 75040 ... 214-272-3571
- § New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 ... 201-748-5089
- § Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 ... 214-542-9461
- † Optelecom, 15940 Lauanne Dr., Gaithersburg, MD 20760 ... 301-948-4232
- § Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 ... 201-348-7000
- §† Raytheon Co., 465 Centre St., Quincy, MA 02169 ... 617-479-5300
- Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 ... 213-882-4100
- Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
- § Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 ... 408-257-7910
- § Sigma Instrs., 170 Pearl St., Braintree, MA 02184 ... 617-843-5000
- Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 ... 608-935-2707
- §† Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 ... 214-995-6611

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Jack Covers-2100 — *See Vol. 2*

Jack Panel Assemblies & Access. — See Panels, Jack (Vol. 2)

Jacks (All Types)-2100 — *See Vol. 2*

Jacks (MIL)-2440

- §† Accessories for Elctrns., Inc., 800 Merrick Rd., Baldwin, NY 11510 ... 516-546-1751
- † ADC Magnetic Controls Co., 4900 W. 78th St., Minneapolis, MN 55435 ... 612-835-6800
- Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 ... 203-929-1401
- Concord Elctrns., 30 Great Jones St., Dept. JE, New York, NY 10012 ... 212-777-6571
- † Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 ... 201-768-5400
- † Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
- Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 ... 401-769-3800
- §† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 ... 603-424-4111
- † Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 ... 516-466-0911
- §† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 ... 201-223-9400
- Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 ... 312-792-2700
- † Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 ... 818-882-1020

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Joints, Rotary, Fiber Optic-2475

- Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 ... 213-241-5121
- Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 ... 703-552-3014

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Keyboard Legends and Symbols-5150

- **§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ... 1B•1773, 1778,1779**
- **Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ... 1B•1783**
- Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
- Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 ... 408-946-6000
- § Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 ... 813-576-2525
- Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 ... 805-969-5805
- Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110

Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 ... 612-375-0011
Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 ... 617-281-2040
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 ... 206-284-2200
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 ... 404-449-6040
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark ... 452-973366
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 ... 203-379-2731
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 ... 308-235-4645

Keyboards, Address Encoded-5150

Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ... 3•1068
† **Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ... 1B•1762,1763**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1764-1766
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1786,1787
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1789
Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788, 516-435-8300 ... 1B•1790
† **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ... 1B•1792**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
Cincinnati Electrosys., 469 Wards Corner Rd., Loveland, OH 45140 ... 513-831-4347
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 ... 617-281-2040
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 ... 818-787-0311
Innovatek Microsystems, Inc., Smithfield Rd., Millerton, NY 12546 ... 914-373-9003
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 ... 404-449-6040
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 ... 313-628-9711
Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 ... 612-755-7660
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 ... 703-435-9496
† SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 ... 602-792-2230

Keyboards, Capacitive-5150

Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1764,1765
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720,1786,1787
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 ... 408-946-6000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 ... 617-658-7800
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
Digitran Co., 3100 New York Dr., Pasadena, CA 91107 ... 818-791-5600
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 ... 509-928-8000
Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 ... 612-755-7660

Keyboards, Ferrite Core-5150

Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 ... 404-449-6040

Keyboards, Full Travel-5150

Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ... 3•1068
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ... 1B•1761
Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ... 1B•1762,1763
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1766
† **Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ... 1B•1770, 1771**
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720,1786,1787
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1789
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 ... 617-658-7800
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 ... 805-969-5805
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 ... 312-354-1040
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 ... 312-364-6038
† Rogers Corp., One Technology Dr., Rogers, CT 06263 ... 203-774-9605
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 ... 602-792-2230

Keyboards, Hall Effect-5150

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777

Keyboards, Hard Contact-5150

† **Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ... 1B•1762,1763**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1758,1764,1765
Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ... 1B•1770, 1771
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ... 1B•1772-1779**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ... 1B•1084,1781
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070, 703-435-9496 ... 1B•1785
† **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ... 1B•1792**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 ... 408-946-6000
§ Amkey, Inc., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887 ... 617-658-7800
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 ... 813-576-2525
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 ... 312-295-2610
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 ... 509-928-8000
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 ... 612-755-7660
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 ... 815-459-5000
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 ... 602-792-2230

Keyboards, Low Profile-5150

Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ... 3•1068
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ... 1B•1761
† **Bowmar Instrument Corp., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, 219-747-3121 ... 1B•1762,1763**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1764-1766,1768
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ... 1B•1774-1777**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ... 1B•1781
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720,1786,1787
§ **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... 1B•1094**
§ **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ... 1B•1792**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 ... 813-576-2525
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
§ Digitran Co., 3100 New York Dr., Pasadena, CA 91107 ... 818-791-5600
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 ... 617-281-2040
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 ... 312-295-2610
† Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 ... 213-321-3260
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ... 301-239-6777
Key Tronic, P.O. Box 14687, Spokane, WA 99214 ... 509-928-8000
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
Optical Techniques Intl., 1800 E. Garry, Ste. 14, Santa Ana, CA 92705 ... 714-540-9040
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 ... 215-277-1300
Rogers Corp., One Technology Dr., Rogers, CT 06263 ... 203-774-9605
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 ... 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 ... 617-699-3800
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 ... 415-428-1626

Keyboards, Membrane-5150

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ... 1B•1761
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1758,1768
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ... 1B•1037
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ... 1B•1615
† **Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930, 617-281-2040 ... 1B•1770**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ... 1B•1781
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ... 1B•1783
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720,1786,1787
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1789
Advanced Input Devices, W. 250 A.I.D. Dr.; Coeur d'Alene, ID 83814 ... 208-765-8000
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 ... 408-946-6000
† C.A.M. Graphics Co., Inc., 145 Toledo St., Farmingdale, NY 11735 ... 516-694-1315
Conductive Rubber Technlg., 1235 Coast Village Rd., Santa Barbara, CA 93108 ... 805-969-5805
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 ... 607-754-9187

GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
Keyex, J. B. Man Corp., 838 S. Main St., Hampstead, MD 21074 ...301-239-6777
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 404-449-6040
Key Tronic, P.O. Box 14687, Spokane, WA 99214 509-928-8000
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 ...818-283-5111
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
† Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
SP America Inc., Shin-Etsu Polymer, 1754 Technology Dr., Ste. 128, San Jose, CA 95110 408-947-0311
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
Stanley/AC Interface, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626 714-979-9830
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† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400

Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800

† Lumitron, P.O. Box 12, Summit, NJ 07901 201-273-8998

§† Luxo Lamp, P.O. Box 951, Port Chester, NY 10573 914-937-4433

Mann, Henry, Inc., 3983 Mann Road, Huntingdon Valley, PA 19006 215-355-7200

Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001

Oxley Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 ...213-463-5120

§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731

Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

§† Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244 603-464-5533

§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990

Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Lamps, Indicator — See Lamps, Miniature & Subminiature (Vol. 1B)

Lamps, Infrared-2450

Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165

† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300

§† Casso-Solar, 3 Pearl Ct., Allendale, NJ 07401 201-825-4600

EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200

ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262

Gamma Scientific Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034

§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121

§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400

GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900

ICL Technology, 399 Java Dr., Sunnyvale, CA 94089 408-745-7900

§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118

Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464

§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 214-239-3565

§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 ..201-748-5089

§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 ...609-448-4000

OAL Assocs., P.O. Box J, Escondido, CA 92025 619-743-7143

§ Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069 214-542-9461

Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220

Oxley Inc., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028 ...213-463-5120

Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910

Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707

Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, LED & LCD — See Diodes, Light Emitting (Vol. 1B), Diodes, Liquid Crystal (Vol. 1B),

Lamps, Magnifying, Inspection-4100 — *See Vol. 3*

Lamps, Mercury Vapor-2450

Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165

§ American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355

Aristo Grid Lamp Prods., 65 Harbor Rd., Port Washington, NY 11050 516-944-3030

† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300

Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808

Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 212-347-0787

§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121

§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900

Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311

Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050

Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464

Mitronics, 18039 Crenshaw Blvd., Torrance, CA 90504 213-323-7934

§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 ...609-448-4000

Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123

Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633

Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, Miniature & Subminiature-2450

§ AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 ....1B•1025

§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ....1B•1026-1028

§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1038

§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ....1B•1608

§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 ....1B•1056

Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801, 617-935-4442 ....1B•1057

Golden Pacific Elctrns., Inc., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, 714-538-9752/9753 ....1B•1058

§ Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 .. 1B•1064,1065,1067-1070,1072-1082

§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ....1B•1088

Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 212-392-8800 .1B•1089

Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ....1B•1062

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1703,1704,1715

§ Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ....1B•1090

§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1092

§† Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan, 03-471-8548 ....1B•1093

§† Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096

Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ....1B•1097

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 ....3•1055

§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ....1B•1098-1101

§† **Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ....1B•1102,1103**
§† **Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244, 603-464-5533 ....1B•1059-1061**
§ **Visual Communications Co., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ....1B•1107**
§† A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
Data Display Products, Box 91072, Los Angeles, CA 90009 213-674-5940
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
Dupree, Inc., 9835 Dupree St., So. El Monte, CA 91733 818-442-4700
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
† Hoffman Engrg. Corp., 183 Sound Beach Ave., Old Greenwich, CT 06870 203-637-1719
† Imtronics Inds., 11930 31st Ct., Clearwater, FL 33520 813-577-9010
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
† Lenox Instr., 111 E. Luray St., Philadelphia, PA 19120 ....215-DA4-4543
† Lumitron, P.O. Box 12, Summit, NJ 07901 201-273-8998
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001
§ Multi Prods. Intl., 218 Little Falls Rd., P.O. Box 238, Cedar Grove, NJ 07009 201-239-8183
§ Paccom, 3928 148th NE, Redmond, WA 98052 ....206-883-9200;800-426-6254
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
§† Precision Lamp, Inc., 480 Aaron Dr., Cotati, CA 94928 707-792-0333
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
† Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Lamps, Neon-2450

§ **Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ....1B•1026**
Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1038
Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ....1B•1608
§† **General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, 312-784-1020 ....1B•1056**
§ **Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 .... 1B•1074-1082**
§ **Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ....1B•1088**
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 212-392-8800 .1B•1089
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ....1B•1062
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ....1B•1090
§ **Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1092**
§† **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096**
Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ....1B•1098,1099
§† **Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ....1B•1102,1103**
§ **Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244, 603-464-5533 ....1B•1059**
§† A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
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Data Display Products, Box 91072, Los Angeles, CA 90009 213-674-5940
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
† Imtronics Inds., 11930 31st Ct., Clearwater, FL 33520 813-577-9010
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
† Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
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Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan 03-471-8548
§ Paccom, 3928 148th NE, Redmond, WA 98052 ....206-883-9200;800-426-6254
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† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Lamps, Oil Tight-2450

§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 212-497-7600
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Lamps, Press-to-Test-2450

Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1092
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Lamps, Projection-2450

§ Alan Gordon Entprs., Inc., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605 818-985-5500
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
§ Christie Elec. Corp., 20665 Manhattan Pl., Torrance, CA 90501 213-320-0808
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
§ Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
† Lamptronix Co., Ltd., 85 N. Williams St., Crystal Lake, IL 60014 815-455-0400
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 ...609-448-4000
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† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325

Lamps, Solid State — See Diodes, Light Emitting (Vol. 1B), Diodes, Liquid Crystal (Vol. 1B),

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Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
Amglo, 5265 Michigan Ave., Rosemont, IL 60018 312-671-4321
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
Video Logic Corp., 597 No. Mathilda Ave., Sunnyvale, CA 94086 408-245-8622

Lamps, Tritium (Hydrogen 3) Powered-2450

† NRD, Mark IV Inds., 2937 Alt Blvd. N., Grand Island, NY 14072 716-773-7634

Lamps, Tungsten Halogen-2450

Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801, 617-935-4442 ....1B•1057
American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Gamma Scientific Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034
Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 212-347-0787
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
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Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

Lamps, Ultraviolet-2450

§ American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
Aristo Grid Lamp Prods., 65 Harbor Rd., Port Washington, NY 11050 516-944-3030
† Canrad-Hanovia, 100 Chestnut St., Newark, NJ 07105 201-589-4300
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Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050

Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§ Luxo Lamp, P.O. Box 951, Port Chester, NY 10573 914-937-4433
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Spectronics Corp., 956 Brush Hollow Rd., Westbury, NY 11590 516-333-4840
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
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Lamps, Xenon-2450

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Gates, Geo. W., & Co., Inc., Hempstead Tpke. & Lucille Ave., Franklin Sq., NY 11010 212-347-0787
§ General Electric Co., OEM Marketing Dept., Nela Park, Clevland, OH 44112 216-266-2121
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Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311
ICL Technology, 399 Java Dr., Sunnyvale, CA 94089 408-745-7900
† Imtronics Inds., 11930 31st Ct., Clearwater, FL 33520 813-577-9010
§† Kemlite Labs., Inc., 1819 W. Grand Ave., Chicago, IL 60622 312-829-6050
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
Mitronics, 18039 Crenshaw Blvd., Torrance, CA 90504 213-323-7934
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
§ North American Philips Lighting, Bank St., Hightstown, NJ 08520 609-448-4000
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Siemens Corp., 186 Wood Ave., S., Iselin, NJ 08830 201-494-1000
Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 213-365-4611
U.S. Scientific Instrs., 61 North Beacon St., Boston, MA 02134 617-787-2411
† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Voltarc Tubes, 176 Linwood Ave., Fairfield, CT 06430 203-255-2633
Xenon Corp., 66 Industrial Way, Wilmington, MA 01887 617-658-8940

Laser Systems-4100 — *See Vol. 3*

Laser Components & Laser Accessories-3700

† Analog Modules, Inc., 126 Baywood Avenue, Longwood, FL 32750, 305-339-4356/4355 .... 3•1004
† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
§ Power Technology, Inc., P.O. Box 9769, Little Rock, AR 72219, 501-568-1995 .... 3•1746
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 714-646-7165
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
§ Apollo Lasers, Inc., 9201 Independence Ave., Chatsworth, CA 91311 213-709-1111
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Chicago Laser Systems, Inc., 4034 N. Nashville Ave., Chicago, IL 60634 312-282-2710
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Electro Scientific Inds., 13900 N.W. Science Pk. Dr., Portland, OR 97229 503-641-4141
Eltec Instrs., P.O. Box 9610, Daytona Bch., FL 32020 904-252-0411
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GTE Sys.-Sylvania Sys. Grp., Western Div., P.O. Box 7188, Mountain View, CA 94039 415-966-2000
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
High Voltage Engrg. Corp., S. Bedford St., Burlington, MA 01803 617-272-1313
Hitachi America, 1800 Bering Dr., San Jose, CA 95112 408-292-6404
§† International Laser Sys., 3404 N. Orange Blossom Trail, Orlando, FL 32804 305-295-4010
Kaiser Systems, Inc., 33 Cherry Hill Drive, Danvers, MA 01923 617-777-5102
KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
Laakmann Electro-Optics, Inc., 33052 Calle Aviador, San Juan Capistrano, CA 92675 714-493-6624
Laser Applications, 91 Carver Ave., Westwood, NJ 07675 201-664-7636
Laser Concepts, Omega Organization Intl., P.O. Box 687, Mercer Island, WA 98040 206-232-6256
† Laser Diode Labs, 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
† Laser Inc., Laser Lane, Box 537, Sturbridge, MA 01566 617-347-7314
† Lenox Laser, 615 Pittsfield Rd., Lenox, MA 01240 413-499-4477
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
§ Macrodyne, 1004 Princetown Rd., Schenectady, NY 12301 518-356-3500
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 619-279-5100
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
† Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 404-429-9061
Photon Technlg., 14125 Capri Dr. , Los Gatos, CA 95030 408-866-0566
Quantronix, 225 Engineers Rd., Smithtown, NY 11787 516-273-6900
Raytheon Co., Laser Center, Fourth Ave., Burlington, MA 01803 617-272-6402
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510 312-879-0020
Staffall Inc., 7 Woodland St., Providence, RI 02908 401-351-8282
§ Sun Research Inc., Phase-R, Box 210, Old Bay Rd., New Durham, NH 03855 603-859-7110
Thermal Amer. Fused Quartz, Change Bridge Rd., Montville, NJ 07045 201-334-7770
† Tobe Deutschmann Labs., Inc., 550 Turnpike St., Canton, MA 02021 617-828-3366
† Union Carbide Corporation, Elctrns. Div., Crystal Prods. Dept., 9320 Chesapeake Dr., Ste. 104, San Diego, CA 92123 619-279-4500
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288

LCDs — See Diodes, Liquid Crystal (Vol. 1B)

Lead Assemblies, High Voltage-6000 (Also See onnectors; Cable Assemblies & Harnesses) — *See Vol. 2*

Leads, Test & Adapters-2900 — *See Vol. 3*

LEDs — See Diodes, Light Emitting (LEDs) (Vol. 1B)

Lenses, Filters, Windows, Infrared-3700

† JMJ Technical Prods., P.O. Box 26, Kendall Park, NJ 08824, 201-589-4257 .... 2•1780
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 .... 2•1785
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
§ IR Scientific, Box 110, Carlisle, MA 01741 617-369-7118
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
3M Co., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144 612-733-4403
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
† Plumer Precision Optics, 601 Montgomery Ave., Pennsburg, PA 18073 215-679-6272
† Saphikon, 51 Powers St., Milford, NH 03055 603-673-5831
§ Schott Elctrns., Hershey Dr., Ansonia, CT 06401 203-736-2677
Schott Optical Glass Inc., York Ave., Duryea, PA 18642 717-457-7485
† Sigma Plastronics, 14531-33 Tireman Ave, Dearborn, MI 48126 313-846-4410
Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 213-359-6691
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288

Lenses, Optical & Camera-3700

AGFA-Gevaert, Inc., 275 North St., Teterboro, NJ 07608 201-288-4100
Alan Gordon Entprs., Inc., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605 818-985-5500
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
§† CAI, 550 W. Northwest Hwy., Barrington, IL 60010 312-381-2400
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
Corning Glass Works, Telecomm Prods Dept., BH-5, Corning, NY 14830 607-974-9000
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
§ General Hardware Mfg., 80 White St., New York, NY 10013 212-431-6100
Heitz, Karl, Inc., P.O. Box 427, Woodside, NY 11377 212-565-0004
Infrared Inds., Inc., P.O. Box 14200, Orlando, FL 32857 305-282-7700
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
§ Laser Inc., Laser Lane, Box 537, Sturbridge, MA 01566 617-347-7314
† Lenox Instr., 111 E. Luray St., Philadelphia, PA 19120 .... 215-DA4-4543
3M Co., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144 612-733-4403
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 .... 212-HI5-0400

Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
§ Optics International, Box 101, Tenafly, NJ 07670 201-567-4799
† Plumer Precision Optics, 601 Montgomery Ave., Pennsburg, PA 18073 215-679-6272
Rolyn Optics Co., 738 Arrowgrand Cir., Covina, CA 91722-2199 ......818-915-5707/5717
Schott Optical Glass Inc., York Ave., Duryea, PA 18642 717-457-7485
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930
Sumita Optical Glass Mfg. Co., Ltd., P.O. Box 521, Millwood, NY 10546 914-762-4959
Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 213-359-6691
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288

Lenses, Readout & Display-2450

† JMJ Technical Prods., P.O. Box 26, Kendall Park, NJ 08824, 201-589-4257 ...... 2•1780
RMF Prods., Inc., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, 312-879-0020 ...... 2•1785
† Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Applied Instrs., Inc., 25 Will Place, Brooklyn, NY 11207 212-257-0885
Atlantic Optical Moulding, Ellis St., P.O. Box 309, Dudley, MA 01570 617-943-1746
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fresnel Optics, Div. of Alliance Tool Corp., 1300 Mt. Read Blvd., Rochester, NY 14606 716-647-1140
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§ Industrial Devices, Inc., Edgewater, NJ 07020 201-224-4700
† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
Metavac, Inc., 45-68 162nd St., Flushing, NY 11358 ......212-HI5-0400
† Moldtronics, Inc., 707 Roger St., Downers Grove, IL 60515 312-968-7000
§ NOBEX Div., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010 415-342-8170
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
Panelgraphic Corp., 10 Henderson Dr., W. Caldwell, NJ 07006 201-227-1500
Pannier Corp., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974 215-672-3600
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
§ Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680 714-544-9970
Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367 213-875-1123
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
§ Visual Communications Co., P.O. Box 986, El Segundo, CA 90245 213-822-4727

Light Choppers-3700

Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
† Electro-Optical Inds., Box 3770, Santa Barbara, CA 93105 805-964-6701
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
ITHACO, Inc., Meas. & Control Instrs. Div., 735 W. Clinton St., P.O. Box 6437, Ithaca, NY 14851-6437 607-272-7640
† Millivac Instrs., Box 997, Curry Rd. Ext., Schenectady, NY 12301 518-355-8300
† Philamon, Inc., 33 Dubon Ct., Farmingdale, NY 11735 516-249-2700
Photon Technlg., 14125 Capri Dr. , Los Gatos, CA 95030 408-866-0566

Light Pens-2000 — *See Vol. 3*

Light Sources, Fiber Optic-2475

Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ......1B•1117
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fiberoptics Technlg., Inc., Quassett Rd., Pomfret, CT 06258 203-928-0443
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
Incom, Inc., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550 617-765-9151
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930

Light Sources, Photoelectric-3700

TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ...... 1B•1234-1237,1240,1244,1245
Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444
§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132 314-423-4900
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ......312-231-3511; 312-932-9380
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800
M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
§† Photo Resch., 3000 N. Hollywood Way, Burbank, CA 91505 213-843-6100
† Power Instrs., Inc., 7352 N. Lawndale Ave., Skokie, IL 60076 312-676-2300
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ......CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453

Light Sources, Stroboscopic-3700

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Video Logic Corp., 597 No. Mathilda Ave., Sunnyvale, CA 94086 408-245-8622

Light Sources, Ultraviolet-3700

Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
§ Electronic Trend Prods., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014 408-996-7401
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
§ Spectronics Corp., 956 Brush Hollow Rd., Westbury, NY 11590 516-333-4840
Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930

Lights, Indicator-2450

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ......1B•1029
§ AND, 770 Airport Blvd., Burlingame, CA 94010, 415-347-9916 ......1B•1025
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ...... 1B•1026-1028
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ......1B•1574
§† Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1038
Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ......1B•1046,1047
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ......1B•1596
Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801, 617-935-4442 ......1B•1057
§ Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 ..1B•1064-1070,1074-1082
§† Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ......1B•1084
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ......1B•1088
§† Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 212-392-8800 .1B•1089
§† Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 ......1B•1062
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ......1B•1703,1714
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590, 516-935-3640 ......1B•1090
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ......1B•1724,1725
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1092
§ Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ......1B•1736
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ......1B•1094
§† Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 ..1B•1096
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 ......1B•1097
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 ...... 1B•1098-1101
§† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ......1B•1102,1103
§† Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244, 603-464-5533 ...... 1B•1059-1061
§ Visual Communications Co., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 ......1B•1107
§† A.C. Interface, 2925 College Ave., Costa Mesa, CA 92626 714-979-9830
APM-Hexseal, 44 Honeck St., Englewood, NJ 07631 201-569-5700
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† Audiosone, Inc., 617 Fan Hill Rd., Monroe, CT 06468 ......203-268-4372; 800-243-8160
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 ..914-425-7460
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Data Display Products, Box 91072, Los Angeles, CA 90009 213-674-5940
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ......201-CA8-0321
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113

§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ....312-662-7667; 800-323-9605
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§ Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Instr., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640 312-784-1020
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§† Glar-Ban Div. of Mark IV Inds., Inc., 2937 Alt Blvd., Grand Island, NY 14072 716-773-2871
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE Sylvania Lighting Prods., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923 617-777-1900
† Imtronics Inds., 11930 31st Ct., Clearwater, FL 33520 813-577-9010
ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Lamp Technology, Inc., 141A Central Ave., Farmingdale, NY 11735 516-454-6464
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Merix Chem. Co., 2234 East 75th St., Chicago, IL 60649 312-221-8242
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Micro Lamps, Inc., 1N111 Linlar Rd., La Fox, IL 60147 312-232-6001
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan 03-471-8548
§ Paccom, 3928 148th NE, Redmond, WA 98052 ....206-883-9200;800-426-6254
Penn Keystone Corp., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492 203-269-8701
§† Precision Lamp, Inc., 480 Aaron Dr., Cotati, CA 94928 707-792-0333
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Westinghouse Elec. Corp., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, NJ 07003 201-429-3325
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

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Lights, Pilot — See Lights, Indicator (Vol. 1B)

Limit Stops — See Knobs, Limit Stop (Vol. 2)

Limit Stops, Mechanical-2500 — *See Vol. 2*

Limiters, Current-4300

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 ....1B•1804
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ....1B•1811,1815,1817
NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, 609-298-7300 ....3•1663
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, 609-298-7300 ....3•1663
§ Burndy Corporation, Richards Ave., Norwalk,, CT 06852 203-838-4444
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Hitran Corp., Agex, Rte. 31, RD 5-65, Flemington, NJ 08822 201-782-5525
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Limiters, Microwave-3450 — *See Vol. 1A*

Limiters, Surge-4300

Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901, 305-725-8000 ....1B•1257
Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406, 213-450-1761 ....1B•1795, 1797
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ....1B•1288,1313
† Control Concepts Corp., P.O. Box 1380, Binghamton, NY 13902-1380, 607-724-2484 ....1B•1263
Displex, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 ....3•1860
Franek, John, Co., Inc., P.O. Box 11752, Santa Ana, CA 92711-1752, 14-832-0290;800-854-9420 ....3•1862-1866,1875
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 ....1B•1804
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ....1B•1490,1674
§† MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 ....1B•1277-1280
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ....1B•1811,1815,1817
Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648, 312-647-9414 ....1B•1284
§ PolyPhaser Corporation, P.O. Box 1237, Gardnerville, NV 89410, 702-782-2511 ....1B•1285
§ Dyma Engrg., Box 1535, Los Lunas, NM 87031 505-865-6700
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
Joslyn Elctrn. Sys., 6868 Cortona Dr., Goleta, CA 93017 805-968-3551
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100

Line Assemblies (MIL), RF Transmission-2440

Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509 213-517-6000
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

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Magnets (MIL), Permanent-2440

Jobmaster Corp., 9008 Liberty Rd., Randallstown, MD 21133 301-655-1400
† Magnet Sales & Mfg. Co. Inc., 11250 Playa Court, Culver City, CA 90230-6127 ....213-391-7213;800-421-6692
† Ogallala Elctrns., Div. Arnold Engrg. Co., Box 59, Ogallala, NE 69153 308-284-4093
† Permanent Magnet, 4437 Bragdon St., Indianapolis, IN 46226 317-547-1336
Steward, D. M., Mfg. Co., P.O. Box 510, Chattanooga, TN 37401 ...615-867-4100
Thomas & Skinner, Box 150 B, Indianapolis, IN 46206 317-923-2501
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000

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Memory Devices/Controllers, Magnetic Core, Add-on-2000 — *See Vol. 3*

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Memory Devices/Controllers, MOS, Add-on-2000 — *See Vol. 3*

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Meters (MIL)-2440

Triplett Corp.—A Penril Co., One Triplett Dr., Bluffton, OH 45817-9987, 419-358-5015 .... 3•1357
† Bowmar/ALI, Bowmar Instr. Corp., 531 Main St., Acton, MA 01720 617-263-8365
Faria, Thomas G., Corp., 19 Faria Lane, Uncasville, CT 06382 203-848-9271
† Gralex Inds., 155 Marine St., Farmingdale, NY 11735 516-694-3600
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 212-383-6904
† Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Simpson Elec. Co., 853 Dundee Ave., Elgin, IL 60120 312-697-2260

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Microcircuits (MIL)-2440

† Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803, 516-694-6700 .... 1A•1644
§† Dale Electronics, Inc., El Paso Div., P.O. Box 26950, El Paso, TX 79926, 915-592-3253 .... 1A•1849,1850
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1A•1373
Ohmtek, Inc., 2160 Liberty Dr., Niagara Falls, NY 14304, 716-283-4025 ... 1A•1919-1921
† Allied Corp. Aerospace Sector, Bendix Communications Div., East Joppa Rd., Towson, MD 21204 301-583-4000
Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
§† Fairchild Microprocessor Div., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042 415-962-3838
§ General Instrument Corp., Microelectronics Div., 600 W. John St., Hicksville, NY 11802 516-733-3107
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
† Piconics, Cummings Rd., Tyngsboro, MA 01879 617-649-7501
§† Raytheon Semiconductor, 350 Ellis St., Mountain View, CA 94043 415-968-9211
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611

Microcircuits (MIL), Linear-2440

Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
§† Precision Monolithics, 1500 Space Dr., Santa Clara, CA 95050 408-727-9222
§† Raytheon Semiconductor, 350 Ellis St., Mountain View, CA 94043 415-968-9211
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611
† Third Domain, P.O. Box 35400, Tucson, AZ 85740-5400 602-293-6310

Microcircuits (MIL), Low Power Schottky-2440

Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611

Microcircuits (MIL), Memories, CMOS, Hybrids-2440

† Integrated Circuits, Inc., 10301 Willows Road, Redmond, WA 98052, 206-882-3100 .... 1A•1660
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818, 402-694-6111 .... 1A•1661
Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
Array Technology, 992 S. Saratoga-Sunnyvale Rd., San Jose, CA 95129 408-252-9900
Catalyst Research, 1421 Clarkview Rd., Baltimore, MD 21209 301-296-7000
† Cincinnati Elctrns., 2630 Glendale Milford Rd., Cincinnati, OH 45241 513-563-6000
Holt Inc., 8 Chrysler Ave., Irvine, CA 92714 714-859-8800
§† Integrated Device Technlg., Inc., 3236 Scott Blvd., Santa Clara, CA 95051 408-727-6116
† Mel Tec, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090 617-329-1508
† Northwest Microcircuits, 2115 N. College, Newburg, OR 97132 503-538-7081
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
† Piconics, Cummings Rd., Tyngsboro, MA 01879 617-649-7501

Microcircuits (MIL), TTL, Schottky, Microprocessor-2440

Andrich Sys., Inc., 1699 Roosevelt Ave., Bohemia, NY 11716 516-589-5656
§† Fairchild Microprocessor Div., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042 415-962-3838
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611

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Microphones, Velocity-1300 — *See Vol. 3*

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Microphones (MIL)-2440
† Telephonics, 770 Park Ave., Huntington, NY 11743 516-549-6000

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Microscopes-3700
American Volpi Corp., 26 Aurelius Ave., Auburn, NY 13021 315-255-1105
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6000
Bausch & Lomb, 820 Linden Ave., Rochester, NY 14625 716-338-6314
§ Bausch & Lomb, S.O.P.D. Div, 1400 N. Goodman St., Rochester, NY 14602 716-338-6000
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
ElectroPhysics Corp., 48 Spruce St., Nutley, NJ 07110 201-667-2262
Excel Technology Intl. Corp., 4-5 Stryker La., Hillsborough Indl. Pk., Belle Mead, NJ 08502 201-874-4747
§ Hacker Instrs., Box 657, Fairfield, NJ 07007 201-226-8450
Jonard Inds. Corp., 134 Marbledale Rd., Tuckahoe, NY 10707 914-793-0700
† Keyan Inds., Inc., P.O. Box 1228, Middleboro, MA 02346 617-947-7719
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990
3D Optics, Box 224, 4 Strathmore Cir., Braintree, MA 02184 617-848-8002
Vision Engrg. Inc., 570 Danbury Rd., New Milford, CT 06776 203-355-3776
ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

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Modulator/Demodulators, Laser-3700
† Andersen Labs., 1280 Blue Hills Ave., Bloomfield, CT 06002 203-242-0761
CATEL Telecommunications, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054 408-988-7722
Coherent, Inc., 3210 Porter Dr., Palo Alto, CA 94304 415-493-2111
Data-Design Labs., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730 714-987-2511
§ International Laser Sys., 3404 N. Orange Blossom Trail, Orlando, FL 32804 305-295-4010
Kappa Scientific Corp., Box 30585, Santa Barbara, CA 93105 805-687-9648
Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 404-429-9061
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617

Modulators, AM-1900 — *See Vol. 3*

Modulators, FM-1900 — *See Vol. 3*

Modulators, Light-3700
Andersen Labs., 1280 Blue Hills Ave., Bloomfield, CT 06002, 203-242-0761 ....1A•1450
Cleveland Crystals, Box 17157, Euclid, OH 44117 216-486-6100
Data-Design Labs., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730 714-987-2511
† Electro-Optical Inds., Box 3770, Santa Barbara, CA 93105 805-964-6701
FG Engrg., Box 476, Fredonia, AZ 86022 602-643-7375
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060
Times Fiber Communications, Inc., 358 Hall Ave., Wallingford, CT 06492 203-265-8500

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Modules, RMS-to-DC Conversion-3130 — *See Vol. 1A*

Modules, Sample & Hold-3130 — *See Vol. 1A*

Modules (MIL), Electronic-2440
† ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 .... 3•1160
§† Appleton Elctrns., 2205 12th Ave., So. Milwaukee, WI 53172 414-764-7200
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
Modular Devices, 50 Orville Dr., Bohemia, NY 11716 516-567-9620
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
† Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735 516-293-3100

Modules (MIL), Standard Electronic-2440
ILC Data Device Corp., 105 Wilbur Pl., Bohemia, NY 11716, 516-567-5600 .... 3•1160
† Abbott Transistor Labs., Power Supply Div., 5200 W. Jefferson Blvd., Los Angeles, CA 90016 213-936-8185
§† Appleton Elctrns., 2205 12th Ave., So. Milwaukee, WI 53172 414-764-7200
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000
† Standard Reference Labs, Inc., Coan Pl., Metuchen, NJ 08840 201-549-9280

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Monitors, Line & Program-1900 — *See Vol. 3*

Monitors, Modulation-2900 — *See Vol. 3*

Monitors, Phase & Phase Angle-2900 — *See Vol. 3*

Monitors, Phase Sequence & Loss-2200 — *See Vol. 3*

Monitors, Power, AC & DC-2200 — *See Vol. 3*

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Monitors, Power Failure-2200 — *See Vol. 3*

Monitors, Power, Microwave-2900 — *See Vol. 3*

Monitors, Power, RF-2900 — *See Vol. 3*

Monitors, Response Time-2900 — *See Vol. 3*

Monitors, Temperature-5300 (Also See Controls, Temperature)

Basic Measuring Insts., 402 Lincoln Centre Dr., Foster City, CA 94404, 415-570-5355 ..... 3•1830
† CML MACARR Div., Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217, 212-857-2400 ..... 3•1845
§ Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401, 513-254-6251 ..... 3•1327
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855, 203-866-2573 ..... 3•1131
Kaye Instruments, 15 De Angelo Dr., Bedford, MA 01730, 617-275-0300 ..... 3•1166
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ..... 1B•1814
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 ..... 3•1088, 1136,1167
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..... 1B•1735,1868,1869,3•1347,1386
PPM, Inc., 23945 Mercantile Rd., Cleveland, OH 44122, 216-292-6006 ..... 3•1285
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037 305-451-1000
§ Acurex-Autodata, 555 Clyde, Mountain View, CA 94039 415-964-3200
Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920
† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 ..... 516-LY3-5600
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 ..... 617-777-4500; 17-246-0300;800-451-1816
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
† Barnes Engrg., 44 Commerce Rd., P.O. Box 53, Stamford, CT 06904 203-348-5381
§ Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
† Cardion Elctrns., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797 516-921-7300
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
Chromalox Instrs. & Controls, 100 Hell-Quaker Blvd., Lavergne, TN 37086 615-793-7561
† Climatronics, 140 Wilbur Pl., Bohemia, NY 11716 516-567-7300
Continental Resources, Inc., 175 Middlesex Tpke., Bedford, MA 01730 617-275-0850
† Control Technology Co., 41-16 29th St., Long Island City, NY 11101 212-361-2133
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cybernetic Micro Sys., P.O. Box 3000, 3000 Hwy. 84, San Gregorio, CA 94074 415-726-3000
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
DCI, Inc., 720 E. Dennis, Olathe, KS 66061 913-782-5672
Electric Tachometer, 68th & Upland Sts., Philadelphia, PA 19142 ..... 215-SA6-7723
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
§ E Technology Corp., 1545 Morse Ave., Ventura, CA 93003 805-644-9544
Esterline Angus, Box 24000, Indianapolis, IN 46224 317-244-7611
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 .....
§ Fluke, John, Mfg. Co., Box C9090, MS 250C, Everett, WA 98206 206-356-5400
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Howell Instrs., 3479 W. Vickery Blvd., Ft. Worth, TX 76107 817-336-7411
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Inconix Corp., 10 Tech Circle, Natick, MA 01760 617-655-1170
International Instruments, 88 Marsh Hill Rd., Orange, CT 06477 203-795-4711
Keystone Carbon, Thermistor Div., St. Marys, PA 15857 814-781-1591
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
Metra Instrs., 2056 Bering Dr., San Jose, CA 95131 408-297-8530
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
Metrosonics, Box 23075, Rochester, NY 14692-3075 716-334-7300
Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
§ Non-Linear Systems/Div. of Kaypro Corp., 533 Stevens Ave., Solana Bch., CA 92075 619-481-3900
§ Pacific Transducer, 2301 Federal, Los Angeles, CA 90064 213-478-1134
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
Rochester Instr. Sys., 255 N. Union St., Rochester, NY 14605 716-263-7700
† Sensortek, Inc., 154 Huron Ave., Clifton, NJ 07013 201-779-5577
Serial Lab Prods., Inc., 50 Brigham St., P.O. Box 766, Marlboro, MA 01752 617-481-1684
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993
§ Tempil Div., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080 201-757-8300
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075 619-481-7177
† Thermo Elec., 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Trans-Met Engrg., 601 S. Palm St., La Habra, CA 90631 213-691-2266
§ TRW, Dynaloo Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096;201-792-2400
VirTis Co., Rte. 208, Gardiner, NY 12525 914-255-5000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241
§ Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 404-253-7000

Monitors, Video-1900 — *See Vol. 3*

Monitors, Voltage — See Meters, Volt (Vol. 3)

Monitors, Waveform — See Oscilloscopes (Vol. 3)

Monitors (MIL), Data-3475 — *See Vol. 3*

Motor & Generator Armatures, Rotors, Stators-3500

† Georator Corp., Box 70, Manassas, VA 22110, 703-368-2101 ..... 3•1880
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ..... 1A•2067,1B•1019
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 ..... 818-882-7979/5280
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
† Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733 818-443-3247
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Framar Metal Prods., 124 W. Main St., Dept. 1201, High Bridge, NJ 08829 201-638-6688
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 516-334-7070
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Magnetic Metals Co., Hayes Ave. at 21st St., Camden, NJ 08105 609-964-7842
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303 213-887-7700
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motor Generator Sets-4000 — *See Vol. 3*

Motor Speed Drives — See Controls, Motor Speed (Vol..3)

Motors, Brushless, DC-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 ..... 1B•1123
Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ..... 1B•1131
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 ..... 1B•1137
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ..... 1B•1138
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ..... 1B•1139
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ..... 1B•1141
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... 1B•1143,1144
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ..... 1B•1157

Motors, Brushless, DC-3500 (Cont'd)

§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 213-887-7700 .... 1B•1160,1161
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 .... 1B•1165
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. F2, Vista, CA 92083, 619-727-7430 .... 1B•1166
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365, 315-823-4050 .... 1B•1169
Pittman Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ... 1B•1170, 1171
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1172,1185
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 .... 1B•1172
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... 1B•1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 .... 1B•1181
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 .... 1B•1179
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 .... 1B•1208,1209
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Dynamics, Inc., 2 Gill St., Woburn, MA 01801 617-935-4944
† Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 213-785-2197
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
Brailsford & Co., 670 Milton Rd., Rye, NY 10580 914-967-1820
EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
§† EG & G Rotron, Commercial Div., Shokan, NY 12481 914-657-6661
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
† Harowe Servo Controls, Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
Hitachi America, Ltd., 59 Route 17 South, Allendale, NJ 07401 201-825-8000
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
Inland Motor, Specialty Prods. Div., Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Kimco, 150 Vallecitos de Oro, San Marcos, CA 92069 619-744-5671
Namiki Precision Jewel Co., Ltd., 15 Essex Rd., Paramus, NJ 07652 201-368-8310
NMB Corp., Motor Div., 9730 Independence Ave., Chatsworth, CA 91311 213-709-1555
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 815-966-3600
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
POWR-UPS Corp., 50 Orville Drive, Bohemia, NY 11716 516-567-9620
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
Tokyo Elec. Co., Ltd., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101 Japan .... (03) 292-1011
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Clock & Timing-3500

† Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 1B•1131
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083, 619-727-7420 .... 1B•1132,1133
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 .. 1B•1135
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... 1B•1140
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 .... 1B•1141
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... 1B•1157
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 .... 1B•1159
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
§ Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motors, Control-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 .... 1B•1123
† Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 1B•1131
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083, 619-727-7420 .... 1B•1132,1133
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 .. 1B•1135
Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 .... 1B•1136
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 .... 1B•1137
§ Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 .... 1B•1138
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 .... 1B•1139
Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... 1B•1140
§ Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ..... 1B•1143,1144
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... 1B•1157
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 .... 1B•1159
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 .... 3•1135
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. F2, Vista, CA 92083, 619-727-7430 .... 1B•1166
Pittman Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ... 1B•1170, 1171
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1172,1185
† Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 .... 1B•1172
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... 1B•1175
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 .... 1B•1177
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 .... 1B•1181
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 .... 1B•1179
§† Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 .... 1B•1182
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 .... 1B•1186-1204
T S Products, 12455 Brandford St., Unit 22, Arleta, CA 91331, 818-896-6676 .... 3•1119
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 3•1934
Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 .... 1B•1208,1209
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Applied Sys., 26401 Harper Ave., St. Clair Shores, MI 48081 313-779-8700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
Centent Co., 3879 S. Main St., Santa Ana, CA 92707 714-979-6491
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
Datatran Labs, P.O. Box 384, Sussex, NJ 07461 914-856-4313
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
§† Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214

Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 ...203-756-7441
Honeywell Inc., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408 ...612-870-5346
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ...800-321-5111, Ext. 596
§ Hurst Mfg. Corp., Box 326, Princeton, IN 47670 ...812-385-2564
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 ...213-926-0927
§† Inertial Motors, 280 N. Broad St., Doylestown, PA 18901 ...215-345-1010
Inland Motor, Specialty Prods. Div., Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 ...602-459-1150
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 ...703-639-9045
IXYS Corp., 3685 Enochs, Santa Clara, CA 95051 ...408-733-4045
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 ...703-639-2495
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 ...602-257-0407
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303 ...213-887-7700
Magnum Opus Custom Elctrn. Engrg., 284 Kennedy St., Iselin, NJ 08830 ...201-283-4925
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010 ...415-697-9614
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 ...516-938-8000
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 ...619-439-7500
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 ...213-442-5981
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 ...914-592-5930
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 ...617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 ...201-785-6000
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 ...516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 ...516-328-0200
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 ...813-855-4621
§ Wadsworth Elec., 20 W. 11th St., Covington, KY 41011 ...606-431-0900
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 ...818-968-6525

Motors, DC Timing-3500

Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ...1B•1131
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ...1B•1141
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ...1B•1157
Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 ...1B•1159
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 ...1B•1172,1185
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 ...1B•1172
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ...1B•1181
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 ...619-727-7420
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 ...203-388-3414
Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 ...703-639-9045
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 ...813-822-2529
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 ...516-328-0200

Motors, Drag Cup-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 ...516-694-6700
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 ...305-748-5527
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 ...213-247-7060
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England ...01-994-3670
† IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590 ...516-334-7070
Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362 ...818-991-6111
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 ...215-277-1300
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 ...201-785-6000
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 ...516-586-5100

Motors, Fractional Horsepower-3500

† **Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 ...1B•1123**
† **Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ...1B•1131**
§ **Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..1B•1135**
§ **Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ...1B•1136**
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 ...1B•1137
§ **Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ...1B•1138**
† **Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ...1B•1139**
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ...1B•1141
§ **Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ...1B•1143,1144**
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ...1B•1157
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 ...1B•1158**
§ **Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, 212-686-3622 ...1B•1159**
† **Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 213-887-7700 ...1B•1160,1161**
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ...1B•1163
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ...1B•1165,3•1135
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. F2, Vista, CA 92083, 619-727-7430 ...1B•1166
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365, 315-823-4050 ...1B•1169
Pittman Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ...1B•1170, 1171
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 ...1B•1172,1185
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 ...1B•1172
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ...1B•1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ...1B•1181
† **Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 ...1B•1179**
Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ...1B•1182
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ...1B•1186-1204**
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ...3•1934**
Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 ...1B•1208,1209
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 ...516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 ...516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 ...212-392-4010
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 ...305-748-5527
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 ...815-459-3080
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 ...818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 ...203-673-7151
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 ...815-877-0241
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 ...603-532-7701
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 ...619-727-7420
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 ...312-588-7700
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 ...201-964-4400
§† Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 ...203-388-3574
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 ...203-847-5861
EG & G Rotron, Commercial Div., Shokan, NY 12481 ...914-657-6661
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 ...914-679-5201
EG & G Torque Systems, 36 Arlington St., Watertown, MA 02172 ..617-924-6000
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 ...805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 ...717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England ...01-994-3670
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 ...305-368-0600
General Inds., Taylor & Olive St., Elyria, OH 44035 ...216-323-3136
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 ...608-524-4341
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 ...203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 ...216-252-4242
Howard Inds., Box 287, Milford, IL 60953 ...815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 ...805-963-2055
§ Hurst Mfg. Corp., Box 326, Princeton, IN 47670 ...812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 ...812-385-3415
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 ...703-639-9045
Kimco, 150 Vallecitos de Oro, San Marcos, CA 92069 ...619-744-5671
Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 ...703-639-2495
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 ...213-452-6000
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 ...609-799-0100
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 ...312-259-8700
Namiki Precision Jewel Co., Ltd., 15 Essex Rd., Paramus, NJ 07652 ...201-368-8310
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 ...815-966-3600

Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§ Powertron, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210 704-525-8962
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
RTE Aerovox Inc., P.O. Box B-970, 740 Belleville Ave., New Bedford, MA 02741 617-994-9661
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
§ Seiko Instrs. U.S.A., Inc., 2990 W. Lomita Blvd., Torrance, CA 90505 213-530-8777
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
§ Standard Pneumatic Motor, Box 10530, Reno, NV 89510 702-329-6311
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Gearhead-3500

† **Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 ....1B•1123**
† **Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ....1B•1131**
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083, 619-727-7420 ....1B•1132,1133
§ **Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 ....1B•1136**
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 ....1B•1137
§ **Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 ....1B•1138**
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ....1B•1140**
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ....1B•1141
§ **Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 ....1B•1143,1144**
† **IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ....1B•1157**
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 ....1B•1158**
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 ....1B•1163
† **Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ....1B•1165,3•1135**
Motor-Tronics, Inc., 2142 Industrial Ct., Bldg. F2, Vista, CA 92083, 619-727-7430 ....1B•1166
Pittman Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 ....1B•1170, 1171
† **Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 ....1B•1172**
† **Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 ....1B•1172**
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 ....1B•1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ....1B•1181
TRW Motor Division, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, 205-983-3542 ....1B•1120
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ....1B•1186-1204**
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 608-524-4341
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Gyro-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
† Astronautics Corp. of America, P.O. Box 523, Milwaukee, WI 53201 414-447-8200
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
Kinetic Sys., 11 Maryknoll Dr., Lockport, IL 60441 815-838-0005
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581

Motors, Hysteresis-3500

IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ....1B•1157
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 ....1B•1158**
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ....1B•1181
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ....1B•1200-1204**
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Incremental, Stepping — See Motors, Stepping (Vol. 1B)

Motors, Induction-3500

Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 .... 1B•1141
† **IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... 1B•1157**
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158**
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1185
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... 1B•1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 .... 1B•1181
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 .... 1B•1200-1204**
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Dynamics, Inc., 2 Gill St., Woburn, MA 01801 617-935-4944
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072 201-933-0220
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
† Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
† Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490 215-277-0433
RTE Aerovox Inc., P.O. Box B-970, 740 Belleville Ave., New Bedford, MA 02741 617-994-9661
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Linear-3500

Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 1B•1131
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 213-283-0015
Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Kaiser ElectroPrecision, Kaiser Aerospace & Elctrns., 1700 S. Redhill Ave., Irvine, CA 92714 714-540-6810
Magnetic Systems, 1021 Pecten Ct., Milpitas, CA 95035 408-263-6680

Motors, Miniature — See Motors, Fractional HP (Vol. 1B)

Motors, Permanent Magnet-3500

† **Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 1B•1131**
§ **Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 .... 1B•1135**
§ **Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 .... 1B•1136**
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 .... 1B•1137
† **Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 .... 1B•1139**
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 .... 1B•1140**
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 .... 1B•1141
§ **Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343, 612-931-2700 .... 1B•1143,1144**
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... 1B•1157
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158**
§ **Mabuchi Motor America Corp., 475 Park Ave. South, New York, NY 10016, [redacted] .... 1B•1159**
† **Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 213-887-7700 .... 1B•1160,1161**
Maxon Precision Motors, Inc., 838 Mitten Rd., Burlingame, CA 94010, 415-697-9614 .... 1B•1163
† **Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 .... 1B•1165**
Pittman Corp., 343 Godshall Dr., Harleysville, PA 19438, 215-256-6601 .... 1B•1170, 1171
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1172
† **Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 .... 1B•1172**
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... 1B•1175
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, [redacted] .... 1B•1181
† **Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 .... 1B•1179**
§† **Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 .... 1B•1182**
TRW Motor Division, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, 205-983-3542 .... 1B•1120
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 .... 1B•1186-1199**
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 1B•1207**
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 213-785-2197
† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
Bertsch U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083 619-727-7420
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† EG & G Rotron, Custom Div., Hasbrouck La., Woodstock, NY 12498 914-679-5201
EG & G Torque Systems, 36 Arlington St., Watertown, MA 02172 617-924-6000
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ Hampton Prods., 2995 Eastrock Dr., Rockford, IL 61109 815-398-2770
Hankscraft Motors, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959 608-524-4341
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† HTL Electro Kinetics, 402 E. Gutierrez St., Santa Barbara, CA 93101 805-963-2055
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 213-926-0927
§† Inertial Motors, 280 N. Broad St., Doylestown, PA 18901 215-345-1010
† Inland Motor, Specialty Prods. Div., Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
† Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 703-639-2495
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353

† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 619-727-7400
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Pacific Scientific Co., 4301 Kishwaukee, Rockford, IL 61105 815-966-3600
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506 201-427-3100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Selsyn — See Motors, Synchronous (Vol. 1B)

Motors, Servo-4900 — *See Vol. 3*

Motors, Squirrel Cage-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072 201-933-0220
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 516-586-5100
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Stepping-3500

Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ......1B•1131
§ **Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..1B•1135**
† **Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 ......1B•1139**
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ......1B•1140**
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ......1B•1141
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 ......1B•1158**
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ......3•1135
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 ......1B•1172
† **Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, 215-277-0433 ......1B•1172**
§ **Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ......1B•1181**
§† **Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ......1B•1182**
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 1A•2067,1B•1019, 1207,1883**
† Abrams Instr. Corp., P.O. Box 26007, Lansing, MI 48909 517-332-6405
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
§ Astrosyn America, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401 213-785-2197
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
† GAP Instr., 110 Marcus Blvd., Hauppauge, NY 11787 516-273-0909
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
Icon, 156 Sixth St., Cambridge, MA 02142 617-868-5400
IMC/Hansen, Box 23, Princeton, IN 47670 812-385-3415
Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
Matrix Corp., 1639 Green St., Raleigh, NC 27603 919-833-2837
Mesur-Matic Elctrns., 50 Grove St., Salem, MA 01970-2294 617-745-7000
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700
Muirhead, 1101 Briston Rd., Mountainside, NJ 07092 201-233-6010
NMB Corp., Motor Div., 9730 Independence Ave., Chatsworth, CA 91311 213-709-1555
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
§† Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
Tokyo Elec. Co., Ltd., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101 Japan ......(03) 292-1011
TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080

Motors, Synchronous-3500

† **Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 ......1B•1131**
§ **Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618, 312-478-3515 ..1B•1135**
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ......1B•1140**
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 ......1B•1141
† **IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 ......1B•1157**
§ **Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 ......1B•1158**
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 ......1B•1181
§† **Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ......1B•1182**
§† **TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404, 513-228-3171 ......1B•1200-1204**
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 1A•2067,1B•1207, 1883,3•1934**
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Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
† Astro Instrument Corp., 2501 NW 17th Ln., Pompano Beach, FL 33064 305-748-5527
Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
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Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
Berger-Lahr Corp., Fitzgerald Dr., Jaffrey, NH 03452 603-532-7701
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Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
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EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
General Inds., Taylor & Olive St., Elyria, OH 44035 216-323-3136
† Harowe Servo Controls, Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§† Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ......800-321-5111, Ext. 596
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
§† Hurst Mfg. Corp., Box 326, Princeton, IN 47670 812-385-2564
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Lincoln Laser Co., 234 East Mohave, Phoenix, AZ 85004 602-257-0407
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
† McLean Engrg., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550 609-799-0100
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, IL 60008 312-259-8700

Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
Papst Mechatronic Corp., Aquidneck Indl. Pk., Newport, RI 02840 401-849-5930
§ Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
§ Rapidsyn, 3233 Roymar Rd., Oceanside, CA 92054 619-439-7500
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008 619-438-3321
Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† Stock Drive Prods., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-0200
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348
† Western Gear Corp., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744 818-968-6525

Motors, Synchronous, Polarized — See Motors, Synchronous (Vol. 1B)

Motors, Timing — See Motors, Clock & Timing (Vol. 1B)

Motors, Torque (Incl. Torquers)-3500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 .... 1B•1123
Airpax Corporation, Cheshire Div., , Cheshire Indl. Pk., Box E, Cheshire, CT 06410, 203-272-0301 .... 1B•1131
Brevel Motors, Inc., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, 201-933-0220 .... 1B•1136
Buehler Prods., P.O. Box A, Hwy. 70 E., Kinston, NC 28501, 919-522-3101 .... 1B•1137
Canon U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, 516-488-6700 .... 1B•1138
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018, 215-622-1000 .... 1B•1139
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820, 603-742-3330 .... 1B•1141
IMC Magnetics Corp., Eastern Div., 570 Main St., Westbury, NY 11590, 516-334-7070 .... 1B•1157
§ Japanese Prods. Corp., 31368 Via Colinas, Ste. 103-104, West Lake Village, CA 91362, 818-991-6111 .... 1B•1158
† Magnetic Technology, 21001 Kittridge St., Canoga Pk., CA 91303, 213-887-7700 .... 1B•1160
† Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 .... 1B•1165,3•1135
Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, 215-277-1300 .... 1B•1185
Robbins & Meyers, Inc., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, 614-446-9868 .... 1B•1175
Servo-Tek Prods. Co., 1086 Goffle Rd., Hawthorne, NJ 07506, 201-427-3100 .... 1B•1177
Shinano Kenshi Corp. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, 818-764-4266 .... 1B•1181
† Sierracin/Magnedyne, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, 619-438-3321 .... 1B•1179
Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 .... 1B•1182
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, 619-428-5581 .... 1B•1208,1209
Aeroflex Labs., Microelctrns. Div., 35 S. Service Rd., Plainview, NY 11803 516-694-6700
Arc Systems, Inc., 400 Oser Ave., Hauppauge, NY 11788 516-231-9261
† Ashland Elec. Prods., 32-02 Queens Blvd., Long Island City, NY 11101 212-392-4010
Axial Magnetics, 6600 Whitaker Ave., Van Nuys, CA 91406 818-994-3346
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
† Harowe Servo Controls, Westtown Rd. at West Chester Pike, W. Chester, PA 19380 215-692-2700
Hertner Div., 12690 Elmwood Ave., Cleveland, OH 44111 216-252-4242
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
† Inland Motor, Specialty Prods. Div., Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635 602-459-1150
† Inland Motor Specialty Prods. Div., Kollmorgen Corp., 501 First St., Radford, VA 24141 703-639-9045
† Kollmorgen Corp., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141 703-639-2495
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 619-727-7400
Motronics Corp., Riverside Indl. Pk., Little Falls, NY 13365 315-823-4050
PMI Motors, Kollmorgen Corp., 5 Aerial Way, Syosset, NY 11791 516-938-8000
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171

Motors, Universal, AC or DC Operation-3500

† Autotrol, P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
§ B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§ Bodine Elec. Co., 2500 W. Bradley Pl., Chicago, IL 60618 312-478-3515
§ Carter Motor, 2707 W. George St., Chicago, IL 60618-7898 312-588-7700
† EDO Corp./Elinco Div., 272 Main Ave., Norwalk, CT 06851 203-847-5861
Howard Inds., Box 287, Milford, IL 60953 815-889-4105
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
RTE Aerovox Inc., P.O. Box B-970, 740 Belleville Ave., New Bedford, MA 02741 617-994-9661
† Sawyer Inds., 5649 Peck Rd., Arcadia, CA 91006 213-442-5981
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
† Valley Electromagnetics Corp., P.O. Box 557, Crystal Lake, IL 60014 815-459-3080
† Valley Electromagnetics, P.O. Box 131, Spring Valley, IL 61362 815-664-2348

Mounts, Antenna-1900 — *See Vol. 3*

Mounts, CRT & Accessories-2500 — *See Vol. 2*

Mounts, Crystal-2300 — *See Vol. 1A*

Mounts, Integrated Circuit — See Sockets, Integrated Circuit (Vol. 2), Boards, Plug-In (Vol. 2),

Mounts, Microwave-3450 — *See Vol. 1A*

Mounts, Mobile Antenna — See Mounts, Antenna (Vol. 3)

Mounts, Shock & Vibration-2825 — *See Vol. 2*

Mounts, Thermistor-5300

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 .... 1B•1735
Baytron, 344 Salem St., Medford, MA 02155 617-391-1550
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
§† Harris Corp., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791 516-364-0400
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Maury Microwave, 8610 Helms Ave., Cucamonga, CA 91730 714-987-4715
† Microlab/FXR, 10 Microlab Rd., Livingston, NJ 07039 201-992-7700
† Premier Microwave, 35 New Broad St., Port Chester, NY 10573 914-939-8900
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 .... 301-948-3434; 800-638-2048

Mounts, Transistor (Incl. Kits) — See Pads, Transistor Mounting (Vol. 2)

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Multiplexers, Digital-2325 — *See Vol. 3*

Multiplexers, Fiber Optic-2475

Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901, 305-725-8000 .... 1B•1257
§† MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
CATEL Telecommunications, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054 408-988-7722
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617

Multiplexers, Frequency Division-1900 — *See Vol. 3*

Multiplexers, Statistical-1900 — *See Vol. 3*

Multiplexers, Time Division-1900 — *See Vol. 3*

Multiplexers, Transmission-1900 — *See Vol. 3*

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Multipliers, Magnetic Analog-2200 — *See Vol. 3*

Multipliers, Meter-2900 — *See Vol. 3*

Multipliers, Servo-4900 — *See Vol. 3*

Nameplates-2450

Acromark, 60 Locust/Dept. 397, Berkeley Hgts., NJ 07922 201-464-6474
† Bell Co., Inc., 106 Morrow Ave., Box 92E, Trussville, AL 35173 205-655-2135
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
† Brady, W. H., Co., Indl. Prods. Div., 2221 W. Camden Rd., Milwaukee, WI 53201 414-351-6630
† Devco Engrg., Control Sys. Div., 36 Pier Lane West, Fairfield, NJ 07006 ....201-CA8-0321
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
† JRW Inds., Inc., 2312 N Second St., Harrisburg, PA 17110 717-236-1418
§† Kepro Circuit Sys., 630 Axminister Dr., Fenton, MO 63026 314-343-1630
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
† Meyercord, 365 E. North Ave., Carol Stream, IL 60187 312-682-6200
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 ...818-283-5111
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ PacTec Div., LaFrance Corp., Enterprise & Executive Avenues, Philadelphia, PA 19153 215-365-8400
Pannier Corp., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974 215-672-3600
† Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 .213-603-0400
Photronic Labs., Secor Rd., Brookfield Ctr., CT 06805 203-775-0465
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† Topflight, 160 East 9th Ave., York, PA 17404 717-843-9901
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212

Networks, Computer, Local Area-2000 — *See Vol. 3*

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Networks, LC-2700 — *See Vol. 1A*

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Networks, Pulse Forming-2700 — *See Vol. 1A*

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Optical Component Mounts & Accessories-3700

§ Aerotech, Inc., 101 Zeta Dr., Pittsburgh, PA 15238 412-963-7470
Angenieux Inc., 120 Derry Rd., Hudson, NH 02051 603-889-2116
† Balzers Optical Grp., 170 Locke Dr., Marlboro, MA 01752 617-481-9860
Barry Controls, Barry Wright Corp., 700 Pleasant St., Watertown, MA 02172 617-923-1150
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 312-298-1420
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9316 Deering Ave., Chatsworth, CA 91311 818-882-0424
† D. O. Industries, 317 E. Chestnut St., E. Rochester, NY 14445 716-385-4920
Ealing Optics Co., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760 617-655-7000
Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811
General Cable Co., Fiber Optics Div., 160 Fieldcrest Ave., Raritan Ctr., Edison, NJ 08817 201-225-4780
Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
KLC/Karl Lambrecht Corp., 4204 N. Lincoln Ave., Chicago, IL 60618 312-472-5442
Lenox Laser, 615 Pittsfield Rd., Lenox, MA 01240 413-499-4477
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
† Melles Griot, 1770 Kettering St., Irvine, CA 92714 714-556-8200
Optics for Research, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4480
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Oriel Corp., 250 Long Beach Blvd., Stratford, CT 06497-0872 203-377-8282
Photobell, 26 Just Rd., Fairfield, NJ 07006 201-227-3613
Photon Technlg., 14125 Capri Dr., Los Gatos, CA 95030 408-866-0566
† Pomfret Research Optics, 817 Long Ridge Rd., Stamford, CT 06902 203-322-6386
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
SpecTran Corp., Hall Rd., P.O. Box 650, Sturbridge, MA 01566 617-347-2261
Teledyne Camera Sys., 131 N. Fifth Ave., Arcadia, CA 91006 213-359-6691
3D Optics, Box 224, 4 Strathmore Cir., Braintree, MA 02184 617-848-8002
† Unique Optical Co., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735 516-420-0288

Optical-Coupler Isolators — See Isolators, Opto (Vol. 1B)

Optical Signal Sources — See Generators, Light Pulse (Vol. 3)

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Oscillators, Audio (Test) — See Generators, Audio (Vol. 3)

Oscillators, Beat Frequency (BFO)-2300 — *See Vol. 1A*

Oscillators, Bias-2300 — *See Vol. 1A*

Oscillators, Bridge (Test)-2900 — *See Vol. 3*

Oscillators, Cavity-2300 — *See Vol. 1A*

Oscillators, Clock-2300 — *See Vol. 1A*

Oscillators, Crystal Controlled (Module)-2300 — *See Vol. 1A*

Oscillators, Decade (Test)-2900 — *See Vol. 3*

Oscillators, LC-2300 — *See Vol. 1A*

Oscillators, Low Frequency (Module)-2300 — *See Vol. 1A*

Oscillators, Microwave-3450 — *See Vol. 1A*

Oscillators, Oven-2300 — *See Vol. 1A*

Oscillators, Power (Module)-2300 — *See Vol. 1A*

Oscillators, Pulse (Module)-2300 — *See Vol. 1A*

Oscillators, Pulse (Test) — See Generators, Pulse (Vol. 3)

Oscillators, RC (Module)-2300 — *See Vol. 1A*

Oscillators, Reed-2300 — *See Vol. 1A*

Oscillators, RF (Module)-2300 — *See Vol. 1A*

Oscillators, RF (Test) — See Generators, RF (Vol. 3)

Oscillators, Sinusoidal (Module)-2300 — *See Vol. 1A*

Oscillators, Sinusoidal (Test) — See Generators, Function (Vol. 3)

Oscillators, Square Wave (Module)-2300 — *See Vol. 1A*

Oscillators, Square Wave (Test) — See Generators, Function (Vol. 3)

Oscillators, Sweep — See Generators, Sweep (Vol. 3)

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Oscillators, UHF/VHF (Module)-2300 — *See Vol. 1A*

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Oscillators, Ultrasonic (Module)-2300 — *See Vol. 1A*

Oscillators, Ultrasonic (Test) — See Generators, Ultrasonic (Vol. 3)

Oscillators, Voltage Controlled (Module)-2300 — *See Vol. 1A*

Oscillators (MIL), Crystal & Ovens-2440

Austron, Inc., P.O. Box 14766, Exit 248 N. IH 35, Austin, TX 78761, 512-251-2313 .... 1A•1314
† Bliley Elec. Co., 2545 W. Grandview Blvd., Erie, PA 16506, 814-838-3571 .... 1A•1323
Comstron Corp., 200 E. Sunrise Hwy., Freeport, NY 11520, 516-546-9700 .... 1A•1325
CTS Knights, 400 Reimann Ave., Sandwich, IL 60548, 815-786-8411 .... 1A•1343-1345
Datum Inc., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806, 714-533-6333 .... 3•1154
Frequency and Time Systems, Inc., 34 Tozer Rd., Beverly, MA 01915, 617-927-8220 .... 3•1154
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377, 212-458-5811 .... 1A•1356
† Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 .... 1A•1359
† Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92663, 714-759-2411 .... 1A•1362,1363
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1A•1372
McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, 717-486-3411 .... 1A•1380-1382
MF Elctrns. Corp., 10 Renewal Pl., New Rochelle, NY 10801, 914-576-6570 .... 1A•1384-1386
Microsonics Inc., 60 Winter St., Weymouth, MA 02188, 617-337-4200 .... 1A•1383
Monitor Prods. Co., Inc., 502 Via Del Monte, Oceanside, CA 92054, 619-433-4510 .... 1A•1389
Oscillatek Corp., 620 North Lindenwood Dr., Olathe, KS 66062, 913-829-1777 .... 1A•1399
† Q-Tech Corp., 2201 Carmelina Ave., Los Angeles, CA 90064, 213-820-4921 .... 1A•1410,1411
Spectrum Technology, Inc., 300 Lopez Rd., Goleta, CA 93116, 805-964-7791 .... 1A•1426,1427
† Vectron Labs., 166 Glover Ave., Norwalk, CT 06850, 203-853-4433 .... 1A•1439, 1441,1442
Xsis Electronics, Inc., 12620 W. 63rd St., Shawnee, KS 66216, 913-631-0448 .... 1A•1443
† Connor-Winfield Corp., 109 Turner Ct., POB L, W. Chicago, IL 60185 312-231-5270
† FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 .... 312-231-3511; 312-932-9380
† Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, PA 17055 717-766-0223
HDS Inc., 12310 Pinecrest Rd., Reston, VA 22091 703-620-6200
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Microwave/Sys., 1 Adler Dr., E. Syracuse, NY 13057 315-437-9951
† Ovenaire, 706 Forrest St., Charlottesville, VA 22901 804-977-8050
† Piezo Technology Inc., 2525 Shader Rd., Orlando, FL 32804 305-298-2000
Reeves-Hoffman Div., 400 W. North St., Carlisle, PA 17013 717-243-5929
† Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Oscillators (MIL), VCO, Solid State, RF-2440

Comstron Corp., 200 E. Sunrise Hwy., Freeport, NY 11520, 516-546-9700 .... 1A•1325,1326
EFRATOM, a division of Ball Corp., 18851 Bardeen Ave, Irvine, CA 92715, 714-752-2891 .... 1A•1350
† Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 .... 1A•1359
Hughes Solid State Products, 500 Superior Ave., Dept. E8, Newport Bch., CA 92663, 714-759-2411 .... 1A•1362,1363
Microsonics Inc., 60 Winter St., Weymouth, MA 02188, 617-337-4200 .... 1A•1383
§† Avantek, Inc., 3175 Bowers Ave., Santa Clara, CA 95051 408-496-6710
† Aydin Corp., 700 Dresher Rd., Horsham, PA 19044 215-657-7510
Central Microwave Co., Alpha Inds., Inc., 20 Sylvan Rd., Woburn, MA 01801 617-935-5150
† Communication Techniques Inc., 36 Route 10, East Hanover, NJ 07936 201-884-2580
Connor-Winfield Corp., 109 Turner Ct., POB L, W. Chicago, IL 60185 312-231-5270
Damon/Elctrns. Div., 80 Wilson Way, Westwood, MA 02090 617-449-0800
† Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611
† Greenray Inds., Inc., 840 W. Church Rd., Mechanicsburg, PA 17055 717-766-0223
HDS Inc., 12310 Pinecrest Rd., Reston, VA 22091 703-620-6200
Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509 213-517-6000
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† K & L Quartztek, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043 602-272-7944
† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
M/A-COM OSW, Inc., 2626 S. Hardy Dr., Tempe, AZ 85282 602-966-1471
§† Magnum Microwave Corp., 365 Ravendale Dr., Mountain View, CA 94043 415-968-9281
McCoy Electronics Co., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065 717-486-3411
† Microwave/Sys., 1 Adler Dr., E. Syracuse, NY 13057 315-437-9951
Monitor Prods. Co., Inc., 502 Via Del Monte, Oceanside, CA 92054 619-433-4510
† Ovenaire, 706 Forrest St., Charlottesville, VA 22901 804-977-8050
† Q-Tech Corp., 2201 Carmelina Ave., Los Angeles, CA 90064 213-820-4921
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611
TRAK Microwave, 735 Palomar Ave., Sunnyvale, CA 94086 408-735-9660
† Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
† Vectron Labs., 166 Glover Ave., Norwalk, CT 06850 203-853-4433

Oscillographs, Direct Writing-3000 — *See Vol. 3*

Oscilloscope Plug-ins-2975 — *See Vol. 3*

Oscilloscopes, Digital-2975 — *See Vol. 3*

Oscilloscopes, General Purpose-2975 — *See Vol. 3*

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Oscilloscopes, Low Frequency (DC to 3 MHz)-2975 — *See Vol. 3*

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Oscilloscopes, Multiple Channel-2975 — *See Vol. 3*

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Panels, Back Lighted & Edge Lighted-2450

Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 .... 1B•1046,1047
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
Dontech Inc., 601-606 Airport Indl. Blvd., Doylestown, PA 18901 215-348-5010

§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
GM Nameplate, Inc., 2040 15th Ave. West, Seattle, WA 98119 206-284-2200
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
KMC Systems Inc., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432 201-447-0007
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Lehighton Elctrns., Inc., Box 328, Dept M, Lehighton, PA 18235 ....717-386-4156; 215-377-5990
† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
Photo Chem. Prods. Cal., 18031 Susana Rd., Compton, CA 90224 213-603-0400
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Screenprint/Dow Industries, 271 Ballardvale St., Wilmington, MA 01887 617-935-6395
Spectra Lux Corp., 12840 N.E. 21 St. Pl., Bellevue, WA 98005 206-747-0560
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 213-285-3105

Panels, Electroluminescent-2450

Dio-Rey, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, 201-941-4455 ....1B•1046,1047
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111

Panels, Fuse-4300

Fil-Coil Economy Intl., Inc., 800 Axinn Ave., Garden City, NY 11530, 516-294-5445 ....1A•1595
Accurate Elctrns., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036 216-365-1211
† Anchor Specialty Mfg. Inc., 300 Hollister Rd., Teterboro, NJ 07608 201-288-1939
§† Bussmann Div., P.O. Box 14460, St. Louis, MO 63178 314-394-2877
Carbone-Ferraz, Inc., Eastmans Rd., Parsippany, NJ 07054 ....201-428-8400; 800-526-9067
Doran Mfg. Co., 2851 Massachusetts Ave., Cincinnati, OH 45225 513-681-5424
† GRIM Corporation, Box 67, Medford, NJ 08055 609-267-7950
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† Mechanical Engraving, 4500 Bullard Ave, Bronx, NY 10470 212-324-4455
National Tel-Tronics, State Road Hill, Meadville, PA 16335 814-724-6440
§ Ratelco, 1260 Mercer, Dept. EEM, Seattle, WA 98109 206-624-7770
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
§ Underwriters Safety Device, An Allied Co., 7300 W. Wilson Ave., Chicago, IL 60656 312-867-4600
§ Wadsworth Elec., 20 W. 11th St., Covington, KY 41011 606-431-0900

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Photodetectors, GaAs-3700

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ....1B•1230
Fiberoptic Fabrications, Inc., 70 Pullman St., Worcester, MA 01606 617-853-6449

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Plugs (MIL)-2440

† ADC Magnetic Controls Co., 4900 W. 78th St., Minneapolis, MN 55435 612-835-6800
† Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
† Lynn Elctrns., 915 Pennsylvania Blvd., Feasterville, PA 19047 215-677-6700
§† M/A-COM Omni Spectra, Inc., 21 Continental Blvd., Merrimack, NH 03054 603-424-4111
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020

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Mepco/Electra, Inc., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121, 619-453-0332 .... 1B•1012

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Printed Circuits & Printed Circuit Materials (MIL)-2440

§† Injectorall Elctrns., 98-100 Glen St., Glen Cove, NY 11542, 516-671-6010 .. 2•1091

† Advanced Circuitry, Litton Inds., 4811 W. Kearney, Springfield, MO 65803 417-862-0751

Associated Circuits Inc., 621 Old County Rd., San Carlos, CA 94070 415-592-7528

§ Bud Inds., Inc., 4605 E. 355th St., Willoughby, OH 44094 216-946-3200
† Compunetics, Inc., 2000 Eldo Rd., Monroeville, PA 15146 412-373-8110
† Cuplex, Inc., 1500 E. Hwy. 66, Garland, TX 75040 214-276-0333
† Dynacircuits Inc., 11230 W. Addison, Franklin Park, IL 60131 312-451-1700
† Elco Corp., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245 213-675-3311
§ Electronic Trend Prods., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014 408-996-7401
† Granite State Circuits, Power Elctrns. Corp., P.O. Box 2208, 96 Milton Rd., Rochester, NH 03867 603-332-3334
Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
Lehighton Elctrns., Inc., Box 328, Dept M, Lehighton, PA 18235 ....717-386-4156; 215-377-5990
† Multi-Plate Co., Inc., 2362 Lu Field Rd., Dallas, TX 75229 214-243-1557
NAZ-DAR Intl., 1087 N. Branch St., Chicago, IL 60622 312-943-8338
† Parlex Corp., 145 Milk St., Methuen, MA 01844 617-685-4341
Power Elctrns., 96 Milton Rd., Rochester, NH 03867 603-332-3334
† Teknational Inds., Inc., 430 S. Clinton Ave., Rochester, NY 14620 ..716-232-1291
† West-Tronics, Inc., 215 Park St., Bensenville, IL 60106 312-860-3560

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Protectors, Brownout-4300

Behlman Engineering Corporation, 1142 Mark Ave., Carpinteria, CA 93013, 805-684-8311 ....3•1838,1839
Clary Corp., Precision Instrs. Div., 320 W. Clary Ave., San Gabriel, CA 91776, 818-287-6111 ....3•1842
Controlled Power Co., 1955 Stephenson Hwy., Troy, MI 48084, 313-528-3700 ....3•1849,1851-1853
§ **Displex, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 ....3•1860**
Franek, John, Co., Inc., P.O. Box 11752, Santa Ana, CA 92711-1752, 14-832-0290;800-854-9420 ....3•1862-1866,1875
Hipotronics, P.O. Drawer A, Brewster, NY 10509, 914-279-8091 ....3•1882,1883
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649, 14-898-2691;800-854-2433 ....3•1897,1899,1900
RTE Deltec Corp., 2727 Kurtz St., San Diego, CA 92110, 619-291-4211 ....3•1907
Sola Elec., 1717 Busse Rd., Elk Grove Village, IL 60007, 312-439-2800 ....3•1912-1915
Abacus Controls Inc., 89 Readington Rd., Somerville, NJ 08876 201-526-6010
Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037 305-451-1000
Albar, Inc., 19013 36th Ave. W., Lynnwood, WA 98036 206-771-4006
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Elgar Corp., 8225 Mercury Ct., San Diego, CA 92111 619-565-1155
Powermark, 3855 Ruffin Rd., San Diego, CA 92123 619-565-8363
§ Power-One, Inc., Power-One Dr., Camarillo, CA 93010 805-484-2806
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Superior Elec. Co., 383 Middle St., Bristol, CT 06010 203-582-9561
Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Topaz Electronics, 9192 Topaz Way, San Diego, CA 92123-1164 619-279-0831

Protectors, Surge-4300 (Also See Suppressors, Transient Voltage)

Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901, 305-725-8000 ....1B•1257
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ....1B•1288,1313**
† **Control Concepts Corp., P.O. Box 1380, Binghamton, NY 13902-1380, 607-724-2484 ....1B•1263**
Controlled Power Co., 1955 Stephenson Hwy., Troy, MI 48084, 313-528-3700 ....3•1849,1851-1853
§ **Displex, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 ....3•1860**
Franek, John, Co., Inc., P.O. Box 11752, Santa Ana, CA 92711-1752, 14-832-0290;800-854-9420 ....3•1862-1866,1875
Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 ....1B•1804
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ....1B•1490,1674
§† **MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 ....1B•1277-1280**
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ....1B•1811,1814,1815,1817**
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649, 14-898-2691;800-854-2433 ....3•1897,1899,1900
Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648, 312-647-9414 ....1B•1284
§ **PolyPhaser Corporation, P.O. Box 1237, Gardnerville, NV 89410, 702-782-2511 ....1B•1285**
Powermark, 3855 Ruffin Rd., San Diego, CA 92123, 619-565-8363 ....3•1904
† **Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 ....3•1917**
Triad-Utrad, 1124 E. Franklin St., Huntington, IN 46750, 219-356-6500 ....3•1918
§ Beckman Instrs., Electro-Prods. Grp., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
§ Brooks Mfg. Co., 2016/24 Amber St., Philadelphia, PA 19125 ....215-425-3395; 800-523-0130
Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406 213-450-1761
Cuesta Systems, Inc., 3440 Roberta Ct., San Luis Obispo, CA 93401 805-541-4160
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
§ Dyma Engrg., Box 1535, Los Lunas, NM 87031 505-865-6700
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
§ Electronic Specialists, 171 South Main St., Natick, MA 01760 ....617-655-1532; 800-225-4876
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 ..617-448-5485
Elgar Corp., 8225 Mercury Ct., San Diego, CA 92111 619-565-1155
Ericson Mfg. Co., 4215 Hamann Pkwy., Willoughby, OH 44094 216-951-8000
§† General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§† General Semiconductor Inds., Inc., 2001 W. 10 Pl., Tempe, AZ 85281 602-968-3101
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Joslyn Elctrn. Sys., 6868 Cortona Dr., Goleta, CA 93017 805-968-3551
Kalglo Elctrns. Co., Inc., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017 215-837-0700
§ LEA, Inc., A Dynatech Co., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 818-944-0916
Lightning Protection Corp., Box 6086, Santa Barbara, CA 93160 ....805-967-5089/4577
§† Micro Semiconductor, 2830 S. Fairview St., Santa Ana, CA 92704 ..714-979-8220
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 ..201-748-5089
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
† Power Integrity Corp., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408 919-379-9773
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
Sanford-Miller Corp., 8 John St., Lynbrook, NY 11563 .516-593-2025;Outside NY 800-645-5900
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Siemens Corp., 186 Wood Ave., S., Iselin, NJ 08830 201-494-1000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Staffall Inc., 7 Woodland St., Providence, RI 02908 401-351-8282

§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 ..215-825-4990
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
† Victor Elec. Wire & Cable, 618 Main St., W. Warwick, RI 02893 .....401-821-1700; SALES 401-821-7800
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

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Pullers, Circuit Board-5400 — *See Vol. 2*

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J-B-T Instrs., Box 1818, New Haven, CT 06508, 203-776-1111 .... 3•1332
Modutec, 18 Marshall St., Norwalk, CT 06854, 203-853-3636 .... 3•1335
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ....1B•1735,3•1346
Triplett Corp.—A Penril Co., One Triplett Dr., Bluffton, OH 45817-9987, 419-358-5015 .... 3•1356
Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
§ Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500
§ Epic, Inc., 150 Nassau St., New York, NY 10038 212-349-2470
Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
† Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 ...603-889-2500
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330
§ Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ....219-232-3900; 800-348-2993

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Reactors (MIL)-2440

† Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11582 ..516-561-6050
† NWL Transformers, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030 816-761-6314
§† TRW Inductive Products Div., 150 Varick St., New York, NY 10013 .212-255-3500

Readers, Badge-2000 — *See Vol. 3*

Readers, Bar Code-2000 — *See Vol. 3*

Readers, Character-2000 — *See Vol. 3*

Readers, Magnetic Card-2000 — *See Vol. 3*

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Receivers, AM/FM (Incl. Precision Test)-2900 — *See Vol. 3*

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Receivers, Fiber Optic-2475

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ....1B•1112,1113,1229
MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
Artel Communications Corp., 93 Grand St., Worcester, MA 01602 ..617-752-5690
§ Augat Fiberoptics, 40 Perry Ave., Attleboro, MA 02703 617-222-2202
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 914-965-6300
Dynamic Measurements, 8 Lowell Ave., Winchester, MA 01890 617-729-7870
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 201-549-9000
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 .914-425-2000
M/A-COM Laser Diode, Inc., M/A-COM, Inc., 1130 Somerset St., New Brunswick, NJ 08901 201-249-7000
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 .... 413-598-8204;592-3834
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 213-281-3636
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320 818-889-8770
† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
SpecTran Corp., Hall Rd., P.O. Box 650, Sturbridge, MA 01566 617-347-2261
Times Fiber Communications, Inc., 358 Hall Ave., Wallingford, CT 06492 203-265-8500

Receivers, Field Intensity, Microwave — See Receivers, Microwave (Vol. 3)

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Rectifiers, Silicon Controlled — See Thyristors (Vol. 1A)

Rectifiers (MIL), Semiconductor-2440

Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 .... 1A•2107
TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 .... 1B•1246-1249
† Voltage Multipliers, Inc., 8711 W. Roosevelt Ave., Visalia, CA 93291, 209-651-1402 .... 1A•2113

† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015

Reducers, Speed-3500 (Also See Gears & Gear Mechanisms)

§ Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101, 212-361-0800 .... 2•1762
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
Eastern Air Devices Motor Div., 1 Progress Dr., Dover, NH 03820 603-742-3330
§ Electrol Co., 321 Dewey St., P.O. Box 29, York, PA 17405 717-848-1722
† Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670
† Instru-Lec, 520 Homestead Ave., Mt. Vernon, NY 10550 914-668-3754
† PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 .... 516-ED3-5955
Singer Co., Kearfott Div., 1150 McBride Ave., Little Falls, NJ 07424 201-785-6000
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
† TRW Motor Div. (Military), 2275 Stanley Ave., Dayton, OH 45404 513-228-3171
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 312-585-1212

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Regulators, Frequency-4050 — *See Vol. 3*

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Relays, Cradle-4500

§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 .... 1B•1405-1407
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000

Relays, Crystal Can, 1/2 Crystal Can-4500

§† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 .... 1B•1291
American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 .... 1B•1524
Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .... 1B•1300
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 .... 1B•1320,1321
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 .... 1B•1348,1349
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386,1387
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 .... 1B•1412
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469
§† Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477
Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132

† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ......201-797-3313; 800-526-5376
† Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257

Relays, Current Sensing-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ......1B•1524, 1525
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ......1B•1337
§ Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 ......1B•1386
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ......1B•1405,1406
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ......1B•1469
Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ......1B•1477
† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735 516-694-5100
Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 ..212-428-5155
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
Instrumentation & Control Sys., 520 Interstate Rd, Addison, IL 60101 312-543-6200
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ......312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ......201-797-3313; 800-526-5376
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 .219-563-2191
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Differential-4500

§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 ..212-428-5155
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Frequency Selective-4500

† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 ..212-428-5155
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 .213-992-6776
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, General Purpose-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ......1B•1291
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ......3•1122
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ...... 1B•1522-1530
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ......1B•1293
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .1B•1295 1306
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ......1B•1310,1311
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ......1B•1312,1314
§ Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ...... 1B•1318-1321
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ...1B•1334, 1335
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ......1B•1610
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ...... 1B•1352-1356,1358
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ......1B•1364
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ...... 1B•1368-1385
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 .1B•1399, 1401,1403
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ...... 1B•1390-1395
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ...... 1B•1405,1406,1410-1412
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ......1B•1414, 1415
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ...... 1B•1417-1425
§† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859, 219-747-6142 ......1B•1474
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ......1B•1433
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ...... 1B•1436-1442
Iskra Electronics, Inc., 8 Greenfield Rd., Syosset, NY 11791, 516-364-2616 ......1B•1443
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 ...... 1B•1444-1448
ITT Comps. Passive Grp., 3201 S. Standard St., Santa Ana, CA 92705, 714-751-3900 ......1B•1449

Relays, General Purpose-4500 (Cont'd)

§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1B•1458,1459
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 .... 1B•1460-1465
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947, 219-722-2244 .... 1B•1474
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§† Associated Engrg. Mfg., 546 Valley Rd., Upper Montclair, NJ 07043 201-783-7800
§ ATR Elctrns., Inc., 280 E. Lafayette Frontage Rd., St. Paul, MN 55107 612-222-3791
Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980 703-949-1000
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 913-342-5544
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 213-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, High Voltage (500 Volts & Over)-4500

† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 .... 1B•1323
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1337,1341
Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 .... 1B•1346
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 .... 1B•1358
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 1B•1396-1398,1402
Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 .... 1B•1400
† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 .... 1B•1452-1454,1651
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 .... 1B•1456, 1457
§† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 .... 1B•1472
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 914-699-2000
Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 212-428-5155
§† Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 913-342-5544
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MSI Electronics, Inc., 34-32 57th St., Woodside, NY 11377 212-672-6500
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Relays, Hybrid-4500

§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 .... 1B•1365
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 .... 1A•1654-1657,1B•1392,1393
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1B•1458,1459
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000

Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000

Relays, Impulse — See Relays, Stepping (Vol. 1B)

Relays, I/O Modules — See Modules, I/O Relays (Vol. 1A)

Relays, Latching-4500

§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 1B•1298, 1300,1301,1303,1304,1306
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 .... 1B•1314,1315
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 .... 1B•1335
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1340
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 .... 1B•1354,1355
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 .... 1B•1348,1349
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386,1387
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 .... 1B•1407,1411
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 .... 1B•1440
† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 .... 1B•1452-1454
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 .... 1B•1460-1465
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477
A.D. Data Sys., 200 Commerce Dr., Rochester, NY 14623 716-334-9649
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 213-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
† Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
§ ZI-TECH Instr. Corp., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306 415-326-2151

Relays, Mercury-Wetted Contacts-4500

§† Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 .... 1B•1288,1312,1313
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1339-1341
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 .... 1B•1352-1355
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 .... 1B•1364
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 .... 1B•1366
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 .... 1B•1385
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 1B•1396-1398,1402
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... 1B•1433
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§ COSAR, 3121 Benton St., Garland, TX 75042 .... 214-276-9487;800-527-1207
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
§ Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 212-428-5155
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 213-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§† Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

Relays, Meter-4500

§ Jewell Electrical Instrs., Grenier Field, Manchester, NH 03108, 603-669-6400 .... 3•1333
NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 .... 1B•1091, 3•1088,1136,1167,1338,1340
§ Simpson Elec. Co., 853 Dundee Ave., Elgin, IL 60120, 312-697-2260 .... 3•1350
Texmate, Inc., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, 619-481-7177 .... 3•1352
A & D Elec. Instrs., 73-07 88th St., Glendale, NY 11385 212-275-6516
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 .... 617-777-4500; 17-246-0300;800-451-1816
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Beede Electrical Instr. Co., S. Main St., Penacook, NH 03303 603-753-6362
Calex Mfg. Co., Inc., 3355 Vincent Rd., Pleasant Hill, CA 94523 415-932-3911
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
DCI, Inc., 720 E. Dennis, Olathe, KS 66061 913-782-5672
§ Electro Industries, Div. E.I. Elctrns. Inc., 316 Westbury Ave., Carle Place, NY 11514 516-334-0870
§† International Instruments, 88 Marsh Hill Rd., Orange, CT 06477 203-795-4711

§—Product sold through distributors †—Product meets MIL specs

§ Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800
LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000
§ Newport Electronics, 630 E. Young St., Santa Ana, CA 92705 714-540-4914
Q.V.S., Inc., 20 North 15th St., East Orange, NJ 07017 201-673-3996
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Sigma Instrs., Intl. Instr. Div., 88 Marsh Hill Rd., Orange, CT 06477 203-795-4711
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Motor Start-4500

Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ....1B•1311
Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ....1B•1442
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ....1B•1651
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
KB Elctrns., 73 Wortman Ave., Brooklyn, NY 11207 212-257-3300
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 813-855-4621
Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000

Relays, Phase Sensing-4500

§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ....1B•1458,1459
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
† Logitek Inc., 101 Christopher St., Ronkonkoma, NY 11779 516-467-4200
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

Relays, Plug-in-4500

† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ....1B•1291
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ....1B•1524
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ....1B•1293
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .1B•1307
§ Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ....1B•1310,1311
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ....1B•1312
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ....1B•1323
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ...1B•1334, 1335
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 ....1B•1348
§ Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ....1B•1370,1377-1381
§† Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 ....1B•1387
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1414, 1415
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ....1B•1417-1419,1421,1422
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ....1B•1437-1442
Iskra Electronics, Inc., 8 Greenfield Rd., Syosset, NY 11791, 516-364-2616 ....1B•1443
ITT Comps. Passive Grp., 3201 S. Standard St., Santa Ana, CA 92705, 714-751-3900 ....1B•1449
§† Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ....1B•1477
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
§† Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§† Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
§† Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 .213-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ....312-AL2-2700
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000

Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
Ziatech, 3433 Roberto Ct., San Luis Obispo, CA 93401 805-541-0488

Relays, Power-4500

Advanced Transformers Inds., Inc., 114 Center St., El Segundo, CA 90245, 213-322-4249 ....1B•1473
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ....1B•1291
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....3•1122
§ **American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ....1B•1522, 1524,1529,1530**
§† **Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .1B•1294 1297,1306-1309**
ATR Elctrns., Inc., 280 E. Lafayette Frontage Rd., St. Paul, MN 55107, 612-222-3791 ....3•1827
§ **Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ....1B•1311**
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ....1B•1312**
Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 ....1A•1691
§ **Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ...1B•1334, 1335**
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ....1B•1340,1343
† **Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ....1B•1347**
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ....1B•1358
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ....1B•1365
Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 ....1B•1350
§ **Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ....1B•1376-1381**
§ **Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ....1B•1388-1395,1400**
§ **Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ....1B•1413**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1414, 1415**
§† **Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859, 219-747-6142 ....1B•1474**
§ **Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ....1B•1441,1442**
ITT Comps. Passive Grp., 3201 S. Standard St., Santa Ana, CA 92705, 714-751-3900 ....1B•1449
† **ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ....1B•1452-1454,1651**
† **Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 .....1B•1456, 1457**
§† **Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ....1B•1460-1465**
§ **Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ....1B•1469**
§ **Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 ....1B•1471**
§† **Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ....1B•1472**
§ **Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947, 219-722-2244 ....1B•1474**
§ **Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ....1B•1477**
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ...203-828-6379
§ Communications Instrs., Inc., Box 520, Fairview, NC 28730 704-628-1711
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
§ Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
Genicom Corp., General Electric Dr., Waynesboro, VA 22980 703-949-1000
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ...213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Power Control, 122 Gamma Dr., Pittsburgh, PA 15238 412-782-3120
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
† Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, Printed Circuit Mounting (Including Transistor & DIP Case Types)-4500

Advanced Transformers Inds., Inc., 114 Center St., El Segundo, CA 90245, 213-322-4249 ....1B•1473
§ **American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 .... 1B•1522-1530**
Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ....1B•1293
§† **Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .1B•1294 1300**
§ **Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ....1B•1310,1311**
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ....1B•1288,1312-1316**
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ....1B•1318-1321
† **Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ....1B•1323**
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ....B•1324-1330
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ....1B•1337-1342
§ **Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ....1B•1352-1361**
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ....1B•1364,1365
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 ....1B•1366
§ **Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ....1B•1368-1385**
§† **Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 ....1B•1386,1387**
§ **Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 1B•1396-1399,1401-1403**
§ **Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ....1B•1390,1391,1394,1395,1400**
§ **Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ....1B•1407,1410,1411,1413**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1414, 1415**
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 .... 1B•1417-1422,1425
§ **Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ....1B•1433**
§ **Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ....1B•1436-1442**

Relays, Printed Circuit Mounting -4500 (Cont'd)

§ **ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 .... 1B•1444-1448**
ITT Comps. Passive Grp., 3201 S. Standard St., Santa Ana, CA 92705, 714-751-3900 .... 1B•1449
§ **Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469**
§ **Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 .... 1B•1471**
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 .... 1B•1475
§ **Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477**
§ **Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992, 219-563-2191 .... 1B•1478,1479**
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ... 203-828-6379
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
§ COSAR, 3121 Benton St., Garland, TX 75042 .... 214-276-9487;800-527-1207
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ... 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MSI Electronics, Inc., 34-32 57th St., Woodside, NY 11377 212-672-6500
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Preferred Elctrns., Inc., Main Line Dr, P.O. Box 954, Westfield, MA 01086 413-568-2301
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 .. 312-932-1660
§ Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947 219-722-2244
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000

Relays, Programmable-4500

§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ... 203-828-6379
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 ... 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 . 213-992-6776
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311

Relays, RF (Incl. Antenna & Coaxial)-4500

§† **Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 . 1B•1296**
§† **Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 .... 1B•1318,1321**
Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 .... 1A•1691
† **Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 .... 1A•1697**
§† **Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 .... 1B•1346,1347**
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 .... 1B•1358,1359
§† **Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 .... 1B•1349**
Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386,1387
Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 .... 1B•1436-1438
† **ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 .... 1B•1452-1454,1651**
§† **Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ..... 1B•1456, 1457**
§ **Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 .... 1B•1469**
§ Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
§ COSAR, 3121 Benton St., Garland, TX 75042 .... 214-276-9487;800-527-1207
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 . 213-992-6776
† Microwave Filter Inc., 6743 Kinne St., East Syracuse, NY 13057 ..... 315-437-4529; 800-448-1666
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
Rockwell Intl., Commercial Elctrns. Opers., 1200 N. Alma Rd., Richardson, TX 75081 214-996-5000
§† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 . 219-563-2191
Wall-Able Manufacturing Corp., 1800 N. Clybourn Ave., Chicago, IL 60614 312-440-1000

Relays, Reed-4500

§ **American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 .... 1B•1529, 1530**
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 .... 1B•1288,1315**
† **Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 .... 1B•1323**
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 .... B•1324-1330
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1337-1341
§ **Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 .... 1B•1352-1359**
§ **Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 .... 1B•1364**
§ **Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 .... 1B•1382-1384**
§ **Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 1B•1396-1399,1401-1403**
Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 .... 1B•1400
§ **Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... 1B•1433**
§ **Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 .... 1B•1436-1438**

§—Product sold through distributors †—Product meets MIL specs

§ **Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ...... 1B•1469**
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 ...... 1B•1475
§† **Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ...... 1B•1477**
§ **Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992, 219-563-2191 ...... 1B•1478,1479**
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
§ ATR Elctrns., Inc., 280 E. Lafayette Frontage Rd., St. Paul, MN 55107 612-222-3791
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
§ COSAR, 3121 Benton St., Garland, TX 75042 ...... 214-276-9487;800-527-1207
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Information Transfer Indl., Box 357, Holcomb, NY 14469 716-657-7074
INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
§ Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 913-342-5544
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 213-992-6776
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ...... 201-797-3313; 800-526-5376
§† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 312-932-1660
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125
Thomson-CSF Comps. Corp., Socapex Div., 6660 Variel Ave., Canoga Pk, CA 91303 213-887-0750
Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Sealed-4500

§ **American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ...... 1B•1522, 1523,1527-1530**
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ...... 1B•1313
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 ...... 1B•1323
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ...... B•1324-1330
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ...... 1B•1337-1339
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ...... 1B•1355,1357,1358
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ...... 1B•1370,1377,1382-1385
Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 ...... 1B•1386,1387
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ...... 1B•1417-1422
Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ...... 1B•1436-1442
ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 ...... 1B•1444-1448
Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ...... 1B•1456
Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ...... 1B•1469
Advanced Transformers Inds., Inc., 114 Center St., El Segundo, CA 90245 213-322-4249
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
† Branson Corp., Box 147, Newton, NJ 07860 201-383-3132
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
Thermosen, P.O. Box 1254, Stamford, CT 06904 203-324-6125

Relays, Sensitive-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ...... 1B•1291
§ **American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ...... 1B•1523, 1525-1528**
§† **Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 . 1B•1294 1298,1300,1301,1303-1305**
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 ...... 1B•1312**
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ...... 1B•1318,1319
Coto Corporation, 55 DuPont Drive, Providence, RI 02907, 401-943-2686 ...... B•1324-1330
§ **Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ...... 1B•1359**
§† **Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 ...... 1B•1348-1350**
§ **Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044, 312-295-2610 ...... 1B•1368,1369,1371-1375**
§† **Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 ...... 1B•1386,1387**
Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ...... 1B•1400
§ **Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ...... 1B•1405,1406,1411,1412**
§† **Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859, 219-747-6142 ...... 1B•1474**
§ **Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ...... 1B•1438**
§ **ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 ...... 1B•1444-1448**
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 ...... 1B•1460,1461
§ **Stancor/Hamilton Standard Controls, 131 Godfrey St., Logansport, IN 46947, 219-722-2244 ...... 1B•1474**
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992, 219-563-2191 ...... 1B•1478,1479
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Barber-Colman Co., Motor Div., 14116 Rock St., Rockford, IL 61101 815-877-0241
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
† Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electro Design Sys., 100 W. 35th St., Ste. S, National City, CA 92050 619-420-2351
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500

Regent Controls, 39 Fanny St., P:O. Box 767, Shelton, CT 06484-0767 203-736-2924
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ....312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relay, Solid State-4500

§† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 ....1B•1293
ATR Elctrns., Inc., 280 E. Lafayette Frontage Rd., St. Paul, MN 55107, 612-222-3791 ....3•1827
§ Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ....1B•1342-1344
§ Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ....1B•1360,1361
§ Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180, 617-438-5300 ....1B•1365
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756, 501-636-5000 ....1B•1388-1391,1394,1395
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 ....1B•1413
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1414, 1415
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ....1B•1425
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 ....1B•1450
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ....1B•1458,1459
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ....1B•1469
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ....1B•1735
§ Opto 22, 15461 Springdale St., Huntington Bch., CA 92649, 714-891-5861 ....1B•1471
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ....1B•1477
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Alpha Comps., 115 Eucalyptus Dr., El Segundo, CA 90245 213-322-7780
Applied Control, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828 201-227-5454
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Basler Elec., Rte. 143, Highland, IL 62249 618-654-2341
Brown Boveri Elec., Norristown Rd., Spring House, PA 19477 215-628-7400
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§† Digitech Inds., Inc., 66 Grove St., Ridgefield, CT 06877 203-438-3731
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Dumont Instrumentation, Inc., 75 Mall Dr., Commack, NY 11725 516-864-8500
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ EDL Inc., 385 Oser Ave., Hauppauge, NY 11787 ....516-435-2808;800-DIAL EDL; 800 342-5335
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
§ Electronic Relays, 30 Plaza Dr., Westmont, IL 60559 312-789-8166
Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
† Genisco Technlg. Corp., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 212-428-5155
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
§† Kings Elctrns., 40 Marbledale Rd., Tuckahoe, NY 10707 914-793-5000
Klockner Moeller, 4 Strathmore Rd., Natick, MA 01760 617-655-1910
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 213-992-6776
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
MSI Electronics, Inc., 34-32 57th St., Woodside, NY 11377 212-672-6500
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Preferred Elctrns., Inc., Main Line Dr, P.O. Box 954, Westfield, MA 01086 413-568-2301
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 203-736-2924
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
Solid State Relays, 213 Eisenhower Lane So., Lombard, IL 60148 312-932-1660
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735 516-694-6312
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
§ Vectrol, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557 813-855-4621
§ Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Stepping-4500

Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ....1B•1321
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ....1B•1426
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
§ Bellofram Corp., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803 ....617-272-2100;800-225-1031
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377 513-898-3621
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ....312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Telephone-4500

Bosch, Robert, Corp., 2800 S. 25th Ave., Broadview, IL 60153, 312-865-5200 ....1B•1311
Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ....1B•1321
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350, 805-252-8330 ....1B•1357
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 ....1B•1441,1442
§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ....1B•1469
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
AT&T, 475 South St., Morristown, NJ 07960 201-631-6790
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Davis Elec. Co., Box 38, Cape Girardeau, MO 63701 314-335-5547
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300

§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Interconnect Devices, Inc., 5101 Richland Ave., Kansas City, KS 66106 913-342-5544
§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900
Lear Siegler, Inc., 2850 Ocean Park Blvd., P.O. Box 2158, Santa Monica, CA 90406 213-452-6000
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435 815-725-2241
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ....312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Schrack North America Corp., 76 N. Broadway, Irvington, NY 10533 914-591-7900
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
§ Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Relays, Thermal-4500

§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-5300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191
† Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Relays, Time Delay-4500

Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406, 215-337-5500;800-441-8245 ....3•1123
§ **Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083, 201-964-4400 ....3•1125**
§ **Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711, 812-426-2806 ....1B•1336**
§† **Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ....1B•1458,1459**
Logitek Inc., 101 Christopher St., Ronkonkoma, NY 11779, 516-467-4200 ....1B•1467
§ **Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630, 312-282-5500 ....1B•1469**
§† **Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 ....1B•1477**
§ Air-O-Tronics Prods., Box K, Morrisville, NY 13408 315-684-3705
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Alpha Comps., 115 Eucalyptus Dr., El Segundo, CA 90245 213-322-7780
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031
§† Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
Artisan Elctrns., 5 Eastmans Rd., Parsippany, NJ 07054 201-887-7100
† Babcock Electro-Mechanical, Inc., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626 714-540-1234
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379
Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000
§ Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215 414-671-6800
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
§† Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230 503-665-0121
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§† Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
§ Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ Instrumentation & Control Sys., 520 Interstate Rd, Addison, IL 60101 312-543-6200
† International Sensor Systems, Inc., Aurora Industrial Pk., Box 345, Aurora, NE 68818 402-694-6111
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-321-3260
§ La Marche Mfg., 106 Bradrock Dr., Des Plaines, IL 60018 312-299-1188
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
§ Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573
§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336
§ Midland-Ross Corp., Midtex Div., P.O. Box 3328, No. Mankato, MN 56001 507-625-6521
MKC Elctrns., 454 E. Donovan Rd., Kansas City, KS 66115 913-371-1351
§ National Controls Corp., 931 N. DuPage Ave., Lombard, IL 60148 312-932-6900
Nolatron, P.O. Box 4042, Harrisburg, PA 17111 717-564-3398
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Pacific Timer Inc., 21739 N.E. 18th Way, Redmond, WA 98052 206-881-1785
Paragon Elect., 606 Parkway Blvd., Two Rivers, WI 54241 414-793-1161
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 203-736-2924
† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
† Sigmapower, Inc., 20790 Leapwood Ave., Carson, CA 90746 ....213-32-Sigma
† Solid State Elctrns. Corp., 18646 Parthenia St., Northridge, CA 91324 818-993-8257
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
§ Syracuse Elctrns., P.O. Box 4770, Syracuse, NY 13221 315-488-4911
† Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
Timeco, Inc., 1035 - 26th St., P.O. Box 8036, Huntington, WV 25705 304-523-5149
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 516-226-5000
§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200
† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays, Transistor & DIP Case Types — See Relays, Printed Circuit Mounting (Vol. 1B)

Relays, Vacuum-4500

§† **Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ....1B•1347**
† **ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ....1B•1452-1454,1651**
§† **Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ....1B•1456, 1457**
† **Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ....1B•1472**

Relays, Vacuum-4500 (Cont'd)

§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700

§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840

§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800

§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521

Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361

Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336

§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300

§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500

Relays, Voltage Sensitive-4500

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 .... 1B•1291

† **Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, 714-556-6570 .... 1B•1293**

Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092, 201-232-4260 .1B•1294 1309

Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 .... 1B•1318-1321

Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 .... 1B•1323

Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1337

§† **Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386**

§ **Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 .... 1B•1405,1406,1410**

§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1414, 1415**

Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 .... 1B•1417-1424

Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 .... 1B•1436-1442

§† **Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1B•1458,1459**

§ **Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477**

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670

§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503

ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314

† Argent Elctrns., 3245 S. County Rd., 25A, Troy, OH 45373 513-335-0031

† Calex Mfg. Co., Inc., 3355 Vincent Rd., Pleasant Hill, CA 94523 415-932-3911

Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 203-828-6379

§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700

Control Engrg., Inc., 1686 Riverdale St., West Springfield, MA 01089 413-781-1330

Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333

Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107

§ Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806

§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116

§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300

§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840

§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800

§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000

§ Guardian California, 16100 S. Figueroa St., Gardena, CA 90240 213-532-3092

§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521

Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142

INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881

§ ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705 714-751-3900

Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090

Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800

§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 203-659-3573

Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820

§ Magnecraft Elec. Co., 5575 N. Lynch Ave., Chicago, IL 60630 312-282-5500

§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336

Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600

§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000

Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700

§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000

Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120

§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400

Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 219-563-2191

§ Ward Leonard Elec., 31 South St., Mt. Vernon, NY 10550 914-664-1000

† Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

† Wilmar Elctrns., Inc., 2430 Amsler St., Torrance, CA 90505 213-326-6668

§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Relays (MIL)-2440

Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803, 914-738-1611 .... 1B•1323

† **Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 .... 1A•1697**

Electronic Specialty Div., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, 503-665-0121 .... 1B•1348,1350

Genicom Corp., General Electric Dr., Waynesboro, VA 22980, 703-949-1000 .... 1B•1386,1387

† **Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, 301-876-2214 .... 1B•1410,1412**

§† **Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 .... 1B•1458,1459**

§† **Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003, 213-232-8221 .... 1B•1460-1465**

Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071, 609-589-7500 .... 1B•1477

† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141

Cornell-Dubilier Elctrns., Wayne Interchange, Plaza 1, Wayne, NJ 07470 201-256-2000

§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487

Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350

† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351

† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025

Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560

§ Master Elctrn. Controls, P.O. Box 25905, Los Angeles, CA 90025 213-452-1336

§† Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 .... CA 415-965-0910;800-221-7060

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Repeaters, Servo-4900 — *See Vol. 3*

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Resistors, Bulk Ceramic-4700 — *See Vol. 1A*

Resistors, Carbon Film-4700 — *See Vol. 1A*

Resistors, Ceramic Core-4700 — *See Vol. 1A*

Resistors, Ceramic Metal (Cermet)-4700 — *See Vol. 1A*

Resistors, Chip (For Microcircuits)-4700 — *See Vol. 1A*

Resistors, Composition, Carbon-4700 — *See Vol. 1A*

Resistors, Decade-4700 — *See Vol. 1A*

Resistors, Deposited Carbon-4700 — *See Vol. 1A*

Resistors, Disk, Rod & Tube-4700 — *See Vol. 1A*

Resistors, Film, Metallized & Nonmetallized-4700 — *See Vol. 1A*

Resistors, Flame Retardant-4700 — *See Vol. 1A*

Resistors, Flux Sensitive-4700 — *See Vol. 1A*

Resistors, Foil, Ultraprecision-4700 — *See Vol. 1A*

Resistors, Fuse-4300

Colber Corp., 26A Buffington St., Irvington, NJ 07111, 201-371-9500 .... 1A•1845

Iskra Electronics, Inc., 8 Greenfield Rd., Syosset, NY 11791, 516-364-2616 .... 1A•1877

§† **RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 .... 1A•1929**

RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 .... 1A•1933

Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 .... 1A•1933

§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 818-765-8300

§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620

Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940

§† Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701 402-371-0080

Elctrn. Precision Comps., 11 W. Sandford Blvd., Mt. Vernon, NY 10550 914-664-2333

§† E-Systems, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750 219-356-4300

§ Gamble, Charles T., Inds., 605 Perkins La., Delanco, NJ 08075 609-461-1900

§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661

General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721

§ KOA Speer Elctrns., Bolivar Dr., P.O. Box 547, Bradford, PA 16701 814-362-5536

Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700

§ Micro-Ohm Corp., 4900 Santa Anita Ave., El Monte, CA 91731 ......818-442-3310; 213-686-0535

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

Tel Labs, Inc., 154 Harvey Rd., Londonderry, NH 03053 603-625-8994

§† TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108 215-922-8900

Vishay Resistive Sys. Grp., 63 Lincoln Hwy., Malvern, PA 19355 215-644-1300

§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Resistors, Glass-4700 — *See Vol. 1A*

Resistors, Heat Sink Encased — See Resistors, Integral Heat Dissipator (Vol. 1A)

Resistors, High Frequency-4700 — *See Vol. 1A*

Resistors, High Megohm (Over 22 Megohms)-4700 — *See Vol. 1A*

Resistors, High Temperature (Over 125)-4700 — *See Vol. 1A*

Resistors, High Voltage (1,000 Volts & Over)-4700 — *See Vol. 1A*

Resistors, Hot Molded-4700 — *See Vol. 1A*

Resistors, Integral Heat Dissipator-4700 — *See Vol. 1A*

Resistors, Low Temperature Coefficient-4700 — *See Vol. 1A*

Resistors, Metal Glazed-4700 — *See Vol. 1A*

Resistors, Microwave-4700 — *See Vol. 1A*

Resistors, Negative Temperature Coefficient-4700 — *See Vol. 1A*

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Resistors, Positive Temperature Coefficient-4700 — *See Vol. 1A*

Resistors, Power-4700 — *See Vol. 1A*

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Resistors, Suppressor-4700 — *See Vol. 1A*

Resistors, Surge-4700 — *See Vol. 1A*

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Resistors, Voltage Sensitive-4700 — *See Vol. 1A*

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Resistors (MIL)-2440

Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204, 414-671-2000 ......1A•1788,1792,1793,1797

Caddock Electronics, Inc., 1717 Chicago Ave., Riverside, CA 92507, 714-788-1700 ......1A•1827

Dale Electronics, Inc., El Paso Div., P.O. Box 26950, El Paso, TX 79926, 915-592-3253 ......1A•1849,1850,1853-1857,1861,1862,1868

Elctrn. Precision Comps., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, 914-664-2333 ......1A•1869

General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ......1A•1873

Iskra Electronics, Inc., 8 Greenfield Rd., Syosset, NY 11791, 516-364-2616 ......1A•1877

Julie Resch. Labs., 211 West 61st St., New York, NY 10023, 212-245-2727 ......1A•1878

KDI Electronics, Inc., 60 S. Jefferson Rd., Whippany, NJ 07981, 201-887-8100 ......1A•1879

Kelvin, 5919 Noble Ave., Van Nuys, CA 91411, 818-782-6662 ......1A•1880

KOA Speer Elctrns., Bolivar Dr., P.O. Box 547, Bradford, PA 16701, 814-362-5536 ......1A•1886

§† **Mepco/Electra, Inc., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, 201-539-2000 ......1A•1890,1B•1012**

§† **Mepco/Electra, Inc., North American Philips Corp., Airport Road, P.O. Box 760, Mineral Wells, TX 76067, 817-325-7871 ......1B•1012**

Micro-Ohm Corp., 4900 Santa Anita Ave., El Monte, CA 91731, 818-442-3310; 213-686-0535 ......1A•1894

Microplex, Inc., 1977 State College Blvd., Anaheim, CA 92806, 714-979-8833; 714-634-1535 ......1A•1897

Milwaukee Resistor Corp., 700 W. Virginia St., Milwaukee, WI 53204, 414-271-9900 ......1A•1898

Mini-Systems, Inc., 20 David Rd., North Attleboro, MA 02761, 617-695-0203 ......1A•1902

Nytronics Comps. Group Inc., Orange St., Darlington, SC 29532, 803-393-5421 ......1A•1907-1909

Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076, 312-675-2600 ...1A•1910, 1912,1913

Ohmtek, Inc., 2160 Liberty Dr., Niagara Falls, NY 14304, 716-283-4025 .....1A•1921

Pacific Resistor Co., 18300 Oxnard St., Tarzana, CA 91356, 213-345-7811 ......1A•1922,1923

Precision Resistive Prods., Inc., P.O. Box 189, Highway 61 South, Mediapolis, IA 52637, 319-394-9131 ......1A•1925

† **Precision Resistor Co., Inc., 109 U.S. Hwy. 22, Hillside, NJ 07205, 201-926-3036 ......1A•1926**

§† **RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 ......1A•1929**

RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 ......1A•1930-1932,1934,1935

Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 ......1A•1930-1932,1934,1935

Tel Labs, Inc., 154 Harvey Rd., Londonderry, NH 03053, 603-625-8994 ... 1A•1941-1943

TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-922-8900 ......1A•1944,1949-1952, 955,1956,1958-1960,1962,1963,1965,1967-1971,1976,1980

Ultronix, Inc., P.O. Box 1090, Grand Junction, CO 81502, 303-242-0810 .. 1A•1992-1995,1998

§† **Vishay Resistive Sys. Grp., 63 Lincoln Hwy., Malvern, PA 19355, 215-644-1300 ......1A•2005,2006,2011**

§† **Vishay Angstrohm, 1 Precision Pl., Hagerstown, MD 21740, 301-739-8722 ......1A•2011**

Bourns, Inc., Resistive Components Group, 1200 Columbia Ave., Riverside, CA 92507 714-781-5050

Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406 213-450-1761

Corning Glass Works, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830 607-974-9000

§† Dale Electronics, Inc., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601 402-564-3131

§† Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701 402-371-0080

E-Systems, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750 ..219-356-4300

Hybrid Systems Corp., 22 Linnell Circle, Billerica, MA 01821 617-667-8700

† HyComp Inc., 75 Union Ave., Box 377, Sudbury, MA 01776 617-443-4631

Res-Net, 110 Route 10, Whippany, NJ 07981 ...... 201-887-2260;out of state 800-526-0704

Stackpole Components Co., 3400 Yonkers Rd., Raleigh, NC 27604 919-828-6201

§† Techno-Components Corp., 7803 Lemona, Van Nuys, CA 91405 818-781-1642

§† Vamistor Corp., 115 Industrial Park, Sevierville, TN 37862 615-453-0001

Resolvers, Synchro-4900 — *See Vol. 3*

Resonators, Ceramic-2700 — *See Vol. 1A*

Resonators, SAW-2300 — *See Vol. 1A*

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Retainers, Relay-4500

§ American Zettler, 16881 Hale Ave., Irvine, CA 92714 714-660-1670

§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000

Retainers, Tube-5700 — *See Vol. 1A*

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Scanners, Fiber Optic-2475

Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444

Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000

General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 201-228-4400

Lightwave Communications, Inc., Sub. of Harbor Electrns., 650 Danbury Rd., Ridgefield, CT 06877 203-438-3591

Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961

Scanners, Flying Spot-1900 — *See Vol. 3*

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Seals, Pressure Sensitive-2500 — *See Vol. 2*

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Security Systems, Data-2325 — *See Vol. 3*

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Sensors — See Transducer Listings (Vol. 1B)

Sensors, Acoustic-2200 — *See Vol. 3*

Sensors, Chemical-2200 — *See Vol. 3*

Sensors, Fiber Optic-2475

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**

Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ....1B•1119

Corning Glass Works, Main Plant, MS 2136, Corning, NY 14831 607-974-4102

Dolan-Jenner Inds., Box 1020, Woburn, MA 01801 617-935-7444

Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000

FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ....312-231-3511; 312-932-9380

§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900

Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060

Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737

Stenning Instrments, Inc., 671 Enchanted Way, Pacific Palisades, CA 90272 213-459-2930

York Technology, Inc., 1101 State Rd., Bldg. O, Princeton, NJ 08540 609-924-7676

Sensors, Light-3700

† **Applied Solar Energy Corp., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749, 818-968-6581 ....1B•1211**

Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ....1B•1212

Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716, 201-291-0500; 800-631-2165 ....3•1132

† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**

§ **Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069, 214-542-9461 ....1B•1232**

Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901, 518-561-3160 ....1B•1233

TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ....1B•1234-1237,1240,1244,1245

† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570

§ Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574

EG&G Gamma Scientific, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123 619-279-8034

§ EG&G Reticon, Div. of EG&G, 345 Potrero Ave., Sunnyvale, CA 94086-9930 408-738-4266

§ EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132 314-423-4900

Evershed & Vignoles Ltd., Acton Lane, Chiswick, London, W4 5HJ England 01-994-3670

§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011

Femco, Inc., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159 408-946-1188

Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380

FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ....312-231-3511; 312-932-9380

§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696

Hamamatsu Photonics K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan 0534-34-3311

§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271

Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515

§ Industrial Computer Designs, Inc., 31121 Via Colinas 1005, Westlake Village, CA 91362 818-889-3179

† Information Control Corp., Light Pen Div., Dept. EM7, 9610 Bellanca Ave., Los Angeles, CA 90045 213-641-8520

LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641

Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220

Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277

Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923

Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991

§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060

Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080

§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 408-257-7910

Silicon Detector Corp., 855 Lawrence Dr., Newbury Park, CA 91320 805-498-6737

Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 608-935-2707

Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961

§ Sprague Elec. Co., Semiconductor Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
§ THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan .... Tokyo 03-402-6161
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453
United Detector Tech., 12525 Chadron Ave., Hawthorne, CA 90250 213-978-0516

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B & B Motor & Control Corp., Apple Hill Commons, Burlington, CT 06013 203-673-7151
§† Berg, W. M., Inc., 499 Ocean Ave., East Rockaway, NY 11518 516-599-5010
Control Inds. Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ Jan Hardware Mfg. Co., 47-27 36th St., Long Island City, NY 11101 212-361-0800
Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701 813-822-2529
§† Norelcom Inds., 63 Marine St., Farmingdale, NY 11735 516-249-7245
PIC Design, P.O. Box 1004, Middlebury, CT 06762 203-758-8272
Skyo Industries Inc., 171 Brook Ave., Deer Park, NY 11729 516-586-4702
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ Vemaline Prods. Div., 487 Jefferson Blvd., Warwick, RI 02886 401-739-7600

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Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 .... 1B•1124-1129
† Fabricast, 2517 Seaman Ave., P.O. Box 3176, S. El Monte, CA 91733, 318-443-3247 .... 1B•1150,1152-1155
Graphite Metallizing Corp., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, 914-968-8400 .... 1B•1156
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 .. 1B•1162
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 .... 1B•1755
† Danmar Inds., 9705 Lurline Ave., Chatsworth, CA 91311 .... 818-882-7979/5280
† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
† IEC Corporation, 3100 Longhorn Blvd., Austin, TX 78759 512-836-0547
† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
§† Superior Carbon Prods. Inc., 9115 George Ave., Cleveland, OH 44105 216-883-4880
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
† Unit Inds., 1140 E. Valencia Dr., Fullerton, CA 92631 714-871-4161

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§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 .... 1B•1027
§ Bivar, Inc., 4 Thomas, Irvine, CA 92714, 714-951-8808 .... 2•1018
Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 .... 1B•1608
Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801, 617-935-4442 .... 1B•1057
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 2•1294
§ Industrial Devices, Inc., Edgewater, NJ 07020, 201-224-4700 .. 1B•1070,1071,1075-1082
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101, 212-392-8800 . 1B•1089
Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016, 312-824-1188 .... 1B•1062
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1715
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021, 516-466-0911 .... 2•1563
§ Sloan Co., 7704 San Fernando Rd., Sun Valley, CA 91353-0367, 213-875-1123 .... 1B•1098,1099
§† Sylvania Miniature Lighting, W. Main St., Hillsboro, NH 03244, 603-464-5533 .... 1B•1060,1061
§ Visual Communications Co., P.O. Box 986, El Segundo, CA 90245, 213-822-4727 .... 1B•1106-1108
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 . 617-685-4371
Alden Products Co., P.O. Box 860, 117 N. Main St., Brockton, MA 02403 617-583-0160
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§ American Ultraviolet, 320 Commerce St., Chatham, NJ 07928 201-635-8355
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825 201-996-6841
§ Asmann Components, Div. of ebm Industries, Inc., 525 New Britain Ave., Unionville, CT 06085 203-674-1515
§† Associated Engrg. Mfg., 546 Valley Rd., Upper Montclair, NJ 07043 201-783-7800
§ Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Auto-Swage Prods., 726 River Rd., Shelton, CT 06484 203-929-1401
§ Bryant Circuit Devices Div., Westinghouse Elec. Corp., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 .. 914-425-7460
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Compu-Lite Corp., 711 W. 17th St. 12, Costa Mesa, CA 92627 714-645-1501
Connector Corp., 6025 N. Keystone Ave., Chicago, IL 60646 312-539-3108
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
Data Display Products, Box 91072, Los Angeles, CA 90009 213-674-5940
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 212-497-7600
Display Devices, Box 667, Encinitas, CA 92024 619-753-0113
† Drawn Metal Products, 6143 W. Howard St., Niles, IL 60648 312-647-8941
Dupree, Inc., 9835 Dupree St., So. El Monte, CA 91733 818-442-4700
Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 401-769-3800
§† Garry Mfg. Co., Div. of Brand-Rex Co., 9 Queen Anne Ct., Laghorne, PA 19047 215-949-2300
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§† Genisco Technology Corp., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
† GTI/Elctrns. Div., P.O. Box 96, Hadley, PA 16130 412-253-3161
§ Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ Ledco Div., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Oshino Electric Lamp Works, Ltd., 5-2, Mianami-Shinagawa 2-chome, Shinagawa-Ku, Tokyo, Japan 03-471-8548
§ Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§† Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ SAMTEC, 810 Progress Blvd., P.O. Box 1147, New Albany, IN 47150 812-944-6733
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
† Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
TRW Connector Div., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007 312-981-6000
§† UVP, Inc., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778 818-285-3123
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

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Sockets (MIL)-2440

† Eby Co., 2751 Southampton Rd., Philadelphia, PA 19154, 215-969-4200 ... 2•1256, 1257
§† H&T Components Inc., H&T Components Ltd., 87 Sand Pit Rd., Danbury, CT 06810, 203-794-1798 .... 2•1318,1319
† AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§† Appleton Elctrns., 2205 12th Ave., So. Milwaukee, WI 53172 414-764-7200
Elctrn. Molding Corp., 96 Mill St., Woonsocket, RI 02895 401-769-3800
† Jettron Prods., P.O. Box 337, E. Hanover, NJ 07936 201-887-0571
Mark Eyelet & Stamping, 202 Wakelee Rd., Wolcott, CT 06716 203-756-8847
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 214-995-6611
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
§† Wells Elctrns., 1701 S. Main St., South Bend, IN 46613 219-287-5941

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Soldering (MIL)-2440

Cardinal Control Co., 110 Kensington Rd., Kensington, CT 06037 ... 203-828-6379
§† Chemtronics Inc., 681 Old Willets Path, Hauppauge, NY 11788 ... 516-582-3322
§† Gardiner Solder Co., Div. of Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, IL 60632 ... 312-847-0100
Kantz Elctrn. Ind., 1804 Wall Church Rd., Wall Township, NJ 07719 ... 201-974-0090
Multicore Solders, Cantiague Rock Rd., Westbury, NY 11590 ... 516-334-7997
Penn Resch. Corp. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144 ... 404-429-9061
Universal Instrs., P.O. Box 825, Binghamton, NY 13902 ... 607-775-1102

Solenoids, Linear-4550

Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ... 1B•1291
Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ... 1B•1482, 1483
Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ... 1B•1485
Electro-Mechanisms, 2745 E. Huntington Dr., Duarte, CA 91010, 818-359-2535 ... 1B•1486,1487
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ... 1B•1427-1431
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ... 1B•1844
ITT Comps. Electromechanical Grp., 3201 So. Standard St., Santa Ana, CA 92705, 714-751-3900 ... 1B•1489
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1490-1492**
Liberty Controls, 500 Brookforest Ave., Shorewood, IL 60435, 815-725-2241 ... 1B•1494,1495
§† **Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513, 312-485-5152 ... 1B•1497**
T S Products, 12455 Brandford St., Unit 22, Arleta, CA 91331, 818-896-6676 ... 3•1119
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 ... 414-671-2000
† A.P.W. Co., 72 W. Main, Rockaway, NJ 07866 ... 201-627-0643
Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 ... 203-824-5125
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 ... 213-283-0015
§ Dormeyer Inds., 3418 N. Milwaukee, Chicago, IL 60641 ... 312-283-4000
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 ... 607-797-1263
† IMC Magnetics Corp., Arizona Div., 1900 East Fifth St., Tempe, AZ 85281 ... 602-968-4441
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 ... 213-926-0927
ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 ... 213-842-6131
Kogyosha, 179 Riveredge Rd., Tenafly, NJ 07670 ... 201-569-8769
Linear Motions Co., 17025 Dubesor St., Valinda, CA 91744 ... 818-918-7806
§† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 ... 203-659-3573
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 ... 315-462-2611
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 ... 216-946-9900
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 ... 815-459-5000
§ Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 ... 812-386-1000
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 ... 408-377-4621
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 ... 714-554-4200
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 ... 602-795-8008
Vanguard Relay Corp., 225 Cortland St., Lindenhurst, NY 11757 ... 516-226-5000
† West Coast Elec. Mfg., 14045 Garfield Ave, Paramount, CA 90723 ... 213-633-1010

Solenoids, Proportional-4550

Deltrol Controls, 2745 S. 19th St., Milwaukee, WI 53215, 414-671-6800 ... 1B•1482, 1483
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1490**
Regdon Corp., 3713 Grand Blvd., Brookfield, IL 60513, 312-485-5152 ... 1B•1497
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 ... 607-797-1263
ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 ... 213-842-6131
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 ... 315-462-2611
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 ... 714-554-4200

Solenoids, Rotary-4550

Densitron Corp., 20775 Western Ave., Torrance, CA 90501, 213-618-9647 ... 1B•1485
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1490,1492**
T S Products, 12455 Brandford St., Unit 22, Arleta, CA 91331, 818-896-6676 ... 3•1119
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 ... 605-665-9301
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905 ... 607-797-1263
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 ... 212-383-6904
† IMC Magnetics Corp., Arizona Div., 1900 East Fifth St., Tempe, AZ 85281 ... 602-968-4441
† IMC Magnetics Corp., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701 ... 213-926-0927
† Line Elec. Prods., G. General Electro-Components, Inc., 122 Naubuc Ave., Glastonbury, CT 06033 ... 203-659-3573
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 ... 315-462-2611
† Magton Inc., 1977 O'Toole Ave., San Jose, CA 95131 ... 408-943-9319
† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 ... 815-459-5000
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 ... 714-554-4200
Tran-Trol Co., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712 ... 602-795-8008

Solenoids (MIL)-2440

† A.P.W. Co., 72 W. Main, Rockaway, NJ 07866 ... 201-627-0643
Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 ... 203-824-5125
† Ideal Precision Meter, 214 Franklin St., Brooklyn, NY 11222 ... 212-383-6904
† Lisk, G. W., Co., 2 South St., Clifton Springs, NY 14432 ... 315-462-2611
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 ... 714-554-4200

Solvents — See Cleaners & Solvents (Vol. 2)

Sonar Systems-3475 — *See Vol. 3*

S100 Bus — See Board Computers & Subassemblies (Vol. 3)

Sound Absorbing Materials-2825 — *See Vol. 2*

Sound Level Indicators — See Meters, Audio Level (Vol. 3)

Sound Recording Equip. — See Microphones (Vol. 3), Recorders (Vol. 3), etc.

Spacers-2825 — *See Vol. 2*

Space Surveillance Systems-3475 — *See Vol. 3*

Spaghetti — See Tubing, Spaghetti (Vol. 2)

Spark Gaps-4300

Connector Corp., 6025 N. Keystone Ave., Chicago, IL 60646, 312-539-3108 .... 2•1245
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 .... 1B•1472
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 617-745-3200
§ Hobson Bros., 4940 W. Lawrence Ave., Chicago, IL 60630-3884 312-283-3600
Joslyn Elctrn. Sys., 6868 Cortona Dr., Goleta, CA 93017 805-968-3551
Lightning Protection Corp., Box 6086, Santa Barbara, CA 93160 .... 805-967-5089/4577
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 619-279-5100
§ PolyPhaser Corporation, P.O. Box 1237, Gardnerville, NV 89410 702-782-2511
Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 415-577-7236

Speakers, Explosion & Flame Proof-1300 — *See Vol. 3*

Speakers, Horn-1300 — *See Vol. 3*

Speakers, Intercom-1300 — *See Vol. 3*

Speakers, Midrange-1300 — *See Vol. 3*

Speakers, Musical Instrument-1300 — *See Vol. 3*

Speakers, Paging — See Speakers, Intercom (Vol. 3)

Speakers, Pillow-1300 — *See Vol. 3*

Speakers, Public Address-1300 — *See Vol. 3*

Speakers, Replacement (Including Aircraft, Automotive & TV)-1300 — *See Vol. 3*

Speakers, Submergence Proof-1300 — *See Vol. 3*

Speakers, Subminiature-1300 (Also See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices) **— *See Vol. 3***

Speakers, Tweeter-1300 — *See Vol. 3*

Speakers, Weatherproof-1300 — *See Vol. 3*

Speakers, Woofer-1300 — *See Vol. 3*

Speakers (MIL)-2440 — *See Vol. 3*

Speaker Systems-1300 — *See Vol. 3*

Spectrometers-2900 — *See Vol. 3*

Speech Compression & Synthesis Equipment-2325 — *See Vol. 3*

Speed Drives, Motor — See Controls, Motor Speed (Vol. 3)

Spiral Wrap — See Tubing, Spiral Wrap (Vol. 2)

Splicers, Coaxial Cable-5400 — *See Vol. 2*

Splicers, Wire (Incl. Butt & Cap Types)-5400 — *See Vol. 2*

Splicing Equipment, Magnetic Tape-1300 — *See Vol. 3*

Splicing Equipment, Fiber Optic-5400 — *See Vol. 2*

Splicers, Fiber Optic-2475

Power Technology, Inc., P.O. Box 9769, Little Rock, AR 72219, 501-568-1995 .... 3•1746
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

Splitters/Combiners, Power — See Dividers, Power (Vol. 1A)

Spoolers, Printer Buffers-2325 — *See Vol. 3*

Spoolers, Punched Tape — See Readers, Punched Tape (Vol. 3)

Springs (All Types)-2500 — *See Vol. 2*

Stabilizers, Current — See Current Sources (Vol. 3), Regulators, Current (Vol. 3),

Stabilizers, Line Impedance-4050 — *See Vol. 3*

Stabilizers, Voltage — See Regulators & Stabilizers, Voltage (Vol. 3), Transformers, Voltage Regulating (Vol. 1A), Voltage Sources (Vol. 3),

Stabilizers, Voltage/Current, Automatic — See Power Supplies, Constant Current (Vol. 3)

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Standards, Noise-2900 — *See Vol. 3*

Standards, Phase-2900 — *See Vol. 3*

Standards, Resistance-2900 — *See Vol. 3*

Standards, Temperature-2900 — *See Vol. 3*

Standards, Time-2900 — *See Vol. 3*

Standards, Voltage-2900 — *See Vol. 3*

Standards, Voltage Ratio-2900 — *See Vol. 3*

Standoffs — See Bushings, Glass, Plastic, Metal, etc. (Vol. 2)

Stands, Instruments-1400 — *See Vol. 2*

Stands, Printer/Terminal-1400 — *See Vol. 2*

Static Eliminating Materials, Devices, & Equipment-4525 — *See Vol. 2*

Stators, Motor & Generator — See Motor & Generator Armatures,Rotors, Stators (Vol. 1B)

STD Bus — See Board Computers & Subassemblies (Vol. 3)

Steppers, Indexing, Motor-3500

† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Portescap U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490 215-277-0433
† Superior Elec. Co., 383 Middle St., Bristol, CT 06010 203-582-9561

Steppers, Indexing, Switch-5100

§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
Femco, Inc., P.O. Box 26710 Parkmoor Sta., San Jose, CA 95159 ..408-946-1188

Storage Euipment, Cartridge/Cassette-3800 — *See Vol. 2*

Storage Equipment, Disk-3800 — *See Vol. 2*

Storage Equipment, Flexible Disk-3800 — *See Vol. 2*

Storage Equipment, Magnetic Card-3800 — *See Vol. 2*

Storage Equipment, Media Transport-3800 — *See Vol. 2*

Storage Equipment, Microform-3800 — *See Vol. 2*

Storage Equipment, Multifunctional-3800 — *See Vol. 2*

Storage Equipment, Paper Tape-3800 — *See Vol. 2*

Storage Equipment, Printout-3800 — *See Vol. 2*

Storage Equipment, Punched Card-3800 — *See Vol. 2*

Storage Equipment, Reel-to-Reel Tape-3800 — *See Vol. 2*

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Strip-Line Components, Microwave-3450 — *See Vol. 1A*

Strips, Ground-1900 — *See Vol. 3*

Strips, Marker & Fanning-6000 — *See Vol. 2*

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Substrates, Ceramic-2800 — *See Vol. 2*

Substrates, Flexible-2800 — *See Vol. 2*

Substrates, Glass-2800 — *See Vol. 2*

Substrates, Metallic-2800 — *See Vol. 2*

Substrates, Sapphire-2800 — *See Vol. 2*

Surface Acoustic Wave, Delay Line-2350 — *See Vol. 1A*

Surface Acoustic Wave, Filter-2700 — *See Vol. 1A*

Suppressors, Arc — See Protectors, Surge (Vol. 1B)

Suppressors, Noise-2700 — *See Vol. 1A*

Suppressors, Transient Voltage (All Types)-4300

Arstan Products Intl. Ltd., 99 Jericho Tpke., Jericho, NY 11753, 516-333-8100 .... 1A•2134
Atlantic Scientific Corp., 2711 S. Harbour City Blvd., Melbourne, FL 32901, 305-725-8000 .... 1B•1257
† **California Instruments, A Div. of Amstar Tech. Prods. Co., Inc., 5150-Convoy St., San Diego, CA 92111, 619-279-8620;800-356-2244;800-821-1634 .... 3•1841**
§ **Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, 312-262-7700 .... 1B•1288,1313**
† **Control Concepts Corp., P.O. Box 1380, Binghamton, NY 13902-1380, 607-724-2484 .... 1B•1263**
Controlled Power Co., 1955 Stephenson Hwy., Troy, MI 48084, 313-528-3700 .... 3•1850-1852
§ **Displex, Inc., Alexander Place, Glen Cove, NY 11542, 516-671-4400 .... 3•1860**
Franek, John, Co., Inc., P.O. Box 11752, Santa Ana, CA 92711-1752, 14-832-0290;800-854-9420 .... 3•1875
§† **General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021, 315-253-7321 .... 1A•2094**
Hipotronics, P.O. Drawer A, Brewster, NY 10509, 914-279-8091 .... 3•1882,1883
Instrument Specialties Co., P.O. Box A, Delaware Water Gap, PA 18327, 717-424-8510 .... 2•1909
JMK, Inc., 15 Caldwell Dr., Amherst, NH 03060, 603-886-4100 .... 1A•1600
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 .... 1B•1490,1674
Maida Development Co., 20 Libby St., Hampton, VA 23663, 804-723-0785 .... 1A•1123
§† **MCG Elctrns., 12 Burt Dr., Deer Park, NY 11729, 516-586-5125 .... 1B•1277-1280**
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 .... 1B•1816**
§ **Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 .... 1A•2099,2102**
Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 .... 1A•1576,1604,1605
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649, 14-898-2691;800-854-2433 .... 3•1897,1899,1900
Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406, 707-523-0600 .... 1A•1606-1610
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 .... 1A•1274
§ **PolyPhaser Corporation, P.O. Box 1237, Gardnerville, NV 89410, 702-782-2511 .... 1B•1285**
Potter Co., P.O. Box 337, North Hwy. 51, Wesson, MS 39191, 601-643-2215 .... 1A•1612
Powermark, 3855 Ruffin Rd., San Diego, CA 92123, 619-565-8363 .... 3•1904
RTE Aerovox Inc., P.O. Box B-970, 740 Belleville Ave., New Bedford, MA 02741, 617-994-9661 .... 1A•1619-1621
SGL Waber, 300 Harvard Ave., Westville, NJ 08093, 609-456-5400;800-257-8384 .... 3•1909
Shape Magnetronics, Inc., 901 DuPage Ave., Lombard, IL 60148, 312-620-8394 .... 3•1910,1911
§† **Superior Elec. Co., 383 Middle St., Bristol, CT 06010, 203-582-9561 .... 3•1917**
Triad-Utrad, 1124 E. Franklin St., Huntington, IN 46750, 219-356-6500 .... 3•1918
Xentek, Inc., 279 S. Pacific St., San Marcos, CA 92069, 619-744-3346 .... 3•1810
§ Amtek Sys., Inc., 1400 S. Sherman, 02, Richardson, TX 75081 214-238-5300
§ Brooks Mfg. Co., 2016/24 Amber St., Philadelphia, PA 19125 .... 215-425-3395; 800-523-0130
§ Bud Inds., Inc., 4605 E. 355th St., Willoughby, OH 44094 216-946-3200
Carborundum Co., Electric Prods. Div., Box 339, Niagara Falls, NY 14302 716-278-2383
§ Codi Semiconductor, Inc., 350 Hurst Ave., Linden, NJ 07036 201-862-8484
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 214-233-1589
Corcom, Inc., 1600 Winchester Rd., Libertyville, IL 60048 312-680-7400
Cuesta Systems, Inc., 3440 Roberta Ct., San Luis Obispo, CA 93401 805-541-4160
§ Dale Electronics, Inc., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078 605-665-9301
§ Dyma Engrg., Box 1535, Los Lunas, NM 87031 505-865-6700
Eastern Delta Corp., 29-09 S. Broadway, Fair Lawn, NJ 07410 201-797-4200
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
§ Electronic Specialists, 171 South Main St., Natick, MA 01760 .... 617-655-1532; 800-225-4876
Electrostatic Consltg. Assocs., 556 Lowell Rd., Groton, MA 01450 617-448-5485
Elgar Corp., 8225 Mercury Ct., San Diego, CA 92111 619-565-1155
Elin Div., California Instrs. Co., Div. of Norlin Ind., 5150 Convoy St., San Diego, CA 92111 619-279-8620
§† General Semiconductor Inds., Inc., 2001 W. 10 Pl., Tempe, AZ 85281 602-968-3101
§ International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245 213-772-2000
Inter-Technical Grp., Box 23, Irvington, NY 10533 914-591-8822
Joslyn Elctrn. Sys., 6868 Cortona Dr., Goleta, CA 93017 805-968-3551
Kalglo Elctrns. Co., Inc., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017 215-837-0700
§ LEA, Inc., A Dynatech Co., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 818-944-0916
Lightning Protection Corp., Box 6086, Santa Barbara, CA 93160 .... 805-967-5089/4577
Marway Prods. Inc., 311 N. Clara St., Santa Ana, CA 92703 714-973-1800
§† Micro Semiconductor, 2830 S. Fairview St., Santa Ana, CA 92704 714-979-8220
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 201-748-5089
§ Perma Power Elctrns., 5615 W. Howard Ave., Chicago, IL 60648 312-647-9414
Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
† Power Integrity Corp., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408 919-379-9773
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054
Sanford-Miller Corp., 8 John St., Lynbrook, NY 11563 . 516-593-2025;Outside NY 800-645-5900
Sanken Elec. U.S.A. Corp., 3848 Carson St., Ste. 105, Torrance, CA 90503 213-540-2209
Semicon, 10 North Ave., Burlington, MA 01803 617-272-9015
§ SemiKron Intl., Inc., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051 603-883-8102
§† Semtech, 652 Mitchell Rd., Newbury Park, CA 91320 213-628-5392
§ Siemens Corp., 186 Wood Ave., S., Iselin, NJ 08830 201-494-1000
Spectrum Control, Inc., 2185 W. 8th St., Erie, PA 16505 814-455-0966
§ St-Semicon, 415 N. College Ave., P.O. Box 609, Bloomington, IN 47402 812-332-1435
§ Techni-Tool, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462 215-825-4990
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ Thomson-CSF Comps. Corp., Semiconductor Div., 6660 Variel Ave., Canoga Pk., CA 91304 213-887-1010
§† Topaz Electronics, 9192 Topaz Way, San Diego, CA 92123-1164 619-279-0831
§ Tripp-Lite, 500 No. Orleans, Chicago, IL 60610 312-329-1777

Surveillance (MIL), EW Drone-3475 — *See Vol. 3*

Surveillance Sets (MIL)-3475 — *See Vol. 3*

Surveillance Systems (MIL), Optical-3475 — *See Vol. 3*

Surveillance Systems (MIL), Radio Frequency-3475 — *See Vol. 3*

Surveillance/Warning Systems (MIL), Control-3475 — *See Vol. 3*

Surface Acoustic Wave Devices-2350 — *See Vol. 1A*

Switches, Backup-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101 818-793-8971
Bytex Corp., 2 California Ave., Framingham, MA 01701 617-879-5050
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Electro Standards Lab., Inc., P.O. Box 9144, Providence, RI 02940 401-943-1164

Switches, Cam-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 .... 3•1122
Datametrics Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 .... 1B•1841
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 .... 215-337-5500;800-441-8245
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
§ Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641 312-282-7177
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 914-425-7460
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Electro Standards Lab., Inc., P.O. Box 9144, Providence, RI 02940 401-943-1164
Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 .... 516-ED3-5955
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844

§ Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 ..201-944-2221
Techniques, Inc., 235 Jackson St., Englewood, NJ 07631 201-569-5900
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Zenith Controls, 830 West 40th St., Chicago, IL 60609 312-247-6400

Switches, Capacitive — See Switches, Touch Actuated (Vol. 1B)

Switches, Coaxial — See Switches, RF (Vol. 1B)

Switches, Coded-5100

Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ....1B•1124
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1506,1514
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 .... 1B•1533-1535
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... 1B•1556-1563
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ....1B•1567
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ....1B•1575
§† EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 .... 1B•1612-1614
Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 ....1B•1621
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1633
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ....1B•1649
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 ....1B•1650
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ....1B•1669
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ....1B•1672
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 213-992-6776 ....1A•1709
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ....1B•1730
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1732
§† Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ....1B•1626,1627
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ....1B•1754,1755
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ....1B•1756
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 203-388-3574
CTS Microelectronics, Inc., 1201 Cumberland Ave., W. Lafayette, IN 47906 317-463-2565
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
IVO Inds., Inc., P.O. Box 603, 201 Industrial Way W., Eatontown, NJ 07724 201-542-5151
Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629 312-581-4555
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany 0911-65521
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473

Switches, Crossbar — See Switches, Matrix (Vol. 1B)

Switches, Data, Manual-2325 — *See Vol. 3*

Switches, Data, Programmable-2325 — *See Vol. 3*

Switches, Decade-5100

Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 ....1B•1650
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Shallco, Box 1089, Smithfield, NC 27577 919-934-3135
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 ..201-944-2221
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201

Switches, Diode-3450 — *See Vol. 1A*

Switches, DIP-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1504,1508
American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 .... 1B•1516-1518
§† AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..1B•1532,1533, 1535
§ Aries Elctrns., Box 130, Frenchtown, NJ 08825, 201-996-6841 .... 2•1149,1151
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ....1B•1565
§† CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 .... 1B•1576-1580
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ....1B•1614
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1629-1633
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 ....1B•1426
Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
§ Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Circuit Assembly Corp., 18 Thomas St., Irvine, CA 92714 714-540-5490
CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 ..212-428-5155
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§† Micro-Products Engrg. Co., 230 Ridgewood Ave., Newark, NJ 07108 201-824-8467
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Products Co., 481 Marshall St.; No. Adams, MA 01247 413-664-4481
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Switches Inc., 949 Stierlin Rd., Mountain View, CA 94043 415-962-8649
§ VRN International, Div. Vernitron, 2801 72nd St. N., Box 44000, St. Petersburg, FL 33743 813-347-2181
Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212

Switches, Fiber Optic-2475

EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Frequency Control Prods., Inc., American Time Prods. Div., 61-20 Woodside Ave., Woodside, NY 11377 212-458-5811

Switches, Foot Pedal, Mat, Ribbon, etc.-5100

§ Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ....1B•1753
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 ...617-782-7440
Lektra Labs., 129-07 18th Ave., P.O. Box 222, College Point, NY 11356 212-939-7171
§† Linemaster Switch, Box 52, Woodstock, CT 06281 203-974-1000
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 315-655-8050
§† Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ....914-698-2026;800-431-2625 (exc NY)
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Hall Effect-5100

EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ....1B•1589

§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1679-1685,1700,1701,1705,1712**
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212 ... 614-486-9561
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 ... 707-778-6311
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 ... 203-269-8701

Switches, High Voltage (Over 250 Volts)-5100

C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ... 1B•1565
§† **Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ... 1B•1010,1622, 1625**
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ... 1B•1646
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 ... 1B•1648
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 ... 1B•1651
† **Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ... 1B•1743**
† **Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ... 1B•1472**
† **Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ... 1B•1755**
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 ... 414-671-2000
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 ... 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 ... 919-934-3104
Beckman Instrs., Cedar Grove Opers., 89 Commerce Rd., Cedar Grove, NJ 07009 ... 201-239-6200
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 ... 203-233-5551
Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 ... 515-573-1300
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 ... 714-556-3100
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069 ... 619-747-4000
Del Elctrns. Corp., 250 E. Sandford Blvd., Mt. Vernon, NY 10550 ... 914-699-2000
Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 ... 203-599-2075
Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ... 312-662-7667; 800-323-9605
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 ... 219-264-1116
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 ... 203-877-4577
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 ... 414-449-7487
EG&G, Inc., Electro-Optics Div., 35 Congress St., Salem, MA 01970 ... 617-745-3200
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 ... 203-651-9557
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 ... 609-393-8350
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 ... 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 ... 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany ... 0911/65521
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 ... 212-428-5155
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 ... 203-756-7441
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 ... 415-347-8217
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 ... 818-846-1800
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 ... 805-684-4560
Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 ... 914-592-4400
Maxwell Labs., 8835 Balboa Ave., San Diego, CA 92123 ... 619-279-5100
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 ... 815-235-6600
Millen Components, Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 ... 617-438-6951
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 ... 312-675-2600
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 ... 312-843-7900
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 ... 315-468-6211
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ... 516-ED3-5955
Pulsar Products Div., 2700 Merced St., San Leandro, CA 94577 ... 415-577-7236
§ Square D Co., Executive Plaza, Palatine, IL 60067 ... 312-397-2600
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 ... 312-844-4300
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 ... 513-871-3777
Supertex, Inc., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086 ... 408-744-0100
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 ... 219-563-2191

Switches, Interlock-5100

§ **Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ... 1B•1544-1546**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1551-1554
§ **EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ... 1B•1589**
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ... 1B•1652
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1673
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1679,1717-1719**
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ... 1B•1750
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ... 1B•1756
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 ... 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 ... 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 ... 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 ... 515-573-1300
§† Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 ... 312-262-7700
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 ... 714-556-3100
† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 ... 805-684-4560
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ... 312-662-7667; 800-323-9605
Durakool, 1010 N. Main St., Elkhart, IN 46514 ... 219-264-1116
† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 ... 818-442-7180
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 ... 612-375-0011
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 ... 609-393-8350
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 ... 201-494-9300
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 ... 312-282-4040
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 ... 805-684-4560
§ Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 ... 312-282-4040
Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 ... 315-655-8050
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark ... 452-973366
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 ... 516-935-3640
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 ... 312-364-6038
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 ... 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 ... 201-666-5600
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 ... 201-741-1120

Switches, Keyboard-5150

Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ... 3•1068
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1758,1767**
§ **EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ... 1B•1589**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ... 1B•1778, 1779**
§ **ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ... 1B•1653, 1654**
§ **Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 ... 1B•1675**
§† **Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070, 703-435-9496 ... 1B•1677, 1784,1785**
§ **Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1789**
§ **Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ... 1B•1094**
† **Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 ... 1B•1792**
§ **Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ... 1B•1757**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 ... 208-765-8000
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 ... 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 ... 717-564-0100
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 ... 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 ... 414-355-8300
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 ... 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 ... 515-573-1300
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 ... 414-228-7380
§ Corby Inds. Inc., P. O. Box 2838, Allentown, PA 18001 ... 215-433-1412
Cortron Div., 400 W. Grand Ave., Elmhurst, IL 60126 ... 312-279-9110
Digitran Co., 3100 New York Dr., Pasadena, CA 91107 ... 818-791-5600
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 ... 714-835-6000
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 ... 612-375-0011
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 ... 617-281-2040
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 ... 312-295-2610
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 ... 815-968-9661
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 ... 201-494-9300
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 ... 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 ... 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany ... 0911/65521
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 ... 414-648-2361
† Hoffman Engrg. Corp., 183 Sound Beach Ave., Old Greenwich, CT 06870 ... 203-637-1719
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 ... 305-884-2924
ITT Thermotech, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343 ... 612-933-9400
ITW, Cortron Div., 400 W. Grand, Elmhurst, IL 60126 ... 312-279-9110
Keytek Div., 6424 Warren Dr., Norcross, GA 30093 ... 404-449-6040
Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 ... 206-223-5400
MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 ... 714-642-2427
§ Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 ... 612-755-7660
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark ... 452-973366
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 ... 815-235-6600
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan ... 489-5333

Switches, Keyboard-5150 (Cont'd)

Nissei Sangyo America, Ltd., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008 ... 312-981-8989
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 ... 312-364-6038
Optical Techniques Intl., 1800 E. Garry, Ste. 14, Santa Ana, CA 92705 ... 714-540-9040
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 ... 201-348-7000
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 ... 312-837-7970
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 ... 312-844-4300
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany ... 0911-65521
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 ... 312-792-2700
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 ... 213-285-3105
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 ... 617-699-3800
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 ... 312-677-3640

Switches, Key Lock-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ... 1B•1508,3•1122
§ Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 ... 1B•1564
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ... 1B•1589
§ Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090, 312-537-1800 ... 1B•1655,2•1332,1333
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1490,1672
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1679,1710
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1732
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 ... 305-973-8620
Ark-Les, 51 Water St., Watertown, MA 02172 ... 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 ... 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 ... 617-222-2202
BLACK BOX Corp., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241 ... 412-746-5500
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 ... 201-796-2886
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 ... 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 ... 203-744-3300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 ... 312-578-3500
Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 ... 914-425-7460
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 ... 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 ... 714-556-3100
§ Corby Inds. Inc., P. O. Box 2838, Allentown, PA 18001 ... 215-433-1412
Cramer Division, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475 ... 203-388-3574
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 ... 312-843-2200
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 ... 414-449-7487
Electro Switch, King Ave., Weymouth, MA 02188 ... 617-335-5200
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 ... 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 ... 312-879-6000
† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 ... 201-494-9300
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 ... 312-354-1040
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ... 800-321-5111, Ext. 596
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 ... 612-934-4400
ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 ... 312-282-4040
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 ... 818-846-1800
§ Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 ... 516-582-3400
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 ... 315-468-6211
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 ... 201-762-6886
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ... 201-797-3313; 800-526-5376
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, HP2 4SG England ... 0442-40471/6
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 ... 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 ... 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 ... 312-397-2600
Stackpole Components Co., Box M, Farmville, VA 23901 ... 804-392-4111
Tansitor Elctrns., West Rd., Bennington, VT 05201 ... 802-442-5473
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 ... 312-362-3700
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 ... 203-269-8701

Switches, Lever-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ... 1B•1511
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ... 3•1068
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ... 1B•1519
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ... 1B•1540
Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ... 1B•1544-1546
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ... 1B•1565
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ... 1B•1551,1552,1554,1556
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ... 1B•1084
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1687,1688,1690,1692,1694
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ... 1B•1728
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ... 1B•1733
§ Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ... 1B•1738
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ... 1B•1750
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 ... 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 ... 818-889-9304
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 ... 203-249-8471
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 ... 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 ... 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 ... 312-489-5500
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 ... 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 ... 714-556-3100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 ... 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 ... 312-843-2200
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 ... 818-791-5600
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 ... 203-877-4577
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 ... 414-449-7487
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 ... 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 ... 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 ... 815-968-9661
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 ... 617-782-7440
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 ... 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 ... 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany ... 0911/65521
Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 ... 219-747-6142
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 ... 612-934-4400
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 ... 312-282-4040
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 ... 203-772-2220
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 ... 312-282-4040
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 ... 315-655-8050
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 ... 516-582-3400
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ... 215-MI2-9222
† Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 ... 215-355-0200
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan ... 489-5333
Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 ... 216-946-9900
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 ... 312-364-6038
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 ... 312-843-7900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 ... 201-348-7000
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746 ... 201-462-6100
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 ... 512-896-4444
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ... 201-797-3313; 800-526-5376
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 ... 201-666-5600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 ... 201-741-1120
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 ... 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 ... 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 ... 800-482-2828
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 ... 413-664-4481
§ Square D Co., Executive Plaza, Palatine, IL 60067 ... 312-397-2600
§† Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 ... 312-844-4300
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 ... 617-699-3800
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 ... 203-269-8701

Switches, Limit-5100

† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731, 516-261-3300 ... 3•1144
Datametrics Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ... 1B•1841
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ... 1B•1667
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1720

§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ...... 1B•1756
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Dillon, W. C., & Co., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
EOTec Corp., 200 Frontage Rd., W. Haven, CT 06516 203-934-7961
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 617-782-7440
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ...... 516-ED3-5955
§† Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ...... 914-698-2026;800-431-2625 (exc NY)
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145 216-871-7617
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ...... 201-797-3313; 800-526-5376
§ San-O Industrial Corp., 85 Orville Dr., Bohemia, NY 11716 516-567-5556
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ...... CA 415-965-0910;800-221-7060
Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600
Sterling Instr., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040 516-328-3300
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
§ Temposonics, 131 East Ames Ct, Plainview, NY 11803 516-349-1950
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310 305-739-4300
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ...... 617-WA6-1000

Switches, Lock — See Switches, Key Lock (Vol. 1B)

Switches, Matrix-5100

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ... 1B•1533,1536
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445, 716-381-4740 ...... 3•1213
Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ...... 1A•1359
† GRIM Corporation, Box 67, Medford, NJ 08055, 609-267-7950 ...... 3•1064
Information Transfer Indl., Box 357, Holcomb, NY 14469, 716-657-7074 ...... 3•1162
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 213-992-6776 ...... 1A•1709
Precision Filters, 240 Cherry St., Ithaca, NY 14850, 607-277-3550 ...... 3•1018-1020
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
† Aiken Advanced Sys., 5901 Edsall Rd., Alexandria, VA 22304 703-370-0900
Atec Sys., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
Bytex Corp., 2 California Ave., Framingham, MA 01701 617-879-5050
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
† CO-ORD Switch Div., LVC Inds., Inc., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
† Daico Inds., Inc., Box 5225, Compton, CA 90224 213-631-1143
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
§ Giltronix, 3780 Fabian Way, Palo Alto, CA 94303 415-493-1300
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
† Hoffman Engrg. Corp., 183 Sound Beach Ave., Old Greenwich, CT 06870 203-637-1719
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
§ Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711
MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
§ Micom Systems, Inc., 20151 Nordhoff Street, Chatsworth, CA 91311 818-998-8844
Stanley/AC Interface, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626 714-979-9830
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 213-285-3105
Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Wavetek San Diego, Div. of Wavetek, 9045 Balboa Ave., P.O. Box 85265, San Diego, CA 92123 619-279-2200

Switches, Membrane-5150

EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ...... 1B•1615
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 . 1B•1653, 1654
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051, 313-628-9711 ...... 1B•1783
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 .. 1B•1789
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
Basic Elctrns., 11762 Western Ave. "Q", Stanton, CA 90680 714-530-2400
† Bergquist Switch, Inc., Bergquist Co., 5300 Edina Indl. Blvd., Edina, MN 55435 612-835-2322
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
† C.A.M. Graphics Co., Inc., 145 Toledo St., Farmingdale, NY 11735 516-694-1315
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 414-228-7380
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Dorman Bogdonoff Corp., Corp. Center, Willow Pond, Andover, MA 01810 617-470-0001
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
Endicott Resch. Grp., Inc., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760 607-754-9187
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GraphTec Services, Inc., 1600 N.W. Madrid Way, Boca Raton, FL 33432 305-392-3373
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 818-283-5111
Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
Nissei Sangyo America, Ltd., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008 312-981-8989
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vlg., IL 60007 312-364-6038
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
§ RMS Electronics Inc., 50 Antin Pl., Bronx, NY 10462 212-892-6700
Rogers Corp., Box 700, Chandler, AZ 85224 602-963-4584
Rogers Corp., One Technology Dr., Rogers, CT 06263 203-774-9605
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Stanley/AC Interface, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626 714-979-9830
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 213-285-3105
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Switches, Mercury Displacement-5100

Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 ..... 1B•1624
§ **Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 .. 1B•1625**
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Thordarson Meissner, Electronic Center, Mt. Carmel, IL 62863 618-262-5121

Switches, Microwave — See Switches, Diode (Vol. 1A)

Switches, Momentary Action-5100

Aerospace Optics Inc., 3201 Sandy La., Dept. E-83, Fort Worth, TX 76112, 817-451-1141 ..... 1B•1503
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... 1B•1510
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... 1B•1538-1541
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... 1B•1565**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ..... 1B•1553,1555
§ **Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ..... 1B•1583**
Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039
§ **Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ..... 1B•1587**
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ..... 1B•1589
§† **Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 .... 1B•1590-1595,1597-1607**
Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ..... 1B•1618,1619
§ **Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 ..... 1B•1621**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... 1B•1634, 1635**
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 . 1B•1652, 1654
§ **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ..... 1B•1659,1661-1665**
Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... 1B•1669
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... 1B•1671
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... 1B•1672,1673
§ **Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 ..... 1B•1675**
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ..... 1B•1676
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... 1B•1679,1695,1699,1701,1702,1712,1717-1719**
§ **NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ..... 1B•1723-1727,1729,1731**
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 .. 1B•1733
Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ..... 1B•1736
† **Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ..... 1B•1738, 1739**
§ **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 . 1B•1096**
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... 1B•1748-1751
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 .. 201-887-9400
§† Electro Switch, King Ave., Weymouth, MA 02188 617-335-5200
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† Hoffman Engrg. Corp., 183 Sound Beach Ave., Old Greenwich, CT 06870 203-637-1719
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ..... 312-AL2-2700
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114 203-527-3092
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Multiposition-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ..... 1B•1506,1509
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ..... 1B•1533-1535
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ..... 1B•1538-1540,1542
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ..... 1B•1565**
Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 ..... 1B•1564
† **Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ..... 1B•1567**
§ **EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ..... 1B•1614**
§† **Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ..... 1B•1010**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ..... 1B•1633, 1636-1645**
Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 ..... 1B•1650
ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ..... 1B•1656-1658,1660
Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ..... 1B•1668,1669
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ..... 1B•1671
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ..... 1B•1673
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ..... 1B•1679,1699
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 . 1B•1732, 1733
Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ..... 1B•1743
Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ..... 1B•1472
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ..... 1B•1744-1747
§ **Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ..... 1B•1626,1627**
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ..... 1B•1752
† **Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ..... 1B•1754**
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ..... 312-662-7667; 800-323-9605
§ EDL Inc., 385 Oser Ave., Hauppauge, NY 11787 ..... 516-435-2808;800-DIAL EDL; 800 342-5335
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900

† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
§ Martin Sound Prods., 28 Alpha Park, Cleveland, OH 44143-2297 216-442-2286
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 714-957-6904
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749 818-964-6565
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Wavetek San Diego, Div. of Wavetek, 9045 Balboa Ave., P.O. Box 85265, San Diego, CA 92123 619-279-2200
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Paddle Handle-5100

§ **Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ...... 1B•1505,1507,1511,1513,3•1122**
§ **American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ...... 1B•1519**
§ **Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ...... 1B•1571,1572**
§ **Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ...... 1B•1549**
§ **Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ...... 1B•1583**
§ **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ...... 1B•1660**
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ...... 1B•1676
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ...... 1B•1679,1700,1705-1707**
§ **NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ...... 1B•1723,1726,1728**
§ **Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ...... 1B•1750**
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ...... 312-662-7667; 800-323-9605
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 315-655-8050
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481

Switches, Peripheral-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ...... 1B•1501
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
Terminal Data Corp., 11878 Coakley Circle, Rockville, MD 20852 301-881-7655

Switches, Photoelectric-3700

Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ...... 1B•1217
§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ...... 1B•1253**
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386, 612-443-2500 ...... 1B•1219
Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ...... 1B•1220-1223
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ...... 1B•1676
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ...... 1B•1720
§ **Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069, 214-542-9461 ...... 1B•1232**
TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ...... 1B•1240-1243
§ Banner Engrg. Corp., 9714 - 10th Ave. N., Minneapolis, MN 55441 612-544-3164
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Optical Techniques Intl., 1800 E. Garry, Ste. 14, Santa Ana, CA 92705 714-540-9040
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 312-537-4277
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
§ Sprague Elec. Co., Semiconductor Div., 115 Northeast Cutoff, Worcester, MA 01606 617-853-5000
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201

Switches, Port Sharing-5100

Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101, 818-793-8971 ...... 1B•1501
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Electro Standards Lab., Inc., P.O. Box 9144, Providence, RI 02940 401-943-1164
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
§ Micom Systems, Inc., 20151 Nordhoff Street, Chatsworth, CA 91311 818-998-8844
§ Terminal Data Corp., 11878 Coakley Circle, Rockville, MD 20852 301-881-7655

Switches, Power-5100

§ **Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ...... 1B•1514,3•1122**
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ...... 3•1068
§ **American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ...... 1B•1519**
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ...... 1B•1541
Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ...... 1B•1544
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ...... 1B•1565**
§ **Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ...... 1B•1549**
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ...... 1B•1553,1555**
§ **Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ...... 1B•1583**
§ **Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ...... 1B•1585,1586**
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ...... 1B•1589
§† **Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ...... 1B•1590-1595,1598-1601, 1603,1605-1607**
§† **Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ...... 1B•1618,1619**
§† **Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ...... 1B•1010,1622, 1623**
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 ...... 1B•1646
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 ...... 1B•1648
§ **ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 ...... 1B•1652, 1653**
§† **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ...... 1B•1659,1665**
† **Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ...... 1B•1668,1669**
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ...... 1B•1679,1686-1688,1693,1696-1698,1700,1701,1707,1711,1713,1718, 1719**
Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ...... 1B•1736
Powermark, 3855 Ruffin Rd., San Diego, CA 92123, 619-565-8363 ...... 3•1906
† **Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ...... 1B•1743**
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 ...... 1B•1744-1747
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ...... 1B•1748
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ...... 1B•1754,1755
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700

§—Product sold through distributors †—Product meets MIL specs

Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Compu-Lite Corp., 711 W. 17th St. 12, Costa Mesa, CA 92627 714-645-1501
§ CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Ledex Inc., P.O. Box 427, Vandalia, OH 45377 513-898-3621
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 315-655-8050
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
§ Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008 408-377-4621
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
Teledyne Kinetics, 410 S. Cedros Ave., Solana Beach, CA 92075 619-755-1181
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212

Switches, Pressure-5100

Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543, 14-698-2026;800-431-2625 (exc NY) ....1B•1741
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ....714-642-2400;800-854-4066
Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143

Switches, Program-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1506,1508
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 .... 1B•1532-1534
§ **Aries Elctrns., Box 130, Frenchtown, NJ 08825, 201-996-6841 .... 2•1149,1151**
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... 1B•1557-1563**
§ **EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ....1B•1612,1613**
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 ....1B•1633
Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ....1B•1649
§ **Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 ....1B•1650**
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ....1B•1490**
NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ....1B•1730
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1732
§† **Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ....1B•1626,1627**
† **Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ....1B•1755**
§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120 312-888-7245
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ....215-337-5500;800-441-8245
§ Bristol Saybrook, 97 Coulter St., Old Saybrook, CT 06475 203-388-3414
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
CDS - Colorado Data Sys., 3301 W. Hampden, Unit C, Englewood, CO 80110 303-762-1640
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
† CO-ORD Switch Div., LVC Inds., Inc., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
Datametrics Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887 617-658-5410
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
† Precision Mechanisms, 44 Brooklyn Ave., Westbury, NY 11590 ....516-ED3-5955
§ Precision Timer, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498 203-399-6253
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
§ Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
§ Siemens Corp., 186 Wood Ave., S., Iselin, NJ 08830 201-494-1000
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany 0911-65521
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Techniques, Inc., 235 Jackson St., Englewood, NJ 07631 201-569-5900
§ Tenor, 17020 W. Rogers Dr., New Berlin, WI 53151 414-782-3800
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212
Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141

Switches, Proximity-5100

Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 ....1B•1338
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1720**
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 ....1B•1879
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 ....215-337-5500;800-441-8245
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Computer Components, Inc., 629 Fifth Ave., Pelham, NY 10803 914-738-1611
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
† Eldec Corp., Sensing Systems Div., 18009 Hwy. 99, P.O. Box 5110, Lynnwood, WA 98036 206-771-7350
Electric Device, PO Box 337, Canfield, OH 44406 216-533-3060
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
FSI/Fork Standards Inc., 666 Western Ave., Lombard, IL 60148 ....312-231-3511; 312-932-9380
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840

§ Gordon Prods., 67 Del Mar Dr., Brookfield, CT 06804 203-775-4501
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
† INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 ....201-291-0500; 800-631-2165
§ Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 214-235-8332
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
† Raymond Engrg. Inc., Raycorder Prods. Div., 217 Smith St., Middletown, CT 06457 203-632-1000
RDI/Reed Devices Inc., 525 Randy Rd., Carol Stream, IL 60188 312-682-4100
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
§ Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ....CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Skan-A-Matic, Box S, Elbridge, NY 13060 315-689-3961
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209 513-871-3777
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
Tri-Tronics Co. Inc., 13420 Wright Cir., Tampa, FL 33624 813-855-4453
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 203-527-7201
Whittaker Corp., 10880 Wilshire Blvd., Los Angeles, CA 90024 213-475-9411

Switches, Pushbutton, Illuminated-5100

† **Aerospace Optics Inc., 3201 Sandy La., Dept. E-83, Fort Worth, TX 76112, 817-451-1141 ....1B•1503**
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ....3•1068
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ....1B•1519
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ....1B•1555,1556,1758**
§ **Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ....1B•1583**
§ **Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039**
§ **EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ....1B•1589**
§† **Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ....1B•1590-1595,1597-1607**
§† **Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733, 818-442-7180 ....1B•1618,1619**
§ **Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 ....1B•1621**
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1084
§† **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ....1B•1661-1664**
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ....1B•1490,1672,1673**
§ **Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 ....1B•1675**
§† **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1679,1700-1702,1711,1712**
§ **NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ....1B•1723-1725**
§ **Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1733**
§ **Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ....1B•1736**
§ **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096**
Sorenson Lighted Controls, 75 Locust St., Hartford, CT 06114, 203-527-3092 ....1B•1102,1103
§ **Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 ....1B•1750, 1751**
§ **Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ....1B•1756**
§ **Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 ....1B•1757**
§ Adalet-PLM Div, Div. Scott & Fetzer Co., 4801 W. 150th St., Cleveland, OH 44135 216-267-9000
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 .617-685-4371
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 ..914-425-7460
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Compu-Lite Corp., 711 W. 17th St. 12, Costa Mesa, CA 92627 714-645-1501
§ CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446 805-238-0350
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085 ....312-662-7667; 800-323-9605
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Fork Standards, Inc., 666 Western Ave., Lombard, IL 60148 312-932-9380
§† Furnas Elec., 1197 McKee St., Batavia, IL 60510 312-879-6000
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§† General Automatic Corp., 70 Liberty St., Metuchen, NJ 08840 201-494-9300
§ General Control Co., 1200 Soldiers Field Rd., Boston, MA 02134 ...617-782-7440
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
† Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-321-3260
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
† Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 714-957-6904
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ....215-MI2-9222
§ Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Panel Components Corp., P.O. Box 6626M, Santa Rosa, CA 95406 707-523-0600
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
§ Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ....914-698-2026;800-431-2625 (exc NY)
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
† Stacoswitch, 1139 Baker St., Costa Mesa, CA 92626 714-549-3041
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
§ Trimm, Inc., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048 312-362-3700
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Pushbutton, Nonilluminated-5100

Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1510,1514,3•1122
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ....3•1068
§ **American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ....1B•1519**
§ **Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ....1B•1541**
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ....1B•1565**
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ....1B•1553,1555,1556
§ **Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ....1B•1583**

Switches, Pushbutton-5100 (Cont'd)

§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 .... 1B•1587
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 .... 1B•1589
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ... 1B•1590-1592,1594,1595, 1597-1604
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 .... 1B•1621
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1634, 1635
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 .... 1B•1426
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 .... 1B•1084
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344, 612-934-4400 .. 1B•1652
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 .... 1B•1661-1664
§† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 .... 1B•1669
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 .... 1B•1671
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 .... 1B•1490,1672,1673
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 .... 1B•1675
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1695,1701,1702,1711-1713,1717-1719
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 .... 1B•1724-1727,1729,1731
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 .. 1B•1733
Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ...... 1B•1736
§† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 .... 1B•1738, 1739
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145, 308-235-4645 .... 1B•1792
§ Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 . 1B•1096
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 .... 1B•1748-1752
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 .... 1B•1757
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 .. 914-425-7460
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
§ Edwards Co., Signaling Prods. Div., P.O. Box 1188, Farmington, CT 06032 203-678-0410
§† Electro-Mech Comps., 1826 N. Floradale Ave., So. El Monte, CA 91733 818-442-7180
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ Gaynor Elec. Co., 172 E. Aurora St., Waterbury, CT 06720 203-755-1175
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025 312-729-5330
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
§ IVO Inds., Inc., P.O. Box 603, 201 Industrial Way W., Eatontown, NJ 07724 201-542-5151
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Korry Electronics, Inc., 223 8th Ave. N., Seattle, WA 98109 206-223-5400
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383 219-465-2200
§ MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
Mechanical Entprs., 461 Carlisle Dr., Herndon, VA 22070 703-435-9496
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Milton Ross Co., 511 Second St. Pike, Southampton, PA 18966 215-355-0200
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§ Paccom, 3928 148th NE, Redmond, WA 98052 .... 206-883-9200;800-426-6254
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749 818-964-6565
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany 0911-65521
§ Tektone Sound & Signal, 1331 S. Killian Dr., Lake Park, FL 33403 . 305-844-2383
Thermo Elec., 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791

Switches, Reed-5100

Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891, 203-599-2075 .... 1B•1338
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003, 201-743-6800 .. 1B•1625
§† Hamlin, Lake & Grove Sts., Lake Mills, WI 53551, 414-648-2361 .... 1B•1646
§† Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360, 212-428-5155 .... 1B•1436,1647
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018, 405-224-4046 .... 1B•1648
Standex Elctrns., 4538 Camberwell Rd., Cincinnati, OH 45209, 513-871-3777 .... 1B•1475
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 .... 1B•1757
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845 . 617-685-4371
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Coto Corporation, 55 DuPont Drive, Providence, RI 02907 401-943-2686
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Electric Device, PO Box 337, Canfield, OH 44406 216-533-3060
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
Fujitsu America, Inc., 918 Sherwood Dr., Lake Bluff, IL 60044 312-295-2610
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
§ INRESCO/Instr. Resistor, 2106 Bridge Ave., Pt. Pleasant, NJ 08742 201-892-5881
§ Kessler-Ellis Prods., 120 1st Ave., Atlantic Highlands, NJ 07716 ..... 201-291-0500; 800-631-2165
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 315-655-8050
§ Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sigma Instrs., 170 Pearl St., Braintree, MA 02184 617-843-5000
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan .... Tokyo 03-402-6161

Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 .219-563-2191

Switches, RF-5100

§ Compac, 279 Skidmore Rd., Deer Park, NY 11729, 516-667-3933 ....1A•1691
CYTEC Corp., 107 N. Washington St., E. Rochester, NY 14445, 716-381-4740 ....3•1213
† Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 .... 1A•1692-1696
§† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 ....1B•1346,1347
Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 ....1A•1359
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735, 516-694-3600 ....1A•1704
Information Transfer Indl., Box 357, Holcomb, NY 14469, 716-657-7074 ..... 3•1162
† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, 408-292-4025 .... 1B•1452-1454,1651
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203, 317-783-9875 .1A•1705
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, NJ 07058-9797, 201-227-2000 ....1A•1708
§† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103, 805-684-4560 .....1B•1456, 1457
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302, 213-992-6776 ....1A•1709
Mini-Circuits Lab., 2625 E. 14th St., Brooklyn, NY 11235, 212-769-0200 ..1A•1713, 1714,1762
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ....1B•1743
† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ....1B•1472
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† Aiken Advanced Sys., 5901 Edsall Rd., Alexandria, VA 22304 703-370-0900
† Alan Inds., P.O. Box 1203, Columbus, IN 47201 812-372-8869
Alford Mfg. Co., P.O. Box 2116, 32 Sixth Rd., Woburn, MA 01888 .617-935-8610
Alpha Inds., Inc.-Microelectronic Div., 3015 Advance Lane, Colmar, PA 18915 215-822-1311
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
Alpha Inds., Inc.-MSD Div., 20 Sylvan Rd., Woburn, MA 01801 617-935-5150
† Applied Research Inc., 160 Dupont St., Plainview, NY 11803 516-349-9200
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
Atec Sys., 107 N. Washington St., E. Rochester, NY 14445 716-381-4740
† Avantek, Inc., 3175 Bowers Ave., Santa Clara, CA 95051 408-496-6710
§ Bell Inds., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224 213-537-5200
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
Coaxial Dynamics, 13110 Enterprise, Cleveland, OH 44135 216-267-2233
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ....207-655-4555;800-341-9678
† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
§ E-H Electronics, Sub. E-H Intl., Inc., 7303 Edgewater Dr., Oakland, CA 94621 415-638-5656
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
Engelmann Microwave Co., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981 201-887-5700
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§ Glasgal Communications, Inc., 207 Washington St., Northvale, NJ 07647 201-768-8082
§† Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018 405-224-4046
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406 ....
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
M/A-COM Millimeter Prods., Inc., South Ave., Burlington, MA 01803 617-272-3000
MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
§† Micronetics, 36 Oak St., Norwood, NJ 07648 201-767-1320
§ Millen Components, Electronic Instr. & Specialty Corp., 42 Pleasant St., Stoneham, MA 02180 617-438-6951
Namco Controls, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060 216-946-9900
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Peca, Inc., 4957 Pearson Ave., Philadelphia, PA 19114 215-824-1550
Reeve Elctrns., 444 N. Orleans, Chicago, IL 60610 312-670-0150
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
§ RMS Electronics Inc., 50 Antin Pl., Bronx, NY 10462 212-892-6700
Sivers Lab, Box 90339, Los Angeles, CA 90009 213-390-7477
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Summit Engineering Corp., Box 938, Bozeman, MT 59715 406-587-4511
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
Telonic/Berkeley, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652 714-494-9401
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
† Trompeter Electronics, Inc., 8936 Comanche, Chatsworth, CA 91311 818-882-1020
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
† Vectronics Microwave Corp., 276 Lincoln Blvd., Middlesex, NJ 08846 201-356-2377
Wabash Relay & Elctrns., First & Webster Sts., Wabash, IN 46992 .219-563-2191
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141
† Waveline, Box 718, W. Caldwell, NJ 07006 201-226-9100
§ Wavetek San Diego, Div. of Wavetek, 9045 Balboa Ave., P.O. Box 85265, San Diego, CA 92123 619-279-2200
Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 .....301-948-3434; 800-638-2048
Wide Band Engrg. Co., Inc., Box 21652, Phoenix, AZ 85036 602-254-1570

Switches, Rocker-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1505,1507,1508,1513,1514,3•1122
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ....1B•1519
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 ....1B•1538,1539
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 ....1B•1571,1572
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ....1B•1565
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ....1B•1548,1549
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ....1B•1575
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ....1B•1583
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ....1B•1585,1586
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1629-1631
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1084
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ....1B•1660,1667
Judco Mfg. Inc., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, 213-534-0959 ....1B•1671
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 ....1B•1675
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ....1B•1676
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1679,1695,1700,1705-1707
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ....1B•1723,1726,1728,1731
Oslo Controls, 328 Industrial Ave, Cheshire, CT 06410, 203-272-2794 ......1B•1737
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 .... 3•1055
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
§ AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§† Heinemann Elec. Co., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800 609-882-4800
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§ Macom Inds., 8230 Haskell Ave., Van Nuys, CA 91406 ....
† Measurement Sys., Inc., 121 Water St., Norwalk, CT 06854 203-838-5561
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
SGL Waber, 300 Harvard Ave., Westville, NJ 08093 .609-456-5400;800-257-8384

Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040

Switches, Rotary-5100

§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002, 201-436-2230 ....1B•1124
§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1506,3•1122
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 ....3•1068
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ....1B•1533
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ....1B•1565
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ......1B•1567
§ CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ....1B•1579
§ Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ....1B•1587
§† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ......1B•1010,1622,1623
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1636-1645
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ....1B•1656-1658
§† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ....1B•1668,1669
† Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ... 1B•1490,1672-1674
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1679
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 ....1B•1730,1731
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 .1B•1732,1733
† Radio Switch Corp., 64 S. Main St., P.O. Box A, Marlboro, NJ 07746, 201-462-6100 ....1B•1743
§† Ross Engrg. Corp., 559 Westchester Dr., Campbell, CA 95008, 408-377-4621 ....1B•1472
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 .... 1B•1744-1747
Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096
§ Spectrol Elctrns., 17070 East Gale Ave., City of Industry, CA 91749, 818-964-6565 ....1A•2062
§† Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507, 312-844-4300 ....1B•1626,1627
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ....1B•1754
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Baytron, 344 Salem St., Medford, MA 02155 617-391-1550
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Carson Mfg. Co., 5453 N. Rural St., P.O. Box 20464, Indianapolis, IN 46220 317-257-3191
† Carter Mfg., Sugar Rd., Bolton, MA 01740 617-779-5501
§† Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Clarostat Mfg., Washington St., Dover, NH 03820 603-742-1120
§ Cogenel/Entrelec Div., 2 Ram Ridge Rd., Spring Valley, NY 10977 ..914-425-7460
§† CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
CTS Microelectronics, Inc., 1201 Cumberland Ave., W. Lafayette, IN 47906 317-463-2565
CTS Halex, 1202 McGaw Ave., Irvine, CA 92714 714-556-2850
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Duncan Electronics, Inc., 2865 Fairview Rd., Costa Mesa, CA 92626 714-545-8261
§ EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460 203-877-4577
§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659 714-835-6000
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GC Elctrns., 400 S. Wvman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Goldwell Comps., 1815 W. 205th St. Ste. 201, Torrance, CA 90501 213-533-1228
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
§ Kel-Am, 308 E. 5th, P.O. Box 313, Eldon, MO 65026 314-392-7174
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Mallory Timers, Emhart Elec./Elctrn. Grp., 3029 E. Washington St., Indianapolis, IN 46201 317-636-5353
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 .213-992-6776
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629 312-581-4555
MEC A/S, Industriparken 23, Ballerup, DK-2750 Denmark 452-973366
Methode Elctrns., Inc., 7444 W. Wilson Ave., Chicago, IL 60656 312-867-9600
† Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 714-957-6904
† Microlab/FXR, 10 Microlab Rd., Livingston, NJ 07039 201-992-7700
§ Microwave Development Labs., 10 Michigan Dr., Natick, MA 01760 617-655-0060
§† Minelco Inc. - A Talley Ind., 135 S. Main St., Thomaston, CT 06787-9985 203-283-8261
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
New England Instr., 14 Kendal Lane, Natick, MA 01760 617-875-9711
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Otto Engrg., 2 E. Main St., Carpentersville, IL 60110 312-428-7171
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
† Poly-Scientific, 1213 N. Main St., Blacksburg, VA 24060 703-552-3014
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
Standard Grigsby Inc., W. Gunther GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 51, West Germany 0911-65521
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630 312-792-2700
Telonic/Berkeley, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652 714-494-9401
Tettex Instruments, Inc., P.O. Box 281, Fairview Village, PA 19409-0281 215-539-6050
Thermo Elec., 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
§† UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492 203-269-8701
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212

Switches, Sealed-5100

† Aerospace Optics Inc., 3201 Sandy La., Dept. E-83, Fort Worth, TX 76112, 817-451-1141 ....1B•1503
Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 ....1B•1506,1510,1511
American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 .... 1B•1516-1518
American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ....1B•1519
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 .... 1B•1568-1572
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 ....1B•1546
CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 ....1B•1579
EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 ....1B•1589
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 ....1B•1610

§ EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 .... 1B•1612,1613
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638, 609-393-8350 .... 1B•1624
§† ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 .... 1B•1667
Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 .... 1B•1668,1669
Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 .... 1B•1674
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1679,1687,1688,1720
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 .. 1B•1733
† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 .... 1B•1738, 1739
Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543, 14-698-2026;800-431-2625 (exc NY) .... 1B•1741
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098, 203-379-2731 ..... 1B•1094
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 .... 1B•1754
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ...... 1B•1756
§ Veetronix, Inc., Sub. Reach Electronics, Box 480, Lexington, NE 68850, 308-324-4600 .... 1B•1757
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
§ Clare Division, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645 312-262-7700
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 .. 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
CSI Capacitors, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069 619-747-4000
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
§ Durakool, 1010 N. Main St., Elkhart, IN 46514 219-264-1116
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ Front Panel Devices, Inc., 530 Burnside Ave., Inwood, NY 11696 212-471-9800
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525 312-354-1040
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hasco Comps., Inc., 214-22 Waters Edge Dr., Bayside, NY 11360 .. 212-428-5155
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
Hermetic Switch, Box 1325, Hwy. 92, Chickasha, OK 73018 405-224-4046
§ Interswitch, 770 Airport Blvd., Burlingame, CA 94010 415-347-8217
† ITT Jennings, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122 408-292-4025
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260 602-991-0942
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
Selec-Key, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103 312-837-7970
Signal Sys. Intl., P.O. Box 198, Holmdel, NJ 07733 201-741-1120
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800

Switches, Slide-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 .... 1B•1507-1509,1512
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 .... 3•1068
American Research & Engineering, 1500 Executive Dr., Elgin, IL 60120, 312-888-7245 .... 1B•1516-1518
AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ... 1B•1533,1535
Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 .... 1B•1542
§ Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 .... 1B•1573
CTS Electronics Corp., Paso Robles Div., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, 805-238-0350 .... 1B•1576-1580
Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 .... 1B•1621
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1629-1631,1633
Guardian Elec. Mfg. Co., 1550 W. Carroll Ave., Chicago, IL 60607 .... 1B•1426
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 .... 1B•1659,1660
§ Switchcraft, Inc., 5555 N. Elston, Chicago, IL 60630, 312-792-2700 .... 1B•1748, 1752
Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
§ AMP Products Corp., P.O. Box 1776, Paoli, PA 19301 215-647-1000
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
Arstan Products Intl. Ltd., 99 Jericho Tpke., Jericho, NY 11753 516-333-8100
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158 617-964-6400
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
Centralab, Inc., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501 515-573-1300
§ Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087 312-578-3500
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
† CO-ORD Switch Div., LVC Inds., Inc., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
§ Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 ... 212-691-9050
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Gaynor Elec. Co., 172 E. Aurora St., Waterbury, CT 06720 203-755-1175
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
General Electric Co., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602 203-382-2000
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Illinois Lock Co., The Eastern Co., 301 W. Hintz Rd., Wheeling, IL 60090 312-537-1800
International Resource Svcs., 7343 N.W. 79th Terr., Miami, FL 33166 305-884-2924
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§ Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800
† LVC Inds., Inc., CO-ORD Switch Div., 23 Hanse Ave., Freeport, NY 11520 516-868-1900
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035 315-655-8050
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
§ Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Paccom, 3928 148th NE, Redmond, WA 98052 .... 206-883-9200;800-426-6254
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Resistance Technology Inc., 1260 Red Fox Rd., St. Paul, MN 55112 612-636-9770
† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
Shogyo Intl. Corp.. 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
Wilbrecht Elctrns., 240 Plato Blvd., St. Paul, MN 55107 612-222-2791
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Snap Action (All Types)-5100

§ **Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 .... 1B•1510**
§ **American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 .... 1B•1519**
§ **Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304, 818-700-1933 .... 1B•1541**
§ **Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062, 312-291-1760 .... 1B•1544-1546**
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 .... 1B•1565**
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 .... 1B•1551-1554**
Chicago Lock Co., 4311 W. Belmont Ave., Chicago, IL 60641, 312-282-7177 .... 1B•1564
§ **Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039**
§ **EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 .... 1B•1589**
§† **Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, 414-449-7487 .... 1B•1607**
Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403, 612-375-0011 .... 1B•1621
§† **Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 .... 1B•1010,1622, 1623**
§ **Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1634, 1635**
§† **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 .... 1B•1665,1666**
§ **Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 .... 1B•1675**
§ **McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 .... 1B•1676**
§† **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1679,1686-1694**
§† **Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 .... 1B•1738**
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 .... 3•1055
§† **Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 .... 1B•1756**
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Airpax Corporation, Woods Rd., Cambridge, MD 21613 301-228-4600
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
§† AMF/Electro Comps. Div., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060 305-973-8620
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
§ Aromat Corp., 250 Sheffield St., Mountainside, NJ 07092 201-232-4260
§† Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
§ Bryant Circuit Devices Div., Westinghouse Elec. Corp., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641 203-233-5551
§ Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
Columbus Elec. Mfg., Box 289A Rt , Piney Flats, TN 37686 615-538-8191
§ Compu-Lite Corp., 711 W. 17th St. 12, Costa Mesa, CA 92627 714-645-1501
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 201-887-9400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
CTS Corp., 905 North West Blvd., Elkart, IN 46514 219-293-7511
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011 212-691-9050
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
§ Entech Systems, Inc., 15 Herman Dr., Simsbury, CT 06070 203-651-9557
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
† Hamilton Std. Controls, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859 219-747-6142
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
§ IDEC Systems & Controls Corp., 3050 Tasman Dr., Santa Clara, CA 95050 408-988-7500
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
§ J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Landis & Gyr, Inc., 4 Westchester Plaza, Elmsford, NY 10523 914-592-4400
Leecraft Mfg., 21-02 44th Rd., Long Island City, NY 11101 212-392-8800
§† Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Mantex Corp., 1800 Metamora Rd., P.O. Box 15E, Oxford, MI 48051 313-628-9711
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Maxi-Switch Co., 9697 East River Rd., Minneapolis, MN 55433 612-755-7660
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 .... 215-MI2-9222
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
§ Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
§ Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
§† Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 .... 201-797-3313; 800-526-5376
† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
Schroff Inc., 170 Commerce Dr., Warwick, RI 02886 401-732-3770
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
SGL Waber, 300 Harvard Ave., Westville, NJ 08093 . 609-456-5400;800-257-8384
§ Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
Stackpole Components Co., Box M, Farmville, VA 23901 804-392-4111
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 201-944-2221
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907 419-756-5911
§ Torq Corp., 32 W. Monroe St., Bedford, OH 44146 216-232-4100
§ United Elec. Controls, 85 School St., Watertown, MA 02172 .... 617-WA6-1000
§ Wadsworth Elec., 20 W. 11th St., Covington, KY 41011 606-431-0900
§ Waldom Elctrns., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629 .312-585-1212
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Solid State-5100

Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 .... 1B•1829
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 .... 1B•1565**
† **Daico Inds., Inc., Box 5225, Compton, CA 90224, 213-631-1143 .... 1A•1694-1696**
§ **EAO Switch Corp., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, 203-877-4577 .... 1B•1589**
† **Frequency Elctrns., 55 Charles Lindbergh Blvd., Mitchel Field, NY 11553, 516-794-4500 .... 1A•1359**
§ **ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 .... 1B•1665**
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1679-1685,1700,1701,1705,1711,1712**
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254, 617-890-6107 .... 1A•2109
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† Aiken Advanced Sys., 5901 Edsall Rd., Alexandria, VA 22304 703-370-0900
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
American Electronic Labs., Box 552, Lansdale, PA 19446 215-822-2929
† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700
† Applied Electro Technlg., Int., STI Company, 2220 So. Anne St., Santa Ana, CA 92704 714-556-6570
† Arra Inc., 15 Harold Ct., Bay Shore, NY 11706 516-231-8400
Astro-Geo-Marine, Inc., 202 E. Cota St., Santa Barbara, CA 93101 805-965-7005
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Baytron, 344 Salem St., Medford, MA 02155 617-391-1550
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
§ Burgess Switch Co., Inc., 638 Anthony Trail, North Brook, IL 60062 312-291-1760
Coaxial Dynamics, 13110 Enterprise, Cleveland, OH 44135 216-267-2233
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§ Crydom Division, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245 213-322-4987
§ Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587 212-497-7600
† Dionics, 65 Rushmore St., Westbury, NY 11590 516-997-7474
§ Douglas Randall, 6 Pawcatuck Ave., Pawcatuck, CT 02891 203-599-2075
Dynage, Inc., Control Prods Grp., 135 Prestige Park Circle, E. Hartford, CT 06108 203-289-6831
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
Elec-Trol, Inc., 26477 N. Golden Valley Rd., Saugus, CA 91350 805-252-8330
§ Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
Enerco, Inc., 9615 W. Marginal Way S., Seattle, WA 98108 206-762-1422
§ Fairchild Camera & Instr. Corp., 464 Ellis St., MS15-1035, Mountain View, CA 94042 415-962-5011

§ General Instr., Optoelctrns. Div., 3400 Hillview Ave., Palo Alto, CA 94304 415-493-0400
General Magnetics, 211 Grove St., Bloomfield, NJ 07003 201-743-2700
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 .516-694-3600
† Genisco Technlg. Corp., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221 213-537-4750
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gordos Arkansas, Inc., 1000 N. Second St., Rogers, AR 72756 501-636-5000
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
Halmar Electronics, Inc., 900 N. Hague Ave., Columbus, OH 43204 614-276-0131
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 612-443-2500
§† Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080 214-234-4271
Hughes Aircraft Co, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009 213-670-1515
Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509 213-517-6000
† Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
Jay-El Prods., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247 213-321-3260
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
§† Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620 714-739-0770
Licon Div., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Lorch Elctrns., 105 Cedar La., Englewood, NJ 07631 201-569-8282
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820
† MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 .213-992-6776
Maxi-Switch Co., 9697 East River Rd.; Minneapolis, MN 55433 612-755-7660
† Merrimac Inds., 41 Fairfield Pl., West Caldwell, NJ 07006 201-575-1300
Microphase, 587 Connecticut Ave., Norwalk, CT 06856 203-866-8000
§† Micro Power Sys. Inc., 3100 Alfred St., Santa Clara, CA 95050 408-727-5350
† Norsal Inds., 85 D Hoffman Lane So., Central Islip, NY 11722 516-234-1200
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 408-725-1220
§ Payne Engrg., Box 70, Scott Depot, WV 25560 304-757-7353
§† Precision Monolithics, 1500 Space Dr., Santa Clara, CA 95050 408-727-9222
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
RCA Solid State Div., Linear Integrated Circuits, Rte. 202, Somerville, NJ 08876 201-685-6000
† Reed Switch Dev. Co. Inc., PO Box 1464, Kerrville, TX 78028 512-896-4444
Regent Controls, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767 203-736-2924
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Roanwell, 180 Varick St., New York, NY 10014 212-989-1090
§ Scientific Technlg., 1201 San Antonio Rd., Mountain View, CA 94043 ......CA 415-965-0910;800-221-7060
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
§† Siliconix, Inc., 2201 Laurelwood Rd., Santa Clara, CA 95054 408-988-8000
§ S S A C, Box 395, Liverpool, NY 13088 315-622-1000
§ Struthers-Dunn, Lamb's Rd., Pitman, NJ 08071 609-589-7500
§ TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
§ Teccor Elctrns., P.O. Box 619009, Dallas, TX 75261-9009 214-252-7651
§† Teledyne-Crystalonics, 147 Sherman St., Cambridge, MA 02140 617-491-1670
Tempo Instrument, Inc., 87 Modular Ave., Commack, NY 11725 516-694-4400
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
§† Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 203-677-1311
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ......617-WA6-1000
† Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, CA 94304 415-493-4141
Wide Band Engrg. Co., Inc., Box 21652, Phoenix, AZ 85036 602-254-1570

Switches, Step Type-5100

§ **Communications Instrs., Inc., Box 520, Fairview, NC 28730, 704-628-1711 ......1B•1321**
† **Ledex Inc., P.O. Box 427, Vandalia, OH 45377, 513-898-3621 ......1B•1490,1674**
Litton Encoder Div., 20745 Nordhoff St., Chatsworth, CA 91311, 818-341-6161 ......1B•1848
† **Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ......1B•1754**
§ Airflyte Elctrns. Co., 56 New Hook Rd., Bayonne, NJ 07002 201-436-2230
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103 603-669-0940
§† ASM, 525 Truck La., Smithfield, NC 27577 919-934-3104
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Chicago Switch, Inc., 1714 N. Damen, Chicago, IL 60647 312-489-5500
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704 714-556-3100
§ Control Prods. Div., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083 201-964-4400
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§ Eagle Signal Controls, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761 512-837-8401
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
† Electrospace Sys., Inc., Box 1359, Richardson, TX 75080 214-783-2004
GTE Automatic Elec., 400 N. Wolf Rd., Northlake, IL 60164 312-681-7071
GTE Switching & Telephone Products, 400 N. Wolf Rd., Northlake, IL 60164 312-681-7100
§ ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Noble U.S.A., Inc., 151 Stanley St., Elk Grove Vllg., IL 60007 312-364-6038
§† Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§ Ohmite Mfg. Co., 3601 W. Howard St., Skokie, IL 60076 312-675-2600
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 ......312-AL2-2700
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ......201-797-3313; 800-526-5376
Schurter, Inc., 1016 Clegg Ct., Petaluma, CA 94952 707-778-6311
Sealectro, 225 Hoyt St., Mamaroneck, NY 10543 914-698-5600
Shallco, Box 1089, Smithfield, NC 27577 919-934-3135
§ Tenor, 17020 W. Rogers Dr., New Berlin, WI 53151 414-782-3800

Switches, Tap — See Switches, Rotary (Vol. 1B)

Switches, Thermally Actuated-5300

Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ......1B•1587
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861, 401-727-1300 ......1B•1802
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 ......1B•1823
§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ......1B•1811-1813**
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 ......1B•1823
Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701 301-663-5141
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 ..201-887-9400
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ E Technology Corp., 1545 Morse Ave., Ventura, CA 93003 805-644-9544
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 ......
Jaidinger Mfg., 1921 W. Hubbard St., Chicago, IL 60622 312-421-1090
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ......201-797-3313; 800-526-5376
§ Selco Products Co., 7580 Stage Rd., Buena Park, CA 90621 714-521-8673
† Sundstrand Data Control, Overlake Ind'l. Pk., Redmond, WA 98052 206-885-3711
Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan ......Tokyo 03-402-6161
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ......617-WA6-1000
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Switches, Thumbwheel-5100

AMP Incorporated, Box 3608, Harrisburg, PA 17105, 717-564-0100 ......1B•1534
§ **C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ......1B•1565**
§ **Cherry Electrical Prods. Corp., 3623 Sunset Ave., Waukegan, IL 60087, 312-578-3500 ......1B•1556-1563,1758**
§ **Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195, 312-843-2200 ......1B•1575**
§† **EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ......1B•1612-1614**
Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ......1B•1010
§ **Inter-Market, 1946 Lehigh Ave., Glenview, IL 60025, 312-729-5330 ......1B•1649**
§ **Interswitch, 770 Airport Blvd., Burlingame, CA 94010, 415-347-8217 ......1B•1650**
§ **Shelly Associates, Inc., 2942 Dow Ave., Tustin, CA 92680, 714-544-9970 .1B•1096**
† **Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ......1B•1754**
§ **Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ......1B•1756**
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Erni Comps. Corp., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005 312-577-8620
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900

Switches, Thumbwheel-5100 (Cont'd)

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
§ Seacor, Inc., 123 Woodland Ave, Westwood, NJ 07675 201-666-5600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Stanford Applied Engrg. Inc., 3520 De La Cruz Blvd., Santa Clara, CA 95050 408-980-1600
Tansitor Elctrns., West Rd., Bennington, VT 05201 802-442-5473

Switches, Tilt — See Switches, Mercury Displacement (Vol. 1B)

Switches, Toggle-5100

§ Alco Elctrn. Prods., Inc., 1551 Osgood St., N. Andover, MA 01845, 617-685-4371 .... 1B•1511-1513
§ American Switch Corp., 134 Water St., Wakefield, MA 01880, 617-246-1007 ....1B•1519
§† Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, 203-249-8471 .... 1B•1568-1570
§ C & K Components, Inc., 15 Riverdale Ave., Newton, MA 02158, 617-964-6400 ....1B•1565
§ Carlingswitch, Inc., 505 New Park Ave., W. Hartford, CT 06110-0641, 203-233-5551 ....1B•1549
§ Dai-Ichi Shoji of Amer., Inc., 150 Fifth Ave., New York, NY 10011, 212-691-9050 ....1B•1583
Dialight Corp., 203 Harrison Pl., Brooklyn, NY 11237-1587, 212-497-7600 1B•1039
Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1630-1632
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405, 818-787-0311 ....1B•1084
Kay Elemetrics Corp., 12 Maple Ave., Pine Brook, NJ 07058-9797, 201-227-2000 ....1A•1708
§ Marquardt Switches Inc., 67 Albany St., EEM, Cazenovia, NY 13035, 315-655-8050 ....1B•1675
§ McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ....1B•1676
§† Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1679,1696-1699
§ NKK Switches of America, Inc., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, 602-991-0942 .... 1B•1723,1726-1728
§† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ....1B•1738, 1739
§ Power Dynamics, 177 Valley, S. Orange, NJ 07079, 201-762-6886 ....1B•1740
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530, 914-681-0700 .... 3•1055
† Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, 201-944-2221 ....1B•1755
§ Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ....1B•1756
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 213-241-5121
Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101 .818-793-8971
† Airpax Corporation, Woods Rd., Cambridge, MD 21613 301-228-4600
Allen-Bradley Co., 1201 S. Second St., Milwaukee, WI 53204 414-671-2000
§ Alpha Products, Inc., 5740 Corsa Ave. 04, Westlake Village, CA 91362 818-889-9304
Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131 408-946-6000
AMP Incorporated, Box 3608, Harrisburg, PA 17105 717-564-0100
§ Arcolectric Corp., 9001 Canoga Ave., Canoga Park, CA 91304 818-700-1933
Ark-Les, 51 Water St., Watertown, MA 02172 617-924-2330
Augat Inc., 33 Perry Ave., Box 779, Attleboro, MA 02703 617-222-2202
§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644 201-796-2886
§ Bryant Circuit Devices Div., Westinghouse Elec. Corp., 500 Sylvan Ave., Bridgeport, CT 06606 203-334-5561
Capitol Machine & Switch Co., Box 890, Danbury, CT 06810 203-744-3300
Cole Hersee, 20 Old Colony Ave., Boston, MA 02127-2467 617-268-2100
§ Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§ Crouzet Controls, Inc., 1083 State Pkwy., Schaumburg, IL 60195 312-843-2200
§† Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ Gaynor Elec. Co., 172 E. Aurora St., Waterbury, CT 06720 203-755-1175
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Haydon Switch & Instr., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705 203-756-7441
ISL Products Intl. Ltd., 235 P Robbins Lane, Syosset, NY 11791-6093 516-822-9601
§ ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
§ Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, IL 60016 312-824-1188
§† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Matrix Sys. Corp., 5177 N. Douglas Fir Rd., Calabasas, CA 91302 .213-992-6776
§ MG Electronics, 32 Ranick Rd., Hauppauge, NY 11788 516-582-3400
† Milli-Switch Corp., Box 67, Gladwyne, PA 19035 ....215-MI2-9222
§ Mitsumi Elec. Co., Ltd., 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan 489-5333
§ Omron Elctrns., Inc., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195 312-843-7900
§† Pass & Seymour, Inc., P.O. Box 4822, Syracuse, NY 13221 315-468-6211
Potter & Brumfield, P.O. Box 322, Princeton, IN 47671 812-386-1000
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
§ Relay Specialties, 1300 Plaza Rd., Fair Lawn, NJ 07410 ....201-797-3313; 800-526-5376
Resistance Technology Inc., 1260 Red Fox Rd., St. Paul, MN 55112 612-636-9770
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Schroff UK Ltd., Maylands Ave., Hemel Hempstead, Herts, HP2 4SG England 0442-40471/6
§† Kulka Smith, Inc., 1913 Atlantic Ave., Manasquan, NJ 08736 201-223-9400
§ SMK Elctrns. Corp., U.S.A., 1901 Nancita Cir., Placentia, CA 92670 714-996-0960
§ SPEMCO Switches, 23425 Harper, St. Clair Shores, MI 48080 800-482-2828
§ Sprague Products Co., 481 Marshall St., No. Adams, MA 01247 413-664-4481
§ T-Bar Incorporated, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897 203-834-8227
Texas Instrs., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703 617-699-3800
§ UID Switches Inc., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634 312-282-4040
§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

Switches, Touch Actuated-5100

Alps Electric (USA), Inc., 3553 N. First St., San Jose, CA 95131, 408-946-6000 .... 3•1068
Tapeswitch Corp. of America, 100 Schmitt Blvd., Farmingdale, NY 11735, 516-694-6312 ....1B•1753
Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 213-241-5121
Advanced Input Devices, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814 208-765-8000
Automation Displays Inc., 3833 N. White Ave., Eau Claire, WI 54701 715-834-9595
§ Bowmar Instrument Corp., Commercial Products Div., 4640 126th Ave. N., Clearwater, FL 33520 813-576-2525
Brady, W.H., Co., Elctrn. Prods. Div., 6150 N. Flint Rd., Milwaukee, WI. 53201 414-332-8100
Brady, W. H., Co., Xymox Div., 8225 W. Parkland Ct., P.O. Box 571, Milwaukee, WI 53201 414-355-8300
§ Centralab, Inc., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209 414-228-7380
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 ..201-887-9400
§ Duralith, 525 Orange St., Millville, NJ 08332 609-825-6900
§ Electronic Components Groupe, 26 N. 5th St., Minneapolis, MN 55403 612-375-0011
† Flex-Key Corp., 18 Sargent St., Gloucester, MA 01930 617-281-2040
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany 0911/65521
† Hallmark Nameplate, Inc./Electropanel Co., 1855 New Highway, Farmingdale, NY 11735 516-454-0700
Industrial Elctrn. Engrs., Inc., 7740 Lemona Ave., Van Nuys, CA 91405 818-787-0311
ITT Schadow, 8081 Wallace Rd., Eden Prairie, MN 55344 612-934-4400
§† MSC Prods./Eaton Corp., 1640 Monrovia St., Costa Mesa, CA 92627 714-642-2427
§ Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 815-235-6600
§† Miller Dial Corp., 4400 N. Temple City Blvd., El Monte, CA 91734 ...818-283-5111
Molex, 2222 Wellington Ct., Lisle, IL 60532 312-969-4550
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014 815-459-5000
§† Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ....914-698-2026;800-431-2625 (exc NY)
§ Refac Elctrns. Corp., P.O. Box 809, Winsted, CT 06098 203-379-2731
Relay Service Co., 1310 N. Pulaski Rd., Chicago, IL 60651 .... 312-AL2-2700
§ Standard Grigsby, Inc., 920 Rathbone Ave., Aurora, IL 60507 312-844-4300
TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703 602-792-2230
Technical Panels, Inc., 9162 La Rosa Dr., Temple City, CA 91780 ...213-285-3105
Toko America, Inc., 5520 W. Touhy Ave., Skokie, IL 60077 312-677-3640
Topflight, 160 East 9th Ave., York, PA 17404 717-843-9901
Unicorn Engrg. Co., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618 415-428-1626

Switches (MIL), Non-RF-2440

Aerospace Optics Inc., 3201 Sandy La., Dept. E-83, Fort Worth, TX 76112, 817-451-1141 ....1B•1503
† Armtec Industries, Inc., Daven Components Grp., Manchester Airport, Manchester, NH 03103, 603-669-0940 ....1B•1543
Cole Instr., 2650 S. Croddy Way, Santa Ana, CA 92704, 714-556-3100 ....1B•1567
EECO Incorporated, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, 714-835-6000 ....1B•1612,1613
† Electro Switch, King Ave., Weymouth, MA 02188, 617-335-5200 ....1B•1010
§† Grayhill Inc., 569 Hillgrove Ave., La Grange, IL 60525, 312-354-1040 .... 1B•1629-1631,1633,1636-1645
ITW Switches, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, 312-282-4040 ....1B•1656,1657,1666,1667
Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504, 818-846-1800 ....1B•1668,1669
McGill Mfg. Co., Inc., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, 219-465-2200 ....1B•1676
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1686,1689,1691,1693,1694,1697,1698
Oak Switch Sys., 100 S. Main St., Crystal Lake, IL 60014, 815-459-5000 ..1B•1732
† Otto Engrg., 2 E. Main St., Carpentersville, IL 60110, 312-428-7171 ....1B•1738, 1739
Shallco, Box 1089, Smithfield, NC 27577, 919-934-3135 .... 1B•1744-1747
Unimax Switch Corp., Ives Rd., Wallingford, CT 06492, 203-269-8701 ....1B•1756
† Accudyne Corp., P.O. Box 1429, Janesville, WI 53547 608-752-9081

Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 213-241-5121
† Advanced Sys. Concepts, 435 N. Lake Ave., Pasadena, CA 91101 ..818-793-8971
Arrow Hart Div., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101 203-249-8471
† Control Products, Inc., 280 Ridgedale Ave., E. Hanover, NJ 07936 ..201-887-9400
† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 401-727-1300
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
§† J-B-T Switches, Cutler-Hammer Prods., Eaton Corp., Box 1904, New Haven, CT 06509 203-772-2220
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
Microavionics Corp., 3198-K Airport Loop Dr., Costa Mesa, CA 92626 714-957-6904
† Orbit Instrument Corp., 80 Cabot Ct., Hauppauge, NY 11788 516-435-8300
† Orbit Instrument of Cal., 6431 Global Dr., Cypress, CA 90630 714-527-0561
Power Dynamics, 177 Valley, S. Orange, NJ 07079 201-762-6886
Tech Labs., Inc., Bergen & Edsall Blvds., Palisades Pk., NJ 07650 ..201-944-2221

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Adams Rite Prods., Inc., 540 W. Chevy Chase Dr., Glendale, CA 91209 213-241-5121
Alpha Inds., Inc.-Microelectronic Div., 3015 Advance Lane, Colmar, PA 18915 215-822-1311
Alpha Inds., Inc., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843 617-681-8520
† Automatic Connector, Inc., 400 Moreland Rd., Commack, NY 11725 516-543-5000
Bird Elctrn., 30303 Aurora Rd., Cleveland, OH 44139 216-248-1200
Crosspoint, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022 201-941-4455
Daico Inds., Inc., Box 5225, Compton, CA 90224 213-631-1143
§† Digitran Co., 3100 New York Dr., Pasadena, CA 91107 818-791-5600
† Dow Key Div., Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
† Eaton Corp., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086 408-733-3883
Fifth Dimension, Inc., 801 New York Ave., Trenton, NJ 08638 609-393-8350
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 .516-694-3600
† Janco Corp., Box 3038-Glenoaks Sta., Burbank, CA 91504 818-846-1800
§† JFW Inds., Inc., 2719 E. Troy Ave., Indianapolis, IN 46203 317-783-9875
K&L Microwave, Inc., 408 Coles Circle, Salisbury, MD 21801 301-749-2424
† Kilovac Corp., Box 4422-EM, Santa Barbara, CA 93103 805-684-4560
† Machine Components Corp., 70 Newtown Rd., Plainview, NY 11803 516-694-7222
† M/A-COM Microwave Circuits, Inc., South Ave., Burlington, MA 01803 617-272-3000
† M/A-COM Millimeter Prods., Inc., South Ave., Burlington, MA 01803 617-272-3000
† MarLee Switch Co., 933-D N. Central Ave., Upland, CA 91786 714-982-8988
† Norsal Inds., 85 D Hoffman Lane So., Central Islip, NY 11722 516-234-1200
† Risk, George, Inds., GRI Plaza, Kimball, NE 69145 308-235-4645
RLC Elctrns., Inc., 83 Radio Cir., Mt. Kisco, NY 10549 914-241-1334
† Sage Laboratories, Inc., 3 Huron Dr., Natick, MA 01778 617-653-0844
§ Support Systems Intl. Corp., 150 South Second St., Richmond, CA 94804 415-234-9090
† Teledyne Microwave, 1290 Terra Bella Ave., Mountain View, CA 94043 415-968-2211
† Transco Prods., 4241 Glencoe Ave., Marina del Rey, CA 90291 213-822-0800
† TRW Microwave, 825 Stewart Dr., Sunnyvale, CA 94086 408-732-0880

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Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
† Innovatek Microsystems, Inc., Smithfield Rd., Millerton, NY 12546 ..914-373-9003
† Natel Engrg. Co., Inc., 4550 Runway St., Simi Valley, CA 93063 805-581-3950
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581

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Terminations, Fiber Optic-2475
† **MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116**
Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 617-778-0700
Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada 613-226-4000
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
Optical Fiber Technologies, Inc., P.O. Box 148, Nutting Lake, MA 01865 617-663-6629
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

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Test Equipment, Fiber Optic-2475
Berkeley Nucleonics Corp., 1198 Tenth St., Berkeley, CA 94710, 415-527-1121 ...... 3•1203
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320, 818-889-8770 ......1B•1118,1119
RE Instruments Corp., 31029 Center Ridge Rd., Westlake, OH 44145, 216-871-7617 ...... 3•1291
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 203-775-8950
Biddle Instruments, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422 215-646-9200
Everett/Charles Test Equip. Inc., 2887 N. Towne Ave., Pomona, CA 91767 714-621-9511
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 703-563-0371
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 516-334-6800
Orionics, Inc., 34368E Frontage Rd., Bozeman, MT 59715 406-586-8256
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 617-443-7333

York Technology, Inc., 1101 State Rd., Bldg. O, Princeton, NJ 08540 609-924-7676

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Thermal Platforms-2900 — ***See Vol. 3***

Thermal Imagers — See Imagers, Thermal (Vol. 3)

Thermistors-5300

Cal-R, Inc., P.O. Box 1397, Santa Monica, CA 90406, 213-450-1761 .... 1B•1795, 1796

Carborundum Co., Electric Prods. Div., Box 339, Niagara Falls, NY 14302, 716-278-2383 .... 1B•1798,1799

Colber Corp., 26A Buffington St., Irvington, NJ 07111, 201-371-9500 .... 1A•1845

Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, 402-371-0080 .... 1B•1800,1801

§† **Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701, 617-872-8841 . 1B•1803**

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. 1B•1804-1807

Mepco/Electra, Inc., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, 201-539-2000 .... 1A•1891

§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 .... 1B•1810,1811,1815-1817**

† **Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 .... 1A•1904**

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ... 1B•1735,1818,1819

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 .... 1B•1820,1821

§† **RCD Components, Inc., 330 Bedford St., Manchester, NH 03101, 603-669-0054 .... 1A•1929**

RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 .... 1A•1936

Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 .... 1A•1936

Sylvania Control Devices, Rte. 35, Standish, ME 04084, 207-642-4535 ..... 1B•1822

† **Thermometrics, Inc., 808 U.S. Hwy. , Edison, NJ 08817-4695, 201-287-2870 .... 1B•1825**

TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-922-8900 .... 1A•1986-1988

§ Allen Co., Inc., Robert G., 7267 Coldwater Canyon, N. Hollywood, CA 91605 818-765-8300

§† Ametek/Rodan Div., 2905 Blue Star St., Anaheim, CA 92806 714-630-0081

§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555

Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241

Baytron, 344 Salem St., Medford, MA 02155 617-391-1550

§ Carbone Lorraine Inds., 400 Myrtle Ave., Boonton, NJ 07005 .... 201-DE4-0700

Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300

Digitec Corp., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401 . 513-254-6251

§ EDL Inc., 385 Oser Ave., Hauppauge, NY 11787 ..... 516-435-2808;800-DIAL EDL; 800 342-5335

† EMCA, Sub. Rohm and Haas Advanced Matls. Co., 605 Center Ave., Mamaroneck, NY 10543 914-698-8434

Extech International Corp., 150 Bear Hill Rd., Waltham, MA 02154 . 617-890-7440

Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600

§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 ....

§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661

† Gulton Inds., Inc., Piezo Prods. Div., Box 4300, Fullerton, CA 92634 714-871-2150

§† Harris Corp., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791 516-364-0400

Hughes Aircraft Co, Aerospace Grps./Support Sys.,,P.O. Box 90515, Los Angeles, CA 90009 213-670-1515

Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509 213-517-6000

Hughes Aircraft Co., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715 714-752-3800

§ Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000

Interelectronics Corp., Interelectronics Park, 550 U.S. Rte. 303, Congers, NY 10920 .... 914-EL8-8000

§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232

§ Murata Mfg. Co. Ltd., 26-10 2-chome-Temjin, Nagaoka-Kyo-Shi, Kyoto, Japan 075-921-9111

§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000

† Quality Thermistor, 2147 Centurion Pl., Boise, ID 83705 208-377-3373

Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860

† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195

R. E. Law Instru. Inc., 7735 W. 112th Pl., Palos Hills, IL 60465 312-974-4000

§ RFL Inds., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733 802-247-6811

Science/Elctrns., 1224-26 McCook Ave., Dayton, OH 45404 513-228-6011

† Sensor Scientific, Inc., 1275 Bloomfield Ave., Fairfield, NJ 07006 201-227-7790

Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700

§ Sprague Elec. Co., 481 Marshall St., No. Adams, MA 01247 413-664-4411

§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600

TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076 312-679-8200

§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082

§ United Elec. Controls, 85 School St., Watertown, MA 02172 .... 617-WA6-1000

United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 .... 800-631-3096;201-792-2400

§† Unitrode Corp., 5 Forbes Rd., Lexington, MA 02173 617-861-6540

§ Victory Engrg. Corp., Victory Rd., Springfield, NJ 07081 201-379-5900

Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043

Weinschel Engrg., One Weinschel La., Gaithersburg, MD 20877 ..... 301-948-3434; 800-638-2048

§† Workman Elctrn. Prods., Box 3828, Sarasota, FL 33578 813-371-4242

§† Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Thermocouple Devices & Materials — See Cooling/Heating Modules, Thermoelectric (Vol. 1B)

Thermocouples, Elements & Accessories-5300

Alberox, New Bedford Ind'l. Pk., New Bedford, MA 02745, 617-995-1725 ... 2•1787

Best Electrics Div., 400 Boren Ave. North, Seattle, WA 98109, 206-382-1300 .... 1B•1794

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 .... 1B•1735,1818,1819,1868,1869,3•1089,1137,1347

Acme Elec. Heating Corp., 4685 E. 11th, Hialeah, FL 33013 305-685-8326

† Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541

§ AEMC, 99 Chauncy, Boston, MA 02111 .... 617-451-0227;800-343-1391

Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021

§ Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000

§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200

† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700

§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000

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§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490

§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555

§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800

Ballantine Labs., 90 Fanny Rd., Boonton, NJ 07005 201-335-0900

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Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481
Corning Glass Works, Telecomm Prods Dept., BH-5, Corning, NY 14830 607-974-9000
Degussa, Rte. 46 & Hollister, Teterboro, NJ 07608 201-288-6500
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Ectron Corp., 8159 Engineer Rd., San Diego, CA 92111 619-278-0600
§ EDL Inc., 385 Oser Ave., Hauppauge, NY 11787 ..... 516-435-2808;800-DIAL EDL; 800 342-5335
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† Engelhard Corp., 70 Wood Ave. S., Iselin, NJ 08830 201-321-5900
§ E Technology Corp., 1545 Morse Ave., Ventura, CA 93003 805-644-9544
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 .....
General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721
† GIC Thermodynamics, 2611 Parmenter, Royal Oak, MI 48073 313-280-1648
Gordon, Claud S., Co., 5710 Kenosha St., Richmond, IL 60071 815-678-2211
§ Gulton Inds., Inc., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818 401-884-6800
Hades Mfg. Corp., 151-A Verdi St., Farmingdale, NY 11735 516-249-4244
§† Heraeus-Volkert Inc., 222-34 96th Ave., Queens Village, NY 11429 . 212-464-8400
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ..... 800-321-5111, Ext. 596
Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000
Julie Resch. Labs., 211 West 61st St., New York, NY 10023 212-245-2727
Kaye Instruments, 15 De Angelo Dr., Bedford, MA 01730 617-275-0300
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§ LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121
§ Modutec, 18 Marshall St., Norwalk, CT 06854 203-853-3636
† NANMAC Corp., 9 Mayhew St., Framingham, MA 01701 617-872-4811
† Narda Microwave Corp., 435 Moreland Rd., Hauppauge, NY 11788 516-231-1700
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† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195
R. E. Law Instru. Inc., 7735 W. 112th Pl., Palos Hills, IL 60465 312-974-4000
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 . 203-269-7701
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Science/Elctrns., 1224-26 McCook Ave., Dayton, OH 45404 513-228-6011
† Sensortek, Inc., 154 Huron Ave., Clifton, NJ 07013 201-779-5577
Simmonds Precision, P.O. Box 310, Norwich, NY 13815 607-335-5000
Solder Absorbing Technology (SAT), South End Bridge Circle, Agawam, MA 01001 800-628-8862
§ Sunshine Sci. Instr., 1810 Grant Ave., Philadelphia, PA 19115 215-673-5600
† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ..... 219-232-3900; 800-348-2993
§ Temptronic, 55 Chapel St., Newton, MA 02158 617-969-2501
§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082
† Thermo Elec., 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800
Tracor Paktronics, 2441 Northeast Pkwy., Ft. Worth, TX 76106 817-625-2311
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§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ..... 800-631-3096;201-792-2400
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Veeco Instruments Inc., Terminal Dr., Plainview, NY 11803 516-349-8300
† Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043
§ West Instrs, Gulton Inds, M. C. S. Div., Gulton Indl Pk, E. Greenwich, RI 02818 401-884-6800
Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

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Thermometers, Electronic (All Types) — See Meters, Temperature (Vol. 3)

Thermometers, Resistance-2900 — *See Vol. 3*

Thermostats-5300 (Also See Switches, Thermally ctuated; Controls, Temperature)

† Airpax Corp., Frederick Div., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, 301-663-5141 ..... 1B•1793
Dreefs Switch Inc., 3782 Hawthorn Ct., Waukegan, IL 60085, 312-662-7667; 800-323-9605 ..... 1B•1587
† Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861, 401-727-1300 ..... 1B•1802
Micro Devices Product Group, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, 419-756-5005 ..... 1B•1823
Therm-O-Disc, Inc., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, 419-756-5911 ..... 1B•1823
§† Amperite Co., Inc., 600 Palisade Ave., Union City, NJ 07087 201-864-9503
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Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
† BTU Engrg. Corp., Bruce Sys., Esquire Rd., N. Billerica, MA 01862 . 617-667-4111
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† Chatham Controls, 33 River Rd., Chatham, NJ 07928 201-635-8892
§ Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216 414-449-7487
§ E Technology Corp., 1545 Morse Ave., Ventura, CA 93003 805-644-9544
Fasco Industries, Inc., Div. of Hawker Siddeley Group, 601 North Federal Highway, Boca Raton, FL 33432 305-368-0600
§ Fenwal, Inc., 400 Main St., Ashland, MA 01721 .....
§ Grasslin Controls Corp., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446 201-825-9696
§† Heraeus-Volkert Inc., 222-34 96th Ave., Queens Village, NY 11429 . 212-464-8400
† Honeywell Inc., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408 612-870-5346
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232
§ Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
Princo Instrs., Inc., 1020 Industrial Hwy., Southampton, PA 18966 .. 215-355-1500
† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621
Selco Products Co., 7580 Stage Rd., Buena Park, CA 90621 714-521-8673
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Texas Instrs., Inc., Box 225012-MS-84, Dallas, TX 75265 214-995-6611
§ United Elec. Controls, 85 School St., Watertown, MA 02172 ..... 617-WA6-1000
§ Vermont Automation Co., Inc., 18 Morse Dr., Essex Junction, VT 05452 802-879-7571
Warren Comms., 101 Okner Pkwy., Livingston, NJ 07039 201-992-6200

Thin-Film Memory Systems, Planar — See Memory Systems (Vol. 3)

Thyristors (Incl. Silicon Controlled Rectifiers)-4800 — *See Vol. 1A*

Thyristors (MIL)-2440

† General Electric Co., Power Elctrns. Semiconductor Dept., W. Genesee St., Auburn, NY 13021 315-253-7321
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 609-298-7300
§† RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 609-541-3636
§† RCA Solid State Div., Transistors, Rte. 202, Somerville, NJ 08876 .. 201-685-6000

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Timers, Delay-2200 — *See Vol. 3*

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Timers, Sequence-2200 — *See Vol. 3*

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Tools, Alignment & Tuning-5400 — *See Vol. 2*

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Tools, Lead Bending & Insertion-5400 — *See Vol. 2*

Tools, Magnetic Pickup-5400 — *See Vol. 2*

Tools, Marking, Numbering, Engraving-5400 — *See Vol. 2*

Tools, Parts Handling, Vacuum Operated-5400 — *See Vol. 2*

Tools, Relay Servicing-5400 — *See Vol. 2*

Tools, Resistance Soldering — See Soldering Equip., Resistance (Vol. 2)

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Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 .... 1B•1871
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 .... 1B•1207
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† General Microwave Corp., 155 Marine St., Farmingdale, NY 11735 . 516-694-3600
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 914-698-0080
† Savoy Elctrns., P.O. Box 5727, Ft. Lauderdale, FL 33310 .... 305-563-1333; 800-327-1282
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

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Blatek Inds., Box 574, Bellefonte, PA 16823, 814-355-4910 .... 1B•1835
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752, 617-481-7000 .... 1B•1837,3•1205
Industrial Computer Designs, Inc., 31121 Via Colinas 1005, Westlake Village, CA 91362, 818-889-3179 .... 3•1111
§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201, 317-636-5353 .... 3•1032-1035
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081, 214-235-8332 .... 3•1043
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 .... 1B•1871
Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854, 201-572-9512 .... 3•1056-1059
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Dunegan/Endevco, Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-831-9131
International Comps. Corp., 105 Maxess Rd., Melville, NY 11747 516-293-1500
Mura Corp., 177 Cantiague Rock Rd., Westbury, NY 11590 516-935-3640
§ Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067 404-952-9777
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
Radio Materials Corp., 4242 W. Bryn Mawr, Chicago, IL 60646 312-478-3600
§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 914-698-0080
Shogyo Intl. Corp., 287 Northern Blvd., Great Neck, NY 11021 516-466-0911
Stanton Magnetics, Inc., Terminal Dr., Plainview, NY 11803 516-349-0200
§ Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, NJ 07740 201-222-6880

Transducers, Ceramic-5500

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† International Transducer, 93 Castilian Dr., Goleta, CA 93117 805-685-1441
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800
Motorola Inc., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196 312-576-4850
§ Murata Mfg. Co. Ltd., 26-10 2-chome-Temjin, Nagaoka-Kyo-Shi, Kyoto, Japan 075-921-9111
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 214-235-8332
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800
§† Raytheon Ocean Sys. Co., Submarine Signal Div., Risho Ave., Westminster Pk., E. Providence, RI 02914 401-438-1780
§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 615-892-0291

Transducers, Displacement-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 .... 1B•1838
† Maurey Instr. Corp., 4555 W. 60th St., Chicago, IL 60629, 312-581-4555 .1A•2042, 2043
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 .... 1B•1680
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 .... 1B•1871
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 .... 1B•1880
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 .... 1B•1879
† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803 516-694-6700
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
Automatic Timing & Controls Co., 201 So. Gulph Rd., King of Prussia, PA 19406 .... 215-337-5500;800-441-8245
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
§ Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147
† Bowmar/TIC, Inc., 850 Lawrence Dr., Newbury Park, CA 91320 805-498-2161
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 716-924-9355
Ceramic Magnetics, Inc., 87 Fairfield Rd., Fairfield, NJ 07006 201-227-4222
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
Disc Instrs., 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 312-662-2666
Electro-Craft, 1600 2nd St. S., Hopkins, MN 55343 612-931-2700
Farrand Controls, Div. of Farrand Inds., 99 Wall St., Valhalla, NY 10595 .... 914-RO1-2600
§ GIC Systems, 2324 A Ridgepoint Dr., Austin, TX 78754 512-926-8840
Giddings & Lewis Elctrns., A Unit of AMCA Intl., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54935 414-921-7100
§ Gordos Corp., 250 Glenwood Ave., Bloomfield, NJ 07003 201-743-6800
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 .... 714-642-2400;800-854-4066
§ Gunther, W., GmbH, Virnsberger Strasse 51, D 8500 Nurnberg 82; West Germany 0911/65521
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 .... 800-321-5111, Ext. 596
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
§† Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096 .... 818-882-2400; FAX 818-998-2050
LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
† Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
§† Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
Northern Precision Labs., 11 Madison Rd., Fairfield, NJ 07006 201-227-4800
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 214-235-8332
§ Research, Inc., Box 24064, Minneapolis, MN 55424 612-941-3300
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
Scanning Devices, 108 Elm St., Waltham, MA 02154 617-891-8991
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, 131 East Ames Ct, Plainview, NY 11803 516-349-1950

Theta Instr. Corp., 24 Dwight Pl., Fairfield, NJ 07006 ... 201-227-1700
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 ... 203-872-8351
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 ... 818-886-2057
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 ... 203-527-7201
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729 ... 516-586-5100
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 ... 617-663-7322
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 ... 617-358-2777

Transducers, Flow-5500

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1850
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ... 1B•1868,1869
§ Ametek, 2 Station Square, Paoli, PA 19301 ... 215-355-6900
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 ... 216-585-5800
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 ... 203-575-3000
Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304 ... 818-884-6860
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 ... 215-532-9464
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 ... 516-483-8200
§† Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 ... 617-872-8841
† Flow Techn., Box 21346, Phoenix, AZ 85036 ... 602-437-1315
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 ... 805-487-8511
§ Kurz Instrs., 20 Village Sq., Carmel Valley, CA 93924 ... 408-659-3421
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 ... 215-643-2000
Micronel U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083 ... 619-727-7400
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 ... 616-777-2602
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 ... 617-272-9255
Ocean Resch. Equip., Inc., Box 709, Falmouth, MA 02541 ... 617-548-5800
Panametrics, 221 Cresent St., Waltham, MA 02254 ... 617-899-2740
§† Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ... 914-698-2026;800-431-2625 (exc NY)
Q-Systems, PO Box 35879, Tucson, AZ 85740 ... 602-293-4923
Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 ... 215-825-9200
Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 ... 408-744-1500
§ Transamerica Delaval, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990 ... 203-677-1311
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 ... 818-886-2057
Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 ... 404-253-7000

Transducers, Force-5500

Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 ... 1B•1878
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ... 1B•1880
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ... 1B•1207
Wilcoxon Resch., P.O. Box 5798, Bethesda, MD 20814, 301-770-3790 ... 1B•1886
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 ... 619-279-5726
† A.L. Design Inc., 2070 Niagara Falls Blvd., Tonawanda, NY 14150 ... 716-692-6272
BLH Elctrns., 42 Fourth Ave., Waltham, MA 02254 ... 617-890-6700
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 ... 617-481-7000
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 ... 215-532-9464
Data Instruments Inc., 4 Hartwell Pl., Lexington, MA 02173 ... 617-861-7450
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 ... 513-866-3300
§ Dillon, W. C., & Co., 2320 Airport Blvd., Santa Rosa, CA 95401 ... 707-527-5555
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 ... 201-227-1002
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 ... 805-487-8511
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 ... 313-476-7875
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ... Call Local Sls. Off.
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 ... 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 ... 602-948-5555
† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 ... 201-945-3000
Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48237 ... 313-643-0220
§ Lion Precision, 60 Bridge St., Newton, MA 02195 ... 617-969-4710
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 ... 413-445-5608
Omega Engrg., Box 4047, Stamford, CT 06907 ... 203-359-1660
PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 ... 716-684-0001
PPM, Inc., 23945 Mercantile Rd., Cleveland, OH 44122 ... 216-292-6006
§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 ... 203-269-7701
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 ... 609-662-8000
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 ... 614-486-7723
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 ... 617-562-9347
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 ... 617-663-7322

Transducers, Frequency — See Transducers, Volt, Watt, Current, etc. (Vol. 1B)

Transducers, Incremental Digital Position, Rotary — See Encoders, Shaft Angle (Vol. 1B)

Transducers, Magnetic Pickup-5500

† Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 ... 1B•1829
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313, 305-587-1100 ... 3•1929
† American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735, 516-694-5100 ... 1B•1830
† International Electro Magnetics, Inc., 350 N. Eric Dr., Palatine, IL 60067, 312-358-4622 ... 3•1031
† Magnetic Shield Div., Perfection Mica Co., 750 North Thomas Dr., Bensenville, IL 60106, 312-766-7800 ... 2•1913
Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212, 614-486-9561 ... 1B•1867
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 ... 1B•1879
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 ... 619-279-5726
Advanced Kinetics, 1231 Victoria St., Costa Mesa, CA 92627 ... 714-646-7165
§ AKG Acoustics, Inc., 77 Selleck St., Stamford, CT 06902 ... 203-348-2121
§† ALTEK Corp., 2150E Indl. Pkwy., Silver Spring, MD 20904 ... 301-622-3906
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 ... 617-777-4500; 17-246-0300;800-451-1816
§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 ... 617-890-2000
§ Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807 ... 305-678-6900
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 ... 617-481-7000
Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304 ... 818-884-6860
§ C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 ... 617-246-1720
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 ... 513-866-3300
§ Dynapar, 1675 Delany Rd., Gurnee, IL 60031 ... 312-662-2666
Giddings & Lewis Elctrns., A Unit of AMCA Intl., 666 S. Military Rd., P.O. Box 1658, Fond du Lac, WI 54935 ... 414-921-7100
§ Grado Labs., 4614 Seventh Ave., Brooklyn, NY 11220 ... 212-435-5340
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 ... 414-648-2361
§ LFE, Process Control Div., 55 Green St., Clinton, MA 01510 ... 617-835-1000
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032 ... 815-235-6600
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 ... 312-289-8820
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 ... 201-348-7000
† Piconics, Cummings Rd., Tyngsboro, MA 01879 ... 617-649-7501
Q-Systems, PO Box 35879, Tucson, AZ 85740 ... 602-293-4923
§ Richard-Lee Co., Box 724, New Providence, NJ 07974 ... 201-276-0710
§ Rye Inds., Inc., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543 ... 914-698-0080
Sensor Corp., Box 140, Scottdale, PA 15683 ... 412-887-4080
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ... 914-681-0700
§ Veeder-Root, 70 Sargeant St., Hartford, CT 06102 ... 203-527-7201
Wabash, First & Webster Sts., Wabash, IN 46992 ... 219-563-3111

Transducers, Piezoelectric-5500

§ Mallory Capacitor Co., Mallory Comps. Grp., 3029 E. Washington St., Indianapolis, IN 46201, 317-636-5353 ... 3•1032-1035
Murata Erie North America, Inc., 1148 Franklin Rd., S.E., Marietta, GA 30067, 404-952-9777 ... 3•1042
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ... 1B•1820,1821,1871
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821, 617-663-7322 ... 1B•1885
BEA electro-optics, Inc., 690 First Ave., Des Plaines, IL 60016 ... 312-298-1420
Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 ... 617-481-7000
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 ... 716-924-9355
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 ... 805-967-0171
Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 ... 714-493-8181
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ... 714-642-2400;800-854-4066
† International Transducer, 93 Castilian Dr., Goleta, CA 93117 ... 805-685-1441
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 ... 619-454-1800
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 ... 214-235-8332
PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 ... 716-684-0001
Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 ... 513-890-1918
† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 ... 401-847-8000
† Savoy Elctrns., P.O. Box 5727, Ft. Lauderdale, FL 33310 ... 305-563-1333; 800-327-1282
§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 ... 615-892-0291

Transducers, Position, Linear-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 ... 1B•1838
Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ... 1B•1679-1684
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ... 1B•1880
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 ... 1B•1879
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ... 1B•1207
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 ... 516-328-1600
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 ... 714-781-5433
Burleigh Instrs., Burleigh Pk., Fishers, NY 14453 ... 716-924-9355
† Component Specialties Corp., 9143 E. La Rosa Dr., Temple City, CA 91780 ... 213-283-0015
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 ... 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9316 Deering Ave., Chatsworth, CA 91311 ... 818-882-0424
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 ... 617-246-1720
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 ... 513-866-3300
Farrand Controls, Div. of Farrand Inds., 99 Wall St., Valhalla, NY 10595 ... 914-RO1-2600

† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ....714-642-2400;800-854-4066
† JDK Controls, Inc., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593 805-499-7779
Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 214-235-8332
Precision Level Vial Co., Warren Industries Inc., 1800-D Mearns Rd., Warminster, PA 18974 215-675-2355
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Position, Rotary-5500

Datametrics Dresser Inds., Inc., 340 Fordham Road, Wilmington, MA 01887, 617-658-5410 ....1B•1841
Micro Mo Electronics, Inc., 742 2nd Ave. S., St. Petersburg, FL 33701, 813-822-2529 ....1B•1849
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ....1B•1880
Transmagnetics, 210 Adams Blvd., Farmingdale, NY 11735, 516-293-3100 ....3•1170
Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ....1B•1207
Astrosystems, 6 Nevada Dr., Lake Success, NY 11042 516-328-1600
† Clifton Precision, Marple at Broadway, Clifton Hgts., PA 19018 215-622-1000
† Computer Conversions Corp., 6 Dunton Ct., E. Northport, NY 11731 516-261-3300
Computer Optical Prods., Inc., Sub. of Hathaway Corp., 9316 Deering Ave., Chatsworth, CA 91311 818-882-0424
C-Tek Inc., 4 Railroad Ave., Wakefield, MA 01880 617-246-1720
Farrand Controls, Div. of Farrand Inds., 99 Wall St., Valhalla, NY 10595 ....914-RO1-2600
† JDK Controls, Inc., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593 805-499-7779
Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
Motorola Inc., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196 312-576-4850
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
† Sequential Info. Sys., 249 N. Saw Mill River Rd., Elmsford, NY 10523 914-592-5930
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
† Vernitron Corp., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073 619-428-5581
Waters Mfg., Longfellow Ctr., Wayland, MA 01778 617-358-2777

Transducers, Power — See Transducers, Volt, Watt, Currents, etc. (Vol. 1B)

Transducers, Pressure-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 ....1B•1838,1839
Data Instruments Inc., 4 Hartwell Pl., Lexington, MA 02173, 617-861-7450 ....1B•1840
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006, 201-227-1002 ....1B•1843
§ **Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096, 818-882-2400; FAX 818-998-2050 ....1B•1846**
† **Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657, 201-945-3000 ....1B•1847**
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1720,1850,1851**
§ **Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036, 602-244-6900 ....1B•1117**
Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ....1B•1735,1819,1868, 1869
† **Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144, 800-426-0366 ....1B•1870**
Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ....1B•1871
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ....1B•1880
† **Vernitech, 300 Marcus Blvd., Deer Pk., NY 11729, 516-586-5100 ....1A•2066,2067, 1B•1019,1207,1883,3•1934**
Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
† A.L. Design Inc., 2070 Niagara Falls Blvd., Tonawanda, NY 14150 716-692-6272
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Analogic Corp., 8 Centennial Dr., Peabody, MA 01961 ....617-777-4500; 17-246-0300;800-451-1816
API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 213-796-9381
§ Bellofram Corp., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803 ....617-272-2100;800-225-1031
§† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
† Conrac Corp., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010 213-359-9141
† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
§ Dynisco, 10 Oceana Way, Norwood, MA 02062 617-769-6600
Electromatic Comps. Ltd., 1531 Burgundy Pkwy., Streamwood, IL 60103 312-837-4600
Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517
§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
Essex Group, 9933 13th St., Ft. Wayne, IN. 46809 219-478-1521
Faria, Thomas G., Corp., 19 Faria Lane, Uncasville, CT 06382 203-848-9271
† Genisco Technlg. Corp., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065 805-581-3985
† Giannini Petro Marine, 9474 Chesapeake Dr., San Diego, CA 92123 619-569-1668
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
Gould Inc., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114 216-361-3315
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ....714-642-2400;800-854-4066
Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855 203-866-2573
Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.
Honeywell Inc., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408 612-870-5186
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
† Kollsman Instr., 220 Daniel Webster Hwy., Merrimack, NH 03054 603-889-2500
§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
LEL Co., 5 Burns Pl., Cresskill, NJ 07626 201-569-8641
† Litton Potentiometer Div., 750 So. Fulton Ave., Mt. Vernon, NY 10551 914-664-7733
Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443 616-777-2602
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 617-272-9255
Motorola Inc., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196 312-576-4850
Optimum Applied Systems, 145 Palisade St., Dobbs Ferry, NY 10522-1696 914-693-9001
PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
§† Pres-Air-Trol Corp., 895 Mamaroneck Ave., Mamaroneck, NY 10543 ....914-698-2026;800-431-2625 (exc NY)
Pressure Sys., 15 Research Dr., Hampton, VA 23666 804-865-1243
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensor Corp., Box 140, Scottdale, PA 15683 412-887-4080
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§† Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 408-744-1500
Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720 617-263-1400
Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347
Technar Inc., 205 N. 2nd Ave., Arcadia, CA 91006 818-445-1143
United Elec. Controls, 85 School St., Watertown, MA 02172 ....617-WA6-1000
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 617-663-7322
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transducers, Proximity-5500

§† **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1720**
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081, 214-235-8332 ....1B•1853
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 ....1B•1879
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304 818-884-6860
Epsilon-Lambda Elctrns. Corp., 427 Stevens St., Geneva, IL 60134 312-232-9611
§ Gould Inc., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157 301-876-2214
Hamlin, Lake & Grove Sts., Lake Mills, WI 53551 414-648-2361
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§ Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
Rehlander Assocs., 363 Rantoul St., Beverly, MA 01915 617-922-5961
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 617-663-7322

Transducers, Sonic-5500

Bell, Floyd, Assocs., Inc., 897 Higgs Ave., Columbus, OH 43212, 614-488-3193 ....3•1028

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752, 617-481-7000 ....3•1205

† International Transducer, 93 Castilian Dr., Goleta, CA 93117 805-685-1441

§† Kyocera Intl., Inc., Elctrn. Comps. Grp., 11425 Sorrento Valley Rd., San Diego, CA 92138 619-454-1800

NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081 214-235-8332

† Raytheon Co., Submarine Signal Div., 1847 W. Main Rd., P.O. Box 360, Portsmouth, RI 02871 401-847-8000

§ Stettner Elctrns., 6135 Airways Blvd., Chattanooga, TN 37421 615-892-0291

Transducers, Strain Gauge-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 ....1B•1839

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1850

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ..1B•1735,1819,1868, 1869

† **Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144, 800-426-0366 ....1B•1870**

Tedea USA, 7800 Deering Ave., Canoga Park, CA 91304, 818-884-8818 ...1B•1878

Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726

Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241

Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 213-796-9381

BLH Elctrns., 42 Fourth Ave., Waltham, MA 02254 617-890-6700

§ Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433

§ Bourns Instrs., Inc., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503 714-781-5147

† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464

† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721

Data Instruments Inc., 4 Hartwell Pl., Lexington, MA 02173 617-861-7450

Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300

§† Dillon, W. C., & Co., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555

§ Dynisco, 10 Oceana Way, Norwood, MA 02062 617-769-6600

Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002

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§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511

§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875

Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.

§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282

§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555

§† Kistler-Morse, 10201 Willows Road NE, Redmond, WA 98052 206-881-8000

† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000

Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48237 313-643-0220

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840 201-548-2800

§† Revere Corp. of Amer., 845 N. Colony Rd., Wallingford, CT 06492 .203-269-7701

† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000

Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723

§ Sensym, Inc., 1255 Reamwood Ave., Sunnyvale, CA 94089 408-744-1500

Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720 617-263-1400

Transducers, Temperature-5500

Carborundum Co., Electric Prods. Div., Box 339, Niagara Falls, NY 14302, 716-278-2383 ....1B•1798,1799

Dale Electronics, Inc., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, 402-371-0080 ....1B•1800,1801

§† **Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701, 617-872-8841 .1B•1803**

† **Harrel, Inc., 16 Fitch St., E. Norwalk, CT 06855, 203-866-2573 ....3•1131**

§ **Industrial Computer Designs, Inc., 31121 Via Colinas 1005, Westlake Village, CA 91362, 818-889-3179 ....3•1111**

Keystone Carbon, Thermistor Div., St. Marys, PA 15857, 814-781-1591 .. 1B•1804-1807

Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1720,1809

§ **Midwest Comps., 1981 Port City Blvd., Muskegon, MI 49443, 616-777-2602 ....1B•1810-1813,1815-1817**

Newport Electronics, 630 E. Young St., Santa Ana, CA 92705, 714-540-4914 ....3•1343

Omega Engrg., Box 4047, Stamford, CT 06907, 203-359-1660 ....1B•1735,1818,1819,1868,1869,3•1347

Piezo Elec. Prods., Inc., 212 Durham Ave., CN-15, Metuchen, NJ 08840, 201-548-2800 ....1B•1820,1821

RCL Electronics, Inc., 195 McGregor St., Manchester, NH 03102, 603-627-3831 ....1A•1936

Shallcross, Inc., U.S. 70 East, Smithfield, NC 27577, 919-934-5181 ....1A•1936

Scientific Columbus, Inc., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228, 614-274-7160 ....1B•1877

TRW Resistive Products Div., TRW Electronic Components Grp., 401 N. Broad St., Philadelphia, PA 19108, 215-922-8900 ....1A•1944,1986-1988

Ultronix, Inc., P.O. Box 1090, Grand Junction, CO 81502, 303-242-0810 ....1A•1997

§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726

Advanced Techn. Research Labs., 5645 K General Washington Dr., Alexandria, VA 22312 703-750-2920

§ Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000

§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900

§† Ametek/Rodan Div., 2905 Blue Star St., Anaheim, CA 92806 714-630-0081

† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 .... 516-LY3-5600

† Analog Devices, P.O. Box 280, Norwood, MA 02062 617-329-4700

§ API Instrs., 1601 Trapelo Rd., Waltham, MA 02254 617-890-2000

§ Athena Controls, Inc., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462 215-828-2490

§ Atkins Tech., 3321 S.W. 40th Blvd., Gainesville, FL 32608 904-378-5555

§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800

Barber-Colman Co., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132 815-877-0241

§ Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181

Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611

Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752 617-481-7000

Burling Instr., P.O. Box 298, Chatham, NJ 07928 201-635-9481

CAL Controls Inc., 1155 Waukegan Rd., Glenview, IL 60025 312-998-5720

Capintec Instrs., 6 Arrow Rd., Ramsey, NJ 07446 201-825-9500

† Consolidated Controls, 15 Durant Ave., Bethel, CT 06801 203-743-6721

Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333

Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107

Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300

ECO Instrs. Div., Sea Data Corp., 1 Bridge St., Newton, MA 02158 617-964-8360

§ EDL Inc., 385 Oser Ave., Hauppauge, NY 11787 ..... 516-435-2808;800-DIAL EDL; 800 342-5335

Electronic Prods. Corp., Interstate Indl. Plaza, R. D. , York, PA 17402 717-767-6517

§ E Technology Corp., 1545 Morse Ave., Ventura, CA 93003 805-644-9544

Faria, Thomas G., Corp., 19 Faria Lane, Uncasville, CT 06382 203-848-9271

General Resistance, Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471 203-481-5721

§ Hades Mfg. Corp., 151-A Verdi St., Farmingdale, NY 11735 516-249-4244

§† Heraeus-Volkert Inc., 222-34 96th Ave., Queens Village, NY 11429 .212-464-8400

Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 .... Call Local Sls. Off.

Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596

Hy-Cal Engrg., 9650 Telstar Ave., El Monte, CA 91731 213-444-4000

Instrulab, P.O. B. 98, Dayton, OH 45404 513-223-2241

† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000

§ Kurz Instrs., 20 Village Sq., Carmel Valley, CA 93924 408-659-3421

Larson Instr., Greenbush Rd., Orangeburg, NY 10962 914-359-3800

Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000

§ LFE, Process Control Div., 55 Green St., Clinton, MA 01510 617-835-1000

§ Love Controls, 1475 S. Wheeling Rd., Wheeling, IL 60090 312-541-3232

Mag-Con, 1626 Terrace Dr., St. Paul, MN 55113 612-633-8820

Meissner Inds., 551 Rte. 10, Dover, NJ 07801 201-366-1700

Mikron Instr., Box 211, Ridgewood, NJ 07451 201-891-7330

Minco Prods., 7300 Commerce La., Minneapolis, MN 55432 612-571-3121

§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 602-244-6900

§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103 312-289-8820

PPM, Inc., 23945 Mercantile Rd., Cleveland, OH 44122 216-292-6006

§† Precision Monolithics, 1500 Space Dr., Santa Clara, CA 95050 408-727-9222

† PSG Inds., 1225 Tunnel Road, Perkasie, PA 18944 215-257-3621

Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923

§ Quality Thermistor, 2147 Centurion Pl., Boise, ID 83705 208-377-3373

§† RCD Components, Inc., 330 Bedford St., Manchester, NH 03101 603-669-0054

† RdF Corporation, 23 Elm Ave., Hudson, NH 03051 603-882-5195

† Relco Prods., 5594 E. Jefferson Ave., Denver, CO 80237 303-756-1143

§ RFL Inds., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733 802-247-6811

Rochester Instr. Sys., 255 N. Union St., Rochester, NY 14605 716-263-7700

Schneider Instr., 8115 Camargo Rd., Cincinnati, OH 45243 513-561-6803

Siltran Digital, 2250 Monterey Rd., Atascadero, CA 93422 805-466-3209

Stow Labs., Inc., Kane Ind'l. Dr., Hudson, MA 01749 617-562-9347

Sylvania Control Devices, Rte. 35, Standish, ME 04084 207-642-4535

† Syscon Intl., Inc., 1108 So. High St., So. Bend, IN 46618-1096 ....219-232-3900; 800-348-2993

Tektronix, Inc., P.O. Box 500, V3-314, Beaverton, OR 97077 ....800-547-1512; Oregon only 800-452-1877

§ Testoterm, P.O. Box 111509, Nashville, TN 37211 615-834-5082

† Thermo Elec., 109 Fifth St., Saddle Brook, NJ 07662 201-843-5800

§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan .... Tokyo 03-402-6161

Trans-Met Engrg., 601 S. Palm St., La Habra, CA 90631 213-691-2266

United States Testing Co., Inc., 1415 Park Ave., Hoboken, NJ 07030 ....800-631-3096;201-792-2400

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† Weed Instr. Co., Inc., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300 512-255-7043

§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transducers, Thermoelectric — See Transducers, Temperature (Vol. 1B)

Transducers, Torque-5500

† A.L. Design Inc., 2070 Niagara Falls Blvd., Tonawanda, NY 14150 ..716-692-6272
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
Daytronic Corp., 2589 Corporate Pl., Miamisburg, OH 45342 513-866-3300
Dillon, W. C., & Co., 2320 Airport Blvd., Santa Rosa, CA 95401 707-527-5555
ESSCO Inds., P.O. Box 515, Sierra Madre, CA 91024-0515 818-355-8315
§ GSE, 23640 Research Dr., Farmington Hills, MI 48024 313-476-7875
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
§ Interface, 7401 Butherus Dr., Scottsdale, AZ 85260 602-948-5555
Lebow Products, Eaton Corp., 1728 Maplelawn Rd., Troy, MI 48237 313-643-0220
Magnetoelastic Devices, 326 Springside Ave., Box 625, Pittsfield, MA 01201 413-445-5608
Omega Engrg., Box 4047, Stamford, CT 06907 203-359-1660
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Vibrac, 1 Columbia Dr., Amherst, NH 03031 603-882-6777
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 617-663-7322

Transducers, Ultrasonic-5500

Blatek Inds., Box 574, Bellefonte, PA 16823, 814-355-4910 ....1B•1835
NTK Technical Ceramics, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. 05, Richardson, TX 75081, 214-235-8332 ....1B•1853
Anders, Inc., 77 Wolcott Rd., Simsbury, CT 06070 203-658-7666
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† Dukane Corp., Communications Sys. Div., 2900 Dukane Dr., St. Charles, IL 60174 312-584-2300
† EDO Western Corp., EDO Corp., 2645 South 300 W., Salt Lake City, UT 84115 ....801-486-7481/3846
§ GC Elctrns., 400 S. Wyman St., Rockford, IL 61101 815-968-9661
† Gulton Inds., Inc., Piezo Prods. Div., Box 4300, Fullerton, CA 92634 714-871-2150
† International Transducer, 93 Castilian Dr., Goleta, CA 93117 805-685-1441
Linden Ultransonics, Inc., 55 Harvey Rd., Londonderry, NH 03053 ..603-434-4323
§ Murata Mfg. Co. Ltd., 26-10 2-chome-Temjin, Nagaoka-Kyo-Shi, Kyoto, Japan 075-921-9111
§† National Sonics/Xertex Corp., 250 Marcus Blvd., Hauppauge, NY 11787 516-273-6600
Ocean Resch. Equip., Inc., Box 709, Falmouth, MA 02541 617-548-5800
Panametrics, 221 Cresent St., Waltham, MA 02254 617-899-2740
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 201-348-7000
Polaroid Corp., 784 Memorial Dr., Cambridge, MA 02139 617-577-2024
Radio Materials Corp., 4242 W. Bryn Mawr, Chicago, IL 60646 312-478-3600
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 914-681-0700
§ Sonobond, 200 E. Rosedale Ave., West Chester, PA 19380 215-696-4710
TDK Corporation of America, 4711 Golf Rd., Skokie, IL 60076 312-679-8200
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan .... Tokyo 03-402-6161
Valpey-Fisher, 75 South St, Hopkinton, MA 01748 617-435-6831

Transducers, Velocity-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 ....1B•1838
Transducers and Systems Inc., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, 203-481-5721 ....1B•1880
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443, 215-256-4611 ....1B•1879
Airpax/NA Philips Controls Corp., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313 305-587-1100
§ Ametek, 2 Station Square, Paoli, PA 19301 215-355-6900
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Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
Disc Instrs., 102 E. Baker St., Costa Mesa, CA 92626 714-979-5300
Electro Physics, 1910 West Birchwood Ave., Chicago, IL 60626 312-274-9669
§ Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
† Humphrey, Inc., 9212 Balboa Ave., San Diego, CA 92123 619-565-6631
§ Kavlico Corp., 20869 Plummer St., Chatsworth, CA 91311-5096 ....818-882-2400; FAX 818-998-2050
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§ Kurz Instrs., 20 Village Sq., Carmel Valley, CA 93924 408-659-3421
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
† Portescap Transicoil, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990 215-277-1300
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
† Teledyne Gurley, 514 Fulton St. P.O. Box 88, Troy, NY 12181 518-272-6300
§ Temposonics, 131 East Ames Ct, Plainview, NY 11803 516-349-1950
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
§ Vibra-Metrics, 385 Putnam Ave., Hamden, CT 06517 203-288-6158
§ Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821 617-663-7322

Transducers, Vibration-5500

Bruel & Kjaer Instrs. Inc., 185 Forest St., Marlboro, MA 01752, 617-481-7000 ....1B•1836,3•1205

Chatsworth Data Corp, Cablemaster Div., 20710 Lassen St., Chatsworth, CA 91311, 818-341-9200 .... 3•1208
Chatsworth Data Corp, Impact-o-Graph Div., 20710 Lassen St., Chatsworth, CA 91311, 213-341-3000 .... 3•1208
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006, 201-227-1002 ..1B•1842
§ **Vibro-Meter Corp., 1 Progress Rd., Billerica, MA 01821, 617-663-7322 ....1B•1885**
Wilcoxon Resch., P.O. Box 5798, Bethesda, MD 20814, 301-770-3790 ....1B•1886
Alpha-M Corp., 3009 Wildflower Dr., Dallas, TX 75229 214-620-0021
Bell & Howell/CEC Div., 360 Sierra Madre Villa, Pasadena, CA 91109 213-796-9381
Bently Nevada Corp., P.O. Box 157, Minden, NV 89423 702-782-3611
† Channel Inds., 839 Ward Dr., Santa Barbara, CA 93111 805-967-0171
† Columbia Resch. Labs., Macdade Blvd. & Bullens La., Woodlyn, PA 19094 215-532-9464
Electro Physics, 1910 West Birchwood Ave., Chicago, IL 60626 312-274-9669
§ Endevco, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675 714-493-8181
† Gulton Inds., Inc., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627 ....714-642-2400;800-854-4066
† HH Controls Co., Inc., 16 Frost St., Arlington, MA 02174 617-646-2626
§ Hottinger Baldwin Measurements, 139 Newberry St., Framingham, MA 01701 617-875-8282
Kinemetrics, Inc., 222 Vista Ave., Pasadena, CA 91107 818-795-2220
Knowles Elctrns., Inc., 3100 N. Mannheim Rd., Franklin Park, IL 60131 312-455-3600
§ Lion Precision, 60 Bridge St., Newton, MA 02195 617-969-4710
§† Mechanical Techn., 968 Albany Shaker Rd., Latham, NY 12110 518-785-2353
§ Metrix Instrument Co., 1711 Townhurst, Houston, TX 77043 713-461-2131
PCB Piezotronics, 3425 Walden Ave., Depew, NY 14043-2495 716-684-0001
§ Projects Unltd., 3680 Wyse Rd., Dayton, OH 45414 513-890-1918
† Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
§† Systron-Donner Inertial Div., 2700 Systron Dr., Concord, CA 94518 415-682-6161
Teledyne/Geotech, 3401 Shiloh Rd., Garland, TX 75041 214-271-2561
§ Tohoku Metal Inds., 5-8, 2-Chome, Kitaaoyama Minato-Ku, Tokyo, Japan .... Tokyo 03-402-6161
Transducer Systems, Inc., 1510 Delp Dr., Kulpsville, PA 19443 215-256-4611
Trans-Tek, P.O. Box 338, Rte. 83, Ellington, CT 06029 203-872-8351
Unholtz-Dickie Corp., 6 Brookside Dr., Wallingford, CT 06492 203-265-3929
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
§ Vibra-Metrics, 385 Putnam Ave., Hamden, CT 06517 203-288-6158

Transducers, Volt, Watt, Current VAR, Power Factor, Frequency-5500

Active Control Instrmn., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037, 305-451-1000 .... 3•1120
Aeroflex Labs., Magnetic Prods. Div., , So. Service Rd., Plainview, NY 11803, 516-694-6700 ....1B•1829
† **American Aerospace Controls, 570 Smith St., Farmingdale, NY 11735, 516-694-5100 ....1B•1830,1831**
American Zettler, 16881 Hale Ave., Irvine, CA 92714, 714-660-1670 ....1B•1826
§ **Bell, F. W., Inc., 6120 Hanging Moss Rd., Orlando, FL 32807, 305-678-6900 .... 3•1196,1197**
Flex-Core Div., Morlan & Assocs., Inc., 6625 McVey Blvd., Worthington, OH 43085, 614-889-6152 ....1A•2165
IXYS Corp., 3685 Enochs, Santa Clara, CA 95051, 408-733-4045 ....1B•1231
Leach Corp., Control Prods. Div., 6900 Orangethorpe Ave., Buena Pk., CA 90620, 714-739-0770 ....1B•1458,1459
§ **Micro Switch, A Honeywell Div., 11 W. Spring St., Freeport, IL 61032, 815-235-6600 ....1B•1720,1852**
† **Ohio Semitronics, Inc., 1205 Chesapeake Ave., Columbus, OH 43212, 614-486-9561 ....1B•1854-1859,1861-1865**
Scientific Columbus, Inc., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228, 614-274-7160 ....1B•1876,1877
§ AEMC, 99 Chauncy, Boston, MA 02111 ....617-451-0227;800-343-1391
† Amprobe Instr., 630 Merrick Rd., Lynbrook, NY 11563 .... 516-LY3-5600
ARGA Controls, 35 E. Glenarm St., Pasadena, CA 91105 213-682-3314
§ Best Electrics Div., 400 Boren Ave. North, Seattle, WA 98109 206-382-1300
Bristol Babcock Inc., 40 Bristol St., Waterbury, CT 06708 203-575-3000
Crompton Instrs., 1562 Parkway Loop, Units A & B, Tustin, CA 92680 714-731-2333
Crompton Instrs., 2763 Higgins Rd., Elk Grove Village, IL 60007 312-593-1107
Cross Elctrns., 100 Commonwealth Dr., Warrendale, PA 15086 412-776-1591
§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 .... 207-655-4555 800-341-9678
Diversified Elctrns., Inc., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711 812-426-2806
Electro Natl., Matthews Ave., Canton, MS 39046 601-859-5511
Electronic Wattmeter Co., 2275 Sixth St., Sarasota, FL 33577 813-953-5355
EWC, Inc., 725 Federal Ave., Kenilworth, NJ 07033 ..201-245-3200;800-526-4048
§ Fenwal Elctrns., 63 Fountain St., Framingham, MA 01701 617-872-8841
Halmar Electronics, Inc., 900 N. Hague Ave., Columbus, OH 43204 614-276-0131
Leach Corp., Relay Div., 5915 Avalon Blvd., Los Angeles, CA 90003 213-232-8221
North Hills Elctrns., Alexander Pl., Glen Cove, NY 11542 516-671-5700
Pacific Power Source Corp., 15122 Bolsa Chica St., Huntington Bch., CA 92649 ....714-898-2691;800-854-2433
Q-Systems, PO Box 35879, Tucson, AZ 85740 602-293-4923
RFL Inds., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
RFL Inds., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boonton, NJ 07005 201-334-3100
Rochester Instr. Sys., 255 N. Union St., Rochester, NY 14605 716-263-7700
Sensitive Research Instrs., 25 Dock St., Mt. Vernon, NY 10550 914-699-9717
§ Square D Co., Executive Plaza, Palatine, IL 60067 312-397-2600

Star Micronics, Inc., Components Div., 70-D Ethel Rd. W., Pisçataway, NJ 08854
....201-572-9512
Tektronix, Inc., P.O. Box 500, V3-314, Beaverton, OR 97077 ....800-547-1512;
Oregon only 800-452-1877
Yokogawa Corp. of America, 2 Dart Rd., Shenandoah, GA 30265 ...404-253-7000

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Abbott Transistor Labs., Transformer Div., 639 So. Glenwood Pl., Burbank, CA 91506, 818-841-3630 ....1A•2119,2121,2122
B. H. Elctrns., 331 Bremer Bldg., St. Paul, MN 55101, 612-228-6463 ....1A•2136
Endicott Coil, 22 E. Charlotte St., Binghamton, NY 13905, 607-797-1263 1A•2152
EWC, Inc., 725 Federal Ave., Kenilworth, NJ 07033, 201-245-3200;800-526-4048 ....1A•2159
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ....1A•2166
† Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ....1A•2175
Magnetico Inc., 182 Morris Ave., Holtsville, NY 11742, 516-654-1166 ....1A•2185
§† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11582, 516-561-6050 ....1A•2114
MTE Corp., 7901 W. Clinton Ave., P.O. Box 23957, Milwaukee, WI 53223, 14-358-5300;800-558-4332 ....1A•2208
† North Hills Elctrns., Alexander Pl., Glen Cove, NY 11542, 516-671-5700 ..1A•2210
† Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746, 213-532-1790 ....1A•2215
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ....1A•2234-2249,2252-2255
Sterling Transformer Corp., 510 Driggs Ave., Brooklyn, NY 11211, 212-782-4200 ....1A•2296
† Technitrol, 1952 E. Allegheny, Philadelphia, PA 19134, 215-426-9105 ....1B•1015
Thordarson Meissner, Electronic Center, Mt. Carmel, IL 62863, 618-262-5121 ....1A•2305,2306
† Torotel Prods. Inc., 13402 S. 71 Hwy., Grandview, MO 64030, 816-761-6314 ....1A•2314-2318
† Torwico Elctrns. Inc., Rte. 70, Lakewood, NJ 08701, 201-364-1800 ...1A•2322,2323
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763, 516-654-1880 ....1A•2325
TRW Inductive Products Div., 150 Varick St., New York, NY 10013, 212-255-3500 .... 1A•2338-2343,2345,2349-2355,2357-2359
† Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248, 213-323-4100 ....1A•1276
Wayne Transformer Co., Inc., 99 Hazel St., Paterson, NJ 07503, 201-278-7674 ....1A•2365
† Adams-Russell, Anzac Div., 80 Cambridge St., Burlington, MA 01803 671-273-3333
† ADC Magnetic Controls Co., 4900 W. 78th St., Minneapolis, MN 55435 612-835-6800
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 714-781-5433
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 805-544-4019
† Elnetic Elctrns., 1730 21st St., Santa Monica, CA 90404 213-828-9541
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 305-894-3351
† Hammond Mfg. Co., 1690 Walden Ave., Buffalo, NY 14225 716-894-5710
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 303-442-6700
† Milwaukee Transformer Co., MTE Corporation, 7901 W. Clinton Avenue, Milwaukee, WI 53223 414-438-5300
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 215-794-7411
Nortran, Power Elctrns. Corp., 96 Milton Rd., Rochester, NH 03867 603-332-3334
† OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 201-454-2600
† Pacific Electro Dynamics, Inc., 11465 Willows Rd. N.E., Redmond, WA 98052 206-881-1700

PC Transformer Corp., 64 D Nancy St., West Babylon, NY 11704 ...516-491-3300
Perkin-Elmer Corp., Elctrn. Prods. Dept., Main Ave., Norwalk, CT 06856 ...203-762-4786
† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034 ...215-643-6950
Power Elctrns., 96 Milton Rd., Rochester, NH 03867 ...603-332-3334
† Power Sys. Grp., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311 ...818-885-8223
Technical Research & Mfg., Inc., R.F.D. 0, Manchester, NH 03103 ...603-627-6000
Todd Systems, 50 Ash St., Yonkers, NY 10701 ...914-963-3400
Transduktor Inc., 600 Steamboat Rd., Greenwich, CT 06830 ...203-661-5726

Transformers (MIL), Pulse & Variable-2440

B. H. Elctrns., 331 Bremer Bldg., St. Paul, MN 55101, 612-228-6463 ...1A•2136
Freed Transformer, 1718 Weirfield St., Ridgewood, NY 11385, 212-386-1300 ...1A•2166
† **Hisonic, Inc., 249 N. Troost, P.O. Box 1130, Olathe, KS 66061-1130, 913-782-0012 ...1A•2175**
Pan-Magnetics Intl., Inc., 455-A Carson Plaza Dr., Carson, CA 90746, 213-532-1790 ...1A•2215
Pico Elctrns., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, 14-699-5514;800-431-1064 ...1A•2250,2251
† **Technitrol, 1952 E. Allegheny, Philadelphia, PA 19134, 215-426-9105 ...1B•1015**
TRW Inductive Products Div., 150 Varick St., New York, NY 10013, 212-255-3500 ...1A•2338,2361-2363
† AIE Magnetics, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210 ...615-244-9024
Bicron Elctrns., Box 807, Barlow St., Canaan, CT 06018 ...203-824-5125
† Bourns Instrs., Inc., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506 ...714-781-5433
† Diamond Magnetics, P.O. Box 4736, San Luis Obispo, CA 93403 ...805-544-4019
† ESC Elctrns. Corp., 534 Bergen Blvd., Palisades Pk., NJ 07650 ...201-947-0400
† Gra-Mar Inc., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803 ...305-894-3351
† Hammond Mfg. Co., 1690 Walden Ave., Buffalo, NY 14225 ...716-894-5710
† Magnetek, 7315 Red Deer Dr., Boulder, CO 80301-4696 ...303-442-6700
† Microtran Co. Inc., 145 E. Mineola Ave., Valley Stream, NY 11582 ...516-561-6050
† Milwaukee Transformer Co., MTE Corporation, 7901 W. Clinton Avenue, Milwaukee, WI 53223 ...414-438-5300
Neshaminy Transformer, Neshaminy Electronics Corp., Edison-Furlong Road, Furlong, PA 18925 ...215-794-7411
† NWL Transformers, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505 ...609-298-7300
† OPT Inds. Inc., 300 Red School La., Phillipsburg, NJ 08865 ...201-454-2600
† Polyphase Instr., 175 Commerce Dr., Ft. Washington, PA 19034 ...215-643-6950
† Power Sys. Grp., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311 ...818-885-8223
† Trans American Transformer, 142 Peconic Ave., Medford, NY 11763 ...516-654-1880
† Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248 ...213-323-4100

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Centronic Inc., 5 Eastmans Rd., Parsippany, NJ 07054, 201-233-7200 ...1B•1212, 1213
§ **Clairex Elctrns., 560 S. 3rd Ave., Mt. Vernon, NY 10550, 914-664-6602 ...1B•1215**
§ **EG & G Vactec, 10900 Page Blvd., St. Louis, MO 63132, 314-423-4900 ...1B•1253**
Gilway Technical Lamp, 165M New Boston St., Woburn, MA 01801, 617-935-4442 ...1B•1057
§† **Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ...1B•1225-1229**
§† **Optek, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069, 214-542-9461 ...1B•1232**
§ A E G Telefunken, Semiconductor Grp., Rte. 22, Somerville, NJ 08876 ...201-722-9800
§ Collmer Semiconductor, Inc., 14368 Proton Rd., Dallas, TX 75234-3335 ...214-233-1589
Ferranti Elec., 87 Modula Ave., Commack, NY 11725 ...516-543-0200
HEI, Inc., 1495 Steiger Lake La., Victoria, MN 55386 ...612-443-2500
§† Lite-On Corp., Sub. Taiwan Liton Elctrn. Co. Ltd., 4951 Airport Pkwy., Ste. 570, Dallas, TX 75248 ...214-239-3565
Micropac Inds., 905 E. Walnut St., Garland, TX 75040 ...214-272-3571
Micropac Inds., Inc., General Sensors Div., 905 E. Walnut St., Garland, TX 75040 ...214-272-3571
§ Motorola Semiconductor Prods. Sector, Adv. 72, Box 20912, Phoenix, AZ 85036 ...602-244-6900
§ NEC Elctrns. USA Inc., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086 ...408-745-6520
§ New-Tone Electronics, Inc., 44 Farrand St., Bloomfield, NJ 07003 ...201-748-5089
Optomicronix, 10080 N. Wolfe Rd., SW 3-360, Cupertino, CA 95014 ...408-725-1220
Opto Technlg., 1674 S. Wolf Rd., Wheeling, IL 60090 ...312-537-4277
§ Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094 ...201-348-7000
§ RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 ...609-541-3636
Rohm Corp., 8 Whatney, Irvine, CA 92714 ...714-855-2131
§ Semiconductor Technlg., Inc., 3131 S.E. Jay St., Stuart, FL 33494 ...305-283-4500
Sensor Techn., 21012 Lassen St., Chatsworth, CA 91311 ...213-882-4100
Shokai Far East Ltd., 280 North Central Ave., Hartsdale, NY 10530 ...914-681-0700
§ Siemens Comps., Inc., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014 ...408-257-7910
Silicon Sensors, Hwy. 18 East, Dodgeville, WI 53533 ...608-935-2707
† Silonex Inc., 331 Cornelia St., Plattsburgh, NY 12901 ...518-561-3160
Sylvania Electronic Components, Philips ECG Inc., A North American Philips Co., 100 First Ave., Waltham, MA 02254 ...617-890-6107
§† Teledyne-Crystalonics, 147 Sherman St., Cambridge, MA 02140 ...617-491-1670

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Transistors (MIL)-2440

TRW Optoelectronics Div., 1201 Tappan Circle, Carrollton, TX 75006, 214-323-2200 ...1B•1246,1247
Germanium Power Devices, Box 3065, Shawsheen Village Sta., Andover, MA 01810 ...617-475-5982
§† RCA Distr. & Special Prods. Div., RCA Corp., 2000 Clements Bridge Rd., Deptford, NJ 08096 ...609-541-3636
§† RCA Solid State Div., Transistors, Rte. 202, Somerville, NJ 08876 ...201-685-6000
§† Siliconix, Inc., 2201 Laurelwood Rd., Santa Clara, CA 95054 ...408-988-8000
Texas Instrs., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769 ...214-995-6611
§† TRW, RF Devices Div., 14520 Aviation Blvd., Lawndale, CA 90260 ...213-536-0888
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 ...415-493-4000

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Transmission Lines (MIL), RF-2440

† M/A-COM Millimeter Prods., Inc., South Ave., Burlington, MA 01803 ...617-272-3000

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Transmitters, Fiber Optic-3700

Honeywell Optoelectronics, 830 E. Arapaho Dr., Richardson, TX 75080, 214-234-4271 ...1B•1112,1113,1229
MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
American Photonics Inc., 71 Commerce Dr., Brookfield Center, CT 06805 ...203-775-8950
Artel Communications Corp., 93 Grand St., Worcester, MA 01602 ...617-752-5690
§ Augat Fiberoptics, 40 Perry Ave., Attleboro, MA 02703 ...617-222-2202
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 ...914-965-6300
Dynamic Measurements, 8 Lowell Ave., Winchester, MA 01890 ...617-729-7870
† Farinon Div., Harris Corp., 1691 Bayport, San Carlos, CA 94070 ...415-594-3000
† Fibronics Intl. Inc., 325 Stevens St., Hyannis, MA 02601 ...617-778-0700
† Foundation Instruments Inc., 24 Colonnade Rd., Nepean, ON K2E 7J6 Canada ...613-226-4000
General Fiber Optics, Inc., P.O. Box 82, Caldwell, NJ 07006 ...201-228-4400
† General Optronics, 3005 Hadley Rd., So. Plainfield, NJ 07080 ...201-549-9000
† Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303 ...Call Local Sls. Off.
§† ITT Electro-Optical Prods., 7635 Plantation Rd., Roanoke, VA 24019 ...703-563-0371
LeCroy Resch. Sys. Corp., 700 S. Main St., Spring Vly., NY 10977 ...914-425-2000
Manage, Inc., Fibre Optics Elctrns. Sys. Grp., P.O. Box 175, 40 Nichols Rd., Chicopee, MA 01014 ...413-598-8204;592-3834
† Math Assocs., 2200 Shames Dr., Westbury, NY 11590 ...516-334-6800
Ortel Corp., 2015 W. Chestnut St., Alhambra, CA 91803 ...213-281-3636
Photodyne, 1175 Tourmaline Dr., Newbury Park, CA 91320 ...818-889-8770
Poulin Associates, Inc., 302 North Rd., Sudbury, MA 01776 ...617-443-7333

Transmitters, Fixed Frequency-1900 — *See Vol. 3*

Transmitters, Laser-3700

MERET, Inc., 1815 24th St., Santa Monica, CA 90404-4998, 213-828-7496 1B•1116
§ American Laser Sys., Inc., 106 Fowler Rd., Goleta, CA 93117 ...805-967-0423
Codenoll Technology Corp., 1086 N. Bwy., Yonkers, NY 10701 ...914-965-6300
Times Fiber Communications, Inc., 358 Hall Ave., Wallingford, CT 06492 ...203-265-8500

Transmitters, Pressure & Flow-5500

Celesco Transducer Prods., Inc., 7800 Deering Ave., Canoga Park, CA 91304, 818-884-6860 ....1B•1839
§ NES, Inc., 1536 Brandy Pkwy., Streamwood, IL 60103, 312-289-8820 ....3•1088, 1136,1167
Acromag, 30765 Wixom Rd., Wixom, MI 48096 313-624-1541
§ Action Instrs., 8601 Aero Dr., San Diego, CA 92123 619-279-5726
§† Bailey Controls Co., 29801 Euclid Ave., Wickliffe, OH 44092 216-585-5800
Beckman Instrs., 2500 Harbor Blvd., Fullerton, CA 92634 714-871-4848
Brooks Instr. Div., Emerson Elec. Co., 407 W. Vine St., Hatfield, PA 19440 215-362-3500
Computer Instrs., 100 Madison Ave., Hempstead, NY 11550 516-483-8200
† Dresser Inds., 1505 Elm St., Dallas, TX 75201 214-746-6000
Entran Devices, 10 Washington Ave., Fairfield, NJ 07006 201-227-1002
§† Gould Inc., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030 805-487-8511
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
† Kulite Semiconductor Prods. Inc., 1039 Hoyt Ave., Ridgefield, NJ 07657 201-945-3000
Leeds & Northrup Instrs., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454 215-643-2000
§† MKS Instrs., Inc., 22 Third Ave., Burlington, MA 01803 617-272-9255
† Paine Instrs., 2401 S. Bayview St., Seattle, WA 98144 800-426-0366
§† Robinson-Halpern, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248 215-825-9200
Schaevitz Engrg., U.S. 130, Union Ave., Pennsauken, NJ 08110 609-662-8000
§ Seaboard Elctrns., 70 Church St., New Rochelle, NY 10805 914-235-8073
Sensotec Inc., 1200 Chesapeake Ave., Columbus, OH 43212 614-486-7723
Setra Systems, Inc., 45 Nagog Park, Acton, MA 01720 617-263-1400
† Sylvania Sys. Grp., Comm. Sys. Div., GTE Prods. Corp., 77 A St., Needham Hgts., MA 02194 617-449-2000
† Validyne Engrg. Corp., 8626 Wilbur Ave., Northridge, CA 91324 818-886-2057
§ Yellow Springs Instr., Box 279, Yellow Springs, OH 45387 513-767-7241

Transmitters, Radar — See Radar System Components (Vol. 1A)

Transmitters, Telemetry-1900 — *See Vol. 3*

Transmitters, Tone-1900 — *See Vol. 3*

Transmitters (MIL), ECM-3475 — *See Vol. 3*

Transmitters (MIL), Shipboard Jamming-3475 — *See Vol. 3*

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Tubes, Backward Wave-5700 — *See Vol. 1A*

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Tubes, Cathode Ray, General Purpose-5700 — *See Vol. 1A*

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Tubes, Counting-5700 — *See Vol. 1A*

Tubes, Electrometer-5700 — *See Vol. 1A*

Tubes, Electron Multiplier-5700 — *See Vol. 1A*

Tubes, Flash-5700 — *See Vol. 1A*

Tubes, Gas-5700 — *See Vol. 1A*

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Tubes, Image Converter-5700 — *See Vol. 1A*

Tubes, Indicator — See Tubes, Readout (Vol. 1A)

Tubes, Magnetron — See Tubes, Microwave (Vol. 1A)

Tubes, Microwave-5700 — *See Vol. 1A*

Tubes, Noise Source-5700 — *See Vol. 1A*

Tubes, Photomultiplier-5700 — *See Vol. 1A*

Tubes, Readout (CRT, Cold-Cathode, Vacuum Fluorescent, Incandescent, etc.)-5700 — *See Vol. 1A*

Tubes, Receiving-5700 — *See Vol. 1A*

Tubes, Rectifying-5700 — *See Vol. 1A*

Tubes, Strobe — See Lamps, Stroboscopic Source (Vol. 1B)

Tubes, Switching-5700 — *See Vol. 1A*

Tubes, TV Camera Pickup-5700 — *See Vol. 1A*

Tubes, Transmitting-5700 — *See Vol. 1A*

Tubes, Voltage Reference or Regulating-5700 — *See Vol. 1A*

Tubes, X-ray-5700 — *See Vol. 1A*

Tubes (MIL), Indicator & Pickup-2440

† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
THORN EMI Gencom Inc., 23 Madison Rd., Fairfield, NJ 07006 516-433-5900

Tubes (MIL), Microwave-2440

§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Hughes Aircraft Co., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509 213-517-6000
† Litton Inds., Electron Tube Div., 960 Industrial Rd., San Carlos, CA 94070 415-591-8411
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
† VTM Microwaves, Inc., 4975 W. 80 Ave., Westminster, CO 80030 303-426-6866

Tubes (MIL), Power & Gas, Planar-2440

§ Amperex Electronic Corp., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802 516-931-6200
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050
Varian Associates, Inc., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000

Tubes (MIL), Receiving, & Tube Shields-2440

Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
† EEV Inc., 7 Westchester Plaza, Elmsford, NY 10523 914-592-6050

Tubing, Ceramic-2500 — *See Vol. 2*

Tubing, Fiberglass-2800 — *See Vol. 2*

Tubing, Glass-2500 — *See Vol. 2*

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Tubing, Waveguide-3450 — *See Vol. 1A*

Tubing, Zipper-6000 — *See Vol. 2*

Tuners, AM/FM-1300 — *See Vol. 3*

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Urea Formaldehyde — See Plastic Raw Materials (Vol. 2)

Valves, Solenoid-4550

§ Airmatic-Allied, 185 Park Dr., Wilmington, OH 45177 513-382-1691
§ Alltech Assocs. Inc., Applied Science Labs., 2051 Waukegan Rd., Deerfield, IL 60015 312-948-8600
Barksdale Controls Div., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058 213-589-6181
† Bendix Corp., Electrodynamics Div., 11600 Sherman Way, N. Hollywood, CA 91605 818-765-1010
† EEMCO Div., 4585 Electronics Pl., Los Angeles, CA 90039 213-247-7060
† Electro Kinetics Co., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102 805-963-2055
Everett/Charles Test Equip. Inc., 2887 N. Towne Ave., Pomona, CA 91767 714-621-9511
Honeywell, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034 ....800-321-5111, Ext. 596
† IMC Magnetics Corp., Arizona Div., 1900 East Fifth St., Tempe, AZ 85281 602-968-4441
§ Industrial Computer Designs, Inc., 31121 Via Colinas 1005, Westlake Village, CA 91362 818-889-3179
§ ITT General Controls Div., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201 213-842-6131
§ Jamesbury, 640 Lincoln St., Worcester, MA 01605 617-852-0200

Magnatrol Valve Corp., 67 Fifth Ave., Hawthorne, NJ 07507 201-427-4341
† SR Engineering Inc., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643 714-554-4200
Vactronic Lab. Equip., 65 Brightside Ave., E. Northport, NY 11731 516-AN1-2660
Varian Assocs., Indl. Equip. Grp., 611 Hansen Way, Palo Alto, CA 94303 415-493-4000
Veeco Instruments Inc., Terminal Dr., Plainview, NY 11803 516-349-8300

Valves, Vacuum-4100 — *See Vol. 3*

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Video Components & Equipment — See Specific Component: Amplifiers (Vol. 3), Cameras (Vol. 3), Networks (Vol. 3), etc.

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Wafer Fabrication, Semiconductor — See Semiconductor Wafer Fabrication (Vol. 3)

Wall Plates — See Boxes, Junction, Outlet & Wall Plates (Vol. 2)

Warning Systems, Lightning-4300

§† Audiosone, Inc., 617 Fan Hill Rd., Monroe, CT 06468 ....203-268-4372; 800-243-8160
Avex Elctrns., 1683 Winchester Rd., P.O. Box 1026, Bensalem, PA 19020 215-638-3300
§ LEA, Inc., A Dynatech Co., 12516 Lakeland Rd., Santa Fe Springs, CA 90670-9990 818-944-0916

Warning Systems (MIL), Computerized-3475 — *See Vol. 3*

Warning Systems (MIL), EW-3475 — *See Vol. 3*

Warning Systems (MIL), IR-3475 — *See Vol. 3*

Warning Systems (MIL), Laser-3475 — *See Vol. 3*

Warning Systems (MIL), SAM Launch-3475 — *See Vol. 3*

Washers, Lock-2825 — *See Vol. 2*

Washers, Plain-2825 — *See Vol. 2*

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Waveguide-Coax Adapters-3450 — *See Vol. 1A*

Waveguides-3450 — *See Vol. 1A*

Waveguides (MIL)-2440

§† Dielectric Communications, General Signal, Tower Hill Rd., Raymond, ME 04071 ....207-655-4555;800-341-9678
Lindgren RF Enclosures, Inc., 1228 Capitol Drive, Addison, IL 60101 312-628-9100

Wave Traps — See Filters, Antenna (Vol. 1A), Filters, Microwave (Vol. 1A), etc.

Welding Equipment & Accessories (Excl. Equipment for Semiconductor Devices)-5400 — *See Vol. 2*

Windows, Sapphire-2500 — *See Vol. 2*

Windows, Shielded — See Shields, RF (Vol. 2)

Wire & Cable Ties-2825 — *See Vol. 2*

Wire, Airframe-2440

§† Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 ....2•1988,1989
§† Consolidated Electronic Wire & Cable Corp., 11044 King St., Franklin Park, IL 60131, 312-455-8830 ....2•2063
† Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 ....1B•1011,2•2104
Judd Wire, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, 619-744-7720 ....1B•1011,2•2104
MWS Wire Inds., 31200 Cedar Valley Dr., Westlake Village, CA 91362, 818-991-8553 ....2•2110
† Arco Cable, 7361 Ethel Ave., North Hollywood, CA 91605 818-982-2832
§† Belden, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375 317-983-5200
† Brand-Rex, Electronic & Indl. Cable Div., Box 498, Willimantic, CT 06226 203-423-7771
† Chester Cable, Oakland Ave., Chester, NY 10918 914-469-2141
§† Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
§ Custom Cable, 242 Butler, Westbury, NY 11590 516-334-3600
§† Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648 201-768-5400
§† Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018 312-696-1000
Delco Wire & Cable, Inc., 257 Rittenhouse Cir., Bristol, PA 19007 ..215-785-0511
† Electro Weave, 38 Harlow St., Worcester, MA 01605 617-752-8932
† Galite, 2 Tower Dr., Wallingford, CT 06492 203-265-7126
† Gore, W. L., & Assocs., 555 Paper Mill Rd., Newark, DE 19714 302-738-4880
† GSI Corp., 1917 Greenspring Dr., Timonium, MD 21093 301-252-1768
§† King Wire & Cable Corp., 179-45 110 Ave., Jamaica, NY 11433 .....212-657-4422; 800-221-0144
† National Electric Cable, 16566 S.W. 72nd Ave., Portland, OR 97223 503-620-9400
§† Olympic Wire & Cable, 1 Madison Rd., Fairfield, NJ 07006 201-227-7996
§† Philadelphia Insulated Wire Co. Inc., 333 New Albany Rd., Moorestown, NJ 08057 609-235-6700
† Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 ....203-265-5533;800-243-3959
§† Pirelli Cimco, 800 Rahway Ave., Union, NJ 07083 201-687-8444
† Standard Wire & Cable Co., 2345 Alaska Ave., El Segundo, CA 90245 213-536-0006
Storm Products Co., 116 Shore Drive, Hinsdale, IL 60521 312-323-9121
§† Tensolite, Old Post Rd., Rte. 9A, Buchanan, NY 10511 914-737-5600
† Thermax Wire, 32-02 Linden Pl., Flushing, NY 11354 212-939-8300
† United Wire & Cable, 425 Shrewsbury St., Worcester, MA 01604 617-757-3872
† Victor Wire & Cable Corp., 3601 Holdrege Ave., Los Angeles, CA 90016 213-870-9933

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Wire, Thermocouple-6000 — *See Vol. 2*

Wire, Transmission — See Cable, Transmission Line (Vol. 2)

Wire, Twisted Pair — See Cable, Twisted Pair (Vol. 2)

Wire (MIL)-2440

§† **Brim Elctrns., 120E Home Pl., Lodi, NJ 07644, 201-796-2886 .... 2•1988**
Carol Cable Co., Inc., Columbia Elctrn. Cables Div., 249 Roosevelt Ave., Pawtucket, RI 02862, 401-724-9605 .... 2•2013
§† **Consolidated Electronic Wire & Cable Corp., 11044 King St., Franklin Park, IL 60131, 312-455-8830 .... 2•2059-2063**
§† **Daburn Elctrns. & Cable, 70 Oak St., Norwood, NJ 07648, 201-768-5400 ... 2•2087**
Dearborn Wire & Cable Co., 9299 Evenhouse Ave., Rosemont, IL 60018, 312-696-1000 .... 2•2101
§† **Judd Wire, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, 413-863-4357 .... 1B•1011,2•2104,2105**
§† **Judd Wire, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, 619-744-7720 .... 1B•1011,2•2104,2105**
National Wire & Cable Corp., 136 San Fernando Rd., Los Angeles, CA 90031-1780, 213-225-5611 .... 2•2117,2118
§† Alpha Wire Corp., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207 201-925-8000
American Insulated Wire Corp., Leviton Mfg. Co., 36 Freeman St., Pawtucket, RI 02862 401-726-0700
† Champlain Cable, PO Box 7, Winooski, VT 05404 802-655-2121
† Computer Cable & Prods. Inc., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735 516-293-1610
Cooner Wire Co., 9186 Independence Ave., Chatsworth, CA 91311 818-882-8311
† Gavitt Wire & Cable, Brookfield, MA 01506 617-867-6476
General Electric Co., Lamp Comps. & Technical Prods. Div. Sls. Oper., 21800 Tungsten Rd., Cleveland, OH 44117 216-266-2451
Malco, Div. Microdot Connector Grp., 12 Progress Dr., Montgomeryville, PA 18936 215-699-5373
Markel Corp., P.O. Box 752, Norristown, PA 19404 215-272-8960
Molecu-Wire, P.O. Box 495, Farmingdale, NJ 07727 201-938-9473
MWS Wire Inds., 31200 Cedar Valley Dr., Westlake Village, CA 91362 818-991-8553
† Pirelli Cable Corp., Special Cable Div., P.O. Box 50, Wallingford, CT 06492 .... 203-265-5533;800-243-3959
Raychem Corp., Elctrns. Grp., 300 Constitution Dr., Menlo Park, CA 94025 415-361-3860
§† Spectra-Strip, 7100 Lampson Ave., Garden Grove, CA 92642-0415 714-892-3361
† Standard Wire & Cable Co., 2345 Alaska Ave., El Segundo, CA 90245 213-536-0006
§† Whitmor Wire & Cable, 13161 Sherman Way, Bldg. B, N. Hollywood, CA 91605 818-764-6296

Wire Twisters, Automatic-5400 — *See Vol. 2*

Wire Twisters, Manual-5400 — *See Vol. 2*

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Work Stations/Decks, Data Entry-1400 — *See Vol. 2*

Work Room, Shielded-1400 — *See Vol. 2*

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Yokes, Deflection, CRT-1800 — *See Vol. 1A*

Yokes, Deflection, TV Camera-1800 — *See Vol. 1A*

Zone Boxes, Thermocouple — See Thermocouples, Elements & Accessories (Vol. 1B)

§—Product sold through distributors †—Product meets MIL specs

MINIGLOSSARY SERVO COMPONENTS

SPECIFICATIONS

Excitation: The input voltage and frequency.

Transformation Ratio: The ratio of the output voltage, at maximum coupling, to the input voltage.

Phase Shift: The lead or lag of the output voltage with respect to the input voltage. For most synchros and resolvers, the phase shift can be approximated by the angle whose tangent is the ratio of the primary winding's DC resistance to its reactive component.

Impedance: Specified as R + jX, where R is the AC resistive component and X is the reactive component. Important impedances are: (a) Z_{po} (or Z_{ro} for rotor primary units); which is the impedance of the primary winding with the secondary open; (b) Z_{so}, which is the impedance of the secondary winding with the primary open; and (c) Z_{ss}, which is the impedance of the secondary with the primry shorted (essentially when driven by a low impedance).

Null Voltage: The voltage remaining when the unit is at electrical zero or in the minimum coupling position.

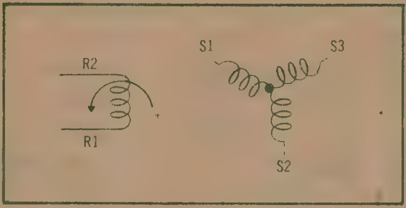
Accuracy: The error of the position of the rotor with respect to the electrical angle. It is defined as the output voltage driven by the "speed" (pole pairs) of the unit, referenced to the starting point of the calibration (usually the electrical zero position). Error is commonly expressed in minutes of arc (1/60 of a degree) or in seconds of arc.

Loads: For a transmitting unit, the impedance that the output voltage signal faces. This can be a receiver, a differential with its load, a control transformer, an A/D converter, etc.

Operation Temperature: The ambient temperature range over which the unit performs its primary function.

FUNCTIONS

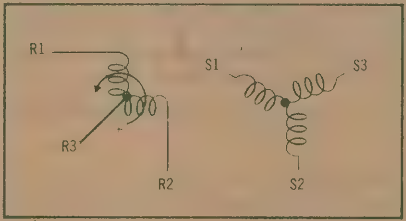
Transmitter: A unit with a Y-connected stator that outputs a signal proportional to the position of its single-phase excited rotor. High power units, called "torque transmitters," are used to drive one or more receivers. Low power transmitters are used to drive control transformers.



Receiver: A unit with a three-phase stator excited by the input, usually from a torque transmitter, and a single-phase rotor that follows the resulting stator field. Usually used to drive a position pointer.

Control Transformer: A unit with a three-phase stator excited by the input from a transmitter and a single-phase rotor mechanically driven to the null position by an external motor or other device.

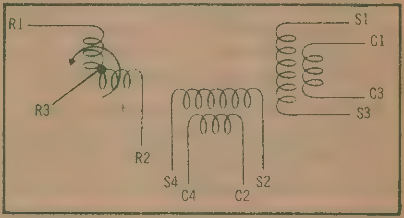
Differential: A unit with a three-phase stator and a three-phase rotor. It is usually connected between a transmitter, which excites its stator, and a receiver or control transformer. It can be used to "dial in" correction factors for the synchro chain.



Transolver: A unit with a three-phase stator and a two-phase rotor that can be used either as a control transmitter (with one rotor phase excited and the other shorted), or as a control transformer with the signal obtained from one phase of the rotor—making sure the other phase is equally loaded to prevent unbalances.

Differential Resolver: A unit with a two-phase stator and a three-phase rotor that is used as a transolver with the advantage that when connected as a control transformer, the signal does not travel through slip rings.

Resolver: A unit with a two-phase rotor and a two-phase stator that is used to create or receive SIN-COS signals such as vector resolutions for solving inertial platform coordinate transformations, unknowns of right triangles, etc. Resolvers can also be used as transmitting, differential, or receiving elements by proper choice of impedances. It is also possible to use resolvers as phase shifters where, in one mode, one rotor phase is excited and the two stator windings are feeding an appropriate RC network and indicating a phase shift, referred to the input, that corresponds to the rotor position.



Compensated Resolver: A unit with a "2×2" phase stator and a two-phase rotor used as a resolver with the added benefit of feedback windings in parallel with the stator windings that increase the useful accuracy over a wide range of environmental operating conditions.

Linear Transformer: A unit with a single-phase stator and single-phase rotor designed to provide a linear output voltage that is directly proportional to the rotor input angle. It operates over a range of less than ±90°, and is analogous to a potentiometer providing infinite resolution, but without contact between the elements. It can be used only with AC voltages.

Brushless Synchro: Available in two types—hairspring and bobbin. Hairspring synchros use spiral wound conductor springs to pick off the rotor signal, and are generally limited to a ±165° rotation. Most have mechanical stops to prevent damage due to overrotation. Bobbin synchros pick off the rotor signal with rotary transformers inside the unit, allowing the rotor unlimited motion.

Pancake Unit: A name derived from the physical dimensions of the unit, which has a diameter that exceeds axial length. Sizes range from under 1" to 20" or more. The unit is frequently used as a gimbal pickoff element and is designed to fit a particular application envelope. It can be supplied as a rotor and stator only.

eem MINIGLOSSARY ELECTROMECHANICAL RELAYS

RELAYS

Hybrid: Isolated input and output either with a solid-state input and an electromechanical output or vice versa. Typically a reed switch is used to trigger a solid-state output or a solid-state amplifier is used to trigger an electromechanical relay.

Differential: Have multiple windings to function when voltage, current and/or power difference reaches a specific level or value.

Close-differential: The dropout value is specified close to the pickup value.

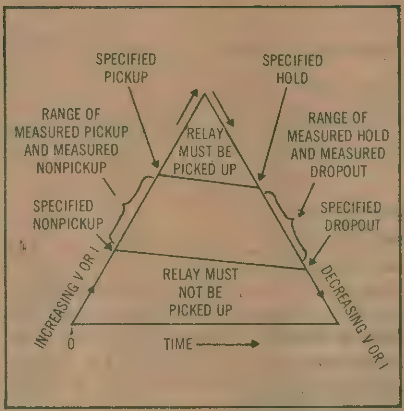
Frequency sensitive: Operates at a set frequency or within specific frequency bands. A resonant reed, for example.

Hermetically sealed: Totally sealed by glass-to-metal or metal-to-metal seals to ensure very low rates of gas leakage over long time periods.

Encapsulated: Imbedded in a suitable potting compound.

Sealed: Enclosed in a relatively airtight cover. (Not the same as hermetically sealed.)

Covered: Unsealed metal or plastic enclosure or housing.


SPECIFIED PICKUP
SPECIFIED HOLD
RANGE OF MEASURED PICKUP AND MEASURED NONPICKUP
RELAY MUST BE PICKED UP
RANGE OF MEASURED HOLD AND MEASURED DROPOUT
SPECIFIED NONPICKUP
SPECIFIED DROPOUT
RELAY MUST NOT BE PICKED UP
INCREASING V OR I
DECREASING V OR I
0
TIME

CONTACTS

Dry circuit: contacts that carry current but do not open or close during energizing of the load circuit. Often wrongly used in reference to low level contacts.

Low Level: Contacts controlling relatively low voltages and low currents. Generally below 5 Vdc and 10mA.

OPERATING CHARACTERISTICS

Measured dropout: The value at which all contacts restore to their unoperated position as current or voltage decreases.

Specified dropout: The value at or *above* which all contacts *must* restore to their unoperated position as voltage or current is decreased.

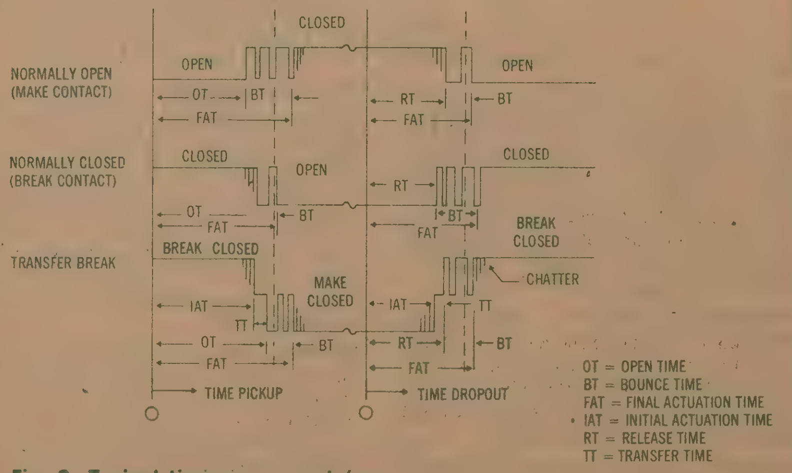

CLOSED
NORMALLY OPEN (MAKE CONTACT)
OPEN
OPEN
OT
BT
FAT
RT
BT
FAT
NORMALLY CLOSED (BREAK CONTACT)
CLOSED
OPEN
CLOSED
OT
FAT
BT
RT
BT
FAT
BREAK CLOSED
TRANSFER BREAK
BREAK CLOSED
MAKE CLOSED
CHATTER
IAT
TT
IAT
TT
OT
BT
RT
BT
FAT
FAT
TIME PICKUP
TIME DROPOUT
OT = OPEN TIME
BT = BOUNCE TIME
FAT = FINAL ACTUATION TIME
IAT = INITIAL ACTUATION TIME
RT = RELEASE TIME
TT = TRANSFER TIME

Fig. 2. Typical time vs. current (non-inductive load)

Specified hold: The value that *must* be reached before any contact change occurs as voltage or current is decreased on an operated relay.

Specified nonpickup: The value that *must* be reached before any contact change occurs as voltage or current decreases on an unoperated relay.

Measured pickup: The value at which all contacts function as voltage or current increases on an unoperated relay.

Specified pickup. The value at or *below* which all contacts *must* function as voltage or current increases on an unoperated relay.

Sensitivity: Specified pickup expressed in watts.

Normal bridging: The make-before-break action between adjacent contacts on relays designed for this purpose.

Abnormal bridging: The undesired closing of contacts caused by a metal bridge or protrusion developed by arcing.

Magnetic freezing: Sticking of the armature to the core as a result of residual magnetism.

TIME

Actuation: The interval from coil energization or de-energization to the functioning of a specified contact.

Initial actuation: The interval from coil energization or de-energization to the *first* closing or opening of a previously open or closed contact.

Final actuation: Sum of initial actuation *and* bounce intervals following an actuation.

Contact bounce: The interval from close or opening of a contact to the end of the bounce of "chatter."

Chatter: See bounce.

Operate: Normally taken as the interval between energization and the opening or closing of the last contact to function not including bounce.

Release: Normally taken as the interval between de-energization and the opening or closing of the last contact to function excluding bounce.

Transfer: The interval between opening a closed contact and closing an open contact of a break-before-make relay.

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MINIGLOSSARY POWER SUPPLIES

Ambient reference: Refers to the temperature of the still air surrounding the power supply

Case reference: One of the specs that make up the nominal rating. The temperature of the case with the temperature of the surrounding still air at a stated temperature (usually 25°C).

Crowbar circuit: Protects the load. A protective circuit that applies a short circuit across the output immediately upon overload. (See overvoltage).

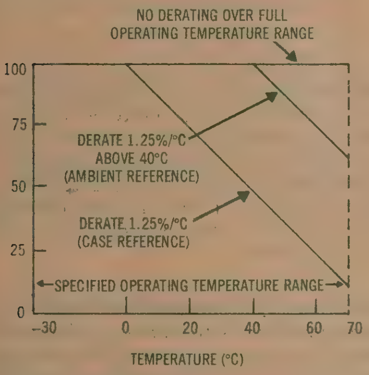


Fig. 1. Power output derating can be referred to ambient or case.

Derating: The degree output is reduced as temperature increases. Usually referenced to ambient case temperature and shown on a graph.

Efficiency: Ratio of the output power to the required input power. Usually expressed as a percentage given nominal environmental temperature.

EMI/RFI: Interference electronic circuitry caused by energy from electromechanical or radio frequency power supplies.

Foldback: Built-in protective circuits that automatically reduce the output voltage and/or current to very low levels in the event of an overload.

Holdover (Holdup): The interval that rated output will continue after input ceases. Usually milliseconds.

Input reflected current: The peak-to-peak alternating current generated by switching transients in DC/DC converters. Should not exceed 1%.

Inrush current limiting: Built-in circuits that monitor high currents through the rectifiers to the capacitors at turn ON. Circuit is usually inhibited as capacitors attain full charge.

Nominal rating: The spec value of the supply at stated conditions of input, output, and temperature.

Overshoot: A transient voltage change occurring during turn ON or OFF or during an abrupt load change.

Overvoltage (Overload) protection: Built-in circuits that protect the load or the supply by shutting it down or providing foldback.

Recovery: The time interval between the termination of an overload and restoration to normal operations.

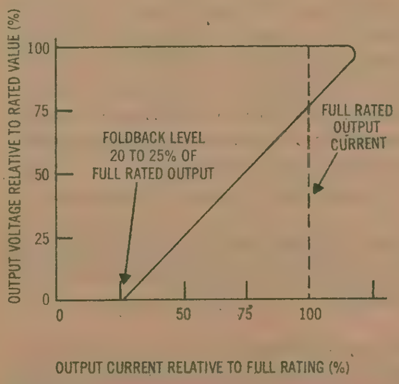


Fig. 2. Current foldback limiting self-resets with removal of fault.

Response: The time interval between a stated step change in input voltage or load current and return of output to normal operating conditions.

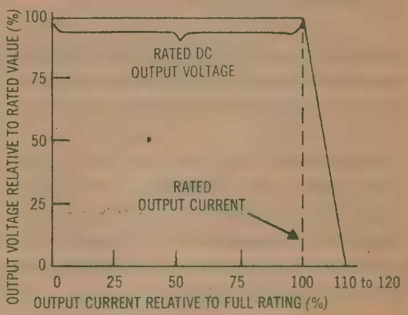


Fig. 3. Current limiting restrictions output current to a valve somewhat greater than full rated output; it resets when fault is removed.

Sensing: Regulation techniques that monitor output voltage and/or current. *Local sensing* refers to the output terminals. *Remote sensing* allows a feedback from the load circuit to the power supply.

Soft start: Allows the supply to start from zero current and/or voltage over a stated period of time during start up to prevent voltage overshoots and current imbalances.

Switchers: Power supplies using switching techniques to achieve high efficiency regulation. These techniques can have attendant EMI/RFI problems.

Tracking: The maintaining of fixed ratios between multiple outlets despite variations in line, load or temperature. Particularly important in supplies with symetrical (+)(−) outputs.

Transient protection: Circuitry designed to protect the supply from high amplitude line transients. Generally expressed in terms of peak voltage and maximum transient time duration.

MINIGLOSSARY
OPTO SEMICONDUCTORS

Avalanche Photodiode: A photodiode that takes advantage of avalanche multiplication of photocurrent. It is particularly suited to low noise and/or high speed applications.

Contrast: A noticeable difference in color, brightness, or other characteristics in a side-by-side comparison.

Chrominance Contrast: The color contrast between two adjacent surfaces of identical area, shape, texture, and luminance. The human eye is more sensitive to differences in color than it is to differences in brightness.

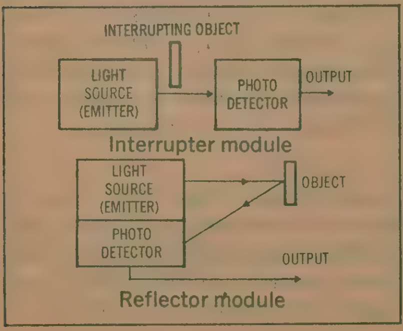
Current Transfer Ratio: The ratio of an optocoupler's output current to input current at a specified bias.

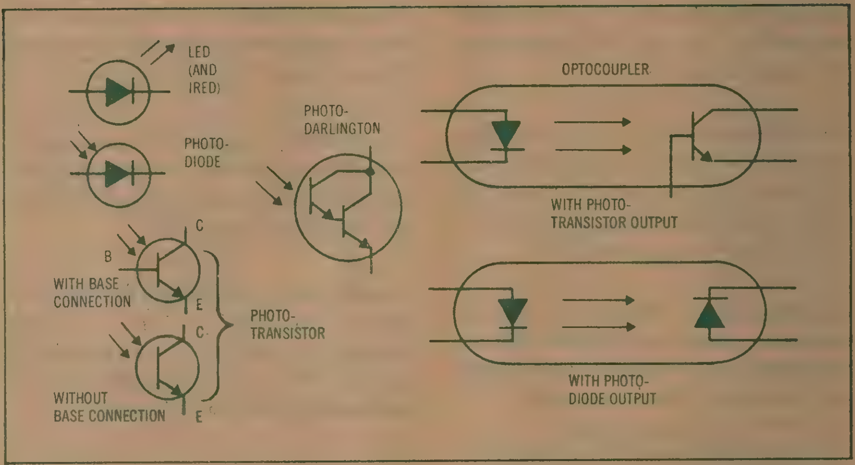
Dark Current: The leakage current of a photodetector with no incident light.

Dominant Wavelength: The wavelength that is a quantitative measure of apparent color of light as perceived by the human eye.

Infrared Radiation: The electromagnetic wavelength region between approximately 0.75 and 100 micrometers longer than the wavelength of visible light.

Interrupter (module): A device that produces an electrical output signal when an object breaks the light (visible or invisible) between a light source and a photodetector.





IRED: An infrared-emitting diode. See light-emitting diode.

Light Current: The current that flows through a photodetector when it is exposed to radiant energy.

Light-Emitting Diode (LED): A semiconductor diode that emits incoherent light at its PN junction when forward biased. The light can be in the visible or invisible (infrared) wavelength region.

Luminance Contrast: The observed brightness of a light-emitting element compared to the brightness of the "surround," an integral part of the device and inseparable from it.

Optocoupler: A device that transmits electrical signals, without electrical connection, between a light source (input) and the receiver (output). The input is generally an LED; the output might be a photodiode, phototransistor, a photo–Darlington, etc. Sometimes referred to as optoisolator.

Peak Wavelength: The wavelength at the peak of the radiated spectrum of an emitter.

Photo–Darlington: A light-sensitive Darlington-connected transistor pair. The photo–Darlington has a very high sensitivity to illumination or radiation.

Photodetector: A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodiodes, phototransistors, and photo–Darlingtons are the most common type of photodetectors.

Photodiode: A junction diode that is responsive to radiant energy. Photodiodes have a high degree of linearity between the input radiation and the output current, and faster switching speeds than phototransistors.

Photothyristor: A thyristor whose switching action is controlled by light applied to the thyristor gate.

Phototransistor: A light-sensitive transister that delivers an electrical output proportional to the light intensity at its input. The low-level photocurrent that is generated is amplified by the current gain of the transistor. The base region (or gate in a FET) may or may not be brought out as an external terminal.

Point Source: A source with a maximum dimension less than one-tenth the distance between sources and detector.

Reflector (module): A device containing a light source and a photodetector that detects any object that reflects light produced by the source back to the detector.

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MINIGLOSSARY
CONNECTORS

Connector terminology is often quite confusing. This confusion starts with the very names of connectors. The name of a connector may derive from its shape, application, type of conductor or even method of termination.

Shape—Circular, cylindrical, and rectangular.

Electrical application—High voltage, RF, microwave, input/output, etc.

Mechanical application—Printed circuit, rack & panel, cable, etc.

Conductor type—Coaxial, flat cable, ribbon cable, flex circuit, etc.

Termination method—Wirewrap, soldercup, solderless, etc.

Hardware such as clamps, hoods, and adapters are frequently used to convert cable connectors to rack and panel types. This adds to the name confusion. A very common telephone connector, for example (the "C" type) got its name from the model number of the original maker.

Contact: The part(s) of the connector that actually provides circuit continuity between its two sections—the parts which are normally mated. The back end of the connector should properly be called the *termination*. This is the point where the wires or PC board is attached to the connector.

Contact alignments: Often called *contact float*. Describes the amount of allowable contact movement within the connector body. Permits self-alignment.

Male vs. female: In the U.S. this describes the contact construction. In Europe this term is more often used to describe the outer shell mating action which may be the reverse of the contacts.

Closed entry: A female contact which prevents entry of a male contact larger than a specific size.

Open entry: A female contact designed for a specific size of male contact but which will allow entry of larger male contacts by spring action.

Hermaphrodite: Contacts or connector bodies which are the same configuration. Male/female designations do not apply. Bodies usually have some mechanical means for maintaining polarity.

Hermetic seal: Glass-to-metal seals at terminations. Often used improperly to describe vacuum-tight seals.

Waterproof seal: May or may not be truly *waterproof*. May prevent easy entrance of casual water by means of a rubber or other boot.

Printed circuit connector: Connectors which are used in conjunction with printed circuit boards. There are two distinctly different styles.

Edgeboard. May be called *edge* or *card*. The printed circuit (PC) board edge enters the connector.

Two-piece: One part of the connecting pair is physically attached to the PC board itself. The other part is attached to something else such as a cable or a motherboard.

Readout: Describes the arrangement at the terminating edge of a PC board. May be single or double. A double readout PC board has termination strips on each side not usually interconnected.

Ribbon connectors: A type of connector which allows flat "ribbon" cable to be attached to a round or rectangular connector but also used interchangeably for flat connectors to flat cable.

Ribbon contact connector: Describes the contacts in a rectangular connector which have a self-wiping mating action. Not the same as ribbon connector.

Solderless terminal: Any style of termination which does not require solder for a permanent connection. See *crimp* and *insulation displacement*.

Crimp termination: A stripped wire is inserted into a barrel or trough which is then crimped to the conductor with a suitable tool.

Insulation displacement: Unstripped insulated wire is fitted into a channel containing metal teeth which are forced through the insulation to make contact with the conductor.

Service rating: The maximum rated voltage and/or current which may be applied continuously. May be called *working voltage*. Can be confused with the term used to describe how many times a connector may be mated and separated.

Withstanding voltage: Also called *test voltage*. The voltage a connector must withstand for one minute without breakdown. Applied between connectors and between connectors and shell and any grounding devices of the connector.

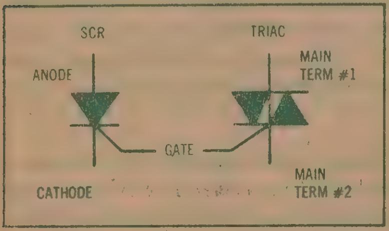
MINIGLOSSARY THYRISTORS/ HIGH POWER DIODES

THYRISTORS

A thyristor is a four-layer semiconductor (pnpn) that can be switched from an OFF to an ON state. This is usually done by a voltage or current pulse to the gate terminal. The device will then continue to conduct so long as the principal current of the device flows through the thyristor's two main terminals.

In many respects a thyristor is analogous to an electromechanical latching relay. In fact, thyristors have largely replaced these relays in newer equipment designs. But, misapplications and/or failure to fully understand the parameters of these and other solid state devices often leads to catastrophic field failures.

The terminology shown on this page has been condensed from common industry data books and is intended to be a guide for the engineer.



di/dt: *Critical rate of rise of ON state current* is the user's maximum design limit (Fig. 1).

di_R/dt: *Rate of decay of ON state current* (Fig. 1 & 2).

dv/dt (critical): *Rate of rise of OFF state voltage*. Lowest voltage rate of rise to cause a thyristor to turn ON.

dv/dt (reapplied) : *Rate of rise of reapplied OFF state voltage.*

I_{FSM}: *Nonrepetitive ON state surge current in diodes*. Maximum peak value of ½ cycles (60 Hz) a diode can withstand up to 100 times in its lifetime.

I_{TSM}: *Nonrepetitive ON state surge current in thyristors*. Maximum peak value of 60 Hz cycles a thyristor can withstand up to 100 times in its lifetime.

I_{DRM}/I_{RRM}: *Maximum peak forward/reverse leakage current* at specified temperature and repetitive conditions.

I_{GDM}: *Continuous gate current not to trigger*. Highest dc gate current that will *not* cause thyristor to switch from OFF to ON at a specific temperature.

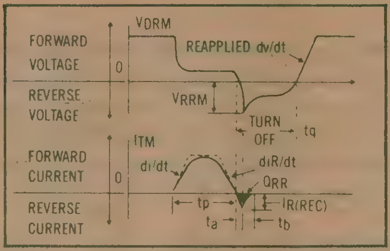


Fig. 1. Concurrent voltage and current waveforms

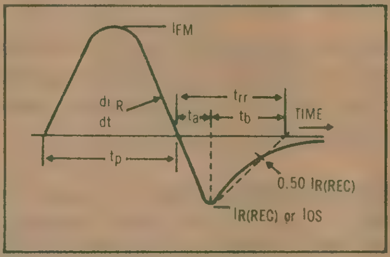


Fig. 2. Recovery current waveform

I_{GT}: *Continuous gate trigger current*. Absolute minimum gate current required to switch thyristor from OFF to ON.

I_H: *Holding Current*. Minimum current required to hold thyristor ON.

I_L: *Latching current*. Minimum current required to hold thyristor ON after removal of gate drive.

$I_{(REC)}$: *Recovery current*. Peak value of reverse current during recovery or turn OFF (Fig. 1 & 2).

I_{OS}: *Overshoot current*. See $I_{R(REC)}$.

I^2t: Maximum ON state, short time thermal capacity of the silicon element for operations less than ½ cycle of 180° conduction angle.

$I_{T(AV)}$: *Average ON state current* (max.)

Q_{RR}: *Reverse recovered charge* (Fig. 1).

$R_{\theta JC}$: *Junction-to-case thermal resistance* in degrees C per watt.

$T_{C(MAX)}$: *Max. allowable case temperature.*

$T_{J(MAX)}$: *Maximum allowable junction temp.*

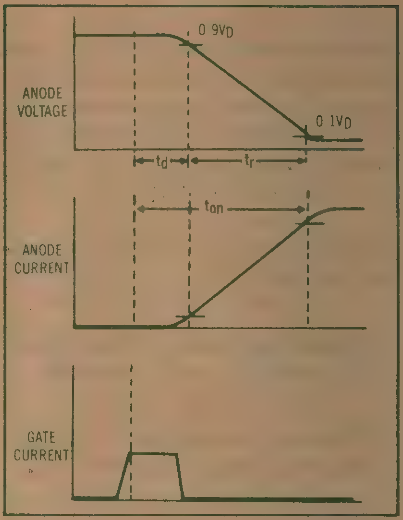


Fig. 3. Turn-on time waveforms

t_d: *Delay time*. Interval between a specified point at beginning of gate pulse and the instant at which the principal voltage drops to a specified value. (OFF-ON) (Fig. 3)

t_{on}: *Turn-on time*. The sum of delay time and rise time. (OFF-ON) (Fig. 3)

t_q: *Turn-off time*. Time between principal current reaching zero and the instant thyristor can block forward voltage without turning ON. (Fig. 1)

t_r: *Rise time*. Time between principal voltage dropping from one value to a second lower value when thyristor turns from OFF to ON. (Fig. 3)

t_{rr}: *Reverse recovery time*. (Fig. 2)

V_{DRM}/V_{RRM}: *Maximum repetitive peak OFF state/reverse voltage* excluding non-repetitive transients.

V_{DSM}/V_{RSM}: *Maximum nonrepetitive peak OFF state/reverse voltage.*

V_{FM}/V_{TM}: *Maximum forward voltage drop* at a specific forward current and case temp.

V_{GDM}: *Gate nontrigger voltage*. Highest dc voltage that will *not* cause thyristor to switch from OFF to ON.

V_{LATCH}: *Latching voltage*. Voltage required for thyristor to latch ON at a given gate current and junction temp.

$V_{TM(DYN)}$: *Dynamic ON state voltage*. Transient ON state voltage of thyristor when triggered into conduction for a given load and time.

84
85 Manufacturers and Sales Offices Directory

Each manufacturer is listed alphabetically with complete address and telephone number of main offices. The names of those with data pages in this edition of EEM are shown in boldface.

Many manufacturers also show TWX and Telex numbers, FSC (Federal Supply Code), other pertinent company data, their sales and/or local distributor offices and phones. The page numbers of their data pages in this edition are shown in all volumes.

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A & D ELEC. INSTRS., 73-07 88th St., Glendale, NY 11385, Tel: 212-275-6516; Empl.: 7

A&M INSTRUMENT, INC., 5 Nassau St., Rockville Centre, NY 11571, Tel: 516-678-6960

AAVID ENGRG., 30 Cook Ct., Laconia, NH 03246, Tel: 603-524-4443, TWX: 510-298-1127; FSC No.: 30161; Empl.: 180; *Sls. Mgr.:* Philip Johnson; *Dist. Mgr.:* Philip Johnson

abacus controls inc.

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TX	Dallas, True Techn.	214-691-7870

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NJ	Fort Lee, Abbott Transistor Labs.	201-461-4411
TX	Richardson, Abbott Transistor Labs.	214-437-0697
VT	S. Burlington, Dynamic Sls.	802-863-6665

ABBOTT TRANSISTOR LABS., Power Supply Div., 5200 W. Jefferson Blvd., Los Angeles, CA 90016, Tel: 213-936-8185, Telex: 69-1398; FSC No.: 15755; Empl.: 500; *Sls. Mgr.:* Fred Silver .... 3•1441-1454

Local Sales Offices & Reps

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MA	Burlington, Dynamic Sls.	617-272-5676
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TX	Richardson, Abbott Transistor Labs.	214-437-0697
VT	S. Burlington, Dynamic Sls.	802-863-6665

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ACC ELECTRONICS, 1300 W. Oak, Independence, KS 67301, Tel: 316-331-1000, Telex: 436483; FSC No.: 316-331-0660; Empl.: 1000; *Sls. Mgr.:* Leon Allen .... **1A**•1643

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ACCUMET ENGRG., 518 Main St., Hudson, MA 01749, Tel: 617-568-8311; *Sls. Mgr.:* J. B. Snook

Local Sales Offices & Reps

CA	Los Altos, Stout Inds.	415-949-0440
CA	Marina Del Rey, R. L. Comps.	213-823-1048
MD	Pasadena, Spectro-Lambda	301-437-7633
NJ	East Windsor, Micro-Lambda	609-443-3113
NY	Chappaqua, Micrel	914-238-4961

ACCUPROBE, INC., 1 Harrison Ave, Box 1044, Salem, MA 01970, Tel: 617-745-7878; Empl.: 18; *Sls. Mgr.:* Dana B. Lee; *Dist. Mgr.:* T. H. Murphy

ACCURASSEMBLY, 9525 Cozycroft Ave., Chatsworth, CA 91311, Tel: 818-700-0708

ACCURATE ELCTRNS., 169 S. Abbe Rd., P.O. Box 1287, Elyria, OH 44036, Tel: 216-365-1211, Telex: 469705; FSC No.: 11375; Empl.: 35

ACCURIDE, Div. Standard Precision, 12311 S. Shoemaker, Santa Fe Springs, CA 90670, Tel: 213-944-0921

ACCUTEST, 25 Industrial Ave., Chelmsford, MA 01824, Tel: 617-256-8124, TWX: 710-347-0620; Empl.: 300; *Sls. Mgr.:* Eldon Scott

ACCUTRONICS/CONNOR-WINFIELD, See Connor-Winfield

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electronics **EMERSON**®

ACDC ELECTRONICS, 401 Jones Rd., Oceanside, CA 92054, Tel: 619-757-1880, TWX: 910-322-1470; Empl.: 750; *Sls. Mgr.:* Warren Ives; *Dist. Mgr.:* Ray Brown .... **3**•1456-1458

Local Sales Offices & Reps

CA	Santa Clara, ACDC Elctrns.	408-727-1626
FL	Tampa, ACDC Elctrns.	813-962-2537
IL	Naperville, ACDC Elctrns.	312-355-8444
IN	Carmel, Tech. Mktg. Corp.	317-844-8462
IN	Fort Wayne, Tech. Mktg. Corp.	219-432-5553
IA	Cedar Rapids, J. R. Sls. Engrg.	319-393-2232
KY	Louisville, Tech. Mktg. Corp.	502-239-2747
MA	Sudbury, ACDC Elctrns.	617-443-9903
MI	Detroit, Rathsburg Assoc.	313-882-1717
NY	East Syracuse, Ossmann Instrs.	315-437-6666
NY	Rochester, Ossmann Instrs.	716-473-5720
NY	Saratoga Springs, Ossmann Instrs.	518-377-8604
NY	Smithtown, ACDC Elctrns.	516-360-3740
NY	Vestal, Ossmann Instrs.	607-785-9947
OH	Dayton, Lyons Corp.	513-278-0714
OH	Highland Hgts., Lyons Corp.	216-461-8288
OH	Westerville, Lyons Corp.	614-890-2743
TX	Austin, ACDC Elctrns.	512-250-1011
TX	Kingwood, Coulomb Elctrns.	713-358-9595

Local Distributors

AZ	Phoenix, R. V. Weatherford	602-272-7144
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Anaheim, R. V. Weatherford	714-634-9600
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Pomona, R. V. Weatherford	213-966-8461
CA	San Diego, R. V. Weatherford	619-695-1700
CA	Santa Barbara, R. V. Weatherford	805-965-8551
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Sunnyvale, R. V. Weatherford	408-738-8694
CA	Torrance, Time Elctrns.	213-320-0880
CO	Englewood, R. V. Weatherford	303-770-9762
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
GA	Atlanta, Milgray Elctrns.	404-393-9666
IN	Carmel, Altex Elctrns.	317-848-1323
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Columbia, Time Elctrns.	301-964-3090
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Woburn, Time Elctrns.	617-935-8080
MI	Livonia, R.S. Elctrns.	313-525-1155
MO	St. Louis, Time Elctrns.	314-391-6444
NY	Freeport, Milgray Elctrns.	516-546-6000
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Rochester, Modutex Corp.	716-424-1620
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Columbus, Hughes-Peters	614-294-5351
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Beaverton, Almac Elctrns.	503-641-9076
PA	Broomall, Time Elctrns.	215-359-1200
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Norvell Elctrns.	713-777-1666
WA	Bellevue, Almac Elctrns.	206-643-9992
WA	Seattle, R. V. Weatherford	206-575-1340
WI	Mequon, Taylor Elec.	414-241-4321

ACD-ELCOR PRODUCTS, P.O. Box 244, Bethel, CT 06801, Tel: 203-743-3510; Empl.: 3

ACHESON COLLOIDS, P.O. Box 288, Port Huron, MI 48060, Tel: 313-984-5581, TWX: 810-231-5265; Empl.: 150; *Sls. Mgr.:* Richard Doehring

A.C. INTERFACE, 2925 College Ave., Costa Mesa, CA 92626, Tel: 714-979-9830, Telex: 655-328; Empl.: 10; *Sls. Mgr.:* P. Marchetti

ACME CHEM. & INSULATION, 166 Chapel St., New Haven, CT 06513, Tel: 203-562-2171; Empl.: 75; *Sls. Mgr.:* Marvin Leonard

ACME ELEC. HEATING CORP., 4685 E. 11th, Hialeah, FL 33013, Tel: 305-685-8326; Empl.: 12

ACME MODEL ENGRG. CO., 654 Bergen Blvd., Ridgefield, NJ 07657, Tel: 201-943-7650; Empl.: 29

ACOPIAN CORP., Box 638, Easton, PA 18042, Tel: 215-258-5441, TWX: 510-651-4919; FSC No.: 14749; *Sls. Mgr.:* T. Skopal .... **3**•1461-1495

Local Sales Offices & Reps

FL	Melbourne, Acopian	305-727-1172
MD	Ellicott City, Doss Elctrns.	301-465-1336

ACOUSTIC POWER SYS., 2151 Las Palmas Dr., Ste. G, Carlsbad, CA 92008, Tel: 619-438-4848, Telex: 67-8401; Empl.: 5

ACQUIS COMMUNICATIONS, 17192 Gillette Ave., Irvine, CA 92714, Tel: 714-545-3732; *Sls. Mgr.:* Patrice Garner

ACRODYNE CONTROLS, See Accudyne Corp.

ACROMAG, 30765 Wixom Rd., Wixom, MI 48096; Tel: 313-624-1541, Telex: 230-505; Empl.: 100; *Sls. Mgr.:* Bill Carey

ACROMARK, 60 Locust/Dept. 397, Berkeley Hgts., NJ 07922, Tel: 201-464-6474; Empl.: 50; *Sls. Mgr.:* W. H. Schmidt

ACTION INSTRS., 8601 Aero Dr., San Diego, CA 92123, Tel: 619-279-5726, TWX: 910-335-2030; Empl.: 260; *Sls. Mgr.:* Frank Williams

ACTIVE CONTROL INSTRMN., P.O. Box 243-Wildwood Circle, Key Largo, FL 33037, Tel: 305-451-1000; FSC No.: 55116; Empl.: 6 .... **3**•1120

AC TRANSFORMER, 89 Madison St., Newark, NJ 07105, Tel: 201-589-8574; Empl.: 13; *Sls. Mgr.:* George Giangrande

ACUREX-AUTODATA, 555 Clyde, Mountain View, CA 94039, Tel: 415-964-3200, Telex: 34-6391, TWX: 910-379-6593; Empl.: 1000; *Sls. Mgr.:* Don Willett

ACUSHNET CAPACITOR CO., INC., 720 Belleville, New Bedford, MA 02741, Tel: 617-999-3291, TWX: 710-344-6451; FSC No.: 61152; Empl.: 300

ACUSHNET ELCTRNS. CO., INC., 8700 E. Thomas Rd., Scottsdale, AZ 85252, Tel: 602-947-7474, TWX: 910-950-1320

ADAC CORP., 70 Tower Office Pk., Woburn, MA 01801, Tel: 617-935-6668, Telex: 951802; Empl.: 80; *Sls. Mgr.:* Les Silvern .... **3**•1143

Local Sales Offices & Reps

AZ	Phoenix, PLS Assocs.	602-246-6614
CA	Los Angeles, ADAC Corp.	213-476-6535
CA	Redwood City, ADAC Corp.	415-366-4300
CO	Englewood, PLS Assocs.	303-799-4260
FL	Orlando, E. G. Holmes & Assocs.	305-894-8901
GA	Chamblee, E. G. Holmes & Assocs.	404-451-6161
IL	Hoffman Estates, Carvel Engrg. & Sls. Co.	312-885-8800
KS	Overland Park, Ramsey Assocs.	913-649-6996
MI	Madison Hgts., WKM Assocs.	313-588-2300
MN	Edina, Carvel Engrg. & Sls. Co.	612-835-7929
MO	St. Louis, Ramsey Assocs.	314-878-5042
NJ	Pennsauken, Sci-Reps	609-662-5222
NM	Albuquerque, PLS Assocs.	505-345-5501
NY	DeWitt, DB Assocs.	315-446-0220
NY	White Plains, Cane Tech Sls.	914-694-9240
NC	Carey, E. G. Holmes & Assocs.	919-469-8850
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OR	Portland, Brett-Ross	503-256-9727
PA	Pittsburgh, WKM Assocs.	412-892-2953
TX	Dallas, SCI Sales	214-931-1487
TX	Houston, SCI Sales	713-224-6128
UT	Midvale, PLS Assocs.	801-566-0671
VA	Fairfax, Sci-Reps	703-385-0600
WA	Redmond, Brett-Ross	206-822-4822
WI	New Berlin, Carvel Engrg. & Sls. Co.	414-784-7007

ADALET-PLM DIV, Div. Scott & Fetzer Co., 4801 W. 150th St., Cleveland, OH 44135, Tel: 216-267-9000, Telex: 98-5349; FSC No.: 73389; Empl.: 177; *Sls. Mgr.:* J. L. Smelko

ADAMS RITE PRODS., INC., 540 W. Chevy Chase Dr., Glendale, CA 91209, Tel: 213-241-5121, TWX: 910-497-2276; Empl.: 130

ADAMS-RUSSELL, Antenna & Microwave Div., Haverhill Rd., Amesbury, MA 01913, Tel: 617-388-5210, TWX: 710-347-6360; Empl.: 300

ADAMS-RUSSELL, Anzac Div., 80 Cambridge St., Burlington, MA 01803, Tel: 671-273-3333, Telex: 200155, TWX: 710-332-0258; FSC No.: 21912; Empl.: 300; *Sls. Mgr.:* Julian D. Parker

ADAMS RUSSELL, Modpak Div., 80 Cambridge St., Burlington, MA 01803, Tel: 617-273-3333, TWX: 710-332-0258; FSC No.: 21912; Empl.: 1; *Sls. Mgr.:* Pat Corrigan

ADAMS-RUSSELL, Parisi Div., 280 Bear Hill Rd., Waltham, MA 02154, Tel: 617-890-0055, TWX: 710-324-6450; FSC No.: 27965; Empl.: 8; *Sls. Mgr.:* J. M. Caputo

ADAPTER/CHARGER PRDTS., Box 3218, Peoria, IL 61614, Tel: 309-691-0810; Empl.: 50

ADAPTIVE INTELLIGENCE, 2944 Scott Blvd., Santa Clara, CA 95050, Tel: 408-970-0777; *Sls. Mgr.:* Jim Breen

ADAPTIVE SCIENCE, 4700 San Pablo Ave., Emeryville, CA 94608, Tel: 415-652-1805; FSC No.: 7379; Empl.: 26; *Sls. Mgr.:* Jesse Huffman

ADATEK, INC., P.O. Box 1339, Sandpoint, ID 83864, Tel: 208-263-1471, 800-323-3343; Empl.: 13; *Sls. Mgr.:* Kim Jones or Ray Pelland; *Dist. Mgr.:* Janis Chilton

ADC MAGNETIC CONTROLS CO., 4900 W. 78th St., Minneapolis, MN 55435, Tel: 612-835-6800, Telex: 290321; Empl.: 2000; *Sls. Mgr.:* Ken Nicholls

ADCOTECH, 1980 Tarob St., Milpitas, CA 95035, Tel: 408-943-9430, TWX: 910-338-2333; Empl.: 82; *Sls. Mgr.:* Bill Sendell

ADC PRODS., 4900 W. 78th St., Minneapolis, MN 55435, Tel: 612-835-6800, TWX: 910-576-2832; Empl.: 1,435

ADDACON, INC., 3708 Alliance Dr., Greensboro, NC 27407, Tel: 919-852-6200, TWX: 510-922-7361; *Sls. Mgr.:* Lynn Cummings

A.D. DATA SYS., 200 Commerce Dr., Rochester, NY 14623, Tel: 716-334-9649, TWX: 510-253-3246; Empl.: 45; *Sls. Mgr.:* Jack Petz

ADDELCO CORP., Advanced Dev. Elctrns. Div., 20 Freeman Pl., Needham, MA 02192, Tel: 617-444-4754, TWX: 710-325-0370; Empl.: 23; *Sls. Mgr.:* C. J. Schmaling; *Dist. Mgr.:* M. B. Polayes

ADDINGTON LABS. INC., SOLID STATE PRODS DIV., See Eaton Corp. Comm. Prods. Div.

ADDITIVE PRODUCTS DIV., Kollmorgen Corp., P.O. Box 700, West La., Aquebogue, NY 11931, Tel: 516-722-4100, TWX: 510-220-0022; Empl.: 450

ADDMASTER CORP., 416 Junipero Serra Dr., San Gabriel, CA 91776, Tel: 213-285-1121, Telex: 67-4770; Empl.: 200; *Sls. Mgr.:* Louis Doshay

ADDRESSOGRAPH FARRINGTON INC., Datatrol Div., Brent Dr., Hudson, MA 01749, Tel: 617-568-1411; Empl.: 350; *Sls. Mgr.:* Tom Galloway

ADE, INC., 1560 E. 98th St., Chicago, IL 60628, Tel: 312-221-3400; FSC No.: 62049

ADEC, 12 Kulick Rd., Fairfield, NJ 07006, Tel: 201-575-1570; FSC No.: 5965; Empl.: 45; *Sls. Mgr.:* D.L. Wiesen

ADI ELECTRONICS, INC., 160 Wilbur Place, Bohemia, NY 11716, Tel: 516-567-3555

ADHESIVE PRODS., 1660 Boone Ave., Bronx, NY 10460, Tel: 212-542-4600; *Sls. Mgr.:* M. S. Peters

ADRET/COMSTRON, See Comstron/Adret

ADTECH POWER INC., 1620 S. Sunkist St., Anaheim, CA 92806, Tel: 714-634-9211, Telex: 68-1498; FSC No.: 56410; Empl.: 70; *Sls. Mgr.:* Fred Weishar; *Dist. Mgr.:* Fred Weishar

ADTEK, Geophysical Survey Sys., Inc., 15 Flagstone Dr., Hudson, NH 03051, Tel: 603-889-4841, Telex: 953038; Empl.: 35; *Sls. Mgr.:* J. V. Rosetta, Jr.

ADVANCE CONVERSION DEVICES CO., 274 S. Salem St., Randolph, NJ 07869, Tel: 201-989-0095; FSC No.: 52298; Empl.: 24; *Sls. Mgr.:* C. C. Applegate .... 3•1824, 1825

ADVANCED AUTOMATION CONCEPTS, INC., 3760 Lower Roswell Rd., Marietta, GA 30067, Tel: 404-973-0027, Telex: 703452; Empl.: 12; *Sls. Mgr.:* Bob Pap

ADVANCED CIRCUITRY, Litton Inds., 4811 W. Kearney, Springfield, MO 65803, Tel: 417-862-0751, TWX: 910-775-4705; Empl.: 1000; *Sls. Mgr.:* Steve Fadler

ADVANCED CIRCUIT TECHNLG., 118 N. Eastern Blvd., Nashua, NH 03062, Tel: 603-880-6000, TWX: 710-228-8961; FSC No.: 57034; Empl.: 125

ADVANCED COATINGS & CHEM., 4343 Temple City Blvd., Temple City, CA 91780, Tel: 818-579-6270, Telex: 675594

ADVANCED COLOR TECHNLG., 21 Alpha Rd., Chelmsford, MA 01824, Tel: 617-256-1222, Telex: 951-419; *Sls. Mgr.:* Jack Flynn

ADVANCED CONTROL SYS., 24 Teed Dr., Randolph, MA 02368, Tel: 617-963-4543; Empl.: 6; *Sls. Mgr.:* Kenneth Egan

ADVANCED DEVICES, 1618 Camino Uva, Los Alamos, NM 87544, Tel: 505-662-7729

ADVANCED ELCTRNS. DESIGN, 440 Potrero Ave., Sunnyvale, CA 94086, Tel: 408-733-3555, Telex: 357-498; *Sls. Mgr.:* Michael J. Long; *Dist. Mgr.:* Randy Fitzpatrick

ADVANCED ELECTRONIC PACKAGING, 2159 Bay St., Los Angeles, CA 90021, Tel: 213-622-9042; *Sls. Mgr.:* Douglas A. Hill

ADVANCED FILTER DEVICES INC., 6241 Yarrow Dr., Ste. D, Carlsbad, CA 92008, Tel: 619-438-2074; FSC No.: 56620; Empl.: 45; *Sls. Mgr.:* Herbert Johnson

ADVANCED HIGH VOLTAGE CO., INC., P.O. Box 2136, Lancaster, CA 93539-2136, Tel: 213-997-7222; *Sls. Mgr.:* J. Richardson

Local Sales Offices & Reps

CA	Mountain View, Energy Devices	415-969-0330
VA	Fairfax, Schibley Assoc.	703-591-3008

ADVANCED INPUT DEVICES, W. 250 A.I.D. Dr., Coeur d'Alene, ID 83814, Tel: 208-765-8000, TWX: 510-776-0584; FSC No.: 95666; Empl.: 550; *Sls. Mgr.:* Peter Wezeman

ADVANCED INTERCONNECTIONS CORP., 5 Division St., Warwick, RI 02818, Tel: 401-885-0485; *Sls. Mgr.:* Max E. Rice .... 2•1102-1104

Local Sales Offices & Reps

AR	Hot Springs, Automation Supplies	501-525-4588
CA	Arcadia, Van Gott & Assoc.	818-445-9728
CA	Rancho San Diego, Van Gott & Assoc.	619-286-3633
CA	Sunnyvale, M2 Mktg. Grp.	408-733-1361
CO	Denver, Control Agency	303-936-6641
FL	Melbourne, EMS, Inc.	305-724-1027
IL	Barrington, Richard Fisk Mktg.	312-381-0653
MD	Pikesville, Imagitron Sls. Co.	301-521-2020
MN	Minneapolis, Electro-Tech Assocs.	612-927-5878
NJ	Avalon, Imagitron Sls. Co.	609-368-5790
NJ	Fairfield, TAM	201-575-4390
NY	Fairport, Net Sales Co.	716-467-4538
NY	So. Hauppauge, TAM	516-348-0800
OH	Akron, B. J. Davis Corp.	216-645-0517
PA	Camphill, Imagitron Sls. Co.	717-763-9577
TX	Carrollton, Paulsen Elect. Sls.	214-386-4785
UT	Salt Lake City, Control Agency	801-972-8788
WA	Lynnwood, The Ransom Co.	206-775-0222

Local Distributors

AZ	Tempe, Elctrn. Hardware, Ltd.	602-967-1691
CA	Belmont, Lo Dan Elctrns., Inc.	415-592-4600; 800-541-1001
CA	No. Hollywood, Elctrn. Hardware, Ltd.	213-982-6100
CA	Santa Clara, Elctrn. Hardware, Ltd.	408-988-1000
CA	Sunnyvale, Sierra West Elctrn. Distrs.	408-747-1188
CO	Aurora, Elctrn. Hardware, Ltd.	303-363-6100
CT	East Haven, J. V. Elctrns. of Boston	203-469-2321
CT	Norwalk, Cobra Comps.	203-847-6442
FL	Palm Bay, Action Elctrns.	305-725-4920
IL	Arlington Heights, Lo Dan Elctrns., Inc.	312-398-5311; 800-323-5207
MD	Gaithersburg, Axis Elctrns. Inc.	301-840-9640
MD	Owings Mills, Cameo Elctrns. Co.	301-363-6161
MA	Burlington, J. V. Elctrns. of Boston	617-273-4300
NJ	Nutley, Vantage Comps., Inc.	201-667-1840
NJ	Whippany, Tonar Inds., Inc.	201-884-1400
NY	Commack, Vantage Comps., Inc.	516-543-2000
NY	Rochester, Masline Elctrns., Inc.	716-546-5373
RI	Warwick, Cal-Greg Comps.	401-738-6170
TX	Austin, Active Comp. Tech.	512-452-5254
TX	Dallas, Active Comp. Tech.	214-980-1888
TX	Houston, Active Comp. Tech.	713-496-4000
UT	No. Salt Lake, Western Controls	801-292-5900
WA	Lynnwood, Oman & Assocs.	206-774-1887

ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, CA 92627, Tel: 714-646-7165; Empl.: 32; *Sls. Mgr.:* R. L. Gradishar

ADVANCED MATERIALS SYSTEMS, See Handy & Harman Electronic Materials Corp.

ADVANCED MICROCOMPUTERS, 3340 Scott Blvd., Santa Clara, CA 95051, Tel: 408-732-2400, Telex: 34-6306, TWX: 910-339-9280; *Sls. Mgr.:* Steve Zelencik; *Dist. Mgr.:* Rick Marz

ADVANCED MICRO DEVICES, P.O. Box 3453, 901 Thompson Pl., Sunnyvale, CA 94088, Tel: 408-732-2400, Telex: 34-6306, TWX: 910-339-9280; Empl.: 11000; *Sls. Mgr.:* Steve Zelencik; *Dist. Mgr.:* Len Brown

ADVANCED SYS. CONCEPTS, 435 N. Lake Ave., Pasadena, CA 91101, Tel: 818-793-8971, Telex: 701 215 ASCI; *Sls. Mgr.:* Wesley Ferris; *Dist. Mgr.:* Laurie Kalnin .... 1B•1501

Local Sales Offices & Reps

IA	Des Moines, Beams Co.	515-255-1148
MN	Edina, Integrated Peripheral Sys.	612-831-0349
OH	Dayton, Ashby Assocs.	513-252-5627
VA	Vienna, Advanced Technlg. Assocs.	703-556-0500

ADVANCED TECHN. RESEARCH LABS., 5645 K General Washington Dr., Alexandria, VA 22312, Tel: 703-750-2920; *Sls. Mgr.:* Bob Palma, Sr.; *Dist. Mgr.:* Bob Palma, Sr.

ADVANCED TECHN. SYS., 17-01 Pollitt Drive, Fair Lawn, NJ 07410, Tel: 201-794-0200, TWX: 710-988-2262; Empl.: 250; *Sls. Mgr.:* R. R. Draudin

ADVANCED TOOL TECHNOLOGY, INC., Sub. of Alliance Resch. Corp., 18217 Parthenia St., Northridge, CA 91325, Tel: 213-993-1202, Telex: 181011; *Sls. Mgr.:* Lou Davis

ADVANCED TRANSFORMERS INDS., INC., 114 Center St., El Segundo, CA 90245, Tel: 213-322-4249; *Sls. Mgr.:* Irma Spreitzer .... 1A•2264, 2265; 1B•1473

ADVANCE ENGRG., 18225 So. Hoover St., Gardena, CA 90248, Tel: 213-321-3100

AD-VANCE MAGNETICS, INC., 625 Monroe St., Rochester, IN 46975, Tel: 219-223-3158, TWX: 810-290-0294; FSC No.: 50788; Empl.: 30; *Sls. Mgr.:* Kay Nixon .... 2•1902

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
CA	El Cajon, A-Tronics	619-444-1501
CA	Los Altos, Frauman Assoc.	415-941-0660
CA	Woodland Hills, A-Tronics	213-703-7212
CT	Meriden, A. Allison	203-237-9232
FL	Orlando, Gillum Sales	305-857-2110
GA	Atlanta, Remco	404-447-6937
IL	Westchester, Brouillette	312-345-6500
NY	Commack, RC Engrg.	516-543-3325
NC	Raleigh, Remco	919-847-5079
OH	Cincinnati, Makin Assocs.	513-871-2424
PA	W. Conshohocken, Eastern Comps.	215-825-8610
TX	Houston, Space Elctns.	713-266-9245
TX	Irving, Space Elctns.	214-251-3636
VA	Herndon, Eastern Comps.	703-471-1025

ADVANCE WIRE & CABLE, 1661 Industrial Way, Belmont, CA 94002, Tel: 415-592-4550, Telex: 334475; FSC No.: 57775; Empl.: 158; *Sls. Mgr.:* Ed Mittelbusher; *Dist. Mgr.:* Ed Mittelbusher

Local Sales Offices & Reps

AL	Decatur, Tenn Tech Inc.	205-350-0630
AZ	Phoenix, Advance Electrical Sls.	602-243-4326
CA	Belmont, Advance Electrical Sls.	415-592-4550
CO	Denver, Advance Electrical Sls.	303-388-0923
FL	Ft. Lauderdale, Hollingsworth & Still	305-748-8964
FL	Winter Pk., Hollingsworth & Still	305-699-0505
GA	Atlanta, Tenn Tech Inc.	404-622-5784
IL	Highland Pk., Bransky Sls.	312-433-2375
KY	Fort Mitchell, G. W. Thelen Co.	606-341-8181
MD	Ellicott City, Marketing Technology	301-465-5944
MA	Sharon, Adcour Inc.	617-784-8123
MN	St. Paul, SKOR Inc.	612-426-1160
NJ	Haddonfield, Mill-Brown Assoc.	609-429-1005
NJ	Parlin, JMR Sls.	201-727-5335
NY	Rochester, Ontec	716-464-8636
NC	Raleigh, Tenn-Tech.	919-266-3610
TN	Nashville, Tenn Tech Inc.	615-646-9811
TX	Houston, Advance Electrical Sls.	713-956-5436
WA	Seattle, Advance Electrical Sls.	206-575-4323
WI	Cedarburg, Bransky Sls.	414-377-6837

A E CORP., 65 Wellesley Ave., Needham, MA 02194, Tel: 617-449-3142; Empl.: 10; *Sls. Mgr.:* H. Harrison

A E G TELEFUNKEN, High Power Grp., Rte. 22, Orr Dr., Somerville, NJ 08876, Tel: 201-722-9800, Telex: 833409; *Sls. Mgr.:* John Szafranski

A E G TELEFUNKEN, Semiconductor Grp., Rte. 22, Somerville, NJ 08876, Tel: 201-722-9800, Telex: 833409; *Sls. Mgr.:* Carl Golasa; *Dist. Mgr.:* Carl Golasa

AEL, INC, See American Electronic Labs

AEMC, 99 Chauncy, Boston, MA 02111, Tel: 617-451-0227, 800-343-1391, Telex: 95-1073; *Sls. Mgr.:* Jon Henderson

AERCOM, 405 Tasman Dr., Sunnyvale, CA 94086, Tel: 408-744-1320, TWX: 910-339-9308; Empl.: 50; *Sls. Mgr.:* H. Putnam

AEROCOM, 3090 S.W. 37th Ave., Miami, FL 33133, Tel: 305-448-6503, Telex: 51-9209; FSC No.: 81535; Empl.: 100; *Sls. Mgr.:* Thomas A. Coleman

AEROFLEX LABS., INTEGRATED MICROSYSTEMS DIV., See Aeroflex Labs., Microelectronics Div.

AEROFLEX LABS., MAGNETIC PRODS. DIV., So. Service Rd., Plainview, NY 11803, Tel: 516-694-6700, TWX: 510-224-6417; Empl.: 490; *Sls. Mgr.:* Herbert S. Kulik .... 1B•1123, 1829

Local Sales Offices & Reps

EXP	New York, Frathom Co.	212-687-9390

AEROFLEX LABS., MICROELCTRNS. DIV., 35 S. Service Rd., Plainview, NY 11803, Tel: 516-694-6700, TWX: 510-224-6417; FSC No.: 88379; Empl.: 100; *Sls. Mgr.:* Melvin D. Schwartz .... 1A•1644

Local Sales Offices & Reps

AZ	Phoenix, The Knight Co.	602-994-1311
CA	Los Altos Hills, HB Mktg.	415-941-4080

CA	Los Angeles, The Knight Co.	213-670-2833
CA	San Diego, The Knight Co.	714-451-0529
CO	Parker, Parker Webster Co.	303-841-4888
CT	Simsbury, Multitronics Sls. Co.	203-651-0140
FL	Altamonte Springs, R. W. Mitscher Co., Inc.	305-788-6844
FL	Boca Raton, R. W. Mitscher Co., Inc.	305-482-5649
IL	Northfield, Feller Assocs., Inc.	312-446-8065
IA	Cedar Rapids, Feller Assocs., Inc.	319-364-0566
MD	Baltimore, Micro Comp, Inc.	301-247-0400
MN	Minneapolis, International Elctrns, Inc.	612-571-0000
NJ	Cherry Hill (Southern N.J.), Danco Elctrn. Sls. Corp.	609-424-5590
NJ	Teaneck (Northern N.J.), Spectrum Sls., Inc.	201-692-8314
NY	Hartsdale, Spectrum Sls, Inc.	914-472-8600
TX	Garland, Tesco Inc.	214-681-1376
UT	Salt Lake City, Parker Webster Co.	801-266-9939
EXP	New York City, New York, Henley & Co.	212-687-9390

AEROSPACE OPTICS INC.

AEROSPACE OPTICS INC., 3201 Sandy La., Dept. E-83, Fort Worth, TX 76112, Tel: 817-451-1141, Telex: 75-8461; Empl.: 83; *Sls. Mgr.:* R. E. Borkowski .... **1B**•1503

AEROTECH, INC., 101 Zeta Dr., Pittsburgh, PA 15238, Tel: 412-963-7470, TWX: 710-795-3125; Empl.: 125; *Sls. Mgr.:* Robert Mitchell

AEROTRONIC ASSOCS., INC., Riverside Dr., Contoocook, NH 03229, Tel: 603-746-4631; FSC No.: 67272; Empl.: 225; *Sls. Mgr.:* Gary Moravchik

AERTECH INDS., See TRW Microwave

AES CORP., 285 Newbury St., P.O. Box 2093, Peabody, MA 01960, Tel: 617-531-8886; *Sls. Mgr.:* Michael Sherman

AETNA ENGRG., P.O. Box 7749, Van Nuys, CA 91409-7749, Tel: 818-341-9409; Empl.: 10; *Sls. Mgr.:* T. W. Collins

AETNA TELECOMMUNICATIONS LABS., P.O. Box 723, 131 Flanders Rd., Westborough, MA 01581, Tel: 617-366-0400, Telex: 951356; *Sls. Mgr.:* Marjorie Katz

AGFA-GEVAERT, INC., 275 North St., Teterboro, NJ 07608, Tel: 201-288-4100, TWX: 710-990-6137; Empl.: 750

AHAM TOR INC (ATI), 999, 27901 Front St., Rahcho California, CA 92390, Tel: 714-676-4151, Telex: 910-332-6201

AIE MAGNETICS, Div. of Vernitron, 701 Murfreesboro Rd., Nashville, TN 37210, Tel: 615-244-9024, Telex: 554466; FSC No.: 06978; Empl.: 300; *Sls. Mgr.:* J. Holeman

Local Sales Offices & Reps

AL	Huntsville, Glen White Assoc.	205-533-5272
CA	Culver City, De Angelo, Rothman & Co.	213-827-2202
CA	Santa Clara, Novatronix	408-727-9530
CO	Thronton, E & C Johnson Co.	303-457-2247
FL	Ft. Lauderdale, Donato & Assoc.	305-352-0727
FL	Tampa, Glen White Assocs.	813-886-6980
GA	Duluth, Glen White Assoc.	404-447-1825
IL	Chicago, M. Gottleib Assoc.	312-775-1151
IN	Indianapolis, Gottleib Assoc.	317-846-5788
IA	Cedar Rapids, Seltec Sales Corp.	319-393-1114
MD	Timonium, Glen White & Assoc.	301-252-6360
MA	Waltham, AIE-Eastern Region	617-899-5900
MI	Livonia, Luebbe Sls. Co.	313-477-3131
MO	Kansas City, A.G.E.S.	816-421-0426
NY	Great Neck, Tylinski Assoc.	516-466-9070
NY	Rochester, Canavan-Scanlon	716-424-1830
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Raleigh, Glen White Assoc.	919-848-1931
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
OH	Cleveland, Luebbe Sls. Co.	216-333-0425
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls. Co.	513-294-0426
OK	Tulsa, MGR, Inc.	918-369-5186
OR	Beaverton, W^3 Associates, Inc.	503-641-5790
PA	Pittsburgh, Luebbe Sales Co.	412-931-0414
PA	Washington Crossing, DVS Co.	215-493-4642
TN	Gray, Glen White Assocs.	615-477-8850
TX	Austin, MGR, Inc.	512-250-0926
TX	Dallas, MGR, Inc.	214-357-3173
VA	Charlottesville, Glen White Assoc.	804-295-0435
VA	Lynchburg, Glen White Assoc.	804-237-6291
WA	Seattle, W^3 Associates, Inc.	206-285-2663

AIKEN ADVANCED SYS., 5901 Edsall Rd., Alexandria, VA 22304, Tel: 703-370-0900, TWX: 710-832-0612; Empl.: 175; *Sls. Mgr.:* C. G. Gilmer

AIL, DIV. CUTLER-HAMMER, See Eaton Corp. AIL Div.

AILTEC DIV. CUTLER-HAMMER, See Eaton Corp., Elctrn. Instrmn. Div.

AIMSCO INC., 4000-4024 22nd Ave. W., Seattle, WA 98199-0056, Tel: 206-284-5563, TWX: 910-444-1333; Empl.: 30; *Sls. Mgr.:* C. Ernst; *Dist. Mgr.:* E. Chadwick

AIPHONE, 1700 130th St. NE, Bellevue, WA 98005, Tel: 206-455-0510, Telex: 32-0288; Empl.: 27; *Sls. Mgr.:* Jim Morrison

AIRBORN, INC., 4321 AirBorn Dr., Addison, TX 75001, Tel: 214-931-3200, Telex: 79-4200, TWX: 910-860-5230; FSC No.: 10400; Empl.: 350; *Sls. Mgr.:* J. L. Wolbrink .... **2**•1105-1112

Local Sales Offices & Reps

AZ	Tempe, Piper Sls. Co.	602-949-0048
CA	Los Angeles, Air Born	213-670-7983
CA	Mountain View, Serra Assocs.	415-964-4300
CA	No. Hollywood, R. A. Strassner	213-761-1231
CA	San Diego, Ohm Spun Elctrns.	619-695-8102
FL	Cocoa Beach, Reynolds & Assoc.	305-259-7000
IL	Chicago, ESCO Assoc.	312-763-0800
MN	Edina, PWC	612-831-5999
MO	Bridgeton, Dytronics, Inc.	314-731-5799
NH	Nashua, Solla - Tronics	603-882-7146
NJ	Manville, Dynorep	201-685-0135
NY	Coxackie, R.P. Kennedy Co.	914-876-2700
NY	Rochester, R.P. Kennedy Co.	716-271-6322
OH	Dayton, Electro-Com	513-898-5140
PA	Doylestown, Monteiro Assocs.	215-345-5855
WA	Bellevue, Dillenbeck Sls.	206-747-4323

Local Distributors

TX	Addison, AirBorn Distribution Service	214-931-3200

AIRCO SPEER ELCTRNS., Resistor Plant, Bolivar Rd., Box 547, Bradford, PA 16701, Tel: 814-362-5536, Telex: 914404, TWX: 510-695-5921; Empl.: 1000; *Sls. Mgr.:* Larry Holzwarth; *Dist. Mgr.:* John Petersen

AIRCRAFT & ELCTRN. SPEC., Box 248, Plainfield, IN 46168, Tel: 317-272-2551; FSC No.: 00529; Empl.: 150; *Sls. Mgr.:* Harry Newburg

AIR ELECTRO SUPPLY, INC., 7700 Gloria Ave., Van Nuys, CA 91406, Tel: 213-873-6400, 818-988-4400, Telex: 66-2459, TWX: 910-495-1794

AIR/FLEX INDS. INC., 2422 Merced Ave., S. El Monte, CA 91733, Tel: 818-579-7060; FSC No.: 22782; *Sls. Mgr.:* Karl Thorp

airflyte ELECTRONICS CO.

AIRFLYTE ELCTRNS. CO., 56 New Hook Rd., Bayonne, NJ 07002, Tel: 201-436-2230; TWX: 710-729-4489; Empl.: 70; *Sls. Mgr.:* John Piret .... **1B**•1124-1129

Local Sales Offices & Reps

CA	Culver City, Westaironics	213-641-4122
CA	Los Altos, Poltronics	415-941-3020
CT	No. Haven, Kitchen & Kutchin	203-239-0212
IL	Park Ridge, Probe Elctrns.	312-698-2044
MA	Lexington, Kitchen & Kutchin	617-862-8230
NJ	Kinnelon, Avionics Equip.	201-838-8105
NY	Rochester, R. P. Kennedy Co.	716-271-6322
PA	Philadelphia, R. P. Luce & Co.	215-884-8365
TX	Dallas, Jacobson Co.	214-363-7584

AIR LAND SYS., 2710 Prosperity Ave., Fairfax, VA 22031, Tel: 703-573-1100, Telex: 710-833-1174, TWX: Airland Frax; Empl.: 35; *Sls. Mgr.:* William C. Axe

AIRMATIC-ALLIED, 185 Park Dr., Wilmington, OH 45177, Tel: 513-382-1691; Empl.: 150

AIR-MAZE DIV., 25000 Miles Rd., Cleveland, OH 44128, Tel: 216-292-6800, Telex: 98-5413; *Sls. Mgr.:* John Cummings; *Dist. Mgr.:* Bob Glasier

AIR-O-TRONICS PRODS., Box K, Morrisville, NY 13408, Tel: 315-684-3705; FSC No.: 16663; Empl.: 10; *Sls. Mgr.:* G. M. Trush

AIRPAX CORPORATION, Woods Rd., Cambridge, MD 21613, Tel: 301-228-4600, Telex: 8-7715, TWX: 710-865-9655; FSC No.: 81541; Empl.: 550; *Sls. Mgr.:* D. Marshall .... **1B**•1256

Local Sales Offices & Reps

AL	Huntsville, BCI	205-539-4411
AZ	Phoenix, Westrep	602-997-8899
CA	Pico Rivera, Westrep	213-949-2551
CA	San Diego, Westrep	714-276-0751
CO	Littleton, Lange Sls.	303-795-3600
CT	Wallingford, Selmark Assocs.	203-573-9088
FL	Ft. Lauderdale, ElectroComp	305-491-4141
GA	Chamblee, BCI	404-455-0405
IL	Palatine, Somers-Reagan, Inc.	312-991-1108
IN	Indianapolis, Leslie M. Devoe	317-842-3245
IA	Marion, Rep Assocs.	319-373-0152
MD	Baltimore, Pro-Rep, Inc.	301-653-3600
MA	Millis, Selmark	617-376-2914
MI	Troy, Pine Sls.	313-589-0350
MN	Hopkins, Peterson & Wolff	612-941-5400
MO	St. Louis, Delltron	314-869-4779
NY	Jericho, Airpax Corp.	516-822-2410
NY	Poughkeepsie, C. W. Floring	914-471-2973
NY	Rochester, Electra Sls.	716-461-5252
NY	Syracuse, C.W. Floring & Assoc.	315-478-2144
NC	Winston-Salem, L.G. White	919-725-3612
OH	Cincinnatti, Baehr, Greenleaf	513-891-3826
OH	Cleveland, Baehr, Greenleaf	216-221-9030
OH	Columbus, Baehr, Greenleaf	614-486-4046
PA	Harleysville, T. Jackson	215-643-5560
PA	Pittsburgh, Russell F. Clark	412-242-9500
SC	Greenville, L.G. White	803-271-0630
TX	Dallas, Airpax Corp.	214-733-4377
UT	Salt Lake City, Lange Sls.	801-487-0843
VA	Richmond, L.G. White	804-740-7093
WA	Seattle, Don Smith	206-633-3160
WI	Wauwatosa, Larsen Assocs.	414-258-0529

AIRPAX CORPORATION, CHESHIRE DIV., Cheshire Indl. Pk., Box E, Cheshire, CT 06410, Tel: 203-272-0301, Telex: 962421, TWX: 710-455-4048; Empl.: 800; *Sls. Mgr.:* Robert Chlebek .... **1B**•1131; **3**•1121

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Phoenix, Westrep	602-997-8899
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Airpax Corp.	408-980-0410
CO	Littleton, Lange Sls.	303-795-3600
CT	Wallingford, Selmark Assocs.	203-573-9088
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
GA	Chamblee, B.C.I.	404-455-0405
IL	Palatine, Somers-Reagan, Inc.	312-991-1108
IN	Indianapolis, Leslie M. Devoe	317-842-3245
IA	Marion, Rep Assocs.	319-373-0152
MD	Baltimore, Pro-Rep, Inc.	301-653-3600
MA	Millis, Selmark Assocs.	617-376-2914
MI	Madison Heights, Pine Sls, Inc.	313-589-0350
MN	Bloomington, PWC	612-831-5999
MO	St. Louis, Delltron	314-869-4779
NH	Hopkinton, Selmark Assocs.	603-746-3299
NY	Jericho, Airpax Corp.	516-822-2410
NY	Rochester, Electra Sls.	716-461-5252
NY	Syracuse, C.W. Floring & Assocs.	315-478-2149
NC	Winston Salem, L.G. White Southern, Inc.	919-725-3612
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OR	Beaverton, Don Smith Sls. Co.	503-643-8020
PA	Harleysville, Thomas Jackson Assocs.	215-256-8877
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
SC	Greenville, L.G. White Southern, Inc.	803-271-0630
TX	Dallas, Airpax Corp.	214-733-4377
UT	Salt Lake City, Lange Sls.	801-487-0843
WA	Seattle, Don Smith Sls Co.	206-633-3160
WI	Wauwatosa, Larson Assocs.	414-258-0529

AIRPAX/NA PHILIPS CONTROLS CORP., Ft. Lauderdale Div., 6801 W. Sunrise Blvd., Ft. Lauderdale, FL 33313, Tel: 305-587-1100, Telex: 51-4448, TWX: 510-955-9866; Empl.: 200 .... **3**•1929

Local Sales Offices & Reps

AZ	Scottsdale, Martech Assoc.	602-994-1285
CA	Buena Park, Pactec	213-921-8381

CA	Mountain View, Manco	415-964-7281
CO	Lafayette, Spectrum Sls.	303-759-4007
CT	Madison, S.I.R. Assoc.	203-245-2242
FL	Ft. Lauderdale, Bredesen Assoc.	305-566-3289
IL	Chicago, Somers Reagan Inc.	312-991-1108
IN	Indianapolis, Electro Dev. Engrg.	317-547-5274
LA	Kenner, D & W System Sls.	504-466-1692
MD	Phoenix, Rebco Sls.	301-592-8907
MA	Lexington, S.I.R. Assoc.	617-862-1812
MI	Detroit, Automatic Controls Co.	313-533-8890
MN	St. Paul, Kencotronics	612-645-7717
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NJ	Spring Lakes Hgts., Neville & Vespo	201-974-1520
NY	Buffalo, Process Mgmt.	716-847-0450
NY	Montgomery, Vespo Mktg.	914-457-9209
NC	Charlotte, MacGuire & Crawford Inc.	704-366-3454
OH	Cincinnati, J. W. Murray & Assoc.	513-574-8500
OH	Cleveland, Automatic Controls Corp.	216-631-0333
OR	Portland, Fry Controls	503-226-2620
PA	Harleysville, T. Jackson & Assocs.	215-643-5560
PA	Pittsburgh, Friday Engrg. Sls.	412-341-1444
TX	Dallas, Automatic Sys.	214-688-1810
TX	Houston, Haltom Co.	713-782-5625
VA	Salem, Process Specialties	703-345-5683
WI	Wauwatosa, Larsen Assocs.	414-258-0529

AIRPAX CORP., FREDERICK DIV., A North American Philips Co., Husky Park P.O. Box 500, Frederick, MD 21701, Tel: 301-663-5141, TWX: 710-862-0901; Empl.: 600; *Sls. Mgr.:* Robert Chlebek; *Dist. Mgr.:* B. L. Reeder ....**1B**•1291, 1793

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Scottsdale, TC Elctrns.	602-994-5153
CA	Brea, Masco	714-529-0866
CA	Los Angeles, Masco	213-295-7781
CA	Santa Clara, Airpax/NAPCC	408-980-0410
CA	Santee, Masco	714-448-6400
CO	Littleton, Lange Sls.	303-795-3600
CT	Cheshire, Selmark Assoc.	203-573-9088
FL	Lauderhill, B.C.I.	305-731-5851
FL	Orlando, B.C.I.	305-851-5747
GA	Doraville, B.C.I.	404-455-0405
IL	Palatine, Somers-Reagan	312-991-1108
IN	Indianapolis, Leslie M. De Voe Co.	317-842-3245
MA	Millis, Selmark Assocs.	617-376-2914
MI	Troy, C.B. Jensen & Assocs.	313-643-0506
MN	St. Paul, Cahill, Schmitz & Cahill	612-646-7217
MO	St. Louis, Delltron Co.	314-869-4779
NH	Concord, Selmark Assocs.	603-623-5774
NJ	Parsippany, NAPCC/Airpax	201-887-6074
NJ	Pitman, Colrud Co.	609-589-5866
NY	Poughkeepsie, C.W. Floring Assocs.	914-471-2973
NY	Rochester, J.G. Welch Assocs.	716-266-2798
NY	Syracuse, C.W. Floring Assocs.	315-478-2149
NC	Raleigh, B.C.I.	919-781-9426
OH	Columbus, Rockford Controls Ohio	614-231-5890
OH	Dayton, Rockford Controls Ohio	513-898-5452
OH	Euclid, Rockford Controls Ohio	216-731-5250
TX	Austin, R.F. Kimball Co.	512-443-5284
TX	Houston, R.F. Kimball Co.	713-840-0590
TX	Richardson, R.F. Kimball Co.	214-231-3447
UT	Salt Lake City, Lange Sls.	801-487-0843
WA	Bellevue, Paul-Hilty Company	206-747-5767
WA	Renton, B&P Assocs.	206-454-6571

Local Distributors

CA	Santa Ana, Norstan Elctrns.	714-540-4165
OK	Tulsa, Altair	918-665-0524
TX	Houston, Altair	713-462-3029
TX	Richardson, Altair	214-231-5166

AIRPOT, 27 Lois St., Norwalk, CT 06851, Tel: 203-846-2021, Telex: 643-688; *Sls. Mgr.:* Mark A. Gaberman

AIRTRON, 200 E. Hanover Ave., Morris Plains, NJ 07950, Tel: 201-539-5500, TWX: 710-986-7473; FSC No.: 80006; Empl.: 350

AIR-VAC ENGRG., 100 Gulf St., Milford, CT 06460, Tel: 203-874-2541; Empl.: 30

AJAX MAGNETHERMIC CORP., 1745 Overland Ave., N.E., Warren, OH 44482, Tel: 216-372-8511, Telex: 098-2482; Empl.: 500

AKG ACOUSTICS, INC., 77 Selleck St., Stamford, CT 06902, Tel: 203-348-2121; Empl.: 40; *Sls. Mgr.:* Peter Wellikoff

Local Sales Offices & Reps

CA	Culver City, Marshank Sls. Co.	213-559-2591
CA	San Francisco, L.P. Mktg.	415-532-5600
CO	Denver, Brake & Assoc.	303-431-5791
DC	Washington, Taub Sls. Inc.	301-942-3100
FL	Miami, World Wide Prods.	305-754-5475
GA	Atlanta, Elrep Sls. Co.	404-938-7108
IL	Chicago, Steffey Mktg.	312-480-3575
IN	Fort Wayne, N. Browning & Co.	219-432-9738
KY	Louisville, N. Browning & Co.	502-955-6473
MA	Boston, VF Sls. Inc.	617-237-6544
MI	Detroit, VF Sls. Inc.	313-453-8720
MN	Minnetonka, Clark Gibb Co.	612-938-5050
MO	Ballwin, Throckmorton Sls.	314-227-7222
MO	Kansas City, Throckmorton Sls.	816-333-0303
NE	Omaha, Throckmorton Sls.	402-346-7500
NY	Stamford, J. B. Anthony Co.	203-322-9209
NY	Syracuse, B. Darmstedter Assoc.	315-638-1261
PA	Erie, N. Browning & Co.	814-456-6453
TX	Dallas, Dimension Mktg.	214-348-9657
TX	Houston, Dimension Mktg.	713-870-9094
WA	Redmond, Luppnow Assoc.	206-883-3205

AKRO-MILS, 1293 S. Main St., Akron, OH 44301, Tel: 216-253-5593, Telex: 98-6321; Empl.: 200; *Sls. Mgr.:* W. J. Tonachio; *Dist. Mgr.:* D. Martin

Local Sales Offices & Reps

CA	Cerritos, Akro-Mils, Inc.	213-926-0465

ALADDIN ELCTRNS., See AIE Div. of Vernitron

ALAN GORDON ENTPRS., INC., P.O. Box 3914, 5362 Cahuenga Blvd., N. Hollywood, CA 91605, Tel: 818-985-5500, Telex: 662532 A-GB FOTO. LSA, TWX: 910-321-4526 GORDON NT LSA; *Sls. Mgr.:* D. Sahlenn

ALAN INDS., P.O. Box 1203, Columbus, IN 47201, Tel: 812-372-8869; FSC No.: 52750; Empl.: 36

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
CA	Los Angeles, RF Assocs.	213-478-1586
CA	Mountain View, Mark V Assoc.	415-964-6275
FL	Bradenton, Saber Assocs.	800-327-0853
FL	Longwood, Saber Assocs.	800-327-0853
FL	Melbourne, Saber Assoc.	800-327-0853
GA	Griffin, Saber Assocs.	800-327-0853
IN	Columbus, Chambers Mktg.	812-372-0272
MD	Randallstown, C. L. Malinow & Co.	301-922-2092
MA	Needham, Addelco Corp.	617-444-4754
MO	St. Louis, Abrams & Assocs.	314-569-0447
NY	Liverpool, R. & D. Assocs.	315-457-0100
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NC	Clayton, Saber Assocs.	800-327-0853
OH	Dayton, Frederic L. Ohmer	513-434-1454
PA	Lafayette Hill, M. Lader Co.	215-825-3177
SC	Columbia, Saber Assoc.	800-327-0853
TX	Dallas, Airep Elctrns.	214-349-4360
TX	Houston, Airep Elctrns.	713-944-2055
EXP	CT, Stamford, Dage Corp.	203-324-3123

ALARM CONTROLS, 19 Brandywine Dr., Deer Park, NY 11729, Tel: 516-586-4220; FSC No.: 55042; Empl.: 50; *Sls. Mgr.:* Howard Berger

ALBAR, INC., 19013 36th Ave. W., Lynnwood, WA 98036, Tel: 206-771-4006; *Sls. Mgr.:* Ronald B. Bradshaw

ALBEROX, New Bedford Ind'l. Pk., New Bedford, MA 02745, Tel: 617-995-1725; Empl.: 140 ....**2**•1787

Local Sales Offices & Reps

CA	Los Gatos, Alberox Corp.	408-358-1714
IL	Chicago, Karl D. Engle Co.	312-539-1820
IN	Indianapolis, Butler Components	317-253-5143
MA	Weston, J. Goode Assocs.	617-235-3900
MI	Birmingham, Clifford Armstrong Co.	313-851-1404
MN	Minneapolis, Magner & Assocs.	612-483-0656
NY	Fayetteville, S. F. Foster Co.	315-637-5427
NY	Valley Stream, Levison Sls.	516-561-9696
OH	Cleveland, Greenleaf & Assocs.	216-333-5480
PA	Philadelphia, Shelton Sls. Corp.	215-248-0131
TX	Dallas, C. M. Farmer Co., Inc.	214-339-4970
WA	Seattle, Demarest Assocs.	206-523-3210

ALCO ELCTRN. PRODS., INC., 1551 Osgood St., N. Andover, MA 01845, Tel: 617-685-4371, TWX: 710-342-0552; Empl.: 300 .... **1B**•1029, 1504-1514; **2**•1758; **3**•1122

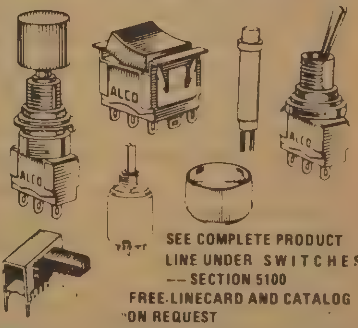
Local Sales Offices & Reps

AL	Huntsville, Glen White Assocs. Inc.	205-883-7938
AZ	Phoenix, Knight Co.	602-582-8506
CA	Los Angeles, Knight Co.	213-670-2833
CA	Redwood City, J. Heaton Co.	415-367-9000
CA	San Diego, Knight Co.	619-571-7903
CO	Littleton, Simpson & Assocs.	303-794-8381
FL	Safety Harbor, Augat/ALCO	813-725-1037
FL	Tamarac, Augat/ALCO	305-721-6021
GA	Norcross, Glen White Assocs. Inc.	404-441-1447
IN	Indianapolis, Rockford Controls	317-248-2518
MA	Norwood, Augat Sls.	617-762-3164
MI	Livonia, Luebbe Sls. Co.	313-477-3131
MN	St. Paul, Countryman Assocs.	612-645-9151
MO	Blue Springs, Kathrinus-Kelly-Baumhauer-Co.	816-229-0001
MO	St. Louis, Kathrinus-Kelly-Baumhauer-Co.	314-647-2400
NM	Albuquerque, C. T. Carlberg & Assoc.	505-888-3883
NY	E. Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Endwell, Tri-Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Fishkill, Tri-Tech Elctrns.	914-897-5611
NY	Great Neck, Cooper-Simon & Co. Inc.	516-487-1142
NC	Raleigh, Glen White Assocs. Inc.	919-787-7023
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
OH	Cleveland, Luebbe Sls. Co.	216-333-0425
OH	Columbus, Luebbe Sls. Co.	614-431-0474
OH	Dayton, Luebbe Sls. Co.	513-294-0426
OR	Beaverton, D. Smith Sls. Co.	503-643-8020
PA	Pittsburgh, Luebbe Sls. Co.	412-931-0414
PA	Trevose, P.S.A., Inc.	215-245-0513
TN	Gray, Glen White Assocs. Inc.	615-477-8850
TX	Dallas, Augat/ALCO	214-788-4211
TX	Georgetown, Augat/ALCO	512-479-9447
TX	Houston, Augat/ALCO	713-495-3100
UT	Midvale, Simpson Assocs. Inc.	801-566-3691
VA	Lynchburg, P.S.A. Inc.	800-233-4242
VA	McLean, P.S.A. Inc.	800-233-4242
WA	Seattle, D. Smith Sls. Co.	206-633-3160

Local Distributors

AL	Huntsville, Hall-Mark Elexs.	205-837-8700
AL	Huntsville, Arrow Elctrns.	205-882-2730
AZ	Phoenix, Hall-Mark Elexs.	602-437-1200
AZ	Phoenix, Kachina Elctrns.	602-269-6201
AZ	Tempe, Acacia Sls.	602-894-2874
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Burbank, Switching Devices	213-849-3211
CA	Chatsworth, Arrow Elexs.	213-701-7500
CA	Gardena, CA Switch & Signal	213-770-2330
CA	Hollywood, Yale Radio Electric	213-465-3186
CA	Irvine, Acacia Sales	714-660-0834
CA	Los Angeles, Electric Switch	213-664-1141
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Newport Beach, Arrow Elexs.	714-851-8961

ALCO
ELECTRONIC PRODUCTS, INC
FULL LINE
AUTHORIZED DISTRIBUTOR
E S I
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Drive, Los Angeles, Calif. 90039
(213) 660-1310
TOLL FREE WATS
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



SEE COMPLETE PRODUCT LINE UNDER SWITCHES -- SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Dow Radio	213-793-1195
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	San Diego, Arrow Elexs.	619-565-4800
CA	San Diego, Hall-Mark Elexs.	619-268-1201
CA	San Diego, Acacia Sls.	619-565-4365
CA	San Diego, El-Com Inc.	619-578-0900
CA	San Francisco, Steven Engrg.	415-588-9200
CA	San Jose, Ratel Inc.	408-946-4300
CA	San Jose, Hall-Mark Elexs.	408-946-0900
CA	Santee, Mouser Elexs.	619-449-2300
CA	Sunnyvale, Arrow Elexs.	408-745-6600
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Van Nuys, Pacific Switch Controls	213-873-4802
CO	Denver, Arrow Elexs.	303-758-2100
CO	Denver, Ragon Elexs.	303-744-1992
CO	Englewood, Hall-Mark Elexs.	303-694-1662
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Greenwich, Wise Comps.	203-531-4880
CT	Hartford, Wes-Garde	203-525-6907
CT	Stratford, Utronics	203-378-4201
CT	W. Hartford, Atlantic Switch Controls	203-527-7705
CT	Wallingford, Arrow Elexs.	203-265-7741
FL	Ft. Lauderdale, Arrow Elexs.	305-776-7790
FL	Ft. Lauderdale, Hall-Mark Elexs.	305-971-9280
FL	Lakeland, Switch Controls	813-644-7564
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Orlando, Hall-Mark Elexs.	305-855-4020
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Palm Bay, Arrow Elexs.	305-725-1480
FL	Pompano Beach, Components South	305-971-0350
GA	Norcross, Hall-Mark Elexs.	404-447-8000
GA	Norcross, Arrow Elexs.	404-449-8252
IL	Arlington Heights, Lo Dan Elctrns.	312-398-5311
IL	Bensenville, Diplomat/Illinois	312-595-1000
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Glen Ellyn, Rockford Controls Co.	312-469-6016
IL	Itasca, Voyager Elexs. Corp.	312-773-4900
IL	Palatine, OHM Elexs.	312-359-5500
IL	Rockford, Midwest Assocs. Inc.	815-962-8036
IL	Rosemont, Advent Elctrns.	312-298-4210
IL	Schaumberg, Arrow Elexs.	312-397-3440
IL	Wheaton, Conectrix	312-653-1460
IN	Indianapolis, Neunier Elex. Supply	317-635-3511
IN	Indianapolis, Arrow Elexs.	317-243-9353
IN	Indianapolis, Graham Elexs.	317-634-8202
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Deeco Inc.	319-365-7551
IA	Cedar Rapids, Arrow Elexs.	319-395-7230
KS	Lenexa, Hall-Mark Elexs Corp.	913-888-4747
KS	Witchita, Lee Products	316-264-2172
MD	Baltimore, Arrow Elexs	301-247-5400
MD	Baltimore, A. S. I.	301-265-5100
MD	Gaithersburg, Pioneer Wash.	301-921-0660
MD	Kensington, Marine Air Supp.	301-949-9560
MD	Rockville, Arrow Elexs	301-251-0644
MA	Burlington, Heilind Elexs	617-272-5610
MA	Canton, Impact Sls.	617-821-1500
MA	Canton, H. Young Jr. Co.	617-828-4880
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Lynn, Land Elctrns.	617-592-2220
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Woburn, Arrow Elexs	617-933-8130
MA	Woburn, CNC	617-933-5017
MI	Ann Arbor, Arrow Elexs	313-971-8220
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Rapids, Arrow Elexs	616-243-0912
MI	Zeeland, Tubergen & Assocs. Inc.	616-772-1548
MN	Edina, Arrow Elexs	612-830-1800
MN	Minneapolis, Newark Elexs	612-331-6350
MN	St. Paul, Ragon	612-642-2828
MO	Kansas City, Walter's Radio Supply	816-531-7015
MO	Maryland Heights, Hall-Mark Elexs.	314-291-5350
MO	St. Louis, Van Sickle Elexs.	314-621-5000
MO	St. Louis, Arrow Elexs.	314-426-4500
MO	St. Louis, Olive Elctrn. Supp.	314-426-4500
NH	Manchester, Arrow Elexs.	603-668-6968
NJ	Bellmawr, Mid Atlantic Elctrns.	609-931-5303
NJ	Camden, General Radio	609-961-8560
NJ	Clifton, J-Mar Elexs. Inc.	201-772-6400
NJ	E. Marlton, Arrow Elexs.	609-596-8000
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Mt. Laurel, Jerseyswitch	609-778-8190
NJ	Springfield, Federated Purchaser	201-272-0505
NM	Albuquerque, Walker Elex. Sup.	505-242-2288
NM	Albuquerque, Arrow Elexs.	505-243-4566
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, Arrow Elctrns.	516-293-4020
NY	Hauppauge, Broadline Elexs.	516-231-4100
NY	Hauppauge, Arrow Elexs.	516-231-1000
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Liverpool, Arrow Elexs.	315-652-1000
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Melville, Arrow Elexs.	516-694-6800
NY	Rochester, Arrow Elexs.	716-275-0300
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Vestal, Pioneer/Harvey	607-748-8211
NC	Raleigh, Hall-Mark Elex. Inc.	919-722-9131
NC	Raleigh, Arrow Elexs.	919-725-8711
NC	Winston-Salem, Arrow Elexs.	919-725-8711
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Centerville, Arrow Elexs.	513-435-5563
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Pruitt Energy Sources Inc.	216-566-1545
OH	Columbus, Ohioswitch	614-885-0319
OH	Columbus, Arrow Elexs.	614-885-8362
OH	Columbus, Hughes-Peter	614-294-5351
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Solon, Arrow Elexs.	216-248-3990
OK	Tulsa, Arrow Elexs.	918-665-7700
OK	Tulsa, Hall-Mark Elexs.	918-665-3200
OR	Beaverton, Component Resources Inc.	503-641-8188
OR	Beaverton, Acacia Sales	503-646-3377
PA	Allentown, A.A. Peters	215-434-5237
PA	Braddock, Leff Elexs.	412-351-5000
PA	McKean, Advacom	814-476-7774
PA	Monroeville, Arrow Elexs.	412-856-7000
PA	Norristown, Century Elctrns.	215-631-5400
PA	Philadelphia, Philadelphia Elexs.	215-568-7400
PA	Philadelphia, Almo Elctrns.	215-698-4000
TN	Knoxville, Indl. Elctrns.	615-573-7135
TX	Austin, Arrow Elexs.	512-835-4180
TX	Austin, Hall-Mark Elex. Corp.	512-258-8848
TX	Dallas, Hall-Mark Elex. Corp.	214-341-1147
TX	Dallas, Arrow Elexs.	214-386-7500
TX	Dallas, Texaswitch	214-357-1768
TX	El Paso, Ideal Industrial Elexs.	915-779-6643
TX	Garland, Newark Elexs.	214-494-5911
TX	Houston, Hall-Mark Elexs. Corp.	713-781-6100
TX	Midland, E.S.I.	915-694-9657
TX	Stafford, Arrow Elexs.	713-491-4100
TX	Stafford, Southwest Elctrns.	713-240-4000
UT	Salt Lake City, Arrow Elexs.	801-539-1135
UT	Salt Lake City, Standard Supply	801-486-3371
VA	Arlington, Arrow Elexs.	804-282-0413
VA	Arlington, Arlington Elctrns.	703-524-2412
WA	Bellevue, Arrow Elexs.	206-643-4800
WA	Bellevue, Almac/Stroum Elctrns.	206-643-9992
WA	Seattle, Zepher Elctrns.	206-241-1980
WI	Madison, Arrow Elexs.	608-273-4977
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Oak Creek, Arrow Elexs.	414-764-6600

ALCOSWITCH, See Alco Elctrn. Prods., Inc.

ALDEN COMPUTER SYSTEMS, 27 Strathmore Rd., Natick, MA 01760, Tel: 617-655-6610; *Sls. Mgr.:* Bob Whitten

ALDEN ELCTRNS. INC., Washington St., Westboro, MA 01581, Tel: 617-366-8851, Telex: 94-8404; Empl.: 125; *Sls. Mgr.:* L. A. Farrington

ALDEN

ALDEN PRODUCTS CO., P.O. Box 860, 117 N. Main St., Brockton, MA 02403, Tel: 617-583-0160, Telex: 92-4451; FSC No.: 01009; Empl.: 135; *Sls. Mgr.:* Donald J. Paul .... **2**•1113-1119

Local Sales Offices & Reps

CA	Tarzana, High Voltage Sales	213-881-9194

ALDEN SYS., 262 N. Main St., P.O. Box 860, Brockton, MA 02403, Tel: 617-583-0160, Telex: 92-4451; Empl.: 5; *Sls. Mgr.:* G. Morrison

A.L. DESIGN INC., 2070 Niagara Falls Blvd., Tonawanda, NY 14150, Tel: 716-692-6272; Empl.: 9

ALESSI INDS., INC., 3195-C Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-979-8912, TWX: 910-595-1528; *Sls. Mgr.:* Tim McFadden

ALFORD MFG. CO., P.O. Box 2116, 32 Sixth Rd., Woburn, MA 01888, Tel: 617-935-8610, TWX: 710-348-1063; FSC No.: 07177; Empl.: 30; *Sls. Mgr.:* Fred Abel

ALGO, INC., 9451 Sohap Lane, Columbia, MD 21045, Tel: 301-730-7442; *Sls. Mgr.:* C.W. "Chuck" Alexander

Local Sales Offices & Reps

AL	Huntsville, Ram-Z Assoc. Inc.	205-532-7808
CA	Novato, Ed Driscoll Assoc.	415-883-0353
FL	Sarasota, Ram-Z Assoc.	813-921-5561
GA	Atlanta, Ram-Z Assoc.	404-898-9091
IL	Park Ridge, Adtech Inc.	312-692-7320
MA	Framingham, J.M. Lancaster Assoc.	617-875-8893
MO	Grandview, Digital Sys. Sls.	316-685-9725
NJ	Englewood Cliffs, Sci. Dvs. East	201-871-3916
OH	Chesterland, EQS, Sys. Inc.	216-729-2222
TX	Houston, Knox Mktg.	713-780-2516
VA	Alexandria, Dyna-Repco	703-354-1222
WA	Bellevue, Gerry Mara Assoc.	206-614-3535

ALINABAL, 28 Woodmont Rd., Milford, CT 06460, Tel: 203-877-3241, TWX: 710-462-1178; Empl.: 255

ALLACO PRODS. DIV., 192 Pleasant St., Watertown, MA 02172-2399, Tel: 617-926-2550, TWX: 710-327-6518; FSC No.: 99098; Empl.: 23; *Sls. Mgr.:* R.S. Cass

ALLEN AVIONICS, INC.

ALLEN AVIONICS, 224 E. 2nd St., Mineola, NY 11501, Tel: 516-248-8080 .... **1A**•1446-1449, 1578-1583, 2124

Local Sales Offices & Reps

AZ	Tempe, J. F. Hurlbut Co.	602-968-5962
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Palo Alto, Adtek Assocs.	415-323-5414
CA	San Diego, Van Gott & Assocs.	619-272-8452
CO	Golden, J. F. Hurlbut Co.	303-279-7796
FL	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
FL	Melbourne, Reynolds & Assocs.	305-259-7000
FL	St. Petersburg, Reynolds & Assocs.	813-360-1484
GA	Atlanta, Reynolds & Assocs.	404-393-9113
MA	Wayland, High-Tech Sls.	617-653-3838
MN	Anoka, Ken Haugen & Assocs.	612-421-3395
MO	Independence, Engrg. Svcs. Co.	816-254-3600
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	Bloomingdale, Eastern Metro Assocs.	201-492-1747
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NY	Rochester, J. G. Welch Assocs.	716-244-1100
NY	Utica, J. G. Welch Assocs.	315-736-7821
OR	Portland, Components West	503-643-5588
PA	Huntingdon Valley, Rabal Assocs.	215-947-4825
TX	Dallas, Bradenco Corp.	214-243-7261
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
VA	Alexandria, Vanguard Engrg. Sls.	703-768-1660
WA	Redmond, Components West	206-885-5880
EXP	CT, Stamford, Dage Corp.	203-324-3123

A-B ALLEN-BRADLEY

ALLEN-BRADLEY CO., 1201 S. Second St., Milwaukee, WI 53204, Tel: 414-671-2000, TWX: 910-262-3451; Empl.: 6500; *Sls. Mgr.:* C. Grimsley; *Dist. Mgr.:* Dale Van Scoyk .... **1A**•1788, 1792-1802, 2019-2021, 2088, 2089; **2**•1788-1791

Local Sales Offices & Reps

AL	Birmingham, A-B Co.	205-879-4641
AK	Anchorage, J. A. Tudor & Assoc.	907-243-4641
AZ	Scottsdale, A-B Co.	602-994-9547
AR	Little Rock, C. H. Stout Inc.	501-372-2555
CA	City of Commerce, A-B Co.	213-724-5713
CA	S. San Francisco, A-B Co.	415-871-0200
CA	San Diego, A-B Co.	619-292-4016
CO	Denver, A-B Co.	303-985-8787
CT	Stratford, A-B Co.	203-378-7364
FL	Ft. Lauderdale, A-B Co.	305-771-0400
FL	Jacksonville, Van & Smith Co.	904-384-2376
FL	Orlando, Van & Smith Co.	305-898-8520
FL	Tampa, Van & Smith Co.	813-877-8393
GA	Doraville, A-B Co.	404-455-7422
HI	Honolulu, J. M. Elec. Sls.	808-833-1744
IL	Chicago, A-B Co.	312-922-9302
IL	Rockford, A-B Co.	815-965-8795
IN	Fort Wayne, A-B Co.	219-432-9538
IN	Indianapolis, A-B Co.	317-293-5223
IN	Merrillville, A-B Co.	219-769-7770
IA	Bettendorf, A-B Co.	319-355-5316
KS	Wichita, A-B Co.	316-686-9631
KY	Louisville, A-B Co.	502-893-2571
LA	Baton Rouge, A-B Co.	504-927-5955
LA	Metairie, A-B Co.	504-888-2281
LA	Shreveport, C. H. Stout	318-221-5555
ME	Portland, A-B Co.	207-772-3555
MD	Baltimore, A-B Co.	301-265-5600
MA	Agawam, A-B Co.	413-785-1984
MA	Framingham, A-B Co.	617-879-5900
MI	Flint, A-B Co.	313-733-3560
MI	Grand Rapids, A-B Co.	616-455-2250
MI	Kalamazoo, A-B Co.	616-344-6163

MI	Lansing, A-B Co.	517-351-4560
MI	Madison Heights, A-B Co.	313-583-9400
MN	Minneapolis, A-B Co.	612-781-3406
MS	Jackson, A-B Co.	601-981-4191
MO	Kansas City, A-B Co.	816-421-4595
MO	Maryland Heights, A-B Co.	314-567-6326
NE	Omaha, A-B Co.	402-592-2010
NJ	Bloomfield, A-B Co.	201-338-4600
NM	Albuquerque, A-B Co.	505-265-7723
NY	Albany, A-B Co.	518-869-5373
NY	Buffalo, A-B Co.	716-634-2711
NY	Rochester, A-B Co.	716-461-3660
NY	Syracuse, A-B Co.	315-463-4501
NC	Charlotte, A-B Co.	704-394-9341
NC	Greensboro, A-B Co.	919-272-5870
OH	Akron, A-B Co.	216-253-2106
OH	Cincinnati, A-B Co.	513-793-7580
OH	Cleveland, A-B Co.	216-442-0000
OH	Columbus, A-B Co.	614-882-7722
OH	Dayton, A-B Co.	513-294-4466
OH	Toledo, A-B Co.	419-841-7726
OK	Tulsa, J. W. Elder Co.	918-583-9149
OR	Eugene, J. A. Tudor & Assoc.	503-686-1252
OR	Portland, J. A. Tudor & Assoc.	503-288-5154
PA	Allentown, A-B Co.	215-437-2401
PA	Erie, A-B Co.	814-868-8214
PA	King of Prussia, A-B Co.	215-337-1990
PA	Pittsburgh, A-B Co.	412-923-1844
PA	York, A-B Co.	717-848-2239
SC	Greenville, A-B Co.	803-235-1280
TN	Knoxville, A-B Co.	615-588-0591
TN	Memphis, C. H. Stout	901-362-1616
TN	Nashville, A-B Co.	615-834-1860
TX	Dallas, A-B Co.	214-243-3665
TX	Houston, A-B Co.	713-445-8474
TX	San Antonio, A-B Co.	512-732-4362
UT	Salt Lake City, Stevens Sls. Co.	801-487-8971
VA	Richmond, A-B Co.	804-282-4285
WA	Pasco, J. A. Tudor & Assoc.	509-547-8414
WA	Seattle, J. A. Tudor & Assoc.	206-682-7444
WA	Spokane, J. A. Tudor & Assoc.	509-327-3328
WV	Charleston, S. C. Payne	304-755-8193
WI	Appleton, A-B Co.	414-731-3202

ALLEN CO., INC., ROBERT G., 7267 Coldwater Canyon, N. Hollywood, CA 91605, Tel: 818-765-8300, Telex: 18-2699; *Sls. Mgr.:* Carl M. Witas

ALLEN DATAGRAPH, INC., 24 Keewaydin Dr., Salem, NH 03079, Tel: 603-893-1983, TWX: 710-366-0504; *Sls. Mgr.:* David Colinan

ALLEN MFG., 22 E. Dudley Town Rd., Bloomfield, CT 06002, Tel: 203-242-8511, Telex: 710-425-0099; Empl.: 420; *Sls. Mgr.:* M. Kubick; *Dist. Mgr.:* M. Kubick

ALLIED CORP. AEROSPACE SECTOR, Bendix Communications Div., East Joppa Rd., Towson, MD 21204, Tel: 301-583-4000, TWX: 710-232-1823; Empl.: 1350; *Sls. Mgr.:* Palmer H. Arnold

ALLIED SYSTEMS CORP., Box 18077, Greensboro, NC 27419, Tel: 919-299-2294; Empl.: 25; *Sls. Mgr.:* E. V. Saude ... 2•1874

Local Sales Offices & Reps

CA	Seal Beach, Texel Engr. Sls. Rep.	213-596-9411
NY	New Hook, R. P. Kennedy Co.	914-876-2700
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NC	Bladenboro, Everette Bolte	919-294-4141
VA	Arlington, H. J. Heffernan Co.	703-522-6666

ALLMETAL SCREW PRODUCTS CO., INC., 821 Stewart Ave., Garden City, NY 11530, Tel: 516-222-1200, TWX: 510-222-8132; Empl.: 200; *Sls. Mgr.:* Fred C. Sidebotham

ALL-STATES, INC., 1801 W. Foster Ave., Chicago, IL 60640, Tel: 312-728-0525; FSC No.: 26863; *Sls. Mgr.:* E. B. Phillips; *Dist. Mgr.:* E. B. Phillips

ALLTECH ASSOCS. INC., Applied Science Labs., 2051 Waukegan Rd., Deerfield, IL 60015, Tel: 312-948-8600, Telex: 687-1132; FSC No.: 36-2696920; *Sls. Mgr.:* Pat Krebs

ALMOND INSTRUMENTS, See EG & G Almond Instruments

ALMOR CO., INC., PO Box 1790, 155 Crescent St., Brockton, MA 02403, Tel: 617-586-5406; *Sls. Mgr.:* Bill Wolfreys

ALPHA COMPS., 115 Eucalyptus Dr., El Segundo, CA 90245, Tel: 213-322-7780; Empl.: 12

ALPHA COMPS., 1106 E. Simpson Rd., Mechanicsburg, PA 17055, Tel: 717-697-8595, TWX: 510-650-4930; FSC No.: 52748

Local Sales Offices & Reps

CO	Boulder, Herb Bass Assocs.	303-499-7509
MD	Towson, Dickison Sls. Co.	301-823-0923
NY	Rochester, H. C. Johnson Agencies	716-586-8777

ALPHA INDS., INC.-MICROELECTRONIC DIV., 3015 Advance Lane, Colmar, PA 18915, Tel: 215-822-1311, TWX: 510-661-7370; FSC No.: 17540; *Sls. Mgr.:* Joe Diesso

ALPHA INDS., INC., Microwave Comp. Div., 90 Glenn St., Lawrence, MA 01843, Tel: 617-681-8520, Telex: 949436, TWX: 710-342-8033; FSC No.: 17540; *Sls. Mgr.:* Frank Tarr

ALPHA INDS., INC.-MSD DIV., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; *Sls. Mgr.:* Peter K. Butler; *Dist. Mgr.:* Nicholas Bishop

ALPHA INDS., INC., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; Empl.: 1200

ALPHA INDS., INC. - TRG MILLIMETER COMP., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; *Sls. Mgr.:* Peter K. Butler; *Dist. Mgr.:* Nicholas Bishop

ALPHA-M CORP., 3009 Wildflower Dr., Dallas, TX 75229, Tel: 214-620-0021; Empl.: 8; *Sls. Mgr.:* W. L. Cowley

ALPHA MERICS CORP., 20931 Nordhoff St., Chatsworth, CA 91311, Tel: 213-709-1155, Telex: 182314, TWX: ALPHA-MER-CHCA 910-494-1931; *Sls. Mgr.:* Geoffrey Groom; *Dist. Mgr.:* Geoffrey Groom

ALPHA METALS, 600 Rte 440, Jersey City, NJ 07304, Tel: 201-434-6778, Telex: 12-5798; Empl.: 400; *Sls. Mgr.:* D. Zerfoss

ALPHA PRODUCTS, INC., 5740 Corsa Ave. #104, Westlake Village, CA 91362, Tel: 818-889-9304

ALPHA WIRE CORP., 711 Lidgerwood Ave., P.O. Box 711, Elizabeth, NJ 07207, Tel: 201-925-8000, Telex: 6853017, TWX: 710-996-5895; Empl.: 450; *Sls. Mgr.:* Paul Dietlian ... 2•1940, 1941

ALPS ELECTRIC (USA), INC., 3553 N. First St., San Jose, CA 95131, Tel: 408-946-6000, Telex: 157061; Empl.: 21 ... 3•1068

Local Sales Offices & Reps

AL	Huntsville, Jack Harvey & Assocs.	205-536-4414
AZ	Phoenix, Eltron	602-266-2164
CA	Garden Grove, West Electronic Sls. Co.	714-829-0120
CA	San Diego, Harvey King, Inc.	619-566-5252
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Englewood, Nelligan Co.	303-761-2121
CT	Yalesville, Technology Sls.	203-269-8853
FL	Clearwater, Jack Harvey & Assocs.	813-725-1841
FL	Ft. Lauderdale, Jack Harvey & Assocs.	305-763-1945
GA	Norcross, Jack Harvey & Assocs.	404-449-4643
IL	Arlington Hgts., Micro Sls.	312-956-1000
IN	Indianapolis, Jack Harvey & Assocs.	317-872-1031
IN	Indianapolis, Alps Elec. (USA)	317-248-2577
IN	Kokomo, Jack Harvey & Assocs.	317-453-4260
KS	Kansas City, BC Electronic Sls.	913-342-1211
KS	Wichita, BC Elctrn. Sls.	316-942-9840
KY	Prospect, Jack Harvey & Assocs.	502-228-4100
MD	Baltimore, Burgin-Kreh Assocs., Inc.	301-265-8500
MA	Waltham, Technology Sls.	617-647-5700
MI	Oak Park, A. Blumenberg Assoc.	313-968-3230
MN	Minneapolis, PSI	612-944-8545
MO	St. Louis, BC Elec. Sls.	314-291-1101
NJ	Boonton, PAF Assoc.	201-335-0680
NY	Albany, Reagan/Compar Albany	518-489-4777
NY	Endwell, Reagan/Compar	607-723-8743
NY	Fairport, Reagan/Compar	716-271-2230
NY	New Hartford, Reagan/Compar	315-732-3775
NY	Rockville Centre, Alps Elec. (USA)	516-766-3636
NY	Smithtown, PAF Assocs.	516-360-0940
NC	Greensboro, Wallace Elctrn. Sls.	919-996-2742
OH	Rocky River, Norm Case Assocs.	216-333-0400
OK	Tulsa, Norcom	918-832-7747
OR	Aloha, Venture Elctrns.	503-642-9090
PA	Willow Grove, Harry Nash Assocs.	215-657-2213
TN	Johnson City, Jack Harvey & Assocs.	615-928-7588
TX	Austin, Norcom	512-451-2757
TX	Dallas, Norcom	214-386-4888
TX	Houston, Norcom	713-778-0392
UT	Salt Lake City, Nelligan Co.	802-261-1121
VA	Lynchburg, Burgin-Kreh Assocs., Inc.	804-239-2626
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Milwaukee, Micro Sales, Inc.	414-782-1171

ALTEC LANSING, Altec Corp., 1250 N. Red Gum St., Anaheim, CA 92806, Tel: 714-632-7117, Telex: 665415; Empl.: 200; *Sls. Mgr.:* Gayle Campbell

ALTEK CO., P.O. Box 1128, Torrington, CT 06790, Tel: 203-482-7626; FSC No.: 53939; Empl.: 34; *Sls. Mgr.:* Stephen Altschuler

ALTEK CORP., 2150E Indl. Pkwy., Silver Spring, MD 20904, Tel: 301-622-3906, TWX: 710-825-0422; Empl.: 55; *Sls. Mgr.:* Lowell Nerenberg; *Dist. Mgr.:* Lowell Nerenberg

ALUMINUM FILTER, P.O. Box 1311, Santa Barbara, CA 93102, Tel: 805-684-7651, Telex: 658325, TWX: 910-336-1113; FSC No.: 17504; Empl.: 40; *Sls. Mgr.:* B. L. Baker

Local Sales Offices & Reps

AZ	Tucson, Windcliff Service Co.	602-624-2272
CA	Fremont, Vontek	415-651-7966
CA	Reseda, Jerry Budenz & Assoc.	818-342-4276
CA	San Diego, Aluminum Filter	805-684-7651
CO	Louisville, X-O Sales Inc.	303-666-7690
MA	Brookline, Harman & Assocs.	617-232-6687
MN	Edina, Peterson & Wolff	612-941-5400
OK	Tulsa, NTR/Data Comp Inc.	918-664-2180

ALZBEAR CORP., 15411 Red Hill Ave., Unit F, Tustin, CA 92680, Tel: 714-557-0910; Empl.: 45; *Sls. Mgr.:* Al Robinson; *Dist. Mgr.:* Al Robinson

AMATOM ELCTRN. HARDWARE, 446 Blake St., New Haven, CT 06515, Tel: 203-397-3311, Telex: 963-419; FSC No.: 06540; Empl.: 55; *Sls. Mgr.:* Vince Maida

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Phoenix, Gabriel & Assoc.	602-866-3622
AR	Ft. Smith, Electra Reps.	501-452-4030
CA	Costa Mesa, Gabriel & Assoc.	714-957-1981
CA	El Monte, MITE/Western	213-686-1354
CA	San Francisco, Tom Boyd	408-727-4401
CO	Englewood, Dynatech, Inc.	303-773-2830
CT	Bethany, Reps. Corp.	203-393-0024
FL	Ft. Lauderdale, Electrocomp Assoc.	305-491-4141
FL	Melbourne, Electrocomp Assoc.	305-242-0621
FL	St. Petersburg, Electrocomp Assoc.	813-327-9677
GA	Atlanta, Remco	404-447-6937
IL	Elk Grove Village, Control Sls.	312-595-2110
IN	Ft. Wayne, Aktron Corp.	219-747-3650
IA	Marion, M.S.B. Assocs.	319-377-6261
KS	Shawnee Mission, M.S.B. Assocs.	913-432-2131
MA	Wellesley, Reps. Corp.	617-237-6476
MI	Dearborn, Pitcher-Poulin	313-582-5450
MN	St. Louis Pk., C. E. Bohlig Co.	612-922-7011
MO	St. Charles, M.S.B. Assocs.	314-946-5577
NY	Bayside, Robert Diamond, Inc.	212-423-7330
NY	Syracuse, Lenard Co.	315-479-9191
NC	Raleigh, Remco	919-847-5079
OH	Cincinnati, J. O. Olsen Co.	513-574-7711
OH	Cleveland, J. O. Olsen Co.	216-662-3454
PA	Birchrunville, Jadelectronics Assocs.	215-296-3800
PA	Pittsburgh, J. O. Olsen Co.	412-279-2550
TX	Dallas, Electra Reps.	214-387-3594
TX	Houston, Electra Reps.	713-988-9022
WA	Seattle, Blum & Assocs.	206-285-2590
WI	Thiensville, Control Sls.	414-242-4580
EXP	NY, North Babylon, EIM	516-643-5700

AMBI-TECH INDS., 319 Knickerbocker Ave., Hillsdale, NJ 07642, Tel: 201-666-0504; Empl.: 20; *Sls. Mgr.:* Al Nagler; *Dist. Mgr.:* Al Nagler

AMBROID CO., P.O. Box 1089, Taunton, MA 02780, Tel: 617-823-1726; Empl.: 10; *Sls. Mgr.:* J. F. Strauss

AMCO ENGRG., 3801 N. Rose St., Schiller Pk., IL 60176, Tel: 312-671-6670, TWX: 910-227-3152; Empl.: 280; *Sls. Mgr.:* F. A. Johnson ... 2•1006, 1007, 1803

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs.	205-837-4304
AZ	Phoenix, Gramer & Co.	602-995-9455
CA	Burlingame, Polach & Bensinger	415-697-2525
CA	Los Angeles, Knight Co.	213-670-2833
CA	Orange County, Knight Co.	714-833-8250
CA	San Diego, Knight Co.	619-693-1806
CO	Englewood, FG Mktg. Co.	303-795-9176
CT	Stratford, Instr. Dynamics	203-378-6019
FL	Altamonte Springs, WMM Assocs.	305-831-4530
FL	Clearwater, WMM Assocs.	813-442-3913

FL	Davie, WMM Assocs.	305-581-7036
FL	Indialantic, WMM Assocs.	305-773-1157
GA	Atlanta, Kemp Instrs.	404-452-8050
IL	Schiller Park, R. L. Lang & Assocs.	312-671-3228
IN	Ft. Wayne, Aktron Corp.	219-747-3650
IA	Davenport, Ensco-Rep	319-386-6600
KS	Overland Park, Ensco-Rep	913-381-7557
KS	Wichita, Ensco-Rep	316-683-1070
LA	Lafayette, Kemp Engrg.	318-269-9452
MD	Silver Spring, L. G. White & Co.	301-434-1555
MA	Wakefield, Instr. Dynamics	617-245-5100
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MN	St. Paul, Bonament Heyda Co.	612-484-8531
MO	Maryland Heights, Ensco-Rep	314-423-3935
NJ	Woodcliff Lake, J. Freid & Assocs.	201-391-6792
NM	Albuquerque, C. T. Carlberg Assocs.	505-888-3883
NY	Fairport, Naco Elctrns.	716-223-4490
NY	Great Neck, F & F Metro Inc.	516-482-4080
NY	Syracuse, NACO Elctrns.	315-699-2651
NY	Utica, Naco Elctrns.	315-732-1801
NC	Winston Salem, L. G. White & Co.	919-725-3612
OH	Cleveland, Electro Sls. Assocs.	216-261-5440
OH	Dayton, Electro Sls. Assocs.	513-426-5551
OK	Tulsa, Don Shuhart Co.	918-747-4136
OR	Beaverton, Barrett/Squibb & Assocs.	503-642-1661
PA	Allison Park, Electro Sls. Assocs.	412-487-3801
PA	Broomall, White-Whiddett	215-353-6343
SC	Greenville, L. G. White & Co.	803-271-0630
TX	Dallas, Don Shuhart Co.	214-349-6000
TX	Houston, Kemp Engrg.	713-466-1465
VA	Richmond, L. G. White & Co.	804-740-7093
WA	Redmond, Barrett/Squibb & Assocs.	206-885-6991
EXP	NJ, Mahwah, Intl. Sls. Div.	201-825-0473

AMDAHL COMMUNICATIONS SYS. DIV., Amdahl Corp., 2500 Walnut Ave., Marina del Rey, CA 90291, Tel: 213-822-3202; Empl.: 350

AMECON

AMECON, INC., 1900 S. Chris La., Anaheim, CA 92805, Tel: 714-634-2220, 800-392-2292; *Sls. Mgr.:* Frank Carleone .... **1A**•2125-2130

AME CORP., 101 E. Main St., Little Falls, NJ 07424, Tel: 201-256-3939; Empl.: 12; *Sls. Mgr.:* Edward Dimitry .... **1B**•1515

Local Sales Offices & Reps

FL	Orlando, EAB Inc.	305-898-7444
NJ	Wyckoff, Chandler Co.	201-891-7866
TX	Dallas, Control Comps. Corp.	214-559-4090

AMERACE CORP., Elastimold Div., Newburg Rd., P.O. Box 503, Hackettstown, NJ 07840, Tel: 201-852-1122

AMEREX, P.O. Box 2815, Riverside, CA 92516, Tel: 714-686-1400; *Sls. Mgr.:* Roger D. Orton .... **2**•1005

AMERICAN AEROSPACE CONTROLS, 570 Smith St., Farmingdale, NY 11735, Tel: 516-694-5100; Empl.: 37; *Sls. Mgr.:* Gregory D'Abramo .... **1B**•1830, 1831

Local Sales Offices & Reps

CA	Los Angeles, Dyna Sls. Co.	213-268-1175
WA	Bellevue, Al Smith Co.	206-746-6770

AMERICAN ALUMINUM, 230 Sheffield St., Dept. EEM, Mountainside, NJ 07092, Tel: 201-233-3500; Empl.: 125

AMERICAN AUTOMATION, 14731 Franklin Avenue, Tustin, CA 92680, Tel: 714-731-1661, TWX: 910-595-2670 AMAUTO TSTN; *Sls. Mgr.:* Paul Niquette

AMERICAN CAPACITOR, 2080 Central Ave, Duarte, CA 91010, Tel: 818-357-8806; FSC No.: 59366; Empl.: 50

AMERICAN CHEMICAL ETCHING, See American Etching & Mfg.

AMERICAN COMPUTER HARDWARE CORP., 2205 S. Wright St., Santa Ana, CA 92705, Tel: 714-549-2688

AMERICAN CYANAMID CO., Metal Coated Fibers Dept., One Cyanamid Plaza, Wayne, NJ 07470, Tel: 201-831-3148, Telex: 130-400, TWX: 710-988-3045; *Sls. Mgr.:* James Tonges;Dave Molnar

AMERICAN ELECTRIC CABLE CO., 181 Appleton St., Holyoke, MA 01040, Tel: 413-539-9893; Empl.: 100; *Sls. Mgr.:* P. Tutschek

AMERICAN ELECTRONIC LABS., Box 552, Lansdale, PA 19446, Tel: 215-822-2929, TWX: 510-661-4976; Empl.: 1300

AMERICAN ELCTRN. LABS., INC., Antenna Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Govt. Grp. Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Hybrid/MIC Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRN. LABS., INC., Special Prods. Div., P.O. Box 552, Lansdale, PA 19446

AMERICAN ELCTRNS., 1600 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-3020, TWX: 910-592-1256; FSC No.: 89321; Empl.: 200; *Sls. Mgr.:* B. G. Guy

AMERICAN ETCHING & MFG., 13730 Desmond St., Pacoima,, CA 91331, Tel: 213-896-1187; Empl.: 90

Local Sales Offices & Reps

AZ	Tucson, Clemick & Assoc.	602-749-4003
CA	San Diego, The Rep. Co.	619-292-9001
CA	San Mateo, Halbar Assoc.	415-349-4700
CT	Guilford, Hamer Assocs.	203-457-1634
MA	W. Boylston, Compatible Comps.	617-835-3614
TX	Plano, Precision Devices	214-596-7379

AMERICAN
HV TEST SYSTEMS, INC.

AMERICAN HV TEST SYSTEMS INC., Central Garrett Ind'l. Pk., Accident, MD 21520, Tel: 301-826-8651, Telex: 86223; Empl.: 45; *Sls. Mgr.:* Rolf B. Persson .... **3**•1188

AMERICAN INSULATED WIRE CORP., Leviton Mfg. Co., 36 Freeman St., Pawtucket, RI 02862, Tel: 401-726-0700, TWX: 710-384-0150; *Sls. Mgr.:* Stanton D. Ose; *Dist. Mgr.:* Gilbert R. DuBois .... **2**•1942

Local Sales Offices & Reps

CA	Los Angeles, Leviton/American	213-949-6575
GA	Atlanta, Leviton/American	404-691-9303
IL	Chicago, Leviton/American	312-766-4100
MA	Boston, Associated Agencies	617-423-9880
MI	Detroit, Jim Groff Sls. Co.	313-933-3100
NY	New York, Leviton Mfg. Co.	212-229-4040
OH	Cleveland, Leviton/American	216-831-0615
WA	Seattle, Leviton/American	206-576-0242

AMERICAN LASER SYS., INC., 106 Fowler Rd., Goleta, CA 93117, Tel: 805-967-0423, Telex: 364412 INTR; *Sls. Mgr.:* L. Shallenberger

AMERICAN MAGNETICS, 740 Watson Center Rd., Carson, CA 90745, Tel: 213-775-8651, TWX: 910-345-6258; Empl.: 175; *Sls. Mgr.:* Robert Mos

AMERICAN MAGNETICS, P.O. Box 8, Carterville, IL 62918, Tel: 618-985-4838; Empl.: 120

AMERICAN MAGNETICS, Box R, Oak Ridge, TN 37830, Tel: 615-482-1056, Telex: 557-482; Empl.: 16

AMERICAN MICROSEMICONDUCTOR, 133 Kings Rd., Madison, NJ 07940, Tel: 201-377-9566, TWX: 710-986-8500; Empl.: 15; *Sls. Mgr.:* W. M. Foley; *Dist. Mgr.:* D. B. Wilson . **1A**•1645, 2090, 2091

AMERICAN MICROSIGNAL, 8431 Monroe Ave., Stanton, CA 90680, Tel: 714-761-1222, TWX: 910-591-1202; Empl.: 80; *Sls. Mgr.:* Pat Nelson

AMERICAN MICROSYSTEMS, INC., See GOULD AMI

AMERICAN MONARCH, 2801-37th Ave., N.E., Minneapolis, MN 55421, Tel: 612-788-9161; Empl.: 300; *Sls. Mgr.:* B. Sutherland

AMERICAN PHOTONICS INC., 71 Commerce Dr., Brookfield Center, CT 06805, Tel: 203-775-8950; *Sls. Mgr.:* James A. Walyus

AMERICAN PLASTICRAFT CO., 814 N. Sacramento Blvd., Chicago, IL 60622, Tel: 312-722-7727, Telex: 910-221-6068; Empl.: 250; *Sls. Mgr.:* Larry J. Ferguson

AMERICAN POWER DEVICES, 7 Andover St., Andover, MA 01810, Tel: 617-475-4074, Telex: 951206; Empl.: 140; *Sls. Mgr.:* Robert Dimodana

AMERICAN RADIO RELAY LEAGUE, 225 Main St., Newington, CT 06111, Tel: 203-666-1541; Empl.: 120; *Sls. Mgr.:* Bobbie Chamalian

AMERICAN RESEARCH & ENGINEERING, 1500 Executive Dr., Elgin, IL 60120, Tel: 312-888-7245, TWX: 910-251-3008 .... **1B**•1516-1518

ASC American Switch Corp.

AMERICAN SWITCH CORP., 134 Water St., Wakefield, MA 01880, Tel: 617-246-1007, TWX: 710-348-6756; FSC No.: 54659; Empl.: 40; *Sls. Mgr.:* Mike Palmerino; *Dist. Mgr.:* Mike Palmerino .... **1B**•1519

Local Sales Offices & Reps

AZ	Scottsdale, Bill Earl Assoc.	602-994-3813
CA	Mountain View, Serra Assocs.	415-964-4300
CA	Temple City, HMC Inc.	818-285-0485
CO	Aurora, Sage Sls.	303-750-3501
CT	Madison, Eastronix, Inc.	203-421-4514
FL	Tampa, J-R Controls, Inc.	813-961-9478
GA	Lawrenceville, Tek-Rep Mktg.	404-963-1600
IL	Wheaton, Chadra-Schilke & Assoc.	312-653-8126
IN	Ft. Wayne, Augnat Assoc.	219-483-0259
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs.	913-432-2131
MA	Bedford, Eastronix	617-275-5775
MI	Detroit, Burcaw Co.	313-533-7700
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Charles, M-S-B Assocs.	314-946-5577
NJ	Englewood, ABS Assocs.	201-871-0020
NY	Macedon, M. M. Hare Co.	315-986-3742
OH	Medina, Augnat Assocs.	216-273-1211
PA	Elkins Park, Arnold Assocs.	215-742-0600
PA	Pittsburgh, Augnat Assocs.	412-281-8283
TX	Dallas, TPC, Inc.	214-357-8207
UT	Salt Lake City, Sage Sls.	801-467-5451
VT	Shelburne, Eastronix	802-985-3743
WA	Bellevue, Comtec	206-453-1188
EXP	CT, Litchfield, Intrade	203-567-5901

Local Distributors

AL	Huntsville, RM Alabama	205-852-1550
AL	Mobile, Specialty Distrbg.	205-344-0450
AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Phoenix, Kachina Elctrn. Distrs.	602-269-6201
CA	Buena Park, RPS Elctrns.	213-744-0355
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Los Angeles, Elec. Switches	213-660-1310
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Sierra West	408-747-1188
CA	Tustin, Western Switch & Controls	714-731-4333
CA	Van Nuys, Patane Avionics	818-988-4455
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Englewood, Indl. Elctrns.	303-771-2636
CT	Greenwich, Wise Comps.	203-531-4880
CT	Wallingford, Mid-State Elctrns.	203-265-9900
FL	Casselberry, Afcom Inc.	305-831-6630
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Northbrook, Rayal Elctrns.	312-498-0935
IN	Terre Haute, Indl. Elctrns.	812-232-5328
IA	Cedar Rapids, Iowa Radio Supply	319-393-4510
IA	W. Des Moines, Ramco Co.	515-225-6933
KS	Wichita, Radio Inc.	316-264-2798
MD	Kensington, Marine Air Supp.	301-949-9560
MA	Newton Upper Falls, In-Stock Prods. Co.	617-964-6200
MA	Woburn, Abbott Elctrns.	617-935-2040
MN	Eden Prairie, Cassidy Elctrns.	612-944-0100
MN	Minneapolis, Tortec Corp.	612-866-3662
NE	Omaha, Radio Equip. Co.	402-341-7700
NJ	E. Brunswick, Brothers Elctrns.	201-238-2200
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Mt. Laurel, P.A.C. Elctrns.	609-778-1526
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Bohemia, Key Comps.	516-567-7500
NY	E. Syracuse, Add Elctrns.	315-437-0300

NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Mt. Vernon, QAR	914-699-2224
NC	Winston-Salem, Kirkman Elect.	919-722-9131
OH	Columbus, Whitehead Elctrns.	614-224-1186
OH	Dayton, Stotts-Friedman	513-298-5555
OK	Tulsa, Radio Inc.	918-587-9123
PA	Norristown, Kimberly James Co.	215-666-7286
PA	Philadelphia, Shap Elctrns.	215-969-3300
RI	Pawtucket, MAJOR/Edwards	401-725-7400
TN	Knoxville, Industrial Elctrns.	615-573-7135
TX	Austin, Galtronics	512-837-7470
TX	Dallas, Force/Solid State	214-438-5700
TX	Dallas, Wholesale Elctrn. Supp.	214-824-3001
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Ft. Worth, Industrial Elctrns.	817-731-7321
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
WA	Kent, Pyramid/Interface	206-872-5800
WA	Redmond, Murphy Elctrns.	206-881-1234
WI	Mequon, Lakeview Elctrns.	414-377-8250

american
technical
ceramics

AMERICAN TECH. CERAMICS, 1 Norden La., Huntington Sta., NY 11746, Tel: 516-271-9600, Telex: 221201, TWX: 510-226-6993; FSC No.: 29990; Empl.: 482; *Sls. Mgr.:* R. Blumkin ...... **1A**•1007-1009

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Scottsdale, Faser Tech. Sls.	602-948-4404
CA	El Segundo, Fetty/Schoenduve	213-322-4991
CA	Mtn. View, Fetty/Schoenduve	415-962-8330
CA	San Diego, Fetty/Schoenduve	619-292-5136
CO	Englewood, FC Mktg.	303-795-9176
DC	Washington, M. Lader Co.	202-296-2497
FL	Lighthouse Point, R. C. Simon & Co.	305-941-2757
GA	Norcross, Interep Assocs.	404-449-8680
IL	Chicago, Tech. Sls.	312-237-7210
MA	Topsfield, R.F. Assocs.	617-887-9762
MN	New Brighton, TWC Sls.	612-636-1770
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NY	Rochester, Sweetco Assocs.	716-225-2383
NY	Utica, Sweetco Assocs.	315-797-6721
OH	Chagrin Falls, Crest Comp. Sls. Co.	216-543-9808
PA	Lafayette Hill, M. Lader Co.	215-825-3177
TX	Richardson, Vector Sls. Co.	214-234-4291
WA	Bellevue, SD-R²	206-747-9424

AMERICAN TIME PRODS. DIV., See Frequency Control Prods., Inc.

AMERICAN ULTRAVIOLET, 320 Commerce St., Chatham, NJ 07928, Tel: 201-635-8355, Telex: 13-9266; Empl.: 14; *Sls. Mgr.:* M. C. Stines; *Dist. Mgr.:* M. C. Stines

AMERICAN VOLPI CORP., 26 Aurelius Ave., Auburn, NY 13021, Tel: 315-255-1105

AMERICAN ZETTLER, 16881 Hale Ave., Irvine, CA 92714, Tel: 714-660-1670, Telex: 67-8472; Empl.: 200; *Sls. Mgr.:* D. O. Barkhurst .... **1B**•1322, 1520-1530

Local Sales Offices & Reps

AL	Huntsville, MacKay, Smith & Assocs.	205-539-8000
AZ	Scottsdale, Thorson Desert States, Inc.	602-998-2444
CA	Fullerton, Groh Assocs.	714-738-7105
CA	Mountain View, G.C. Woempner	415-964-5454
CA	San Diego, Addem/San Diego	619-729-9216
CO	Englewood, Delta Sls. Assoc.	303-799-0646
CT	Madison, Forsberg Sls.	800-343-9610
FL	Clearwater, Perrott Assoc.	813-443-5214
FL	Orlando, Perrott Assoc.	305-298-7748
FL	Sunrise, Perrott Assoc.	305-792-2211
GA	Norcross, McKay, Smith & Assoc.	404-449-7444
IL	Rolling Meadows, KMA Sls.	312-398-5300
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Wichita, Baka Corp.	316-262-0179
MA	Brockton, Forsberg Sls.	617-522-6300
MI	Union Lake, Imtech	313-363-7129
MN	Minneapolis, R.W. Marshall Co.	612-929-0457
MO	Ferguson, Baka Corp.	314-878-4224
NJ	Cherry Hill, Danco Elctrn. Sls.	609-424-5590
NJ	Parlin, Martech	201-721-2200
NM	Albuquerque, Thorson Desert States, Inc.	505-293-8555
NY	Alexander, B.H. Tollefson Assoc.	716-591-1219
NY	Auburn, B.H. Tollefson Assocs.	315-253-4109
NY	Manhasset, Martech	516-627-1151
NY	Rochester, B.H. Tollefson Assoc.	716-271-4141
NC	Raleigh, J & B Sales	919-878-8600
OH	Cincinnati, Makin Assocs.	513-871-2424
OR	Beaverton, Thorson Co. N.W.	503-644-5900
TX	Houston, AID Elctrns.	713-955-6204
TX	Irving, AID Elctrns.	214-259-4761
UT	Salt Lake City, Delta Sls. Assocs.	801-487-7571
WA	Bellevue, Thorson Co. N.W.	206-455-9180
WI	Milwaukee, KMA Sales Company	414-259-1771

Local Distributors

AZ	Tempe, Acacia Sls.	602-894-2874
CA	Irvine, Acacia Sls.	714-660-0834
CA	Los Angeles, Master Distrs.	213-452-1229
CA	San Diego, Acacia Sls.	619-565-4365
CA	San Diego, Shanks & Wright	619-239-0176
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Clara, Components Center	408-988-3751
CA	Santa Monica, Distr. Spec.	213-393-9666
CA	Torrance, Cypress Elctrns.	213-533-6005
CO	Lakewood, Acacia Sls.	303-232-2882
CT	New Haven, The Green-Shaw Co.	203-397-0710
IL	Northbrook, Classic Comps.	312-272-9650
IN	Carmel, Altex Elctrns.	317-848-1323
MD	Savage, Pyttronic Inds.	301-953-9650
MA	Woburn, Time Elctrns./New England	617-935-8080
NV	Reno, Elec. Dist. Co. of Nev.	702-323-2766
NJ	Fairlawn, Relay Specialties	201-797-3313
NY	Farmingdale, Pride Elctrns.	516-293-4020
OR	Beaverton, Acacia Sls.	503-646-3377
TN	Memphis, Bluff City Elctrns.	901-345-9500
TX	Dallas, Wallace Elctrns.	214-340-0400
WA	Seattle, Westlake Elec. Supp.	206-622-6600
Can	Vancouver, B.C., Intek	604-324-6831
Can	Winnipeg, Manitoba, L. A. Varah, Ltd.	204-633-6190

AMETEK, 2 Station Square, Paoli, PA 19301, Tel: 215-355-6900; Empl.: 100

AMETEK, INC, Hunter Spring Division, 1 Spring Ave., Hatfield, PA 19440, Tel: 215-822-2971, TWX: 510-661-4888; Empl.: 270; *Sls. Mgr.:* F. J. York

AMETEK/RODAN DIV., 2905 Blue Star St., Anaheim, CA 92806, Tel: 714-630-0081, TWX: 910-591-1684; FSC No.: 15454; Empl.: 100; *Sls. Mgr.:* Steve Iovin

Local Sales Offices & Reps

AL	Huntsville, Alpha Marketing	205-533-0766
CA	Mountain View, Gene Woempner Co.	415-964-5454
CO	Westminster, Straube Assocs.	303-426-0890
FL	Coral Springs, H.A. Inc.	305-752-7520
IL	Downers Grove, Richmar Elctrns.	312-968-0118
IN	Ft. Wayne, Menze Sls. Co.	219-747-5616
IA	Cedar Rapids, Snider Sls.	319-362-4410
KS	Overland Park, S. W. Wollard Co.	913-898-6552
MA	Hopkinton, Marathon Sls.	617-435-6984
MI	Lathrup Village, R. C. Nordstrom Co.	313-559-7373
MI	Southfield, R. A. Casalou	313-559-0350
MN	Mendota Hgts., G-II Sls.	612-454-3086
MO	St. Louis, Abrams & Assocs.	314-569-0447
NJ	Cherry Hill, Danco Elctrn. Sls.	609-424-5590
NM	Albuquerque, Straube Assocs.	505-265-7759
NY	Fayetteville, Henry G. Richter, Inc.	315-637-6713
NY	Melville, Comtronic Assoc.	516-249-0505
NY	Rochester, Henry G. Richter, Inc.	716-436-0300
TX	Dallas, Cunningham Components Corp.	214-233-4303
TX	Houston, Cunningham Components Corp.	713-461-4197
UT	Salt Lake City, Straube Assocs.	801-486-5473
VA	Gladys, Ralley Entprs.	804-283-5656
WA	Vancouver, R. Over Sls.	206-695-6179
EXP	NY, Westbury, CPS Intl.	516-334-8500

AMF INC., AMF Cuno/General Filter Products Division, 400 Research Pkwy., Meriden, CT 06450, Tel: 203-237-5541, Telex: 962457; Empl.: 700; *Sls. Mgr.:* Gregg Samal

AMF/ELECTRO COMPS. DIV., AMF, 2713 Gateway Dr., Pompano Beach, FL 33060, Tel: 305-973-8620, TWX: 510-956-9400; Empl.: 900; *Sls. Mgr.:* C. Smith; *Dist. Mgr.:* C. Smith

AMF POTTER & BRUMFIELD, See Potter & Brumfield

AMGLO, 5265 Michigan Ave., Rosemont, IL 60018, Tel: 312-671-4321; Empl.: 21

AMI/COAST MAGNETICS, AMI Div., 1207 North La Brea Ave., Inglewood, CA 90302, Tel: 213-673-3245

AMICON CORP., 25 Hartwell Ave., Lexington, MA 02173, Tel: 617-861-9600; Empl.: 300; *Sls. Mgr.:* James Gilliland

AMILON CORP., 49-12 30th Ave., Woodside, NY 11377, Tel: 212-274-1794; Empl.: 50; *Sls. Mgr.:* L. Rosenblatt

AMKEY, INC., Sub. American Pwr. Dvs., Inc., 220 Ballardvale St., Wilmington, MA 01887, Tel: 617-658-7800; *Sls. Mgr.:* P. D. Prevett

amlan inc.

AMLAN, INC., 97 Thornwood Rd., Stamford, CT 06903, Tel: 203-322-1913, Telex: 643647; *Sls. Mgr.:* Mark Landeweer; *Dist. Mgr.:* Mark Landeweer ...... **2**•1153-1159

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs., Inc.	205-533-1730
CA	Escondido, Cirolia Elctrn. Sls., Inc.	619-489-9607
CA	Santa Cruz, Krippner & Assocs.	408-429-9798
CA	Ventura, Astralonics	213-706-0488
FL	Tampa, J-R Controls	813-961-9478
GA	Norcross, Interep Assocs. Inc.	404-449-8680
IL	Chicago, Electro-Tech Mktg. Assoc.	312-588-4535
MA	Scituate, Marketing Svcs.	617-545-0899
MN	St. Paul, Complete Sls.	612-644-0484
NJ	Parlin, JMR Sales	201-727-5335
NY	E. Setauket, JMR Sales	516-689-8871
NY	N. Syracuse, JMR Sales, Inc.	315-458-6576
NC	Raleigh, Interep Assocs. Inc.	919-872-1401
TN	Greeneville, Interep Assocs. Inc.	615-639-3491
VA	Reston, Tytronics Tech. Sls.	703-471-0440
WA	Mukilteo, Krippner & Assocs.	206-743-3579

Local Distributors

CT	New Haven, Greene-Shaw Co., Inc.	203-397-0710
CT	Torrington, Northeast Connectors	203-482-2817
MA	Chelmsford, Dynamic Engrg.	617-250-0200
MA	Norwood, Emtel Elctrns.	617-769-9500
MA	Waltham, Vantage Elctrns. Corp.	617-894-8690
MA	Woburn, EPC	617-935-0400
WA	Seattle, Pacific Elctrns.	206-575-1057

AMP

AMP INCORPORATED, Box 3608, Harrisburg, PA 17105, Tel: 717-564-0100, TWX: 510-657-4110; Empl.: 19,650 ... **1A**•1584; **1B**•1109-1111, 1532-1536, 1761; **2**•1121-1148, 1869, 1944

Local Sales Offices & Reps

CA	Compton	213-537-4490
CA	Cupertino	408-255-3830
CO	Englewood	303-773-0422
CT	Windsor	203-683-2715
FL	Altamonte Springs	305-869-6766
GA	Atlanta	404-934-6363
IL	Edwardsville	618-656-5081
IL	Schaumburg	312-351-7811
IN	Carmel	317-848-1250
MA	Boston	617-891-7500
MA	Framingham	617-879-3255
MI	Southfield	313-645-5590
MN	Minneapolis	612-831-8242
NJ	Parsippany	201-334-6664
NY	Holbrook	516-585-4430
NY	Pittsford	716-385-2860
NC	Winston- Salem	919-725-8968
OH	Dublin	614-764-8866
PA	Berwyn	215-647-6060
PA	Malvern	215-296-5303
TN	Knoxville	615-691-5711
TX	Irving	214-258-1114
VA	Alexandria	703-683-5955
WA	Renton	206-255-0064

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2626
CA	Buena Park, RPS Elctrns.	213-744-0355
CA	Canoga Park, Marshall Elctrns. Grp., LA Div.	213-999-5001
CA	Fullerton, Pyramid Elctrns., Fullerton Div.	714-773-0781
CA	Hawthorne, Electro-Sonic Comps.	213-679-9781
CA	Irvine, Marshall Elctrns. Grp., Irvine Div.	714-556-6400
CA	San Diego, Marshall Elctrns. Grp., San Diego Div.	619-578-9600
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CO	Denver, CSID, Inc.	303-893-9594
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Norcross, Schweber Elctrns. Corp.	404-449-9170
IL	Elk Grove, Schweber Elctrns. Corp.	312-364-3750
IL	Elmhurst, Semiconductor Spec.	312-279-1000
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Edwardsville, C. Tennant, Sons & Co.	913-441-1801
MD	Columbia, Powell Elctrns.	301-621-4070
MD	Rockville, MS Elctrns.	301-621-4070
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Winchester, Rush Industries, Inc.	617-729-5800
MI	Grand Rapids, RS Elctrns.	616-241-3483
MI	Livonia, RS Elctrns.	313-525-1155
MO	St. Charles, Lectronix	314-946-6424
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Buffalo, Summit Distrs.	716-884-3450
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Farmingdale, Harrison Radio Corp.	516-293-7990
NY	Lynbrook, Peerless Elctrns.	516-593-2121
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Akron, Akron Elctrn. Supp. Co.	216-762-8818
OH	Columbus, Hughes-Peters Inc.	614-294-5351
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
TX	Austin, Kent Elctrns. Corp.	512-834-1900
TX	Houston, Kent Elctrns.	713-780-7770
TX	Richardson, Kent Elctrns. Corp.	214-669-2600
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
WA	Kent, Interface Elctrns. Corp.	206-872-5800

AMP PRODUCTS CORP., P.O. Box 1776, Paoli, PA 19301, Tel: 215-647-1000; Empl.: 20,000 .... **1B**•1531; **2**•1120, 1858, 1945

Local Sales Offices & Reps

CA	Los Angeles	213-639-1691
CA	San Francisco	415-573-7722
CO	Denver	303-773-1885
GA	Atlanta	404-939-7604
IL	Chicago	312-439-7800
KS	Kansas City	913-642-9800
MA	Boston	617-879-8221
MI	Detroit	313-646-0090
NJ	Cranford	201-272-4600
NC	Winston-Salem	919-725-9222
OH	Cincinnati	513-984-5302
PA	Philadelphia	215-647-3250
PA	Pittsburgh	412-344-7900
TX	Dallas (Irving)	214-258-1911

Local Distributors

AMP Standard Distributors

AL	Birmingham, Forbes Elctrn. Distr.	205-251-3941
AL	Decatur, Forbes Elctrn. Distr.	205-353-4546
AZ	Tucson, Inland Elctrns.	602-889-5301
AR	Little Rock, Electro Entprs.	501-664-9207
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Cerritos, El-Com	213-404-2961
CA	Costa Mesa, Mar Vac Elctrns.	714-540-3280
CA	Fountain Valley, Comps. Center	714-979-0433
CA	Fresno, Jack C. Arbuckle Co.	209-264-6554
CA	Gardena, California Switch & Signal	213-538-9830
CA	Manhattan Bch., Prime Electro Prods.	213-379-3642
CA	Monrovia, Erik-A-Elctrn. Distr.	213-574-1020
CA	North Hollywood, Alatec Prods.	213-875-1790
CA	Northridge, Acort Inds.	213-993-6444
CA	Oakland, Brill Elctrns.	415-834-5888
CA	Sacramento, Dunlap Elctrns.	916-442-5801
CA	Sacramento, Sacramento Elctrn. Supp. Co.	916-441-4821
CA	San Diego, Western Radio	619-239-0361
CA	San Diego, El-Com	619-578-0900
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Ana, C R Elctrns.	714-556-2040
CA	Santa Clara, Cypress Elctrns.	408-945-8400
CO	Commerce City, Waco Elctrns.	303-289-4743
CO	Denver, Denver Wintronics	303-934-2406
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	E. Hartford, R & S Elctrn Distrs.	203-528-9901
CT	Norwalk, Park Distrs.	203-853-2010
CT	Stratford, Electro Comp.	203-375-5811
FL	Casselberry, AFCOM	305-831-6630
FL	Dania, Summit Distrs.	305-920-6263
FL	Ft. Lauderdale, EMSCO Div. Hammond Elctrns.	305-973-7103
FL	Ft. Lauderdale, Southeastern Elctrns.	305-563-4131
FL	Jacksonville, EMSCO Div. Hammond Elctrns.	904-356-4851
FL	Miami, Elctrn. Equip. Co.	305-871-3500
FL	Miami, Electro Std. Labs.	305-633-6973
FL	Orlando, EMSCO Div. Hammond Elctrns.	305-849-6362
FL	Pensacola, Pensacola Elctrns.	904-478-3771
FL	Sarasots, Dow Elctrns.	813-365-3393
FL	Tampa, EMSCO Div. Hammond Elctrns.	813-253-0104
FL	Tampa, Leader Elctrns.	813-870-3315
GA	Atlanta, Ack Radio Supp. Co.	404-351-6340
GA	Atlanta, Specialty Distrbg. Co.	404-873-2521
HI	Honolulu, Tech. Mktg. Corp.	808-841-4175
HI	Honolulu, Elctrl. Equip. Co.	808-533-3884
ID	Boise, Kimball Elctrns.	208-342-3559
ID	Pocatello, Kimball Elctrns.	208-232-2201
ID	Spirit Lake, A-I Elctrn. Supp.	208-623-3111
IL	Addison, L-Comp	312-628-1400
IL	Berwyn, B-B&W Elctrns.	312-749-1710
IL	Chicago, Elctrn. Connector Corp.	312-767-2200
IL	Chicago, Stranco Prods.	312-738-1580
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Harvey, George Elctrns.	312-331-1983
IL	Melrose Park, Belford Elctrns.	312-865-2400
IL	Mt. Prospect, Tri-State Elctrn. Corp.	312-255-0600
IL	Niles, Joseph Elctrns.	312-297-4200
IL	Northbrook, Classic Comps. Supp.	312-272-9650
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Peoria, Warren Radio Co.	309-674-5998
IL	Rosemont, Advent Elctrns.	312-297-6200
IL	Villa Pk., Melvin Elctrns.	312-279-5015
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Meunier Elctrns.	317-635-3511
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Deeco	319-365-7551
KY	Louisville, Peerless Elctrn. Equip. Co.	502-637-7674
LA	Lafayette, Ralph's Elctrns. Supp.	318-233-0105
LA	Marrero, AFG Elctrn. Supp.	504-368-9696
LA	New Orleans, Radio Parts	504-581-5959
LA	New Orleans, Southern Radio Supp. Co.	504-524-2343
LA	New Orleans, W. B. Allen Supp. Co.	504-525-8222
LA	Shreveport, Industrial Elctrn. Supp.	318-222-9459
MD	Aberdeen, Harco Elctrns.	301-838-7990
MD	Baltimore, Whitney Distrs.	301-944-8080
MD	Rockville, Capitol Radio Wholesalers	301-881-2270
MA	Burlington, J. V. Elctrns. of Boston	617-273-4300
MA	Burlington, Heiland Elctrns.	617-272-5610
MA	Burlington, QPL Elctrn Distrs.	617-891-0460
MA	Cambridge, Apollo Elctrns.	617-868-3120
MA	Canton, Impact Sls. Co.	617-821-1500
MA	Lynn, Land Elctrns. Supp.	617-592-2220
MA	Mendon, ADD Elctrns. Corp.	617-478-4200
MA	Middleboro, Glynn Elctrns.	617-947-4262
MA	N. Chelmsford, Pilgrim Elctrns.	617-251-8746
MA	Needham, You Do It Elctrns.	617-449-1005
MA	Newton, In-Stock Prods. Co.	617-964-6200
MA	S. Boston, Controller Svc & Sls. Co.	617-269-1300
MA	Waltham, March Elctrns.	617-899-4220
MA	Waltham, Vantage Elctrns. Corp.	617-894-8690
MA	Westboro, Future Elctrns. Corp.	617-366-2400
MA	Westborough, Powell Elctrns.	617-366-6100
MA	Wilmington, Aved Elctrns.	617-657-8310
MA	Woburn, AFCOM	617-935-3200
MA	Woburn, A.C.I. Elctrns. Corp.	617-935-7230
MA	Woburn, Abbot Elctrns.	617-935-2040
MA	Woburn, Semtex Indl. Corp.	617-935-2466
MI	Flint, Shand Elctrns.	313-743-8940
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Grand Rapids, S-F Elctrn. Supp.	616-459-0219
MI	Livonia, Camelot Elctrns.	800-482-3905
MI	Troy, Northern Wire & Cable	313-589-0510
MN	Minneapolis, Stark Elctrns. Supp.	612-332-1325
MN	Minneapolis, Elctrn. Center	612-371-5200
MN	St. Paul, Gopher Elctrns. Co.	612-483-3322
MS	Pascagoula, Hooper Elctrns. Supp. Co.	601-762-9383
MO	Kansas City, Electrn. Supp. Co.	816-931-0250
MO	St. Louis, Olive Elctrns.	314-426-4500
MO	St. Louis, Van Sickle Radio-Elctrns.	314-621-5000
NE	Lincoln, Scott Elctrns. Supp. Corp.	402-466-8221
NV	Las Vegas, CRW, Inc.	702-451-5490
NH	Manchester, Yankee Elctrn. Supp.	603-625-9746
NJ	Edison, William Elctrns. Supp.	201-985-3700
NJ	Hanover, State Elctrns. Parts Corp.	201-887-2550
NJ	Pine Brook, Alatec Prods.	201-227-8140
NJ	Prospect Park, Kappe Inds.	201-790-1999
NJ	Springfield, Route Elctrns. 22	201-379-7710
NM	Albuquerque, Elctrn. Parts	505-293-6161
NY	Binghamton, Help Elctrns.	607-729-3528
NY	Brooklyn, Brooklyn Elctrns.	212-748-1300
NY	Buffalo, Genesee Radio & Parts Co.	716-873-9661
NY	Elmsford, Ancar Elctrns. Supp.	914-592-7100
NY	Hempstead, Davis Elctrns. Corp.	516-483-9200
NY	Port Chester, Wise Components	914-939-8600
NY	Poughkeepsie, Chief Elctrns.	914-471-1300
NY	Rochester, Rochester Radio Supp. Co.	716-454-7800
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rome, Rome Elctrns.	315-337-5400
NY	West Babylon, Delman Elctrns.	516-420-1234
NY	West Hempstead, March Elctrns.	516-486-6511
NC	Cary, Powell Elctrns.	919-467-1212
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, U.R.I. Elctrns.	513-761-4030
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Columbus, Whitehead Elctrns.	614-224-1186
OH	Columbus, Thompson Elctrn. Supplies	614-228-6191
OH	Dayton, Stotts-Friedman Co.	513-298-5555
OH	Dayton, E.S.C.O., Inc.	513-226-1133
OH	Lima, LRP Elctrns.	419-228-1220
OH	Marion, Servex Elctrns. Distrib.	614-383-3117
OH	Solon, Repco Elctrns.	216-248-8900
OH	Solon, Target Elctrns. Corp.	216-248-7930
OH	Twinsburg, Schuster Elec. Co.	216-425-8134
OH	Warren, REM Elctrns. Supp. Co.	216-373-1300
OK	Oklahoma City, Elctrn. Supp. Co.	405-232-5215
OK	Oklahoma City, Electro Engerprises	405-478-1752
OK	Tulsa, Combined Technlog. Cos.	918-582-8242
OK	Tulsa, Radio, Inc.	918-587-9123
PA	Allentown, P.A. Peters, Inc.	215-434-5237
PA	Altoona, Allegheny Elctrns.	814-946-0871
PA	Braddock, Leff Radio Parts Co.	412-351-5000
PA	Drexel Hill, Kass Elctrns. Distrib.	215-449-2300
PA	Essington, Tri-Com Inc.	215-521-3080
PA	Folcroft, Delphi Wire and Cable	215-534-3900
PA	Philadelphia, Arch Elctrns. Co.	215-563-4660
PA	Reading, Barbey Elctrns. Corp.	215-376-6116
PA	Wayne, Peak Elctrns. Corp.	215-293-9000
RI	Pawtucket, Major Elctrn. Supp.	401-725-7400
RI	Pawtucket, Jabbour Elctrn. Supplies	401-728-4600
SC	Charleston, Wholesale Indl. Elctrns.	803-722-2634
SC	Columbia, Dixie Elctrns.	803-779-5332
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Chattanooga, Curle Elctrns.	615-266-4727
TN	Nashville, Electra Distrib. Co.	615-329-3971
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Dallas, LBI Electro-Optics Corp.	214-358-4151
TX	Dallas, Wallace Elctrns. Co.	214-340-0400
TX	Dallas, Target Elctrns. Ind.	214-350-6853
TX	El Paso, Ideal Indl. Elctrn.	915-779-6647
TX	Fort Worth, Indl. Elctrns.	817-731-7321
TX	Fort Worth, Swieco, Inc.	817-335-6521
TX	Fort Worth, Texas Connector Corp.	817-246-0109
TX	Houston, Electrotex	713-526-3456
TX	Houston, Geophysical Supp. Co.	713-666-4100
TX	Houston, Elctrn. Packaging Comp.	713-447-5800
TX	Houston, Powerline Products	713-461-9791
TX	Midland, ESI Supp.	915-694-9657
UT	Provo, Central Utah Elctrns.	801-373-7522
VT	Rutland, S.A.I. Semispecial of Amer.	802-775-7126
VA	Norfolk, Priest Elctrns.	804-855-0105
VA	Richmond, Sterling Elctrns.	804-226-2190
VA	Richmond, Avec Elctrns. Corp.	804-359-6071
VA	Roanoke, Mexitronics	703-342-4444
WA	Seattle, Radar Electric Co.	206-282-2511
WA	Seattle, Pacific Elctrns.	206-575-1050
WA	Seattle, Connector World Supp.	206-767-6773
WV	Dunbar, State Electric Supp.	304-523-7491
WV	Kenova, Burco Distrs.	304-292-1641
WV	Morgantown, State Elctrns. Co.	304-292-1641
WI	Fond du Lac, Fedco Elctrns.	414-922-6490
WI	Madison, Superior Elctrns.	608-257-1477
WI	Milwaukee, Indl. Elctrns. Corp. of WI	414-276-1212
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Oshkosk, Elctrn. Inds.	414-235-8930

AMP Industrial Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2626
CA	Buena Park, RPS Elctrns.	213-744-0355
CA	Canoga Park, Marshall Elctrns. Grp.	213-999-5001
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	Hawthorne, Electro-Sonic Comps.	213-679-9781
CA	Irvine, Marshall Elctrns. Grp.	714-556-6400
CA	San Diego, Marshall Elctrns. Grp.	619-578-9600
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Pyramid Elctrns. Supp.	408-727-9810
CO	Denver, CSID	303-292-9594
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Norcross, Schweber Elctrns. Corp.	404-449-9170
IL	Elmhurst, Semiconductor Specialists	312-279-1000

IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Edwardsville, C. Tennant Sons & Co.	913-441-1801
MD	Rockville, MS Elctrns.	301-340-6400
MA	Needham, Cronin Elctrns.	617-449-0500
MA	Winchester, Rush Inds.	617-729-5800
MI	Grand Rapids, RS Elctrns.	616-241-3483
MI	Livonia, RS Elctrns.	313-525-1155
MO	St. Charles, Lectronix	314-946-6424
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, Harrison Radio Corp.	516-293-7990
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Akron, Akron Elctrn. Supp. Co.	216-762-8818
OH	Columbus, Hughes-Peters	614-294-5351
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
TX	Austin, Kent Elctrns. Corp.	512-834-1900
TX	Houston, Kent Elctrns. Corp.	713-780-7770
TX	Richardson, Kent Elctrns. Corp.	214-669-2600
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
WA	Kent, Interface Elctrns.	206-872-5800

AMPEREX ELECTRONIC CORP., Ferroxcube Div., 5083 Kings Hwy., Saugerties, NY 12477, Tel: 914-246-2811, TWX: 510-247-5410; Empl.: 1200; *Sls. Mgr.:* R. Denison; *Dist. Mgr.:* Ed Hellenschmidt

Refer to Amperex, Slatersville Div. for sales office information.

AMPEREX ELECTRONIC CORP., Hicksville Div., Box 418 - 230 Duffy Ave., Hicksville, NY 11802, Tel: 516-931-6200, TWX: 510-221-1839; Empl.: 270; *Sls. Mgr.:* Robert Carlin; *Dist. Mgr.:* Robert Carlin

AMPEREX ELCTRN. CORP., Slatersville Div., Providence Pike, Slatersville, RI 02876, Tel: 401-762-3800, Telex: 927584, TWX: 710-382-6332; FSC No.: 73445; Empl.: 565; *Sls. Mgr.:* Robert Carlin

AMPEREX ELECTRONIC INDS., Smithfield Div., George Washington Hwy., Smithfield, RI 02917, Tel: 401-232-0500, Telex: 92 76 43

Refer to Amperex, Slatersville Div. for sales office information.

AMPERITE CO., INC., 600 Palisade Ave., Union City, NJ 07087, Tel: 201-864-9503, TWX: 710-992-8834; FSC No.: 70563; Empl.: 76; *Sls. Mgr.:* T. Whalen; *Dist. Mgr.:* T. Whalen

AMPEX CORP., 401 Broadway, Redwood City, CA 94063, Tel: 415-367-2011, TWX: 910-364-9034; Empl.: 9,800

AMPHENOL, 2801 South 25th Ave., Broadview, IL 60153, Tel: 312-345-9000

AMPHENOL, An Allied Co., 2122 York Rd., Oak Brook, IL 60521, Tel: 312-986-2300, TWX: 910-651-0191; Empl.: 3600

AMPHENOL R F OPERATIONS, 33 E. Franklin St., Danbury, CT 06810, Tel: 203-743-9272

AMPLIFIER RESEARCH

AMPLIFIER RESEARCH, 160 School House Rd., Souderton, PA 18964-9990, Tel: 215-723-8181, TWX: 510-661-6094; FSC No.: 30639; Empl.: 27; *Sls. Mgr.:* D.W. Roth .... **3**•1002, 1003

Local Sales Offices & Reps

AZ	Tempe, Mar Tech Assocs.	602-968-4944
CA	N. Hollywood, O'Halloran Assoc.	213-877-0173
CA	Palo Alto, O'Halloran Assoc.	415-326-1493
CA	Santa Ana, Shoshin, U.S.A.	714-641-0417
CO	Boulder, H. Bass. Assoc.	303-499-7509
CT	Hamden, J.B.L. Assoc.	203-281-3161
FL	Orlando, E.G. Holmes & Assocs.	305-894-8901
GA	Chamblee, E.G. Holmes & Assocs.	404-451-6161
IL	Park Ridge, Elctrn. Instr. Assocs.	312-298-2290
IN	Indianapolis, Elctrn. Instr. Assocs.	317-257-7231
MD	Severna Park, Delmarva Eng. Assoc. Ltd.	301-647-8007
MA	Lexington, R.J. Sickles	617-862-5100
NJ	Denville, Metro-Mics	201-625-5959
NJ	Westfield, Metro Mics	201-233-6116
NM	Albuquerque, Don Hewitt & Assocs.	505-299-7746
NY	Melville, Metro Mics	516-433-3333
NC	Cary, E.G. Holmes & Assocs.	919-469-8850
OH	Centerville, Micro Sls.	513-433-8171
OH	North Olmsted, Micro Sls.	216-734-3080
PA	Philadelphia, R. Meyers Assoc.	215-224-1663
TX	Austin, Airep Elctrns.	512-327-0778
TX	Dallas, Airep Elctrns.	214-349-4360
TX	Houston, Airep Elctrns.	713-944-2055
UT	Bountiful, Herb Bass Assoc.	801-295-0469
UT	Salt Lake City, Herb Bass Assoc.	801-268-0262
WA	Seattle, J. B. Jolly	206-938-4166

AMPLIFONIX INC., 220 Rte. 13, Bristol, PA 19007, Tel: 215-788-2350, TWX: 510-667-0501; *Sls. Mgr.:* Jason A. Day; *Dist. Mgr.:* Jason A. Day

AMPROBE INSTR., 630 Merrick Rd., Lynbrook, NY 11563, Tel: 516-LY3-5600, TWX: 510-225-8403; Empl.: 230; *Sls. Mgr.:* W. Eagle

AMPTEK, INC., 6 De Angelo Dr., Bedford, MA 01730, Tel: 617-275-2242; Empl.: 11; *Sls. Mgr.:* George Kobaly, Jr.

Local Sales Offices & Reps

EXP	MA, Plainville, Teknis	617-695-3591

AMPTEK INC., Teksys Inc., 11103 Dennis Rd., P.O. Box 59841, Dallas, TX 75229, Tel: 214-241-2511, Telex: 730338; *Sls. Mgr.:* Don Stephens

AMRAD, Div. Transcon Mfg. Co., Box 876, Paris, TX 75460, Tel: 214-785-4544; FSC No.: 55943; Empl.: 17; *Sls. Mgr.:* Curtis Vining; *Dist. Mgr.:* Curtis Vining

AMTEK DIGITAL SYSTEMS, INC., 12740 28th N.E., Seattle, WA 98125, Tel: 206-363-0217, Telex: 329473 (Burgess Sea); Empl.: 18; *Sls. Mgr.:* Fred Graham

AMTEK SYS., INC., 1400 S. Sherman, #202, Richardson, TX 75081, Tel: 214-238-5300; *Sls. Mgr.:* Barry Epstein; *Dist. Mgr.:* Peter Diamond

AMUNEAL MFG., 4737 Darrah St., Philadelphia, PA 19124, Tel: 215-535-3000; FSC No.: 23740; Empl.: 120; *Sls. Mgr.:* S. M. Kamens; *Dist. Mgr.:* S. M. Kamens .... **2**•1903

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn	602-257-9015
CA	Fremont, William Parks Assocs.	415-490-2011
CA	San Diego, C.E.M., Inc.	619-692-3551
CA	Santa Ana, C.E.M., Inc.	714-835-2702
CO	Wheatridge, Waugaman Assocs.	303-423-1020
GA	Stone Mountain, Dixie Tech. Mktg.	404-962-2530
IL	Chicago, Brock & Cushman, Inc.	312-622-4110
KS	De Soto, Midtec Assocs.	913-441-6565
MD	Baltimore, Muncy Sls.	301-484-6376
MA	Norwood, MPS Elctrns.	617-769-8700
MI	Ann Arbor, Metal-Tronics	313-437-7530
MN	Hamel, Hedtke Mktg.	612-478-2120
MO	Florissant, Midtec Assocs.	314-837-5200
NM	Albuquerque, Shefler Kahn Co.	505-296-0749
NY	Queens Village, L.A. Buscaglia Co.	212-468-3666
OH	Akron, Imtech Inc.	216-666-1185
OH	Dayton, Imtech Inc.	513-278-6507
OK	Tulsa, Barry Sls.	918-749-7775
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
UT	Salt Lake City, Waugaman Assocs. Utah, Inc.	801-261-0802
WA	Seattle, Rep-West	206-283-8351
WI	Menomonee Falls, Brock & Cushman, Inc.	414-255-2166
EXP	NJ, Oradell, Sylvan Ginsbury	201-261-3200

ANACONDA-ERICSSON INC., Continental Wire & Cable, P.O. Box 1863, York, PA 17405, Tel: 717-767-4434

ANADEX, 1001 Flynn Rd., Camarillo, CA 93010, Tel: 805-987-9660, TWX: 910-494-2761; Empl.: 350

ANADYNE, 14830 Valley View Ave., La Mirada, CA 90638, Tel: 714-522-8924, TWX: 910-583-4807; Empl.: 100

ANAHEIM AUTOMATION, 910 E. Orangefair Lane, Anaheim, CA 92801, Tel: 714-992-6990; Empl.: 25; *Sls. Mgr.:* Bud McNally

ANALOG & DIGITAL PERIPHERALS, INC. (ADPI), 815 Diana Dr., Troy, OH 45373, Tel: 513-339-2241, TWX: 810-450-2685; FSC No.: 31-0949-745; Empl.: 19; *Sls. Mgr.:* Alan Kuebier

ANALOG DEVICES, P.O. Box 280, Norwood, MA 02062, Tel: 617-329-4700, TWX: 710-394-6577; FSC No.: 24355; Empl.: 4,000

ANALOGIC CORP., 8 Centennial Dr., Peabody, MA 01961, Tel: 617-777-4500, 617-246-0300, 800-451-1816, Telex: 94-9307, TWX: 710-348-0425; Empl.: 2000; *Sls. Mgr.:* M. E. Culverhouse; *Dist. Mgr.:* D. Vermilyea

Local Distributors

AL	Mobile, Brownell Electro	205-479-8581
AZ	Phoenix, Metermaster	602-243-4111
CA	Costa Mesa, F.L.W.	714-751-7512
CA	Gardena, Instr. Lab.	213-327-3279
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Los Angeles, Metermaster	213-685-4340
CA	North Hollywood, B. J. Wolfe Entprs.	213-877-5518
CA	Palo Alto, Metermaster	415-968-0313
CA	Redwood City, Marchi Assoc.	415-364-3411
CA	San Diego, Metermaster	714-560-4841
CA	Santa Clara, Fisher Brownell	408-988-6041
CA	Santa Clara, E.I.L. Instrs.	408-727-0396
CO	Denver, E.I.L. Instrs.	303-534-4160
CT	Middletown, E.I.L. Instrs.	203-346-6646
FL	Miami, Brownell Electro.	305-591-3215
FL	Orlando, Brownell Electro.	305-843-6770
FL	Palm Bay, E.I.L. Instrs.	305-725-8300
GA	Atlanta, Brownell Electro	404-762-5181
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Elk Grove Village, Metermaster	312-593-8650
IN	Indianapolis, E.I.L. Instrs.	317-545-1373
LA	Kenner, Breard-Gardner	504-466-3401
LA	Slidell, Mid-South Sls.	504-641-7480
MD	Gaithersburg, Pioneer Instr.	301-948-0710
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Burlington, E.I.L. Instrs.	617-272-9450
MA	Waltham, Calibron Corp.	617-894-6440
MA	Woburn, Brownell Electro	617-935-7820
MI	Farmington Hills, Star-Tronic Dist.	313-477-7586
MI	Royal Oak, George Instr. Co.	313-280-1111
MN	Minneapolis, Process Meas. Co.	612-544-4035
MO	St. Louis, Instr. & Control Sls.	314-535-5760
NJ	Fairfield, Ampower Elctrn. Instr.	201-227-7720
NJ	Plainfield, Brownell Electro.	201-753-4600

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Atlanta	(404) 446-0166
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Minneapolis	(612) 332-6117
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Albuquerque	(505) 292-3330
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Milwaukee	(414) 643-0554
ALL OTHER STATES	**(800) 962-8128**

NY	Clarence, Trott Elctrns.	716-634-8500
NY	Hauppauge, E.I.L. Instrs.	516-231-6333
NY	Rochester, E.I.L. Instrs.	716-424-5750
NC	Charlotte, Trott Elctrns.	704-376-2237
NC	Charlotte, Brownell Electro	704-597-1270
OH	Cleveland, Pioneer/Instr. Div.	216-587-3600
OH	Dayton, Pioneer/Dayton Div.	513-236-9900
OH	Dayton, E.I.L. Instrs.	513-435-2134
OR	Portland, Branom Instr.	503-283-2555
PA	Philadelphia, Sunshine Sci. Instr.	215-673-5600
PA	Pittsburgh, E.I.L. Instrs.	412-731-5230
TN	Knoxville, Brownell Electro	615-966-3441
TN	Memphis, Brownell Electro	901-795-8487
TN	Nashville, Brownell Electro	615-889-8230
TX	Allen, Prime Distrib. Co.	214-231-0170
TX	Dallas, Economy Gauge & Instr. Supp.	214-243-8370
TX	Garland, Metermaster	214-271-5671
TX	Houston, Quality Instr.	713-524-0528
TX	Houston, E.I.L. Instrs.	713-271-3100
UT	North Salt Lake, Western Controls	801-292-5900
VA	Alexandria, E.I.L. Instrs.	703-354-4330
VA	Virginia Beach, E.I.L. Instrs.	804-499-3746
WA	Seattle, Eicher-Richards	206-523-7888
WA	Seattle, Branom Instr.	206-762-6050
WA	Seattle, E.I.L. Instrs.	206-762-0880

ANALOGIC CORP., Data Conversion Prods. Grp., Audubon Rd., Wakefield, MA 01880, Tel: 617-246-0300, Telex: 94-9307, TWX: 710-348-0425; *Sls. Mgr.:* Leonard D. Sacon .... **3**•1140, 1141

Local Sales Offices & Reps

AZ	Scottsdale, Arcom Sls., Inc.	602-947-5745
CA	Carson, AMASCO	213-516-8561
CA	San Jose, Analogic Corp.	408-247-6401
CA	Sunnyvale, AMASCO	408-733-8690
CO	Denver, Westek Data Prods., Inc.	303-232-2250
CT	Portland, BBI	203-342-0648
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Rosemont, Synmark Sls. Co.	312-825-3455
MA	Holbrook, McLellan Assocs.	617-767-4771
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	Montville, PAF Assocs.	201-335-0680
NY	Smithtown, PAF Assocs.	516-360-0940
OH	Cincinnati, Analogic Corp.	606-371-0064
OH	Dayton, Midwest Mktg. Assocs.	513-433-2511
PA	Ambler, Denco Data Equip. Corp.	215-542-9876
TX	Dallas, Norcom	214-386-4888

ANALOG MODULES, INC., 126 Baywood Avenue, Longwood, FL 32750, Tel: 305-339-4356/4355, Telex: ANALOG MOD C1 467617; FSC No.: 61651; Empl.: 20; *Sls. Mgr.:* Ian D. Crawford .... **3**•1004

ANALOG SYSTEMS, P.O. Box 35879, Tucson, AZ 85740-5879, Tel: 602-293-4923, TWX: 910-952-1185; FSC No.: 58976; Empl.: 13; *Sls. Mgr.:* Sharon Raban; *Dist. Mgr.:* Julie Kosmata

ANALOG TECHNOLOGY CORP., 15859 E. Edna Pl., Irwindale, CA 91706, Tel: 213-960-4004, TWX: 910-584-1855; *Sls. Mgr.:* James L. Lawrence, Jr.

ANALYTICAL MEAS., 31 Willow St., Chatham, NJ 07928, Tel: 201-273-7500; Empl.: 35

ANALYTICS COMMUNICATIONS SYS., 1820 Michael Faraday Dr., Reston, VA 22090, Tel: 703-471-0892, Telex: 710-833-0326; Empl.: 35; *Sls. Mgr.:* Paul G. Jones

ANAREN MICROWAVE, P.O. Box 178, 6635 Kirkville Rd., E. Syracuse, NY 13057, Tel: 315-432-8909, Telex: 937351, TWX: 710-541-1507; FSC No.: 31597; Empl.: 310

ANCHOR SPECIALTY MFG. INC., 300 Hollister Rd., Teterboro, NJ 07608, Tel: 201-288-1939; Empl.: 10

AN/COM INDUSTRIES, P.O. Box 530, 5521 Cleon Ave., N. Hollywood, CA 91603, Tel: 818-769-5518, TWX: 910-498-5713; *Sls. Mgr.:* E. J. Wubben; *Dist. Mgr.:* E. J. Wubben

AND

AND, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-9916, TWX: 910-374-2353; Empl.: 30; *Sls. Mgr.:* Dean Ransom .... **1B**•1023-1025

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak, Frazier	205-536-1506
AZ	Tempe, Foley, Tallent & Lee	602-438-1564
AR	Little Rock, J. Y. Schoonmaker	501-375-2168
CA	Burlingame, William J. Purdy	415-347-7701
CA	Costa Mesa, Berman-Gravely Co.	714-549-2122
CO	Denver, William J. Purdy	303-777-1411
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Orlando, Currie, Peak, Frazier	305-855-0843
IL	Elmhurst, Hill-Gray Assocs.	312-832-4101
MD	Baltimore, S. K. MacDonald	301-924-5880
MA	Needham Heights, Sturgeon Co.	617-444-6603
MI	Detroit, R. P. Urban Assoc.	313-535-2355
MI	Grand Rapids, R. P. Urban Assoc.	616-245-0511
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	Grandview, Harris-Hanson	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
NJ	Englewood, Harold Gray Assocs.	201-894-0894
NM	Albuquerque, William J. Purdy	505-266-7959
NY	Syracuse, Paston-Hunter Co.	315-437-2843
NC	Greensboro, Currie, Peak, Frazier	919-273-3040
OH	Columbus, McFadden Sls.	614-459-1280
OR	Beaverton, W. J. Purdy Co.	503-641-9373
PA	Philadelphia, Samuel K. MacDonald	215-545-1205
TX	Austin, J. Y. Schoonmaker	512-467-8809
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J. Y. Schoonmaker	713-738-2427
UT	Salt Lake City, W. J. Purdy Co.	801-486-8557
WA	Seattle, William J. Purdy	206-284-8020

Local Distributors

CA	Burlingame, Rose Elctrn.	415-348-2740
CA	Chatsworth, Panel Parts Co.	213-998-5991
CA	Sacramento, Dunlap Elctrns.	916-442-5801
CA	Sacramento, Zackit	916-446-3131
CA	San Diego, Pro-Am	619-274-4120
CA	Santa Clara, Waltronic Sls.	408-727-1200
CA	Sunnyvale, Sierra West Elctrns.	408-747-1188
CA	Van Nuys, Patane Avionics	213-988-4455
CO	Denver, Denver Wintronics	303-934-2406
CO	Denver, Integrated Elctrns.	303-534-6121
CT	Stratford, Utronics	203-378-4201
CT	Wallingford, Sager Electrical Supp.	203-265-4600
FL	Miami, ESL Elctrn. Distr.	305-633-6973
HI	Honolulu, Honolulu Elctrns.	808-949-5564
IL	Chicago, Newark/Chicago	312-638-4411
IL	Rosemont, Advent Elctrns.	312-298-4210
MA	Lynn, Land Elctrn. Supp.	617-592-2220
MI	Farmington Hills, Advent Elect.	313-447-1650
MN	Minneapolis, Elctrn. Center	612-371-5200
MN	Minneapolis, The Joel Co.	612-545-5669
NJ	Cranford, Garden State Elect.	201-272-6400
NY	Buffalo, Genessee Radio & Parts Co., Inc.	716-873-9661
NY	East Syracuse, ADD Elctrns.	315-437-0300
NY	Farmingdale, Midway Indl. Elctrns. Inc.	516-293-6800
NY	Rochester, Simcona	716-328-3230
NY	Rome, Rome Elctrns.	315-337-5400
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Warren, REM Elect.	216-373-1300
OR	Beaverton, Almac/Stroum	503-641-9070
OR	Lake Oswego, Rose Elctrns.	503-635-8823
PA	Drexel Hill, Kass Elect.	215-449-2300
PA	Philadelphia, Almo Elctrns.	215-698-4000
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Richardson, Southwest Elect.	214-234-3050
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Bellevue, Almac/Stroum	206-643-9992
WA	Seattle, United Products	206-682-5025
WI	Milwaukee, Industrial Elect.	414-276-1212

ANDERS, INC., 77 Wolcott Rd., Simsbury, CT 06070, Tel: 203-658-7666; FSC No.: 52045; Empl.: 18; *Sls. Mgr.:* R. A. Grover

ANDERSEN LABS., 1280 Blue Hills Ave., Bloomfield, CT 06002, Tel: 203-242-0761, TWX: 710-425-2390; FSC No.: 03947; Empl.: 125; *Sls. Mgr.:* Donald Lowcavage .... **1A**•1450

Local Sales Offices & Reps

AL	Huntsville, Beacon	205-881-5031
AR	Little Rock, Beacon	501-224-5449
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CA	Sherman Oaks, Midwin & Olifson	213-996-9093
FL	Clearwater, Beacon	813-796-2378
FL	Ft. Lauderdale, Beacon	305-491-1054
FL	Maitland, Beacon	305-647-3498
FL	Melbourne, Beacon	305-724-8010
GA	Atlanta, Beacon	404-256-9640
IL	Northfield, Feller Assocs.	312-446-8065
IA	Cedar Rapids, Feller Assocs.	319-364-0566
MD	Randallstown, Beacon	703-591-1300
MA	Wayland, High-Tech Sls.	617-653-3838
NY	Melville, Carnes Assocs.	516-694-1600
NC	Greensboro, Beacon	919-275-9997
PA	Huntingdon Valley, Rabal Assoc.	215-947-4825
TN	Johnson City, Beacon	615-282-2421
TX	Fort Worth, McDonald Assocs.	817-429-4272
VA	Fairfax, Beacon North	703-591-1300

ANDERSON ELCTRNS., 310 Penn St., P.O. Box 89, Hollidaysburg, PA 16648, Tel: 814-695-4428, TWX: 510-691-2516; Empl.: 85; *Sls. Mgr.:* W. H. Anderson .... **1A**•1313

Local Sales Offices & Reps

AZ	Scottsdale, Fryco	602-945-3281
CA	Fullerton, GRU Assocs.	714-738-0903
CA	Santa Clara, Logan Sls	408-496-0660
GA	Lawrenceville, B. T. Funderburk, Inc.	404-963-9495
IL	South Elgin, R.K. Elctrn.	312-695-8552
IN	Indianapolis, Wilson Techn. Sls.	317-259-4032
MA	Plymouth, Newby, Inc.	617-746-3869
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
NY	Smithtown, Long Island, PAF Assocs.	516-360-0940
NC	Apex, Wolff's Elctrn Sls.	919-362-5022
OH	Dayton, Dynel Co.	513-434-6467
OR	Hillsboro, Western Techn. Sls.	503-640-4621
PA	Rydal, Espy Sls.	215-576-0780
TX	Plano, GW Prods.	214-422-1746
WA	Bellevue, Western Techn. Sls.	206-641-3900

ANDERSON POWER PRODS., Div. of High Voltage Engrg., 145 Newton St., Boston, MA 02135, Tel: 617-787-5880, Telex: 940453; *Sls. Mgr.:* Robert G. Maxwell; *Dist. Mgr.:* Robert G. Maxwell

ANDREW CORP., 10500 W. 153rd St., Orland Pk., IL 60462, Tel: 312-349-3300, Telex: 25-3897, TWX: 910-651-3340; *Sls. Mgr.:* Carl Van Hecke

ANDRICH SYS., INC., 1699 Roosevelt Ave., Bohemia, NY 11716, Tel: 516-589-5656; *Sls. Mgr.:* Robert G. Andrews

ANDROMEDA SYS., 9000 Eton Ave., Canoga Park, CA 91304, Tel: 818-709-7600, TWX: 910-444-1248; Empl.: 23; *Sls. Mgr.:* Mike Morgan; *Dist. Mgr.:* J. William Graham

ANDROTEK/DMI, Box 29098, Columbus, OH 43229, Tel: 614-882-7821; *Sls. Mgr.:* James M. Shively

ANGENIEUX INC., 120 Derry Rd., Hudson, NH 02051, Tel: 603-889-2116, Telex: 94-3469; *Sls. Mgr.:* Edward A. Wollensak

ANGO ELECTRONICS CORP., Post Office Box 112, Harrison, NJ 07029, Tel: 212-685-6336, 201-483-7116, Telex: 421531; *Sls. Mgr.:* Brian K. Yuen .... **2**•1008

ANN ARBOR TERMINALS, 6175 Jackson Rd., Ann Arbor, MI 48103, Tel: 313-663-8000, TWX: 810-223-6033; Empl.: 50; *Sls. Mgr.:* Gary DeLuca

ANORAD CORP., 110 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-1990, TWX: 510-227-9894; Empl.: 200

ANRO ELCTRN. INDS., 300 Wildcat Rd., Downsview, ON, Canada, Tel: 416-661-2600; Empl.: 85; *Sls. Mgr.:* E.H. Jones

ANSLEY ELECTRONICS, DIVISION OF THOMAS & BETTS, See Thomas & Betts

ANTENNACRAFT, Box 1005, Burlington, IA 52601

ANTENNA RESCH. ASSOCS., 11317 Frederick Ave., Beltsville, MD 20705, Tel: 301-937-8888, Telex: 908754; Empl.: 25; *Sls. Mgr.:* H.W. Rapalus

ANTENNA SPECIALISTS, 12435 Euclid Ave., Cleveland, OH 44106, Tel: 216-791-7878, Telex: 980-732, TWX: 810-421-8149; Empl.: 1000; *Sls. Mgr.:* Patti Fritz

ANTEX DIV., 7 Hawkes St., Marblehead, MA 01945, Tel: 617-631-7100; *Sls. Mgr.:* C. Loutrel; *Dist. Mgr.:* C. Loutrel

ANTONA CORP., 13600 Ventura Blvd.,, Sherman Oaks, CA 91423, Tel: 213-986-6651

ANTRONIC CORP., 7755 E. Redfield Rd., Ste. 300, Scottsdale, AZ 85260, Tel: 312-287-5110

APAHOUSER-ELCOM, INC., 101 Walnut St., Watertown, MA 02172, Tel: 617-924-1500; FSC No.: 53721; Empl.: 90; *Sls. Mgr.:* Fred Gately

APA DIVISION, 399 Executive Blvd., Elmsford, NY 10523, Tel: 914-592-7322, Telex: 646186; *Sls. Mgr.:* Carl Gruenberg .... 2•1924

Local Distributors

AZ	Phoenix, Scottsdale Tool & Supply	602-273-7376
AZ	Tempe, Marshall Claude Michael	602-894-2188
CA	El Monte, Marshall Claude Michael	213-442-7204
CA	Fullerton, Bertech	714-526-3700
CA	Irvine, Marshall Claude Michael	714-556-6500
CA	Sunnyvale, Marshall Claude Michael	408-739-8720
CA	Sunnyvale, Com-Kyl	408-734-9660
CO	Denver, Marshall Claude Michael	305-841-1878
FL	Clearwater, Tartan Tools	813-447-5364
GA	Norcross, Marshall Claude Michael	404-925-1895
IL	Chicago, McMaster-Carr Supp.	312-834-9600
IL	Chicago, EMF Co. Inc.	312-889-8323
IL	Chicago, Addison Int'l Soldering Sy. Inc.	312-628-8083
IL	Hillside, Miltex Sls. Co.	312-449-0420
MA	Burlington, Marshall Claude Michael	617-272-1234
MI	Royal Oak, Murray Percival Co.	313-548-1971
MN	Excelsior, Tonka Elctrn. Supp.	612-474-5414
NJ	Fairfield, Marshall Claude Michael	201-882-0320
NJ	Mt. Laurel, Marshall Claude Michael	609-778-8720
NM	Alberquerque, Betatron Elctrns.	505-344-2381
NY	Hauppauge, Marshall Claude Michael	516-273-1515
OR	Portland, Murphy Indl. Supp.	503-620-8680
OR	Portland, MPI Assocs.	503-641-6624
TX	Dallas, Marshall Claude Michael	214-233-7650
TX	Dallas, Roy E. Davis Co.	214-688-0652
TX	Houston, Specialized Prods.	713-995-0595
UT	Salt Lake City, Indl. Supp.	801-484-8644
Can	Markham, ON, Brock Elctrns. Ltd.	416-294-8080

A. P. CIRCUIT CORP., 513 East 86th St., P.O. Box 1350, New York, NY 10028, Tel: 212-737-1348, Telex: 428759 .... **1A**•1585

Local Sales Offices & Reps

MI	Detroit, Comtel Instrs.	313-255-1970
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573

APEX MICROTECHNOLOGY CORP., 1130 E. Pennsylvania St., Tucson, AZ 85714, Tel: 602-746-0849, TWX: 910-952-1176; Empl.: 30; *Sls. Mgr.:* Rita Olschewski; *Dist. Mgr.:* Rita Olschewski .... **3**•1005

Local Sales Offices & Reps

CA	Los Altos, Kolm Mktg.	415-948-2635
CA	San Diego, California Elctrn. Mktg.	619-692-3551
CA	Santa Ana, California Elctrn. Mktg.	714-835-2702
CO	Denver, W. H. Howard Assocs.	303-426-3499
IL	La Grange Park, Bierhaus Sls.	312-354-5100
IN	Indianapolis, J & B Sales	219-483-2813
MD	Ellicott City, Nelson Elctrns.	301-747-7887
MA	Malden, J.K. Assocs.	617-321-2922
MN	Bloomington, Merril Franklin Co.	612-854-9446
NJ	Upper Saddle River, Bob Cameron Assocs., Inc.	201-825-1304
NY	Smithtown, T & K Sls.	516-724-3456
OH	Fort Wayne, TX Sales	219-489-4447
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TX	Dallas, Repmasters	214-247-6236
TX	Houston, Repmaster	713-692-8204
WI	Elm Grove, Bierhaus Sls.	414-963-0318

Local Distributors

Intl	Finland, Helsinki, Turion Oy	90-372144
Intl	France, Orsay, Microel	907-08-24
Intl	Germany, Nauheim, Emtron Vertriebs GmbH	(06152) 6003
Intl	India, Bombay, Elmatronic Dvs.	362421
Intl	Israel, Giuataim, EIM	03-77-40-41
Intl	Italy, Milan, Disprel	02-284-0539
Intl	Japan, Tokyo, Kyokuto Boeki Kaisha	244-3511
Intl	Netherlands, Oosterhout, Klaasing Elctrns.	01620-51400
Intl	Norway, Oslo, Eltron	02-462-870
Intl	South Africa, Johannesburg, Advanced Semiconductor	27/11802-4107
Intl	Sweden, Stockholm, Scancopter AB	046-828-9425
Intl	Switzerland, Zug, Anatech AG	042-315-477
Intl	Taiwan, Taipei, Hitek Co. Ltd.	536-1157
Intl	UK, Sunbury-on-Thames, Pascall Elctrns.	09327-87418

API INSTRS., 1601 Trapelo Rd., Waltham, MA 02254, Tel: 617-890-2000, Telex: 92-3445, TWX: 710-324-0681; FSC No.: 20905; Empl.: 350; *Sls. Mgr.:* R. Yates; *Dist. Mgr.:* G. Wood

APM-HEXSEAL, 44 Honeck St., Englewood, NJ 07631, Tel: 201-569-5700, Telex: 13-3403; Empl.: 80; *Sls. Mgr.:* Riva Solins; *Dist. Mgr.:* Riva Solins

APOLLO LASERS, INC., 9201 Independence Ave., Chatsworth, CA 91311, Tel: 213-709-1111, Telex: 66-2278; Empl.: 82; *Sls. Mgr.:* John Q. Adams

APOLLO MAGNETICS CORP., 2720 W. Beverly Rd., Los Angeles, CA 90057, Tel: 213-381-2500, TWX: 910-321-4348; Empl.: 420 .... **3**•1069

Local Sales Offices & Reps

CT	Stratford, Gerald Rosen	203-375-5456
MA	Framingham, Gerald Rosen	617-879-5505
NH	Hollis, Gerald Rosen	603-465-7902
NY	Rochester, J. W. Welch	716-244-1100
NY	Utica, J. W. Welch	716-244-1100
OK	Oklahoma City, MGR Elctrns.	918-366-0125
TX	Dallas, MGR Elctrns.	214-349-9940

APPLETON PAPERS INC., P.O. Box 359, Appleton, WI 54912, Tel: 414-734-9841 .... **3**•1070

APPLIED CIRCUITS, INC., 36-06 43rd. Ave., Long Island City, NY 11101, Tel: 212-786-7200; Empl.: 20

APPLIED CIRCUIT TECHNLG. (ACT), 2931 La Jolla St., Anaheim, CA 92806, Tel: 714-632-9230; *Sls. Mgr.:* Hank Pselos

APPLIED COMMUNICATIONS, Amstar Tech. Prods. Co., 9125 Gaither Rd., Gaithersburg, MD 20877, Tel: 301-948-5210, TWX: 710-828-9706; Empl.: 200; *Sls. Mgr.:* Joseph Rock

APPLIED COMMUNICATIONS, 9125 Gaither Rd., Gaithersburg, MD 20877, Tel: 301-948-5210, TWX: 701-828-9706; Empl.: 200; *Sls. Mgr.:* Joseph Rock

APPLIED CONTROL, 1275 Bloomfield Ave., Fairfield, NJ 07006-2828, Tel: 201-227-5454; FSC No.: 4A725; Empl.: 26; *Sls. Mgr.:* Monica E. Merel

APPLIED DATA COMMUNICATIONS, 14272 Chambers Rd., Tustin, CA 92680, Tel: 714-731-9000; Empl.: 75

APPLIED DIGITAL DATA SYSTEMS INC., 100 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-231-5400, TWX: 510-227-9886; Empl.: 760; *Sls. Mgr.:* Dennis O'Donnell

APPLIED ELECTRO TECHNOLOGY, INT.
AN Sti COMPANY

APPLIED ELECTRO TECHNLG., INT., STI Company, 2220 So. Anne St., Santa Ana, CA 92704, Tel: 714-556-6570, TWX: 910-595-1797; FSC No.: 52797; Empl.: 25; *Sls. Mgr.:* Deborah Core .... **1B**•1293

Local Sales Offices & Reps

CA	Mountain View, Scientific Technlg.	415-965-0910
OR	Eugene, Dennis Ellingsen	503-484-5564
TX	Richardson, Dwain Lawhon	214-231-2289

APPLIED ENGRG. PRODS., P.O. Box A-D, Amity Sta., New Haven, CT 06525, Tel: 203-387-5282, TWX: 710-465-1173; FSC No.: 19505; Empl.: 65; *Sls. Mgr.:* C. Goff; *Dist. Mgr.:* C. Goff

APPLIED INSTRS., INC., 25 Will Place, Brooklyn, NY 11207, Tel: 212-257-0885; *Sls. Mgr.:* I. L. Litty

APPLIED MAGNETICS, 75 Robin Hill Rd., Goleta, CA 93117, Tel: 805-683-5353, TWX: 910-334-1195; FSC No.: 11935; Empl.: 4000; *Sls. Mgr.:* O. M. Fundingsland

APPLIED MICRO TECHNLG., A Burr Brown Co., 2430 N. Hauchuca, Ste. A, Tucson, AZ 85745, Tel: 602-622-8605, TWX: 910-952-1164; Empl.: 15; *Sls. Mgr.:* Lee Davis

APPLIED MICROWAVE DIV. EPSCO, See Epsco Microwave

APPLIED RESEARCH INC., 160 Dupont St., Plainview, NY 11803, Tel: 516-349-9200; Empl.: 50; *Sls. Mgr.:* S. Klipper .... **1A**•1686, 1687

Local Sales Offices & Reps

CA	Los Angeles, EBA Microwave	213-822-7510
CA	Orange, E. Bell Assocs.	714-857-6079
MA	Lowell, Russell Engrg.	617-458-7146
NY	Great Neck, Industron Assocs.	516-487-2620

Applied
Solar
Energy
Corporation

APPLIED SOLAR ENERGY CORP., Photosensor Div., 15251 E. Don Julian Rd., City of Industry, CA 91749, Tel: 818-968-6581, TWX: 910-584-4890; Empl.: 160; *Sls. Mgr.:* George Pankau .... **1B**•1211

Local Sales Offices & Reps

CA	Lomita, Component Mkt. Assoc.	213-326-1460
CA	Mountain View, Weseloh Swanson	415-961-0565
CT	Hartford, Sturgeon Co.	203-249-7800
GA	Stone Mountain, Dixie Tech.	404-962-2530
IL	Chicago, Hill Sls.	312-541-0661
MA	Needham, Sturgeon Co.	617-444-6603
MI	Brooklin, Engineered Comps.	517-592-3236
MN	Minneapolis, Furber Sales	612-881-3620
OH	Centerville, Engrg. Mktg. Assocs.	513-433-2800
PA	Lancaster, Supra Tech.	717-569-0243

APPLIED SYS., 26401 Harper Ave., St. Clair Shores, MI 48081, Tel: 313-779-8700; Empl.: 15; *Sls. Mgr.:* Marty Wyrod

AP PRODUCTS
INCORPORATED

A P PRODUCTS INCORPORATED, 9450 Pineneedle Dr., Box 540, Mentor, OH 44060, Tel: 216-354-2101, TWX: 810-425-2250; Empl.: 84; *Sls. Mgr.:* Kathy M. Dusa .... **2**•1900, 1901

Local Sales Offices & Reps

AZ	Tempe, Electronic Development & Sls.	602-829-9699
AR	Little Rock, Erickson Sls.	501-225-7379
CA	Anaheim, Westrep	714-527-2822
CA	Los Altos, Ewing-Foley, Inc.	415-941-4525
CA	San Diego, D² Sales, Inc.	619-560-6266
CO	Englewood, Computech Mktg.	303-773-3981
FL	Clearwater, Hutto-Hawkins-Peregoy	813-797-4447
FL	Ft. Lauderdale, Hutto-Hawkins-Peregoy	305-971-5750
FL	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
GA	Roswell, Henry W. Philips Co.	404-992-3070
IL	Lombard, RMP/McBride Corp.	312-932-9090
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
LA	Chalmette, Erickson Sls.	504-271-1976
MA	Norwood, MacInnis Co.	617-762-8090
MN	Minneapolis, Donald Luger & Assocs.	612-553-1122
MO	Blue Springs, Kathrinus Kelly Baumhauer	816-229-0001
MO	St. Louis, Kathrinus Kelly Baumhauer	314-647-2400
NJ	Englewood, ABS Assocs.	201-871-0020
NJ	Medford, Champion Elctrn. Sls.	609-983-0932
NY	Buffalo, R. W. Mitscher Co.	716-633-7970
NC	Matthews, Henry W. Phillips Co.	704-882-2878
OH	Dayton, Shamrock Elctrn. Sls.	513-258-1227
OH	Mentor, K. W. Braund Co.	216-255-2334
OK	Oklahoma City, Erickson Sls.	405-682-2947
OR	Portland, Dussault & Assocs. Inc.	503-641-8540
TX	Austin, Erickson Sls.	512-244-3068
TX	Dallas, Erickson Sls.	214-739-5833
TX	Houston, Erickson Sls.	713-980-9609
UT	Salt Lake City, Meridian Mktg.	801-968-4177
WA	Seattle, Dussault & Assocs. Inc.	206-527-5454
WI	Colgate, Rep 1 & Assocs.	414-628-4016

Local Distributors

AL	Birmingham, Ack Radio Supp. Co.	205-322-0588
AZ	Phoenix, Arizona Comps. Co.	602-269-5655
AZ	Phoenix, Tri-Tek	602-995-9352
CA	Burlingame, Rose Elctrn. Dist.	415-348-2740
CA	Chatsworth, Priority One Elctrns.	213-709-5464
CA	Concord, Pacific Radio Supp.	415-682-4700
CA	El Monte, Marshall Inds.	213-442-7204
CA	Laguna Hills, M P Systems	714-770-6411
CA	Mountain View, Haltek Elctrns.	415-969-0510
CA	Palo Alto, Zack Elctrns. of Palo Alto	415-326-5432

CA	Redwood City, HDB Elctrns.	415-368-1388
CA	San Diego, Mock III Sls. Co.	619-560-0515
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Advanced Computer	408-946-7010
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Clara, R.G.B. Electro-Industrial	408-980-1300
CA	Santa Clara, Quest Elctrns.	408-988-1640
CA	Santa Clara, Anchor Elctrns.	408-727-3693
CA	Sun Valley, Richey Western	213-768-3800
CA	Sunnyvale, Sunnyvale Elctrns.	408-736-1324
CO	Colorado Springs, Centennial Elctrns.	303-633-4666
CO	Denver, Integrated Elctrns.	303-292-6121
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	East Hartford, E. J. Stephens Inc.	203-568-1927
CT	Hartford, Hatry Elctrns.	203-527-1881
CT	New Haven, Hatry Elctrns.	203-787-5921
CT	New London, Jan Elctrn. Supplies	203-442-4386
CT	New London, Aikens Elctrn.	203-442-4406
CT	Norwalk, Park Distributors	203-853-2010
CT	Old Lyme, Electronics Warehouse	203-434-8308
CT	Stratford, Hatry Elctrns.	203-375-5886
CT	West Hartford, Signal Elctrn. Ctr.	203-233-8551
FL	Ft. Lauderdale, Southeastern Elect.	305-563-4131
FL	Melbourne, H.I.S. Computermation Inc.	305-254-9399
FL	Miami, Electronic Equip.	305-871-3500
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, Sun Elctrn. Supp. Inc.	305-841-4650
FL	W. Palm Beach, Nurmi Elctrn. Supp.	305-686-8553
GA	Atlanta, Atlanta Computer Mart	404-455-0647
GA	Atlanta, Ack Radio Supp. Co.	404-351-6340
IL	Champaign, Klaus Radio, Inc.	217-356-1896
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Semiconductor Specialists	312-279-1000
IL	Mt. Prospect, Tri State Elect. Corp.	312-255-0600
IL	Niles, Joseph Elctrns., Inc.	312-297-4200
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Evansville, Ohio Valley Sound, Inc.	812-425-6173
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Deeco	319-365-7551
KY	Louisville, Peerless Elctrn. Equip. Co.	502-637-7677
LA	New Orleans, Wm. B. Allen Supp. Co., Inc.	504-525-8222
MD	Aberdeen, Harco Elctrns., Inc.	301-838-7990
MD	Rockville, Capitol Radio Wholesalers	301-881-2270
MA	Burlington, Contact East	617-272-5051
MA	Lowell, Frank P. McCartin Co.	617-454-9101
MA	Lowell, A B Company	617-452-6120
MA	Needham, YDI Elctrn. Corp.	617-449-1005
MA	Needham, Cronin Elctrns.	617-449-0500
MA	Newton, In-Stock Products Co.	617-964-6200
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Somerville, Solid State Sls.	617-547-7053
MA	Westboro, Future Elctrns. Corp.	617-366-2400
MA	Wilmington, R C Components	617-273-1860
MA	Woburn, Pacer Elctrns.	617-935-8330
MA	Worcester, RM Elctrns.	617-756-8311
MI	Livonia, RS Elctrns.	313-525-1155
MI	Westland, Westland Elctrns.	313-728-0063
MN	Burnsville, Electronic Tool Supp.	612-894-3700
MN	Minneapolis, Acme Elctrns.	612-338-4754
MN	St. Paul, Ragon Elctrns.	612-642-2828
MN	Thief River Falls, Digi-Key Corp.	800-346-5144
MO	Columbia, Alpha Labs	314-874-1514
MO	St. Louis, Van Sickle Radio	314-621-5000
MO	St. Louis, Olive Elctrns.	314-426-4500
NH	Hudson, C & H Elctrns.	603-882-1133
NH	Manchester, Yankee Elctrns.	603-625-9746
NJ	Camden, General Radio Supp.	609-964-8560
NJ	East Brunswick, Brothers Elctrns.	201-238-2200
NJ	East Hanover, State Elctrns. Parts	201-887-2550
NJ	Greenbrook, Greenbrook Elect.	201-968-3500
NJ	Kenilworth, Federated Purchaser	201-272-0505
NJ	Rahway, R.S.R./Elctrns.	201-381-8777
NJ	Springfield, Route Elctrns.	201-467-0166
NM	Albuquerque, Electronic Devices Co.	505-884-2950
NY	Astoria, S. L. Jack	212-545-8843
NY	Bohemia, Car Lac Elctrns.	516-567-4200
NY	Buffalo, Summit Distributors	716-887-2800
NY	Hempstead, Davis Elctrns. Corp.	516-483-9200
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Plainview, ACI Elctrns. Corp.	516-293-6630
NY	Pleasantville, Electronic Tool Co.	914-769-8070
NY	Rochester, Compuworld	716-473-5790
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Schenectady, Grimmer's Elect. Supp.	518-374-8480
NY	Troy, Trojan Elctrn. Supp.	518-274-4481
NY	Yorktown Hts., ABL Elctrn. Supp.	914-962-2253
OH	Cincinnati, United Radio	513-761-4030
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Englewood, Argent/Electra	513-836-8633
OH	Reynoldsburg, Hydun Lab Assocs.	614-861-7779
OR	Beaverton, Norvac Elctrns.	503-644-1025
PA	Allentown, P. A. Peters, Inc.	215-434-5237
PA	Colmar, A. B. Computers	215-822-7727
PA	Drexel Hill, Kass Elctrns.	215-449-2300
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
PA	Reading, Barbey Elctrns.	215-376-7451
PA	York, Alvo Elctrns.	814-238-0506
PA	York, E.C.I. Inc.	717-843-8971
RI	Pawtucket, Major Elctrn. Supp.	401-724-7100
RI	Pawtucket, Jabbour Elctrn. Supplies	401-728-4600
SC	Columbia, Dixie Elctrns.	803-779-5332
TN	Chattanooga, Curle Elctrns.	615-266-4727
TN	Nashville, Eddie Warner's, Inc.	615-254-1224
TX	Dallas, Specialized Prods. Co.	214-358-4663
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, Redco	214-688-0652
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Fort Worth, Allied Elctrns.	817-336-5401
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
UT	Salt Lake City, Standard Supply Co.	801-486-3371
VT	Essex Junction, I.E.S. Elctrns. Inc.	802-878-5369
VA	Annandale, Arcade Elctrns.	703-256-4610
VA	Arlington, Arlington Elctrn. Wholesalers	703-524-6256
VA	Fairfax, Nine Assocs.	703-273-1803
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Seattle, Radar Elec. Co.	206-282-2511
WA	Seattle, United Products	206-682-5025
WI	Madison, Schrenk Sls. Co.	608-255-7400
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Milwaukee, Industrial Elctrns.	414-276-1212
WI	Oshkosh, Electronic Inds.	414-235-8930

APTEK MICROSYSTEMS, INC., Hillsboro Plaza, 700 N.W. 12th Ave., Deerfield Beach, FL 33441, Tel: 305-421-8450, Telex: 441020; Empl.: 250; *Sls. Mgr.:* Joseph F. Centeno

APT APTRONICS CORPORATION

APTRONICS CORPORATION, 9450 Pineneedle Dr., P.O. Box 270, Mentor, OH 44060, Tel: 216-354-9239, TWX: 810-425-2250; FSC No.: 30146; *Sls. Mgr.:* Phillip F. Fram; *Dist. Mgr.:* Debra L. Kardum ....2•1160, 1161

Local Sales Offices & Reps

AL	Huntsville, Electronic Sls.	205-533-1735
AZ	Tempe, Electronic Dev. & Sls.	602-438-1547
AR	Little Rock, Erickson Sls.	501-225-7379
CA	Anaheim, Westrep	714-527-2822
CA	Mountain View, Brooks Tech. Grp.	415-960-3880
CA	San Diego, D² Sales	619-560-6266
CA	Santa Clara, Ross Mktg. Assocs.	408-988-8111
CO	Denver, West Inc.	303-692-0131
FL	Ft. Lauderdale, Interface Dynamics	305-565-5075
GA	Norcross, Electronic Sls.	404-448-6554
IL	Lombard, RMP/McBride Corp.	312-932-9090
IN	Indianapolis, M & L Elctrn. Sls., Inc.	317-359-4742
LA	Chalmette, Erickson Sls.	504-271-1976
MA	Burlington, Omni-Rep	617-938-0039
MI	St. Joseph, I. E. Hampton & Assocs.	616-983-0862
MO	Blue Springs, Kathrinus-Kelly-Baumhauer	816-229-0001
MO	St. Louis, Kathrinus-Kelly-Baumhauer	314-647-2400
NJ	Englewood, ABS Assocs.	201-871-0020
NJ	Medford, Champion Elctrn. Sls. Co.	609-983-0932
NY	Buffalo, R. W. Mitscher Co.	716-633-7970
OH	Rocky River, Norm Case Assocs.	216-333-0400
OK	Oklahoma City, Erickson Sls.	405-682-2947
TX	Austin, Erickson Sls.	512-445-2952
TX	Dallas, Erickson Sls.	214-739-5833
TX	El Paso, Epec, Inc.	915-593-8481
TX	Houston, Erickson Sls.	713-980-9606
UT	Salt Lake City, West, Inc.	801-466-2888
WA	Seattle, ECCO Mktg.	206-364-0200

Local Distributors

AL	Huntsville, Marshall Inds.	205-381-9235
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Tempe, Marshall Inds.	602-968-6181
AZ	Tempe, Richey Elctrns.	602-894-9251
CA	Burlingame, Rose Elctrn. Distributing	415-348-2740
CA	Canoga Park, Marshall Inds.	213-999-5001
CA	El Monte, Marshall Inds.	213-442-7204
CA	Fremont, Terminal Sls. Corp.	415-656-7722
CA	Irvine, Marshall Inds.	714-556-6400
CA	Irvine, Ratel Elctrns.	714-549-8611
CA	San Diego, Mock III Sls. Co.	619-560-0515
CA	San Diego, Marshall Inds.	619-578-9600
CA	San Jose, Richey Elctrns.	408-946-6611
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	Sun Valley, Richey Elctrns.	213-768-3800
CA	Sunnyvale, Marshall Inds.	408-732-1100
CO	Denver, Integrated Elctrns.	303-534-6121
CO	Denver, Marshall Inds.	303-427-1818
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	Norwalk, Park Distrs.	203-853-2010
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Orlando, Marshall Inds.	305-841-1878
GA	Norcross, Marshall Inds.	404-923-5750
IL	Chicago, Semiconductor Specialists	312-279-1000
IL	Rosemont, Advent Elctrns.	312-298-4210
IL	Schaumberg, Marshall Inds.	312-490-0155
IN	Indianapolis, Pioneer/Indiana	317-849-7300
MD	Gaithersburg, Marshall Inds.	301-840-9450
MA	Burlington, Marshall Inds.	617-272-8200
MA	Newton, In-Stock Products	617-964-6200
MA	Newton Upper Falls, Greene-Shaw Co.	617-969-8900
MA	Westboro, Future Elctrns.	617-366-2400
MA	Wilmington, RC Components	617-273-1860
MN	Minneapolis, Semiconductor Specialists	612-854-8841
MN	Plymouth, Marshall Inds.	612-559-2211
MO	Kansas City, Semiconductor Specialists	816-452-3900
MO	St. Charles, Finnigan Elctrns., Inc.	314-946-6201
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Camden, General Radio Supp.	609-964-8560
NJ	East Brunswick, Brothers Elctrns.	201-238-2200
NJ	East Hanover, State Elctrns. Parts	201-887-2550
NJ	Fairfield, Marshall Inds.	201-882-0320
NJ	Mt. Laurel, Marshall Inds.	609-234-9100
NY	Bohemia, Car Lac Elctrn. Indl. Sls.	516-567-4200
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Endwell, Marshall Inds.	607-754-1570
NY	Hauppauge, Marshall Inds.	516-273-2424
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Rochester, Masline Elctrns., Inc.	716-546-5373
NY	Rochester, Marshall Inds.	716-235-7620
NY	Troy, Trojan Elctrn. Supp.	518-274-4481
NY	Yorktown Hgts., ABL Elctrn. Supp.	914-962-2253
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Dayton, Marshall Inds.	513-236-8088
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Portland, Radar Elec. Co.	503-232-3404
PA	Pittsburgh, Semiconductor Specialists	412-963-7241
PA	York, E.C.I., Inc.	717-843-8971
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Dallas, Marshall Inds.	214-233-5200
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Houston, Marshall Inds.	713-789-6600
WA	Bellevue, Marshall Inds.	206-747-9100
WA	Seattle, Radar Elec. Co.	206-282-2511
WA	Seattle, Carlyle Technical Sls.	206-575-6750
WA	Spokane, Radar Elec. Co.	509-747-3053
WI	Milwaukee, Marsh Elctrns.	414-475-6000

A.P.W. CO., 72 W. Main, Rockaway, NJ 07866, Tel: 201-627-0643; Empl.: 18

AQ SYS., 1736 Front St., Yorktown Hgts., NY 10598, Tel: 800-431-2104; Empl.: 15; *Sls. Mgr.:* Charles E. Fitzsimmons; *Dist. Mgr.:* Charles E. Fitzsimmons

ARCO CABLE, 7361 Ethel Ave., North Hollywood, CA 91605, Tel: 818-982-2832; Empl.: 10; *Sls. Mgr.:* J. R. Parke

ARCO ELCTRNS., 400 Moreland Rd., Commack, NY 11725, Tel: 516-864-7000, TWX: 510-226-0241; FSC No.: 84171; Empl.: 40; *Sls. Mgr.:* Abe Kosakowsky

ARCOLECTRIC CORP., 9001 Canoga Ave., Canoga Park, CA 91304, Tel: 818-700-1933, Telex: 65-1349; Empl.: 20; *Sls. Mgr.:* L. Lewis; *Dist. Mgr.:* G. Miller ....1B•1026-1028, 1538-1542

Local Distributors

AZ	Tucson, Electronic City	602-622-1173
CA	Berkeley, Al Lashers Elctrns.	415-843-5915
CA	Fullerton, Orvac Elctrns.	714-871-1020
CA	Los Angeles, Electric Switches	213-664-1141
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Dow Radio	213-681-3416
CA	Riverside, Material Techniques	714-686-6186
CA	San Diego, Western Radio	619-239-0361
CA	San Jose, Quement Elctrns.	408-998-5900
FL	Hialeah, Hialeah Elctrns.	305-887-5936
ID	Caldwell, A Gem Supply	208-537-5291
IL	Rockford, GC Elctrns.	815-968-9661
LA	Harvey, AFG Elctrns.	504-368-9696
MA	Needham, YDI Elctrns.	617-449-1005
NJ	Denville, Lashen Elctrns.	201-627-3783
NJ	Springfield, Route Elctrns.	201-379-7710
NY	Bronx, CAM Elctrns.	212-893-8300
NY	Bronx, Wescon Elctrns.	212-584-6325

NY	New Hyde Park, Electronic City	516-352-7145
NC	Raleigh, Capital Elctrns.	919-832-2811
OH	Ashtabula, Sesco Sims Elctrns.	216-997-8391
OR	Eugene, Larsco	503-484-7491
PA	Willow Grove, Resco Elctrns.	215-659-4575
RI	Newport, J. S. Elctrns.	401-847-2991
TX	Houston, City Elctrns.	713-621-1060

ARC SYSTEMS, INC., 400 Oser Ave., Hauppauge, NY 11788, Tel: 516-231-9261, Telex: 230199 SWIFT UR ARC; *Sls. Mgr.:* Robert Miller

AREMCO PRODS., Box 429, Ossining, NY 10562, Tel: 914-762-0685, Telex: 13-7442; Empl.: 30; *Sls. Mgr.:* Mark Wandzilak

ARENBERG SAGE INC., P.O. Box 250, 57 Cornwall St., Jamaica Plain, MA 02130, Tel: 617-522-8640; FSC No.: 04-2593524; Empl.: 9; *Sls. Mgr.:* R. J. Toronto

A.R.F. PRODS., 2559 75th St., Boulder, CO 80301, Tel: 303-443-4844, TWX: 910-940-3446; Empl.: 65; *Sls. Mgr.:* R. C. Lloyd, Jr.

ARGA CONTROLS, 35 E. Glenarm St., Pasadena, CA 91105, Tel: 213-682-3314; FSC No.: 50290; Empl.: 20; *Sls. Mgr.:* Linda Galman

Local Sales Offices & Reps

AL	Atlanta, A.P. Beamish & Assocs.	404-394-0077
AZ	Phoenix, RLS Instrs.	602-892-9329
CA	Santa Ana, Brooks-Moore & Assoc.	714-544-8900
GA	Atlanta, A.P. Beamish & Assocs.	404-394-0077
MA	Boston, Adcour	617-784-8123

ARGENT ELCTRNS., 3245 S. County Rd., 25A, Troy, OH 45373, Tel: 513-335-0031; FSC No.: 55901; Empl.: 20; *Sls. Mgr.:* W. Zickafoose

ARGOS PRODS., 600 S. Sycamore St., Genoa, IL 60135, Tel: 815-784-5118; Empl.: 50; *Sls. Mgr.:* Ron Evers

Local Sales Offices & Reps

CA	Burlingame, Meyer, Ross & Fleming	415-348-6800
CA	Culver City, W. Alderson	213-837-1398
CO	Wheatridge, Bill Newman & Co.	303-425-9503
FL	Ocala, Bencsik Assoc.	904-732-9775
GA	Atlanta, Murphy & Cota	404-875-2525
IL	Chicago, G. Mcl. Cole	312-774-3535
IN	Mulberry, Maish Sls.	317-296-2322
MA	North Scituate, W.A. Hendrickson	617-545-0652
MI	Pontiac, Ted Firaneck Sls.	313-373-9595
MN	Edina, Foster Tech. Sls.	612-941-9800
MO	Kansas City, Nevco	816-421-1751
NJ	Fort Lee, TMC Sls.	201-944-5665
NY	Syracuse, Lewis & Dunnigan	315-446-5522
OH	Dayton, Shamrock Elctrn	513-258-1227
PA	Wynnewood, Stinson Assocs.	215-896-7378
WA	Lynnwood, Pacnor Mktg.	206-284-8020
EXP	N.Y., New York, Roburn Agencies	212-989-5939

ARGO TRANSDATA CORP., Box 554, Clinton, CT 06413, Tel: 203-669-2233; Empl.: 15

ARIES®
ELECTRONICS, INC.

ARIES ELCTRNS., Box 130, Frenchtown, NJ 08825, Tel: 201-996-6841, TWX: 510-235-3391; FSC No.: 51167; Empl.: 110; *Sls. Mgr.:* Frank Folmsbee .... **2**•1149-1152

Local Sales Offices & Reps

AL	Huntsville, CSR	205-533-2444
AZ	Glendale, Adtek, Inc.	602-931-9289
CA	Los Angeles, Universal Comp.	213-641-4255
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Aurora, Mountain View Mktg.	303-360-9641
CT	Canton, Bell Controls	203-693-8926
FL	Ft Lauderdale, APM Assoc.	305-565-0056
FL	Longwood, APM Assoc.	305-869-6831
FL	Merritt Island, APM Assoc.	
FL	Tampa, APM Assoc.	813-886-2457
GA	Atlanta, CSR	404-396-3720
ID	Boise, Doran Sls. Assoc.	208-343-9969
IL	Elk Grove Village, Carlson Sls. Assoc.	312-956-8240
IN	Indianapolis, J and W Sls.	317-842-3740
IA	Cedar Rapids, Carlson Sls. Assoc.	319-377-6341
KS	Gladstone, Delltron Co.	816-436-6445
MD	Lutherville, J. A. Dougherty Sls.	301-321-7890
MI	St. Joseph, OBE Inc.	616-429-7788
MI	W. Bloomfield, OBE Inc.	313-332-4900
MI	West Bloomfield, OBE Inc.	313-332-4900
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Gladstone, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NH	Nashua, Bell Controls	603-882-6984
NJ	Ho-Ho-Kus, DJ Fisher Co.	201-652-0090
NM	Albuquerque, Varigon Assoc.	505-344-5503
NY	Morrisville, Promark Elect.	315-662-3310
NC	Raleigh, CSR	919-878-9200
OH	Akron, Augnat Assoc.	216-273-1211
OH	Dayton, Augnat Assoc.	513-298-1507
OH	Mansfield, Augnat Assoc.	419-526-1488
OK	Tulsa, Advance Technical Sls.	918-664-0482
OR	Forest Grove, Doran Sls. Assoc.	503-357-3333
PA	Harleysville, Thomas Jackson Assoc.	215-643-5560
PA	Harrison City, Augnat Assoc.	412-281-8283
SC	Matthews, CSR	704-847-1927
TX	Austin, Advance Tech. Sls.	512-459-1351
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
UT	Murray, Mountain View Mktg.	801-261-4867
WA	Greenacres, Doran Sales Assoc.	509-922-2317
WA	Redmond, Doran Sls. Assoc.	206-885-1885
WI	Milwaukee, Carlson Sls. Assoc.	414-476-2790

Local Distributors

AL	Huntsville, Comp. Dist.	205-993-7501
AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Scottsdale, Fiesta Elctrns.	602-861-1141
AZ	Tempe, Circuit Specialists	602-966-2878
AR	Little Rock, Component Distrs.	501-227-6278
CA	Canoga Park, Tim-Co	213-992-5040
CA	Fullerton, Pyramid Elctrns.	213-691-0561
CA	San Diego, Sigma Elec.	619-565-2000
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santa Clara, Peters De-Laet	408-727-9440
CO	Englewood, Industrial Elctrns.	303-694-9444
CT	Danbury, Pilgrim Elect.	203-792-7274
CT	Norwalk, Cobra Comps.	203-847-6442
CT	Wallingford, Cronin	203-265-3134
FL	Ft. Lauderdale, Comp. Dist.	305-971-4950
GA	Atlanta, KSM Elect.	800-554-9227; 404-458-2013
GA	Norcross, CDI	404-441-3320
IL	Northbrook, Classic Comps. Supply	312-272-9650
IN	Indianapolis, Meunier Elctrn. Supply	317-635-3511
LA	Lafayette, Ralph's	318-234-4507
MD	Baltimore, A S I Elctrns.	301-265-5100
MA	Burlington, OPL Elctrns.	617-229-2424
MA	Middleboro, Glynn Elctrns.	617-947-4262
MA	Wilmington, Cronin Elctrns.	617-449-5000
MI	Grand Rapids, T & W Elctrns.	616-241-3645
MN	Minneapolis, The Joel Co.	612-545-5669
MO	Valley Park, Beckwith Computer Elctrns.	314-825-2237
NH	Salem, Cronin	603-898-4440
NM	Albuquerque, Intl. Elctrns.	505-345-8120
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Raleigh, Comp. Distrs.	919-834-9465
OH	Cleveland, Pruitt Energy	216-566-1545
OH	Columbus, Wedemeyer Elect. Supp.	614-436-9600
OH	Warren, REM Elctrns.	216-373-1300
OR	Portland, Carlyle	503-292-2053
PA	Erie, REM Elctrns.	814-453-5626
PA	McKeesport, Barno Radio	412-751-5966
PA	Philadelphia, Shap Elctrns.	215-969-3300
TX	Addison, Connec-Tek	214-239-7552
TX	Arlington, Bell Comp. Sls.	817-461-5303
TX	Austin, Quality/Components	512-835-0220
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Fort Worth, Indl. Elctrns.	817-731-7321
TX	Houston, Ralph's	713-748-4909
TX	Richardson, Air Quip Sls.	214-234-3285
VA	Falls Church, Comp. Dist.	703-533-3500
WA	Seattle, Pacific Elctrns	206-575-1050
WA	Seattle, Carlyle Wire & Cable	206-575-6750
WI	Mequon, Taylor	414-241-4321
WI	New Berlin, Classic	414-786-5300

ARISTO GRID LAMP PRODS., 65 Harbor Rd., Port Washington, NY 11050, Tel: 516-944-3030; Empl.: 21

ARK ELCTRNS. CORP., 1325 Industrial Hwy., Southampton, PA 18966, Tel: 215-322-6510; *Sls. Mgr.:* S. Kalos

ARMIGER & ASSOCS., INC., Daniel Woodhead, Inc., 2525 Ridgmar Blvd., Fort Worth, TX 76116, Tel: 817-737-2900; *Sls. Mgr.:* Dave Forcey; *Dist. Mgr.:* Dave Forcey

ARK-LES, 51 Water St., Watertown, MA 02172, Tel: 617-924-2330, Telex: 92-2441; Empl.: 700; *Sls. Mgr.:* Stephen Glorioso

ARMEL ELCTRNS., 1601 75th St., N. Bergen, NJ 07047, Tel: 201-869-4201, TWX: 710-992-8842; FSC No.: 91663; Empl.: 55; *Sls. Mgr.:* V. A. Pasqualino

ARMSTRONG WORLD INDS., W. Liberty St., Lancaster, PA 17604, Tel: 717-397-0611, TWX: 717-560-4405; Empl.: 24,000

ARMTEC INDUSTRIES, INC., Daven Components Grp., Manchester Airport, Manchester, NH 03103, Tel: 603-669-0940, TWX: 710-220-1747; FSC No.: 58880; Empl.: 400; *Sls. Mgr.:* Dave Richards .... **1B**•1543

Local Sales Offices & Reps

AL	Huntsville, Technlg. Mktg. Assoc.	205-883-7893
AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Fullerton, Groh Assoc.	714-738-7105
CA	Santa Clara, Fischer Assoc.	408-733-7350
CO	Lakewood, Trembly Assoc.	303-233-9544
FL	Pompano Beach, Techlg. Mktg. Assoc.	305-942-0774
GA	Atlanta, Technlg. Mktg. Assoc.	404-257-0374
IL	Northfield, Imex	312-446-8934
IN	Ft. Wayne, J&B Eng. Sls.	219-483-2813
KS	Shawnee Mission, Technical Sls.	913-888-3330
MD	King of Prussia, Freedman-Malta Assoc.	215-337-9211
MA	Norwood, MPS Elctrns.	617-769-8700
MN	Minneapolis, R-J Inc.	612-866-3661
MO	St. Louis, Technical Sls.	314-725-5361
NV	Las Vegas, Trembly Assoc.	702-739-9770
NJ	New Providence, Al Robinson Assoc.	201-464-4812
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Clarence Center, Nu-Tekneex Inc.	716-741-9138
NY	Guilderland, Nu-Tekneex Inc.	518-355-1829
NY	Lynbrook, HLJ Comp-Tech	516-599-2999
NC	Burlington, P. J. Nahser	919-226-8053
OH	Englewood, Allen Nace Co.	513-836-0931
OH	Richfield, Allen Nace Co.	216-659-7178
OR	Portland, Comp. Technlg. Inc.	503-292-1518
PA	King of Prussia, Freedman-Malta Assoc.	215-337-9211
TX	Dallas, Oeler & Menelaides	214-361-8876
TX	Houston, Oeler & Menelaides	713-772-0730
UT	Salt Lake City, Trembly Assoc.	801-486-5292
WA	Seattle, Comp. Technlg. Inc.	206-789-4555
EXP	NY, Islip, Lothar-Sanford	516-581-3662

ARNOLD ENGRG., Box "G", Marengo, IL 60152, Tel: 815-568-2000, Telex: 25-7448, TWX: 910-642-2790; Empl.: 900; *Sls. Mgr.:* C. F. Templeton, V.P.

ARNOLD MAGNETICS

ARNOLD MAGNETICS, 11520 W. Jefferson Blvd., Culver City, CA 90230, Tel: 213-390-3537/8837, TWX: 910-343-6468; FSC No.: 04879; Empl.: 105; *Sls. Mgr.:* Phil Kite; *Dist. Mgr.:* Phil Kite .... **3**•1496-1499

Local Sales Offices & Reps

AZ	Phoenix, Faser Tech. Sls.	602-948-4404
CA	El Segundo, L. L. Stoakes	213-640-2178
CA	Los Altos, Kolm Mktg. Assocs.	415-948-2635
CA	San Diego, L. L. Stoakes	619-452-1600
FL	DeBary, DJE Assocs.	305-668-6827
MD	Silver Springs, Youth Assocs.	301-598-5740
MA	Andover, Bee Assocs.	617-475-2124
NY	New Rochelle, Ascor Elctrns.	914-235-8838
TX	Houston, Spectra Sls.	713-747-2798
TX	Richardson, Spectra Sls.	214-234-3600

Aromat
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AROMAT CORP., 250 Sheffield St., Mountainside, NJ 07092, Tel: 201-232-4260, TWX: 710-997-9536; Empl.: 150 .... **1B**•1294-1309

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assoc.	205-881-5031
AZ	Tempe, Sys. Sls. of Arizona, Inc.	602-829-9338
AR	Little Rock, Beacon Elctrns. Assoc.	501-224-5449
CA	Cupertino, Aromat Corp.	408-446-5000
CA	Garden Grove, Aromat Corp.	714-895-7707
CA	Garden Grove, Elsco	213-533-1255

CA	Santa Clara, Westrep	408-988-8833
CO	Littleton, Omega Ltd.	303-798-7040
CT	Madison, United Comps.	203-245-4810
FL	Fern Park, EIR	305-830-9600
FL	Orlando, Aromat Corp.	305-855-1075
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IL	Elk Grove Village, Aromat Corp.	312-593-8535
IN	Indianapolis, J & W Sls. Co.	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Gilman, United Comps.	203-889-4050
MA	Norwood, United Comps.	617-226-0556
MI	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
MI	Redford, R. P. Urban & Assocs.	313-535-2355
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Independence, Repco	816-254-3410
NJ	Hackensack, Meg Elctrn. Sls.	201-489-7700
NJ	Mountainside, Aromat Corp.	201-232-4260
NM	Albuquerque, SSA Inc. of New Mexico	505-881-8877
NY	Binghamton, Rochester Comps.	607-772-9292
NY	W. Henrietta, Rochester Comp.	716-546-4766
NC	Raleigh, Beacon Elctrns. Assoc.	919-787-0330
OH	Cleveland, J. R. Thornberry Co.	216-321-3328
OH	Kettering, J. R. Thornberry Co.	513-258-1863
OK	Tulsa, Advanced Tech. Sls.	918-664-0482
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TX	Austin, C. R. Colvin & Assocs.	512-474-8698
TX	Dallas, Advanced Tech. Sls.	214-340-1300
TX	Houston, C. R. Colvin & Assocs.	713-961-1262
TX	Richardson, Aromat Corp.	214-235-0415
WA	Bellevue, Sls. & Engrg.	206-883-4999
WA	Vancouver, Sls. & Engrg.	206-573-5161
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

Local Distributors

AL	Huntsville, Contact Elctrns.	205-881-9321
AZ	Tempe, Bell Inds.	602-966-7800
CA	Chatsworth, Mil-Com Dist.	213-998-3111
CA	Mountain View, U.S.I.	415-969-5420
CA	Santa Clara, Patane Selectronics	408-496-6151
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Van Nuys, Patane Avionics	213-988-4455, 213-873-5541
CO	Denver, Ragon Elctrns.	303-744-3601
CO	Englewood, Industrial Elctrns.	303-694-9444
CT	Naugatuck, SCR Elec. Co.	203-729-8274
FL	Longwood, Intertec Comps.	305-834-7777
IL	Lombard, R. M. Elctrns.	312-932-5150
IL	Mt. Prospect, Magnuson Elctrns.	312-956-0700
IN	Indianapolis, R. M. Elctrns.	317-247-9701
IN	Indianapolis, Magnuson Elctrns.	317-247-5108
IA	Cedar Rapids, Bergquist Co.	319-366-8733
IA	Cedar Rapids, Ragon Elctrns.	816-254-3410
KS	Derby, Ragon Elctrns.	816-254-3410
MA	Canton, Impact Sls. Co.	617-821-1500
MA	Middleboro, Glynn Elctrns.	617-947-4262
MI	Grand Rapids, R. M. Elctrns.	616-531-9300
MN	Minneapolis, Joel Co.	612-545-5669
MN	Minneapolis, Bergquist Co.	612-835-2322
MN	St. Paul, Ragon Elctrns.	612-642-2828
MO	Berkeley, Ragon Elctrns.	319-254-3410
MO	Independence, Ragon Elctrns.	816-254-3410
NJ	Bellmawr, Mid-Atlantic Elctrns. Corp.	609-931-5303, 215-923-6868
NJ	Fair Lawn, Relay Specialties	201-797-3313
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Lynbrook, Peerless Radio Corp.	516-593-2121, 212-523-3456
NY	Millbrook, Villarreal Elctrns.	914-677-3447
NY	Mt. Vernon, QAR Indl. Elctrn. Sls.	914-699-2224
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rome, Rome Elctrns.	315-337-5400
NC	Charlotte, Elctrns. Mktg. Corp.	704-394-6195
NC	Charlotte, Dixie Elctrns.	704-377-5413
NC	Hickory, Dixie Elctrns.	704-328-2646
NC	Winston-Salem, Dixie Elctrns.	919-724-5961
OH	Columbus, Elctrns. Mktg. Corp. (EMC)	614-299-4161
OH	Highland Heights, Elctrns. Mktg. Corp. (EMC)	216-442-3441
OH	Kettering, Elctrns. Mktg. Corp. (EMC)	513-439-4711
OK	Tulsa, Norvell Elctrns.	918-254-8606
OR	Portland, P&R Inds.	503-641-9525
PA	Harrisburg, Advacom	717-545-5674
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	McKean, Advacom	814-476-7774
PA	Wayne, Peak Elctrns.	215-293-9000
RI	Pawtucket, Major/Edwards	401-725-7400
SC	Charleston, Dixie Elctrns.	803-554-7515
SC	Columbia, Dixie Elctrns.	803-779-5332
SC	Greenville, Dixie Elctrns.	803-297-1430
TN	Gray, Dixie Elctrns.	615-477-3838
TN	Knoxville, Dixie Elctrns.	615-938-4131
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Dallas, Computer Comps. Corp.	214-239-0271
TX	El Paso, ERA Elctrns., Inc.	915-592-4126
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Stafford, Southwest Elctrns.	713-491-4900
VA	Roanoke, Mexitronics Corp.	703-342-4444
WA	Bellevue, Bell Inds.	206-747-1515
WA	Seattle, Pacific Elctrns.	206-575-1050
WI	Mequon, Taylor Electric	414-241-4321

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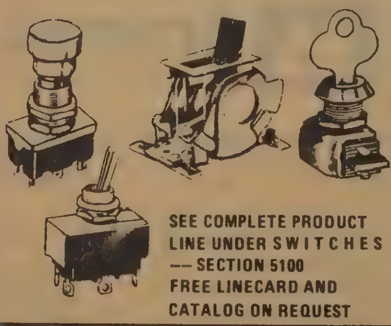

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Local Sales Offices & Reps

AL	Huntsville, Redstone Military Svc.	205-837-6136
AZ	Chandler, Blackhart Assoc.	602-831-2566
CA	Los Angeles, McDougall/McLaughlin	213-477-8556
CA	Mountain View, Mark V Assocs.	415-964-6275
FL	Winter Park, Microwave Mktg.	305-678-2141
IL	Mt. Prospect, Cain & Co.	312-253-3578
IA	Cedar Rapids, Palatine Sls.	319-365-8071
KS	Mission, Palatine Sls.	913-831-0555
KS	Wichita, Palatine Sls.	316-776-0065
MD	Ellicott City, Doss Elctrns.	301-465-1336
MA	Chelmsford, BBC	617-256-6593
MO	Hazelwood, Palatine Sls.	314-839-0800
NY	Great Neck, EAC	516-466-9798
NY	Utica, B D Hummel Co.	315-736-7821
NC	Raleigh, Barker Assoc.	919-851-7841
OH	Dayton, Haacke Co.	513-254-1951
OH	Lancaster, Cain & Co.	614-654-4800
PA	Newtown, SWR Assocs. Corp.	215-356-8550
TX	Garland, TESCO	214-681-1376
WA	Seattle, Datacom Assocs.	206-285-2525

ARRAY TECHNOLOGY, 992 S. Saratoga-Sunnyvale Rd., San Jose, CA 95129, Tel: 408-252-9900; *Sls. Mgr.:* Jim Schenck

ARROW FASTENER, 271 Mayhill St., Saddlebrook, NJ 07662, Tel: 201-843-6900; Empl.: 600

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ARROW HART

ARROW HART DIV., Cooper Inds., 103 Hawthorn St., Hartford, CT 06101, Tel: 203-249-8471, Telex: 99328 .... **1B•1568-1573**

Local Sales Offices & Reps

AL	Huntsville, Hollingsworth & Still	800-241-5712
AZ	Phoenix, Elec-Com	602-967-8643
CA	Los Angeles, Arrow Hart Div.	213-588-5251
CO	Denver, West, Inc.	303-692-0131
CT	Hartford, Arrow Hart	203-249-8471
FL	Ft. Lauderdale, Hollingsworth & Still	800-241-5712
FL	Miami, Hollingsworth & Still	800-241-5712
FL	Orlando, Hollingsworth & Still	800-241-5712
GA	Norcross, Hollingsworth & Still	800-241-5712
IL	Wood Dale, Arrow Hart Div.	312-766-9570
MO	St. Louis, Arrow Hart	314-569-0626
NJ	Berlin, Arrow Hart	609-768-9520
NM	Albuquerque, Elec-Com Assoc.	505-898-6101
NC	Greensboro, Hollingsworth & Still	800-241-5712
NC	Kernersville, Hollingsworth & Still	800-241-5712
OH	Mason, Arrow Hart	513-398-0156
OR	Portland, Micro Sales, Inc.	503-297-4726
PA	Willow Grove, Arrow Hart	215-659-3728
TX	Richardson, Arrow Hart Div.	214-644-6210
UT	Salt Lake City, Meridian West	801-466-2888
WA	Belleview, Micro Sales, Inc.	206-451-0569
WI	Pewaukee, Arrow Hart Div.	414-367-0081

Local Distributors

AL	Muscle Shoals, Jones Elctrns.	205-383-1241
AZ	Phoenix, Be Switched	602-275-4805
AZ	Tempe, Fisher/Brownell	602-967-1464
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Alhambra, Fisher/Brownell	213-289-0255
CA	Commerce, Electro Comps.	213-727-0200
CA	Covina, Selecta Switch	213-967-4123
CA	Gardena, California Switch & Signal	213-770-2330
CA	Los Angeles, Master Distributor	213-452-1229
CA	Los Angeles, Electric Switches	213-660-1310
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Diego, Fisher/Brownell	714-560-8545
CA	San Francisco, Zack Elctrns.	408-626-1444
CA	San Jose, Consolidated Parts	408-263-9521
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	San Leandro, Electro Components	415-352-5210
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Santa Fe Springs, Eurton Elec.	213-946-4477
CA	Tustin, Western Switches & Control	714-731-4333
CO	Denver, Elctrn. Parts	303-744-1992
CO	Denver, Integrated Elctrns.	303-534-6121
CO	Denver, Denver Wintronics	303-934-2406
CO	Denver, Consolidated Parts	303-623-5313
CO	Denver, Star for Parts	303-623-4224
CO	Denver, Fistells Elctrn. Supp.	303-244-4691
CT	Shelton, Century Elec. Sy	203-736-2684
CT	West Hartford, Gal Elec.	203-232-9880
FL	Ft. Lauderdale, Peerless Radio	305-973-4141
FL	Jacksonville, Ace Elec. Supp.	904-398-9857
FL	Miami, Electrn. Equip.	305-871-3500
FL	Miami, Alpeco Intl.	305-592-2985
FL	Sarasota, Workman Elctrn.	813-371-4242
FL	Sarasota, Dow Elctrns.	813-365-3393
GA	Atlanta, Ack Radio Supply	404-351-6340
GA	Atlanta, A-C Equip.	404-451-2747
HI	Honolulu, Honolulu Elctrns.	808-949-5564
IL	Addison, LComp Chicago	312-628-1400
IL	Chicago, Revere Elec. Supp.	312-738-3636
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Rockford, G. C. Elctrns.	815-968-9661
IL	Wood Dale, Electro Kinetics	312-595-6700
IN	East Chicago, Acro Elctrns.	219-397-8681
IN	Evansville, Hutch & Son	812-425-7201
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Marion, Brenneman & Assoc.	319-377-6394
LA	Lafayette, Ralph's Elctrns.	318-233-0105
LA	New Orleans, William B. Allen	504-525-8222
LA	Shreveport, Ind. Elctrns.	318-222-9459
MD	Bethesda, Empire Elec. Sy	301-656-3300
MD	Rockville, Capital Radio Whlsrs.	301-881-2270
MA	Allston, Hilco Elec. Supp.	617-783-2600
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Hingham, Sager Elctrl.	617-749-6700
MI	Grand Rapids, S-F Elctrn. Sy.	616-459-0216
MI	Livonia, Pioneer Michigan	313-525-1800
MI	Livonia, RS Elctrns.	313-525-1155
MI	St. Clair Shores, SPEMCO	313-771-2700

MN	Minneapolis, Sterling Elec.	612-332-4571
MN	St. Paul, Gopher Elctrns. Co.	612-483-4450
MS	Jackson, Ellington Elctrns.	601-355-0561
MO	Kansas City, LComp Kansas City	816-221-2400
MO	Maryland Heights, LComp St. Louis	314-291-6200
NE	Lincoln, Scott Elctrns.	402-466-8221
NJ	Camden, General Radio Sy. Co.	609-964-8560
NJ	East Hanover, State Elctrn. Parts	201-887-2550
NJ	Manasquan, Heiman H. Smith	201-223-9400
NJ	Prospect Park, Kappe	201-790-1999
NM	Albuquerque, Walker Radio	505-247-2288
NY	Binghamton, Florance Elec Sy	607-724-2455
NY	Buffalo, Genesee Radio & Parts	716-873-9661
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, S.A.I.	516-293-2710
NY	Hempstead, Electronic Equip.	516-538-5510
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	New York City, Brownell Electro	212-691-1171
NY	Rochester, Rochester Radio Sy.	716-454-7800
NY	Woodside, Switches Unltd.	212-478-5000
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Cleveland, Midland Elec.	216-248-3800
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Esco	513-226-1133
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Portland, Johnstone Corp.	503-231-4833
PA	Philadelphia, Philadelphia Elctrns.	215-568-7444
RI	Providence, W. M. Dandreta	401-861-2800
TN	Memphis, Bluff City Elctrns.	901-345-9500
TN	Nashville, Carlton-Bates	615-244-3562
TN	Nashville, Randolph & Rice	615-255-5602
TX	Austin, Harrison Equip.	512-458-3555
TX	Dallas, Associated Aircraft	214-331-4381
TX	Dallas, Wilkinson Brothers	214-941-9963
TX	Dallas, Harrison Equip.	214-239-2750
TX	El Paso, Midland Specialty	915-533-9555
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Harrison Equip.	713-879-2600
TX	Lubbock, Texas Elctrn. Sy. Corp.	806-765-8456
TX	Richardson, Fisher/Brownell	214-235-3177
TX	San Antonio, Sherman Elctrns.	512-224-1004
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Charlottesville, Virginia Radio Sy	804-296-4184
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Bell Ind.	206-747-1515
WA	Bellevue, Integrated/Jaco	206-455-2727
WA	Seattle, Zepher Elctrn. Sls.	206-241-1980
WA	Seattle, Radar Elec.	206-282-2511
WI	Mequon, Taylor Elec. Co.	414-241-4321

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Local Sales Offices & Reps

CA	San Diego, S & A Technical Sales	619-295-8330
FL	North Miami, Ben Goldner	305-932-2782
GA	Atlanta, Electro Sls.	404-394-1122
IL	Chicago, Berndt Assoc.	312-283-0713
KY	Louisville, KW Electronic Sales, Inc.	502-451-1860
MA	Southboro, K.S.A. of New England	617-485-9432
MI	Novi, Lektronics Sales	313-349-3304
MN	Minneapolis, Berndt Assoc.	612-546-2021
NY	Bayside, John Kavanagh	212-229-2731
NC	Greensboro, KZJ Component Sales	919-852-5990
OH	Dayton, KW Electronic Sales, Inc.	513-890-2150
OH	Shaker Heights, KW Electronic Sales, Inc.	216-491-9177
OH	Worthington, KW Electronic Sales, Inc.	614-888-0483
PA	Philadelphia, Check Associates	215-487-3007
TN	Chattanooga, Electro Sales	615-267-4260

ARTECH CORP., 2901 Telestar Ct., Falls Church, VA 22042, Tel: 703-560-3292; Empl.: 40; *Sls. Mgr.:* S. Martin

ARTEL COMMUNICATIONS CORP., 93 Grand St., Worcester, MA 01602, Tel: 617-752-5690

ARTISAN ELCTRNS., 5 Eastmans Rd., Parsippany, NJ 07054, Tel: 201-887-7100; Empl.: 200; *Sls. Mgr.:* Gail Norton; *Dist. Mgr.:* Gail Norton

Local Distributors

CA	Haywards, Allied Elctrns. Inc.	415-487-5250
IL	Elgin, Allied Elctrns. Inc.	312-697-8200
NJ	Fair Lawn, Relay Specialties	800-526-5376
NY	Rochester, Simcona Elctrns. Corp.	716-328-3230
OH	Euclid, Rockford Controls Ohio, Inc.	216-731-5250
PA	Washington Crossing, Riverside Comp. Supp. Co.	215-493-5228
TX	Fort Worth, Allied Elctrns.	817-336-5401

ARTRONIC INSTR. CO., INC., 9 Division St., Sidney, NY 13838, Tel: 607-563-8444; FSC No.: 09446

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ASACA SHIBASKU CORP. OF AMER., 12509 Beatrice St., Los Angeles, CA 90066, Tel: 827-7144, Telex: 182089; *Sls. Mgr.:* Alan R. Davis; *Dist. Mgr.:* Susan Grossinger

ASCO WIRE & CABLE CO., 412 Housatonic Ave., Bridgeport, CT 06608, Tel: 203-366-5294; Empl.: 30; *Sls. Mgr.:* M. Madow

Local Sales Offices & Reps

FL	Melbourne Beach, James Indus.	305-725-9807
IL	Inverness, James Indus.	312-358-8000
VA	Portsmouth, FBD Sales	804-484-3162

Local Distributors

NY	Corona, Magnet Wire	212-651-0900

ASHLAND CHEMICAL, Ashland Oil, Inc., Box 2219, Columbus, OH 43216, Tel: 614-889-3333

ASHLAND ELEC. PRODS., 32-02 Queens Blvd., Long Island City, NY 11101, Tel: 212-392-4010; Empl.: 115; *Sls. Mgr.:* Harland W. Cashman

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ASMANN COMPONENTS, Div. of ebm Industries, Inc., 525 New Britain Ave., Unionville, CT 06085, Tel: 203-674-1515, TWX: 710-423-8723; *Sls. Mgr.:* Edward A. Cyr ....**2•1255**

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ASSEM-PRO INSTRS., Div. of Overnight Engineering Inc., 1859 Andrews Ave., San Jose, CA 95124, Tel: 408-267-1168; *Sls. Mgr.:* Lynn Riordan; *Dist. Mgr.:* Lynn Riordan

ASSEMBLY SPECIALISTS, 914 Main St., Box 965, Acton, MA 01720, Tel: 617-263-9100; *Sls. Mgr.:* George L. Boyden

ASSOCIATED CIRCUITS INC., 621 Old County Rd., San Carlos, CA 94070, Tel: 415-592-7528; *Sls. Mgr.:* Betty Smeland

ASSOCIATED ENGRG. MFG., 546 Valley Rd., Upper Montclair, NJ 07043, Tel: 201-783-7800, Telex: 138866; Empl.: 69

ASSOCIATED ENVIRONMENTAL SYSTEMS, 10 Industrial Way, Amesbury, MA 01913-4848, Tel: 617-388-5662, TWX: 710-347-0590; Empl.: 300; *Sls. Mgr.:* A. P. Campagna

ASSOCIATED RESEARCH, INC., 8221 N. Kimball Ave., Skokie, IL 60076, Tel: 312-647-7850, Telex: 28-3511; FSC No.: 04237; Empl.: 80; *Sls. Mgr.:* Larry Gulik

ASSOCIATED SPECIALTIES, 1751 Main St., Orefield, PA 18069, Tel: 215-395-9172; *Sls. Mgr.:* V. Laudenslager; *Dist. Mgr.:* V. Laudenslager

ASSOCIATED SPRING, BARNES GRP., 18 Main St., Bristol, CT 06010, Tel: 203-583-1331, Telex: 962449, TWX: 710-454-0592; Empl.: 1850; *Sls. Mgr.:* R. Hufsmith

Local Sales Offices & Reps

CA	Gardena	213-323-4833
CT	Bristol	203-582-9581
GA	Atlanta	404-955-1123
IL	Lombard	312-495-4760
IL	Mattoon	217-235-5601
MI	Ann Arbor	313-665-8686
MI	Livonia	313-478-5300
NY	Syracuse	315-457-9200
NC	Arden	704-684-7836
OH	Dayton	513-253-4131
PA	Corry	814-664-9646
TN	Memphis	901-362-9544
TX	Dallas	214-330-8661
WI	Milwaukee	414-482-1600

ASSOCIATED TESTING LABS., Div. of Kidde, Inc., 53 Second Ave., Burlington, MA 01803, Tel: 617-272-9050; Empl.: 80; *Sls. Mgr.:* Robert H. Croft

ASTEC USA, LTD., A BSR Intl. Co., 2880 San Tomas Expwy., #200, Santa Clara, CA 95051, Tel: 408-748-1200, Telex: 4745018 ASTEC UI, TWX: 310-474-5018; *Sls. Mgr.:* Russ Sinagra ....**3•1500**

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
AZ	Tempe, Cantec Sls.	602-829-0191
CA	San Diego, SR Elctrns.	619-560-8330
CA	Santa Clara, I Squared	408-988-3400
CA	Santa Clara, Astec (USA) Ltd.	408-748-1200
CA	Thousand Oaks, SC Cubed	805-496-7307
CA	Tustin, SC Cubed	714-731-9206
CO	Wittleton, Lange Sales Inc.	303-795-3300
DC	Fairfax, Scientific Assocs.	703-385-0600
GA	Stone Mtn., 20th Century Mktg.	404-292-7088
IL	Rolling Meadows, Sumer	312-991-8500
MA	Burlington, Mill-Bern Assocs.	617-273-1313
MN	Bloomington, Elctrn. Sls. Agency	612-884-8291
NJ	Pennsauken, Representatives Inc.	609-662-5222
NY	Jamaica, SJ Assocs.	212-291-3232
OH	Beachwood, Elctrn. Salesmasters	216-831-9555
OK	Tulsa, West Assocs.	918-492-0390
TN	Knottsville, 20th Century Mktg.	615-690-1618
TX	Austin, West Assocs.	512-454-3681
TX	Dallas, West Assocs.	214-248-7060
TX	Houston, West Assocs.	713-777-4108
WA	Bellevue, SDR Squared	206-747-9424

Local Distributors

CA	El Segundo, Wyle Labs.	213-322-8100
CA	Irvine, Wyle Labs.	714-863-9953
CA	Rancho Cordova, Wyle Labs.	916-638-5282
CA	San Diego, Wyle Labs.	619-565-9171
CA	Santa Clara, Wyle Labs.	408-727-2500
CO	Phoenix, Wyle Labs.	602-249-2232
CO	Thornton, Wyle Labs.	303-457-9953
OK	Tulsa, Quality Comps.	918-634-8812
OR	Hillsboro, Wyle Labs.	503-640-6000
TX	Austin, Quality Comps.	512-835-0220
TX	Dallas, Quality Comps.	214-387-4949
TX	Sugarland, Quality Comps.	713-491-8812
UT	Salt Lake City, Wyle Labs.	801-974-9953
WA	Bellevue, Wyle Labs.	206-453-8300

ASTRO CIRCUIT, 100 Hale St., Lowell, MA. 01851, Tel: 617-458-3240, TWX: 710-343-0754; Empl.: 220

ASTROCOM ELECTRONICS, INC., Box 370, Oneonta, NY 13820, Tel: 607-432-1930

ASTRO DYNAMICS, INC., 2 Gill St., Woburn, MA 01801, Tel: 617-935-4944; Empl.: 50

ASTRODYNE, 35 Executive Dr., Hudson, NH 03051, Tel: 603-880-8600; FSC No.: 28023; Empl.: 60; *Sls. Mgr.:* Warren Heinzelmann; *Dist. Mgr.:* Warren Heinzelmann

ASTRO-GEO-MARINE, INC., 202 E. Cota St., Santa Barbara, CA 93101, Tel: 805-965-7005; FSC No.: 51473; Empl.: 15

ASTRO INSTRUMENT CORP., 2501 NW 17th Ln., Pompano Beach, FL 33064, Tel: 305-748-5527, TWX: 510-956-9601; FSC No.: 51761; *Sls. Mgr.:* William E. Watson

ASTROLAB, 345 Dalziel Rd., Linden, NJ 07036, Tel: 201-862-0022, TWX: 710-996-5930; FSC No.: 16301; Empl.: 36; *Sls. Mgr.:* J. R. Toma

ASTRO-MED, INC., Atlan-Tol Indl. Pk., W. Warwick, RI 02893, Tel: 401-828-4000, TWX: 710-382-6409; Empl.: 120; *Sls. Mgr.:* Everett V. Pizzuti; *Dist. Mgr.:* Everett V. Pizzuti ....**3•1382**

ASTRONAUTICS CORP. OF AMERICA, P.O. Box 523, Milwaukee, WI 53201, Tel: 414-447-8200, TWX: 910-262-3153; FSC No.: 10138

ASTRON CORP., 2852 Walnut #E, Tustin, CA 92680, Tel: 714-832-7770; *Sls. Mgr.:* William Pochirowski; *Dist. Mgr.:* William Pochirowski ....**3•1501**

Local Distributors

CA	Los Angeles, Henry Radio	213-820-1234
CA	Northridge, Ora Elctrns.	213-701-5848
CA	Sun Valley, Cartwright Comms.	213-768-7744
CO	Aurora, Electro Tech Sls.	303-343-8937
GA	Marrietta, NBC Mktg.	404-424-9097
IL	Joliet, Primus Elctrns.	815-436-8945
IL	Joliet, Communications Assoc.	815-744-6444
MD	Cockleysville, Tessco.	301-252-0860
NJ	Clifton, Meridian Comms.	201-473-1623
OH	Cincinnati, Cartwright Comms.	513-489-1755
TX	Dallas, M. Hutton Co.	214-484-0580

ASTROSYN AMERICA, 14349 Victory Blvd., Ste. 304, Van Nuys, CA 91401, Tel: 213-785-2197, Telex: 651446; *Sls. Mgr.:* D. F. Dowis; *Dist. Mgr.:* D. F. Dowis

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ASTROSYSTEMS, 6 Nevada Dr., Lake Success, NY 11042, Tel: 516-328-1600, TWX: 510-223-0411; Empl.: 150; *Sls. Mgr.:* James R. Boyer ....3•1189, 1504, 1817

Local Sales Offices & Reps

AL	Huntsville, Kemp Engrg.	205-837-4304
AR	El Dorado, Indust. Controls Assoc.	501-862-2051
CA	Cerritos, Foxco Equip.	213-921-3421
CO	Englewood, Dynatech	303-773-2830
CO	Englewood, Dynatech	303-773-2830
FL	Sanibel, Motion Products	813-472-0066
GA	Atlanta, Kemp Instrs.	404-452-8050
GA	Doraville, Kemp Inst.	404-938-5973
IL	Elgin, JHS Assocs.	312-741-9070
IN	Mishawaka, Engineered Sls.	219-255-5111
MD	Bethesda, Multi-Measurements, Inc.	301-889-0471
MI	Detroit, Static Controls Corp.	313-537-2975
MI	Walled Lake, Static Controls Corp.	313-363-4500
MS	Industrial, Controls Assoc.	501-862-2051
NC	Charlotte, Jake Rudisill Assoc. Inc.	704-377-6901
OH	Cleveland, Instr. Sys.	216-845-8800
OH	Dayton, Instr. Sys.	513-294-2838
OK	Tulsa, Industrial Controls Assoc.	501-862-2051
PA	Pittsburgh, Instrumentation Sys.	412-243-1111
PA	Warminster, Multi-Measurements	215-675-3082
TX	Fort Worth, Indust. Controls Assoc.	501-862-2051
TX	Houston, Indust. Controls Assoc.	501-862-2051
WA	Bothell, Pacific N.W. Controls Inc.	206-821-0448

ASTRO TOOL CO., INC., 21615 Southwest Tualatin Valley Hwy., Beaverton, OR 97006, Tel: 503-642-9853

AT&T, 475 South St., Morristown, NJ 07960, Tel: 201-631-6790; *Sls. Mgr.:* D. J. Liedberg

Local Sales Offices & Reps

CA	Sunnyvale	408-746-2332
CO	Denver	303-538-2406
GA	Atlanta	404-257-6495
MA	Burlington	617-229-5672
MN	Minneapolis	612-724-2019
NJ	Morristown	201-631-6790
OH	Columbus	614-860-5155
PA	King of Prussia	215-768-2626

ATEC, Box 19426, 8219 Kempwood Dr., Houston, TX 77055, Tel: 713-468-7971, Telex: 77-4132 FLEKS HOU; FSC No.: 09552; Empl.: 80; *Sls. Mgr.:* F. Sawberger

A-SYSTEMS INC., Box 13, Ivy, VA 22945, Tel: 804-295-7200; *Sls. Mgr.:* F. M. Artrip

ATEC SYS., 107 N. Washington St., E. Rochester, NY 14445, Tel: 716-381-4740; Empl.: 6; *Sls. Mgr.:* Harry Turner

ATHENA CONTROLS, INC., 5145 Campus Dr., Whitemarsh Ind. Campus, Plymouth Meeting, PA 19462, Tel: 215-828-2490; Empl.: 85; *Sls. Mgr.:* David A. Tryon; *Dist. Mgr.:* Allen Breckenridge

ATKINS TECH., 3321 S.W. 40th Blvd., Gainesville, FL 32608, Tel: 904-378-5555, Telex: 51-4736-HALA; Empl.: 30; *Sls. Mgr.:* Walter Fitz-William; *Dist. Mgr.:* Walter Fitz-William

ATLANTIC MAGNETICS, INC., P.O. Box 4127, Margate, FL 33063, Tel: 305-492-5196; *Sls. Mgr.:* Edward Cammarata; *Dist. Mgr.:* Rolando Marrero

ATLANTIC OPTICAL MOULDING, Ellis St., P.O. Box 309, Dudley, MA 01570, Tel: 617-943-1746; Empl.: 6

ATLANTIC RESEARCH, 5390 Cherokee Ave., Alexandria, VA 22312, Tel: 703-642-4000, Telex: 248893; FSC No.: 95335; Empl.: 2000

ATLANTIC
SCIENTIFIC CORPORATION

ATLANTIC SCIENTIFIC CORP., 2711 S. Harbour City Blvd., Melbourne, FL 32901, Tel: 305-725-8000, Telex: 755959; *Sls. Mgr.:* Murray W. Boggs .... **1B**•1257

Local Sales Offices & Reps

AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CO	Englewood, R. A. Mayes Co.	303-761-9447
CT	Mt. Carmel, Scientific Dvcs.	203-248-9361
MA	Waltham, Scientific Dvcs.	617-890-2252
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	Albany, H. C. Johnson Agencies Inc.	518-459-1239
NY	Buffalo, H. C. Johnson Agencies Inc.	716-632-7880
NY	Rochester, H. C. Johnson Agencies Inc.	716-586-0777

Distributor

ATLANTIC SWITCH CONTROLS, INC., 194 Elliott St., Hartford, CT 06114, Tel: 203-527-7705 .... **1B**•1742

ATLANTIC SWITCH CONTROLS, INC., 5 Coliseum Ave., Nashua, NH 03063, Tel: 603-880-1971 .... **1B**•1742

ATLAS
ENERGY SYSTEMS

ATLAS ENERGY SYS., 9457 Rush St., S. El Monte, CA 91733, Tel: 213-575-0755, TWX: 910-587-3531; Empl.: 35; *Sls. Mgr.:* J. Thompson .... 3•1826

Local Sales Offices & Reps

CA	Santa Ana	714-953-9645
CA	Santa Clara	408-988-5386
IL	Chicago	312-372-2237
MA	Boston	617-492-2525

ATLAS ENGRG. CORP., 10 Cheney St., Dorchester, MA 02121; Tel: 617-445-7100; FSC No.: 07001; Empl.: 75; *Sls. Mgr.:* Norman Scotch

ATLAS EYELETS, Pinkham St., Fairhaven, MA 02719, Tel: 617-997-9491; *Sls. Mgr.:* Arthur S. Tisch

ATLAS SOUND DIV., 10 Pomeroy Rd., Parsippany, NJ 07054, Tel: 201-887-7800, Telex: 13-6119; Empl.: 350; *Sls. Mgr.:* H. M. Jaffe; *Dist. Mgr.:* David A. Chambers

ATLEE

ATLEE INC., One Gill St., Woburn, MA 01801, Tel: 617-933-3510, Telex: 949407; FSC No.: 99378; Empl.: 40; *Sls. Mgr.:* Leon Kadis ......**1B**•1259; **2**•1009, 1859, 1875, 1904

Local Sales Offices & Reps

CA	Agoura, Cal Rep	213-991-1940
CA	Corte Madera, Paul Oneal Assoc.	415-924-1691
CO	Arvada, Challange Sls.	303-427-3149
FL	Melbourne, R-Rep	305-725-6993
MD	Baltimore, Stitzer Assocs.	301-823-7688
MN	St. Paul, Countryman Assoc	612-645-9151
NY	Huntington, C. R. Mayer Co.	516-921-7876
NY	Rochester, Net Sls.	716-467-4538
NC	Raleigh, B. T. Funderburk	919-782-3493
OH	Cleveland, Techn. Sls. Assocs.	216-461-0826
PA	Paoli, Stitzer Assocs.	215-644-5500
TX	Dallas, Rem-Air Comp. Corp.	214-234-1069

Local Distributors

AZ	Phoenix, EGR	602-840-0320
CA	Northridge, Acort Inds.	213-993-6444
CA	San Jose, Afcom	408-263-0660
CA	San Jose, Bisco Inds.	408-946-8980
IN	Ft. Wayne, Graham Elec. Supp.	219-423-3422
IA	Cedar Rapids, Deeco	319-365-7551
MA	Winchester, Rush Inds.	617-729-5800
MN	Minneapolis, Aerospace Computer	612-884-4725
NJ	Nutley, Essex Electric	201-661-2600
NJ	Paramus, N.Y. Fastener	201-265-8770
NY	Bayshore, Merrit Fastener	516-242-1800
NY	Bohemia, Car-Lac	516-567-4200
NY	Buffalo, Summit Dist.	716-887-2800
NY	Long Island City, Hardware Specialty	212-361-9393
NY	Plainview, G & B Fastener	516-694-0990
NY	Plainview, G & B Fasteners	516-694-0990
TX	Dallas, National Precision	214-357-3921
TX	Richardson, Altair Co.	214-231-5166
VA	Charlottesville, Virginia Radio Supp. Co.	804-296-4184

ATMOSPHERE CONTROLS PRODS., 295 Polaris, Mountain View, CA 94043, Tel: 415-969-2640; Empl.: 14; *Sls. Mgr.:* Walter Quave Jr.; *Dist. Mgr.:* W. H. Ellis

ATR ELCTRNS., INC., 280 E. Lafayette Frontage Rd., St. Paul, MN 55107, Tel: 612-222-3791; *Dist. Mgr.:* R. D. Van Valin .... 3•1827

ATV RESEARCH, INC., 1301 Broadway, Dakota City, NE 68731, Tel: 402-987-3771; *Sls. Mgr.:* Mel Shadbolt

AUBURN MFG., Pease Ave. & Stack St., Middletown, CT 06457, Tel: 203-346-6677; Empl.: 45; *Sls. Mgr.:* Richard Agria

AUDIO EQUIP., Div. W. Kidde & Co., Inc., 706 Forrest St., Charlottesville, VA 22901, Tel: 804-977-8050, TWX: 510-587-5461; Empl.: 50

AUDIOSEARS, South St., Stamford, NY 12167, Tel: 607-652-7305; FSC No.: 97101; Empl.: 140; *Sls. Mgr.:* D. Hartwell

AUDIOSONE, INC., 617 Fan Hill Rd., Monroe, CT 06468, Tel: 203-268-4372, 800-243-8160; *Sls. Mgr.:* Rudolph Duris

AUDIOTRONICS CORP., 7428 Bellaire Ave., N. Hollywood, CA 91605, Tel: 818-765-2645, Telex: 69-1241; Empl.: 300; *Sls. Mgr.:* Roy Schaub

AUDIOVOX CORP., 150 Marcus Blvd., Hauppage, NY 11787

AUGAT INC., 33 Perry Ave., Box 779, Attleboro, MA 02703, Tel: 617-222-2202, TWX: 710-391-0644; FSC No.: 91506; Empl.: 3,200; *Sls. Mgr.:* Jim Fuchs; *Dist. Mgr.:* William Hall .... 2•1162, 1163, 1876-1879

Local Sales Offices & Reps

AL	Huntsville, Glen White Assocs.	205-883-7938
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CA	Santa Clara, Augat Sls.	408-980-0955
CO	Littleton, Simpson Assocs.	303-794-8381
FL	Castleberry, Augat Sls.	305-339-3724
FL	Safety Harbor, Augat Sls.	813-725-1037
FL	Tamarac, Augat Sls.	305-721-6021
GA	Norcross, Glen White Assocs.	404-441-1447
HI	Honolulu, Hawaii Elctrns. Sls. & Svc.	808-845-8207
IL	Rolling Meadows, Sumer	312-991-8500
IA	Davenport, Ensco-Rep. Inc.	319-386-6600
KS	Overland Park, Ensco-Rep, Inc.	913-381-7557
KS	Wichita, Ensco-Rep. Inc.	316-683-1070
MD	Silver Spring, NKA Inc. (Govt.)	301-585-6141
MA	Norwood, Augat Sls.	617-762-3164
MI	Detroit, Rathsburg Assocs.	313-882-1717
MN	Edina, Augat Sls.	612-925-0255
MO	Maryland Hts., Ensco-Rep. Inc.	314-423-3935
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NJ	Maple Shade, NKA Inc. (Govt.)	609-234-4008
NM	Albuquerque, C. T. Carlberg Assoc.	505-888-3883
NY	Mt. Vernon, D. Sonkin Assocs.	914-668-9809
NY	N. Syracuse, L. D. Allen, Inc.	315-437-8387
NC	Raleigh, Glen White Assocs.	919-787-7016
OH	Dayton, NKA, Inc.	513-268-8771
OH	Englewood, A. Nace Co.	513-836-0931
OH	Richfield, A. Nace Co.	216-659-7178
TN	Gray, Glen White Assocs.	615-447-8850
TX	Houston, Augat Sls.	713-495-3100
TX	Richardson, Augat Sls.	214-235-7166
UT	Midvale, Simpson Assocs.	801-566-3691
VA	Lynchburg, Glen White Assocs.	804-237-6291
WA	Bellevue, Augat Sls.	206-455-2846
WI	Brookfield, Sumer Inc.	414-784-6641

AUGAT/ALCOSWITCH, See Alco Elctrn. Prods., Inc.

AUGAT/ES•P, INC., 12832 Chadron Ave., Hawthorne, CA 90250, Tel: 213-973-0262, Telex: 66-4467; Empl.: 85

AUGAT FIBEROPTICS, 40 Perry Ave., Attleboro, MA 02703, Tel: 617-222-2202, TWX: 710-391-0644; *Sls. Mgr.:* Bob Goecheler; *Dist. Mgr.:* Bill Hall

AULT, INC.

AULT, INCORPORATED, 1600 Freeway Blvd., Minneapolis, MN 55430, Tel: 612-560-9300, TWX: 910-756-3435; Empl.: 450; *Sls. Mgr.:* Dennis Getter .... **3**•1502, 1503

Local Sales Offices & Reps

AL	Huntsville, L & D, Inc.	205-837-1469
AZ	Scottsdale, DAR-C, Inc.	602-948-2240
CA	Los Angeles, West Elctrn. Sls.	714-898-0120
CA	San Diego, Dick West & Assocs.	619-233-0236
CA	Santa Clara, Magna Sls.	408-727-8753
CO	Denver, William J. Purdy	303-777-1411
CT	Manchester, G/M Assocs.	203-646-4443
FL	Ft. Lauderdale, QXI, Inc.	305-485-6030
FL	St. Petersburg, QXI, Inc.	813-821-2281
GA	Atlanta, L & D, Inc.	404-455-3483
IL	Arlington Hgts., MSI	312-956-1000
IN	Indianapolis, McFadden Sls.	614-459-1280
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Framingham, G/M Assocs.	617-872-4871
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MO	St. Louis, Beams Co.	314-569-1060
NV	Carson City, Magna Sls.	702-883-1471
NH	Exeter, G/M Assocs.	603-778-7472
NJ	Ocean, P. Saftler Assoc.	201-922-3014
NY	Lynbrook, P. Saftler Assoc.	516-593-7880
NC	Greensboro, L & D, Inc.	919-292-3201
OH	Cleveland, Lyons Corp.	216-659-9224
OH	Dayton, E. Lyons Co.	513-278-0714
OR	Portland, Jas. J. Bacher Co.	503-297-8744
PA	Philadelphia, Samuel K. MacDonald, Inc.	215-545-1205
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
WA	Seattle, Jas. J. Backer Co.	206-285-1300

Local Distributors

CA	Cincinnati, Hughes Peters	513-351-2000
CA	Mountain View, USI Elctrn. Comps.	415-969-5420
CA	San Diego, Tauber Elctrns.	619-274-7242
CA	Santa Monica, Distr. Specialists	213-393-9666
CA	Van Nuys, Natl. Electro Sls. Corp.	213-781-0505
IL	Downers Grove, JaBro Batteries	312-964-9358
MA	Sharon, Adcour	617-784-8123
MO	St. Charles, Finnigan Elctrns.	314-946-6201
Can	St. Laurent, Quebec, Tech-Rep Elctrns. Ltd.	514-337-6046

AURA MFG., 50 McDermott Rd., New Haven, CT 06473, Tel: 203-777-2541; Empl.: 150; *Sls. Mgr.:* Joe Abbatiello

AURIC CORP., 470 Frelinghuysen Ave., Newark, NJ 07114, Tel: 201-242-4100; Empl.: 35

AUSTRON, INC., P.O. Box 14766, Exit 248 N. IH 35, Austin, TX 78761, Tel: 512-251-2313, TWX: 910-874-1356; FSC No.: 24672; Empl.: 153; *Sls. Mgr.:* R. Ellis .... **1A**•1314, 1315

Local Sales Offices & Reps

AL	Huntsville, Sci. Devices - SE	205-536-1969
AZ	Scottsdale, Territorial Mktg.	602-994-8665
CA	Goleta, Thorson Co.	805-964-8751
CA	Pleasant Hill, Austron	415-930-7268
CA	San Carlos, Westronics Assocs.	415-592-1417
CA	San Diego, Thorson Co.	619-292-8525
CA	Signal Hill, Thorson Co.	213-595-0361
CT	Southington, Scheinfein Assocs.	203-621-3492
FL	Orlando, Sci. Devices - SE	305-841-8180
FL	Shalimar, Sci. Devices - SE	904-651-4407
GA	Atlanta, Sci. Devices-SE	404-452-8709
IL	Elk Grove, Loren Green Assoc.	312-593-0282
IN	Indianapolis, Loren Green Assoc.	317-293-9827
MA	Reading, Scheinfein Assocs.	617-944-2304
MI	Union Lake, Ashby Assocs.	313-363-1100
MN	Minneapolis, Loren Green Assoc.	612-571-6666
NY	Frankfort, Kapital Instr. Sls.	315-894-4245
NY	Huntington, CDB Entprs.	516-692-5200
NC	Winston Salem, Sci. Devices-SE	919-765-5766
OH	Dayton, Ashby Assocs.	513-252-5627
OH	Lyndhurst, Ashby Assocs.	216-461-0826
OR	Portland, Cascade Data Mktg.	503-641-9266
PA	Plymouth Meeting, Sci. Devices - Phila.	215-825-9515
TX	Houston, Sci. Devices - Gulfcoast	713-864-1711
TX	Richardson, Sci. Devices - SW	214-231-8106
VA	McLean, Austron	703-734-1990
WA	Woodinville, Cascade Data Mktg.	206-788-3421

AUTOMATED PROD. EQUIP. CORP., 142 Peconic Ave., Medford, NY 11763, Tel: 516-654-1197, TWX: 510-228-2120; FSC No.: 57216; *Sls. Mgr.:* Edward F. Farnham; *Dist. Mgr.:* Edward F. Farnham

AUTOMATIC COIL CORP., Sub. Designatronics, Inc., 455 E. 10th Ave., Hialeah, FL 33010, Tel: 305-883-5311, TWX: 810-848-8097; Empl.: 125 .... **1A**•1221-1223, 1451-1453

Local Sales Offices & Reps

AL	Huntsville, CRS Elctrns.	205-533-2444
CA	Huntington Beach, Mil-Com Sls.	714-840-2424
GA	Atlanta, CRS Elctrns., Inc.	404-396-3720
IL	Palatine, T-Squared Assocs.	312-999-2144
MA	Manchester, Alard, Galagan & Assoc.	617-526-7733
NY	Brooklyn, Irv Morse Sls.	212-444-4974
OH	Dayton, Rockford Controls Ohio, Inc.	513-898-5452
OH	Euclid, Rockford Controls Ohio, Inc.	216-731-5250
OK	Broken Arrow, Genzel Sls. & Assoc., Inc.	918-258-8656

AUTOMATIC Connector, Inc.

AUTOMATIC CONNECTOR, INC., 400 Moreland Rd., Commack, NY 11725, Tel: 516-543-5000, TWX: 510-226-3744; FSC No.: 94375; Empl.: 250; *Sls. Mgr.:* William Pitcher

Local Sales Offices & Reps

AZ	Tucson, WJM Sls.	602-888-4847
CA	Cupertino, Dura Elctrn. Sls.	408-255-2084
CA	Garden Grove, Elsco Elctrns.	714-891-4621
CA	San Diego, Elsco Elctrns.	714-292-1771
CO	Boulder, Comp. Prods. Sls.	303-530-2800
CT	Bridgeport, Millennium Elctrn. Sls.	203-372-2037
FL	Clearwater, Brennan Assoc.	813-446-5006
FL	Melbourne, Brennan Assoc.	305-724-0854
GA	Atlanta, Brennan Assoc.	404-996-6623
IL	Westchester, WG Controls	312-344-0690
IN	Ft. Wayne, Given Corp.	219-432-5585
MD	Union, Jedco Elctrn. Sls.	201-355-0474
MA	Woburn, Component Technology	617-933-5390
MO	St. Louis, R. F. Carlson Co.	314-961-4485
NJ	Haddonfield, Sunday - O'Brien	609-429-4013
NJ	Ho-Ho-Kus, J&B Assocs.	201-447-0126
NJ	Union, Jedco Elctrn. Sls.	201-355-0474
NM	Albuquerque, WJM Sls.	505-898-5917
NY	Buffalo, Quality Comp.	716-837-5430
NY	Manlius, Quality Comp.	315-682-8885
NY	Mt. Vernon, Sonkin Assoc.	914-668-9809
NC	Raleigh, B. T. Funderburk	919-782-3493
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
OH	Kettering, Government Bidders Svc.	513-296-5991
OH	Vandalia, Stegman Blaine Mktg.	513-890-7975
TX	El Paso, WJM Sls.	915-566-4628
TX	Houston, Aid Elctrns.	713-777-3882
TX	Irving, Aid Elctrns.	214-259-4761
UT	Salt Lake City, Comp. Prods. Sls.	801-262-0000
WA	Bellevue, Venture Elctrn.	206-454-4594

AUTOMATIC TEST SYSTEMS, 23 Poplar St., Malden, MA 02148, Tel: 617-322-1107

AUTOMATIC TIMING & CONTROLS CO., 201 So. Gulph Rd., King of Prussia, PA 19406, Tel: 215-337-5500; 800-441-8245, Telex: 84-6437; Empl.: 300; *Sls. Mgr.:* V. C. McMahon .... **3**•1123

Local Sales Offices & Reps

AZ	Phoenix, Portis & Assocs.	602-947-4379
CA	Gardena, Instrument Lab.	213-327-3282
CA	San Francisco, Automated Process Controls	415-467-6162
CO	Englewood, E & M Sls.	303-761-6202
FL	Lakeland, A.A. Elec. Div.	813-665-6941
GA	Norcross, A.A.Electric Div. of AEC	404-449-8670
IL	Glen Ellyn, Rockford Controls	312-469-6016
IN	Indianapolis, Rockford Controls	317-248-2518
KY	Louisville, Air-Hydro Power	502-451-1000
LA	New Orleans, Mid South Sls.	504-641-7480
MD	Baltimore, Jobe & Co.	301-327-0220
MA	Hingham, Hingham Bay Corp.	617-749-8700
MI	Brighton, H. H. Barnum Co.	313-229-2961
MN	Minneapolis, Automated Controls	612-941-4092
MO	Kansas City, Duncan Sls. & Engrg.	816-356-1888
MO	St. Louis, E. Mooney Co.	314-878-9910
NE	Omaha, Lakeland Engrg. Equipt.	402-734-2600
NJ	Newark, Norman Bragar Co.	201-344-1100
NM	Albuquerque, E & M Sls.	505-883-8955
NY	Buffalo, Niagara Electric Sls.	716-886-4000
NY	Rochester, Niagara Electric Sls.	716-271-1223
NY	Syracuse, Niagara Elec. Sls.	315-437-1656
NC	Charlotte, Brown & Morrison	704-554-8570
OH	Cincinnati, Anderson-Bolds	513-528-5680
OH	Cleveland, Anderson-Bolds	216-229-4700
OH	Worthington, Anderson-Bolds	614-885-3933
OK	Tulsa, Driscoll Automatic Control	918-747-6625
OR	Portland, Coons Western	503-295-0411
PA	King of Prussia, Applied Controls	215-265-3832
PA	Pittsburgh, Gilson Engrg. Sls.	412-931-6114
TX	Houston, Gettys-Eads-Adair	713-781-3005
UT	Salt Lake City, Control Equip.	801-487-7741
VA	Richmond, Jobe & Co.	804-282-6508
WA	Seattle, J. A. Tudor & Assoc.	206-682-7444
WA	Spokane, J. A. Tudor & Assoc.	509-327-3328
WI	Cedarburg, Automation Engrg.	414-377-7500

AUTOMATION ASSOCS., 1212 Westheimer #120, Austin, TX 78752, Tel: 512-458-4412

AUTOMATION DISPLAYS INC., 3833 N. White Ave., Eau Claire, WI 54701, Tel: 715-834-9595; Empl.: 38

Local Sales Offices & Reps

AZ	Scottsdale, Al Meurer Co.	602-941-4848
GA	Atlanta, Secom Sys.	404-434-8101
IN	Indianapolis, GEB Controls Group Inc.	317-271-9008
MA	Norwell, Besco	617-659-4915
MN	Minneapolis, Countryman Assocs.	612-645-9151
NY	New York, Friedman-Smith Elctrn. Sls.	914-664-4866
TX	Dallas, Jacobson Co.	214-363-7584
WA	Bellevue, Hudson Co.	206-455-0773

AUTOMATION DYNAMICS, 77 Brookside Pl., Hillsdale, NJ 07642, Tel: 201-666-2458; FSC No.: 53089; Empl.: 40

AUTOMATION COMPONENTS, INC., One Short Ave., Peckville, PA 18452, Tel: 717-489-7508

AUTOMATION PRODS., INC., 3030 Max Roy, Houston, TX 77008, Tel: 713-869-0361, Telex: 775-959

AUTOMATION UNLTD., 10H Roessler Rd., Woburn, MA 01801, Tel: 617-933-7288, Telex: 949329; *Sls. Mgr.:* Stephen A. Gould

AUTOSPLICE, INC., 59-12, 37th Ave, Woodside, NY 11377, Tel: 212-429-0500, Telex: 420902, TWX: 968171; Empl.: 86; *Sls. Mgr.:* O. Nedelkovich

Local Sales Offices & Reps

CA	Glendale, Tooltronics	213-240-4000
CA	San Diego, Autosplice West	619-560-0571
CA	Santa Clara, Tooltronics	408-496-6000
IL	Chicago, Schiffer Assoc.	312-847-2400
IN	Fort Wayne, Menze Sls.	219-747-5616
MA	Cambridge, Autosplice Northeast	617-576-3838

AUTO-SWAGE PRODS., 726 River Rd., Shelton, CT 06484, Tel: 203-929-1401, Telex: 963-542; Empl.: 170; *Sls. Mgr.:* R. Mikulsky .... **2**•1860

Local Sales Offices & Reps

CA	Glendale, Haldeman & Frazier	213-247-3330
CO	Denver, Regional Sls. Co.	303-433-7397
CT	Newtown, Yankee Engrg.	203-426-5679
FL	Boca Raton, F/G Assocs.	305-395-3907
IL	Barrington, Perhats Assocs.	312-381-6360
IN	Greensburg, H. K. Feaster Assocs.	812-663-5689
MN	Minneapolis, W. R. Maleckar Co.	612-926-7601
MO	St. Louis, Meiners Sls.	314-383-4833
NY	Rochester, Antil-Thrasher Assoc.	315-468-2370
OH	Chagrin Falls, Bray Assocs.	216-247-4474
PA	Broomall, AM Tech. Sls. Co.	215-356-0574
SC	Fort Mills, Eagle Sales, Inc.	803-548-2222
EXP	NY, New York, Lang & Zysk	212-227-1743

AUTOTROL, P.O. Box 557, Crystal Lake, IL 60014, Tel: 815-459-3080, Telex: 72-2417; Empl.: 140; *Sls. Mgr.:* Gerald L. Adair

AUTO-TROL TECH., 12500 N. Washington St., Denver, CO 80233, Tel: 303-452-4919, TWX: 910-320-0772; Empl.: 600; *Sls. Mgr.:* Jim Norrod

AUTRONICS, 314 E. Live Oak, Ste. A, Arcadia, CA 91006, Tel: 818-445-5470, TWX: 910-582-3216; FSC No.: 03972; Empl.: 65

Local Sales Offices & Reps

CA	Fullerton, Hawk Assocs.	714-773-4152
CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Westlake Village, Jayess Co.	213-991-0632
TX	Richardson, Scientific Sls. & Svcs.	214-231-6541
WA	Bellevue, Thorson Northwest	206-455-9180

AVA INSTRMN., INC., 8010 Highway 9, Ben Lomond, CA 95005, Tel: 408-336-2281, Telex: 357403 AVA; FSC No.: 61933; Empl.: 6; *Sls. Mgr.:* Allan Hughes

Local Sales Offices & Reps

CA	Encino, King Eng.	213-995-7271
CA	San Jose, Data Rep.	408-279-1212
MA	Andover, PC Associates	617-475-3298
NY	NY, Hartford, PDQ Assocs.	315-768-8167
PA	Huntingdon Valley, Lynbar Group	215-947-3554

AVANTEK, INC., 3175 Bowers Ave., Santa Clara, CA 95051, Tel: 408-496-6710, Telex: 34-6337, TWX: 910-339-9274; Empl.: 2268

Local Distributors

AL	Huntsville, CDI Branch Off.	205-883-7501
AZ	Scottsdale, Spirit Elctrns.	602-998-1533
CA	Los Altos, Pen Stock Co.	415-948-6552
CA	Los Angeles, Sertek, Inc.	213-477-9051
CA	Orange, Sertek, Inc.	714-997-7311
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
IL	Arlington Heights, Peak Distrs.	312-255-0707
IN	Indianapolis, Peak Distrs.	317-247-1316
MD	Beltsville, Applied Specialties	301-595-5393
NC	Raleigh, CDI Branch Off.	919-781-0262

AVCO-ELCTRNS. DIV., 4807 Bradford Dr., Huntsville, AL 35805, Tel: 205-837-6500, TWX: 810-726-2240; Empl.: 700; *Sls. Mgr.:* Jim Pool and David Helms

AVEL-LINDBERG INC., Peacock Alley 116, 1 Padanaram Rd., Danbury, CT 06810, Tel: 203-797-8698, TWX: 710-456-9984; Empl.: 4; *Sls. Mgr.:* Harvey R. Snider

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MA	Hingham, Sager Electrical Supp. Co.	617-749-6700
NY	New York, Martin Audio/Video Corp.	212-541-5900

AVEX ELCTRNS., 1683 Winchester Rd., P.O. Box 1026, Bensalem, PA 19020, Tel: 215-638-3300; FSC No.: 58414; *Sls. Mgr.:* Mike Battery Batley; *Dist. Mgr.:* Mike Batley ....3•1403

AVIBANK MFG., 210 S. Victory Blvd., Burbank, CA 91503, Tel: 818-843-4330, TWX: 910-498-2215; FSC No.: 84256; Empl.: 330; *Sls. Mgr.:* D. Ladin

AVIONIC INSTRS., 943 E. Hazelwood Ave., Rahway, NJ 07065, Tel: 201-388-3500, Telex: 844413; Empl.: 42; *Sls. Mgr.:* Wallace J. Izzo; *Dist. Mgr.:* Wallace J. Izzo ....3•1828, 1829

Local Sales Offices & Reps

EXP	NJ, Rahway, REA Intl. Ltd.	201-382-7100

AVIONICS, Box 200, Niagara-On-Lake, ON , Canada, Tel: 416-468-3632; Empl.: 25

AVTEL
DIVISION OF UNITRON INCORPORATED

AVTEL DIV., UNITRON INC., 2826 W. Kingsley Rd., Dept. G, Garland, TX 75041, Tel: 214-271-4531, Telex: 73-0644; FSC No.: 6130; Empl.: 95; *Sls. Mgr.:* R. L. Beutel ....3•1831, 1832

Local Sales Offices & Reps

CA	Sunland, Unitron (Jim Crevier)	818-352-7348
GA	Byron, Unitron (Joe Joiner)	912-956-2866
PA	Lansdowne, Unitron (Douglas S. Feisler)	215-622-4811

AVX CORPORATION, Box 867, Myrtle Bch., SC 29577, Tel: 803-448-9411, TWX: 810-661-2252; FSC No.: 9K916; *Sls. Mgr.:* John Winn; *Dist. Mgr.:* George Lees ....**1A**•1002, 1010-1014; **1B**•1002, 1008, 1009

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Interstate Mktg.	602-244-9050
AR	Little Rock, Beacon Elctrns.	501-224-5449
CA	San Diego, Interstate Mktg.	619-292-8117
CA	San Jose, Quadrep Inc.	408-946-4000
CA	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
CO	Denver, Elcom	303-337-2300
FL	Clearwater, Dyne-a-Mark	813-441-4702
FL	Fort Lauderdale, Dyne-a-Mark	305-771-6501
FL	Maitland, Dyne-a-Mark	305-831-2097
FL	Palm Bay, Dyne-a-Mark	305-727-0192
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Highland Park, T.B. Hunter Assocs.	312-433-7000
IN	Ft. Wayne, F.J. Campisano Co.	219-747-2633
IN	Indianapolis, Frank J. Campisano	317-253-7651
IA	Cedar Rapids, Comstrand	319-377-1575
MD	Baltimore, Burgin-Kreh Assocs.	301-265-8500
MA	Lexington, J.E. Boeing Co.	617-862-2500
MI	Grand Rapids, J.L. Montgomery	616-774-9308
MI	Southfield, J.L. Montgomery	313-358-2616
MN	Minneapolis, Comstrand Inc.	612-788-9234
MO	Grandview, Beneke & McCaul	816-765-2998
NJ	Bellmawr, Thomas Assoc.	609-933-2600
NM	Albuquerque, Thorson Co.	505-293-8555
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NY	Melville, Comtronic Assocs.	516-249-0505
NC	Raleigh, Tingen Technical Sales	919-781-1100
OH	Cincinnati, F.J. Campisano Co.	513-574-7111
OH	Cleveland, Frank J. Campisano	216-749-5550
OH	Dayton, Schmidt & Assoc.	513-293-6652
OK	Oklahoma City, Ammon & Rizos	405-942-2552
OR	Hillsboro, Western Tech. Sls.	503-640-4621
PA	Coraopolis, F.J. Campisano Co.	412-264-5151
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Dallas, Ammon & Rizos Co.	214-644-5591
TX	Houston, Ammon & Rizos Co.	713-781-6240
UT	Salt Lake City, Elcom, Inc.	801-532-7940
VA	Lynchburg, Burgin-Kreh Assoc.	804-239-2626
WA	Bellevue, Western Tech. Sls.	206-641-3900
WA	Spokane, Western Techn. Sls.	509-922-7600

Local Distributors

AL	Huntsville, R. M. Elctrns.	205-852-1550
AZ	Phoenix, TTI	602-966-1616
AZ	Phoenix, Kierulff Elctrns.	602-243-4101
AZ	Phoenix, Wyle Distr.	602-249-2232
AZ	Tempe, Arrow Elctrns.	910-950-2019
CA	Chatsworth, IEC	213-998-2200
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Chatsworth, IEC Elctrns.	213-998-2200
CA	El Monte, Marshall Elctrns	818-442-7204
CA	El Segundo, Wyle Distribution Grp.	213-322-8100
CA	Hayward, Arrow Dist. Center	415-487-4300
CA	Irvine, Wyle Dist. Gp.	714-863-9953
CA	Irvine, IEC	714-660-1055
CA	Irvine, Marshall Elctrns	714-556-6400
CA	Irvine, Wyle Distr. Grp.	714-863-9953
CA	Los Angeles, Kierulff Elctrns.	213-725-0325
CA	N. Hollywood, T.T.I.	818-982-0201
CA	Rancho Cordous, Wyle Dist. Gp.	916-638-5252
CA	Sacramento, IEC	916-424-5297
CA	San Diego, Kieruff Elctrns.	714-278-2112
CA	San Diego, Wyle Distr.	619-565-9171
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	San Jose, Eric Elctrns.	408-262-1111
CA	San Jose, IEC	408-263-1100
CA	Santa Clara, Wyle Distr.	408-727-2500
CA	Southgate, Cetec Elctrns.	213-773-6521
CA	Sun Valley, Q.C. Components	213-768-6111
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Tustin, Arrow Elctrns.	714-838-5422
CA	Tustin, Kierulff Elctrns.	714-731-5711
CO	Denver, IEC	303-292-6121
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Denver, Kierulff Elctrns.	303-371-6500
CO	Thornton, Wyle Dist. Gp.	303-457-9953
CT	E. Haven, J. V. Elctrns.	203-469-2321
CT	Wallingford, Marshall Elctrns.	203-265-3822
CT	Wallingford, Kierulff Elctrns.	203-265-1115
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Orlando, Marshall Elctrns.	305-841-1878
FL	Orlando, T.T.I.	305-859-1000
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	St. Petersburg, Kierulff Elctrns.	813-576-1966
GA	Norcross, Kierulff Elctrns.	800-241-0560
GA	Norcross, Marshall Elctrns.	404-923-5750
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Elk Grove, Kierulff Elctrns.	312-640-0200
IL	Lombard, RM Elctrns.	312-932-5150
IL	Schaumburg, Marshall Elctrns.	314-490-0155
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, RM Elctrns.	317-247-9701
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Gaithersburg, Marshall Elctrns.	301-840-9450
MD	Rockville, M.S. Elctrns.	301-340-6400
MA	Wakefield, MCI	617-245-5967
MA	Westboro, Future Elctrns.	617-366-2400
MA	Wilmington, RC Components	617-273-1860
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Grand Rapids, Arrow Elctrns.	616-243-0912
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Livonia, Marshall Elctrns.	313-525-5850
MN	Edina, Kierulff Elctrns.	612-941-7500
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Plymouth, Marshall Elctrns.	612-559-2211
MO	Maryland Hgts., Kierulff Elctrns.	314-739-0855
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Clifton, J-Mar Elctrns.	201-772-6400
NJ	Fairfield, Marshall Elctrns.	201-882-0320
NJ	Fairfield, Arrow Elctrns.	201-797-5800
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Mt. Laurel, Marshall Elctrns.	609-234-9100
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Bohemia, TTI	516-567-1500
NY	E. Farmingdale, Tri-Start	516-293-0400
NY	Endwell, Marshall Industries	607-754-1570
NY	Hauppague, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Marshall Industries	516-273-2424
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Liverpool, Arrow Elctrns	315-652-1000
NY	Lynbrook, Patriot	516-599-8881
NY	Melville, Arrow Elctrns.	516-391-1484
NY	Rochester, Marshall Industries	716-235-7620
NY	Rochester, Arrow Elctrns.	716-275-0300
NC	Greensboro, Kierulff Elctrns.	919-852-9440
NC	Raleigh, Kierulff Elctrns.	919-872-8410
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston Salem, Arrow Elctrns.	919-725-8711
OH	Akron, Akron	216-762-8818
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cleveland, Kierulff Elctrns.	216-587-6558
OH	Dayton, Marshall Elctrns.	513-236-8088
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Kierulff Elctrns.	918-252-7537
OK	Tulsa, Arrow Elctrns.	918-665-7700
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TX	Austin, Kierulff Elctrns.	512-835-2090
TX	Dallas, Kierulff Elctrns.	214-343-2400
TX	Dallas, R.M. Elctrns.	214-235-3100
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Ft. Worth, T.T.I.	817-429-1440
TX	Houston, Kierulff Elctrns.	713-530-7030
TX	Richardson, Jaco	214-235-9575
TX	Stafford, Arrow Elctrns.	713-491-4100
UT	N. Salt Lake City, IEC	801-298-1868
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
UT	Salt Lake City, Kierulff Elctrns.	801-973-6913
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Bellevue, Wyle Elctrns.	206-453-8300
WA	Bellevue, IEC	206-455-2727
WI	New Berlin, R.M. Elctrns.	414-784-4420
WI	Oak Creek, Arrow Elctrns.	414-764-6600

AXEL ELCTRNS., 134-20 Jamaica Ave., Jamaica, NY 11418, Tel: 212-291-3900, TWX: 710-582-2618; FSC No.: 13058; Empl.: 210; *Sls. Mgr.:* J. Alaimo

AXIAL MAGNETICS, 6600 Whitaker Ave., Van Nuys, CA 91406, Tel: 818-994-3346

AXIOM CORP., 1014 Griswold Ave., San Fernando, CA 91340, Tel: 213-365-9521

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AXIS, INC., 7825 Engineer Rd., Ste. 208, San Diego, CA 92111, Tel: 619-560-7737; FSC No.: 9S849; Empl.: 12; *Sls. Mgr.:* Mark J. Prager ....2•1010

Local Sales Offices & Reps

FL	St. Petersburg, Southern Engrg. Assoc.	813-577-7700
IL	Chicago, Fairlines Co.	312-735-2606
MD	Catonsville, Robert Elctrn. Sls.	301-788-2380
MI	Southfield, Infinity	313-557-7230
MN	Eden Prairie, First Rep Co. of Minn.	612-944-2097
MO	St. Louis, Design Solutions	314-961-7170
WA	Bellevue, Olson Ferree & Assocs.	206-883-7792

AYDIN CORP., 700 Dresher Rd., Horsham, PA 19044, Tel: 215-657-7510, Telex: 685 1211, TWX: 510-661-0518; Empl.: 2,000; *Sls. Mgr.:* B. Jack Miller

AYDIN CONTROLS, 414 Commerce Dr., Ft. Washington, PA 19034, Tel: 215-542-7800, Telex: 6851057, TWX: 510-661-0518; Empl.: 533; *Sls. Mgr.:* Joseph J. Taylor

AYDIN MICROWAVE, 75 East Trimble Rd., San Jose, CA 95131, Tel: 408-946-5600, Telex: 4990756, TWX: 910-338-0216; Empl.: 200; *Sls. Mgr.:* Bruce M. Jennings

Local Sales Offices & Reps

VA	Alexandria, Aydin Corp.	703-823-9735

AYDIN MONITOR SYS., 502 Office Center Dr., Ft. Washington, PA 19034, Tel: 215-646-8100, TWX: 510-661-1520; Empl.: 241

AYDIN VECTOR DIV., Box 328, Newtown, PA 18940, Tel: 215-968-4271, TWX: 510-667-2320; FSC No.: 13923; Empl.: 280

BABCOCK ELECTRO-MECHANICAL, INC., Sub. of Electro-Module, Inc., 3535 Harbor Blvd., Costa Mesa, CA 92626, Tel: 714-540-1234, TWX: 910-595-1517; FSC No.: 56623; Empl.: 245; *Sls. Mgr.:* Albin Gudis; *Dist. Mgr.:* Albin Gudis

Local Sales Offices & Reps

CA	Palo Alto, Horne Electro Sales	415-494-6777
TX	Houston, Barry Sls.	713-784-5860

BACH-SIMPSON LTD., 1255 Brydges St., London, ON N5W-2C2, Canada, Tel: 519-452-3200

BACON INDS., 192 Pleasant St., Watertown, MA 02172-2399, Tel: 617-926-2550, TWX: 710-327-6518; FSC No.: 99098; Empl.: 23; *Sls. Mgr.:* R. S. Cass

BAILEY CONTROLS CO., 29801 Euclid Ave., Wickliffe, OH 44092, Tel: 216-585-5800, Telex: 980621, TWX: 216-944-4160; Empl.: 2300; *Sls. Mgr.:* R. A. Purmal; *Dist. Mgr.:* R. C. Wright

BAKER, J. T., CHEMICAL CO., 222 Red School La., Phillipsburg, NJ 08865, Tel: 201-859-2151, TWX: 510-235-2924; Empl.: 1,200; *Sls. Mgr.:* D. J. Calder

BAKER CO., INC., Drawer E - Sanford Airport, Sanford, ME 04073, Tel: 207-324-8773; Empl.: 105

BALLANTINE LABS., 90 Fanny Rd., Boonton, NJ 07005, Tel: 201-335-0900, TWX: 710-987-8380; FSC No.: 50423; Empl.: 90; *Sls. Mgr.:* Joe Deery; *Dist. Mgr.:* Joe Deery ....3•1191

Local Sales Offices & Reps

AZ	Phoenix, Zeus Elctrns.	602-263-6022
CA	Costa Mesa, FLW Inc.	714-751-7512
CA	San Jose, MCH Assocs.	408-246-7330
CA	Van Nuys, FLW Inc.	213-989-5237
CO	Denver, Zeus Elctrns.	303-321-6818
FL	Orlando, Micro Spec, Inc.	305-299-6508
GA	Lawrenceville, Micro Spec, Inc.	404-979-3444
IL	Arlington Hgts., Dytec/Central	312-394-3380
IN	Indianapolis, Dytec/Central	317-247-1316
MA	Reading, Scheinfein Assoc.	617-944-2304
MI	Madison Hgts., WKM Assoc.	313-588-2300
NJ	Elmwood Park, L & M Assocs.	201-797-0441
NM	Albuquerque, Zeus Elctrns.	505-842-6633
OH	Cleveland, WKM Assoc.	216-267-0445
OH	Dayton, WKM Assoc.	513-434-7500
OR	Portland, Westcon	503-283-0132
PA	Andalusia, L & M Assocs.	215-245-6658
PA	Pittsburgh, WKM Assoc.	412-292-2953
SC	Rock Hill, Micro Spec, Inc.	803-366-3015
UT	Salt Lake City, Zeus Elctrns.	801-534-0500
VA	Alexandria, Dyna Rep Co.	703-354-1222

BALL ELECTRONIC DISPLAY DIV, Box 43376, St Paul, MN 55164, Tel: 612-786-8900, TWX: 910-563-3552; Empl.: 500; *Sls. Mgr.:* L. R. Lemke

BALL ELCTRN., Systems Div., 1950 33rd St., Boulder, CO 80302, Tel: 303-441-5400, Telex: 45776; Empl.: 500

BALSTON, 703 Massachusetts Ave., Lexington, MA 02173, Tel: 617-861-7240, Telex: 92-3481; Empl.: 50; *Sls. Mgr.:* J. Alpert

BALZERS OPTICAL GRP., 170 Locke Dr., Marlboro, MA 01752, Tel: 617-481-9860, Telex: 951-562; Empl.: 136; *Dist. Mgr.:* Michael G. Allen

B & B MOTOR & CONTROL CORP., Apple Hill Commons, Burlington, CT 06013, Tel: 203-673-7151, Telex: 14-1484; Empl.: 90; *Sls. Mgr.:* Sam Mandel

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FL	Clearwater	800-845-1020
IL	Chicago	312-681-0089
IN	Indianapolis	317-248-0396
KY	Louisville	502-589-7753
MA	Boston	617-890-4944
NH	Nashua	603-883-1062
NJ	Piscataway	201-572-0500
NY	Baldwin	212-784-1313
NY	Elmira	607-732-6599
NY	Long Island City	212-784-1313
NY	Rochester	716-424-7040
NC	Charlotte	704-375-0577
OH	Cincinnati	513-381-1885
SC	Greenville	803-268-5702
TX	Dallas	214-641-0857
TX	Houston	713-820-7931

B & G PRECISION ELCTRNS., 538 Maple Ave., Doylestown, PA 18901, Tel: 215-348-4413; *Sls. Mgr.:* Eugene R. Bigay; *Dist. Mgr.:* Xavier Garcia

B & K PRECISION PROD. GRP., DYNASCAN, 6460 W. Cortland, Chicago, IL 60635, Tel: 312-889-9087, Telex: 253475; FSC No.: 08098, 18110, 48560, 30678; Empl.: 250; *Sls. Mgr.:* Dennis Hoy ....3•1182, 1198-1202, 1362-1364, 1509

Local Sales Offices & Reps

CA	Irvine, Mike Roth Sls.	714-250-0722
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CO	Louisville, Stan Sliz & Assocs.	303-666-4760
FL	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
GA	Tucker, Maitland K. Smith	404-939-3322
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
KS	Shawnee Mission, Lowell-Kangas & Assocs.	913-631-3515
LA	Chalmette, Erickson Sls.	504-271-1976
MD	Perry Hall, Electra-Tech	301-256-2723
MA	Woburn, W & D Marketing	617-935-5610
MI	Southfield, Robert Milsk Co., Inc.	313-354-3310
MN	Minneapolis, HMR, Inc.	612-888-2100
MO	St. Louis, Lowell-Kangas Assoc.	314-821-4050
NY	Bellmore, Selectra Sls.	516-221-7865
NY	Rochester, Warren Kaufman & Assoc.	716-266-2728
OH	Conneaut, Thomas P. Clements	412-261-0950
OK	Oklahoma City, Erickson Sls.	405-682-2947
OR	Portland, Fleehart & Sullivan	503-641-8540
PA	Norristown, Precision Meas. Co.	215-279-4242
TX	Dallas, Erickson Sls.	214-739-5833
VA	Dumfries, Electra-Tech	703-670-6962
WA	Seattle, Fleehart & Sullivan	206-527-5454
WI	Waukesha, Brainard-Wilson Mktg.	414-547-2285
EXP	NY, Plainview, Empire Exporters	516-293-5582

BANNER ENGRG. CORP., 9714 - 10th Ave. N., Minneapolis, MN 55441, Tel: 612-544-3164, Telex: 29-1011; *Sls. Mgr.:* Floyd Schneider

BARBER-COLMAN CO., Indl. Instrs. Div., P.O. Box 2940, 1354 Clifford Ave., Loves Park, IL 61132, Tel: 815-877-0241, Telex: 257327; Empl.: 5000; *Sls. Mgr.:* John Parry

BARBER-COLMAN CO., Motor Div., 14116 Rock St., Rockford, IL 61101, Tel: 815-877-0241, Telex: 25-7419, TWX: 910-631-3425; Empl.: 3500; *Sls. Mgr.:* R. B. Nelson

BARCEL WIRE & CABLE CORP., Electronics Div., 2851 Aton Ave., Irvine, CA 92714

BARKSDALE CONTROLS DIV., Transamenca DeLaval, 3211 Fruitland Ave., P.O. Box 58843, Los Angeles, CA 90058, Tel: 213-589-6181, Telex: 67-4113; Empl.: 325; *Sls. Mgr.:* R. C. Wolf

BARNES & REINECKE, INC., 2375 Estes Ave., Elk Grove Village, IL 60007, Tel: 312-640-7200; Empl.: 290

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BARNES ENGRG., 1645 So. Claudina Way, Anaheim, CA 92805, Tel: 714-533-7530; FSC No.: FSCM 53823 S.I.C. 3469; Empl.: 38; *Sls. Mgr.:* Gorgdon Mackenzie ....2•1011-1013

BARNES ENGRG., 44 Commerce Rd., P.O. Box 53, Stamford, CT 06904, Tel: 203-348-5381, Telex: 965921, TWX: 710-474-3367; Empl.: 300; *Sls. Mgr.:* H. R. Hofmann, Jr.

BARON-BLAKESLEE, INC., Sub. Purex Inds., Inc., 2001 N. Janice Ave., Melrose Pk., IL 60160, Tel: 312-450-3900, Telex: 25-4701; *Sls. Mgr.:* B. Uffer

BARON WIRE & CABLE, 1811 W. Bryn Mawr Ave., Chicago, IL 60660, Tel: 312-728-7480, Telex: 72-4322; Empl.: 50; *Sls. Mgr.:* Al Desaluo

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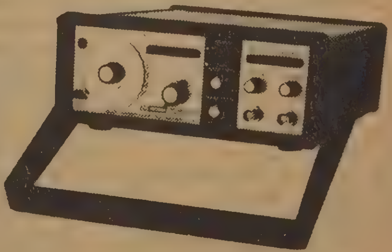

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BARTLETT-EMERY INSTR., 14th & Ave. 'M', P.O. Box 445, Ft. Madison, IA 52627, Tel: 319-372-8366; Empl.: 25; *Sls. Mgr.:* P. R. Bartlett

BASCOM-TURNER INSTRS., 111 Downey St., Norwood, MA 02062, Tel: 617-769-9660, Telex: 92-2413; Empl.: 35; *Sls. Mgr.:* D. Weise; *Dist. Mgr.:* S. Holly

Local Sales Offices & Reps

IL	Union	815-923-4494
MA	Norwood	617-769-9660
PA	Pittsburgh	412-279-5544

BASE TEN SYS., One Electronics Dr., Box 3151, Trenton, NJ 08619, Tel: 609-586-7010, Telex: 4754158, TWX: 510-685-5692; FSC No.: 30377; Empl.: 255; *Sls. Mgr.:* Oleh Pavlovsky

BASF SYS., Crosby Dr., Bedford, MA 01730, Tel: 617-271-4000, 800-343-4600, Telex: 92-3423; Empl.: 1,100; *Sls. Mgr.:* David F. Pippin

BASIC MEASURING INSTRS., 402 Lincoln Centre Dr., Foster City, CA 94404, Tel: 415-570-5355; *Sls. Mgr.:* Joseph K. Kirkup .... 3•1830

BASLER ELEC., Rte. 143, Highland, IL 62249, Tel: 618-654-2341, TWX: 910-996-2522; Empl.: 940

BASLER ELEC. CIRCUITS, INC., 204 Highland Dr., P.O. Box 1165, Taylor, TX 76574, Tel: 512-352-7683; Empl.: 110; *Sls. Mgr.:* Sam Jones

Local Sales Offices & Reps

CO	Lakewood, Mike Ikeda	303-987-0900
TX	Dallas, Barry Black	214-321-4359

BAUSCH & LOMB, 820 Linden Ave., Rochester, NY 14625, Tel: 716-338-6000, Telex: 97-2286; *Sls. Mgr.:* Martin Green

BAUSCH & LOMB, 820 Linden Ave., Rochester, NY 14625, Tel: 716-338-6314, Telex: 98-8286; Empl.: 500

BAUSCH & LOMB, S.O.P.D. DIV, 1400 N. Goodman St., Rochester, NY 14602, Tel: 716-338-6000, Telex: 97-8231, TWX: 510-253-6189; Empl.: 5000; *Sls. Mgr.:* D. Curtiss

BAYLEY INSTR. CO., Box 357, Kenwood, CA 95452, Tel: 707-833-6014

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BBC-METRAWATT/GOERZ, 6901 W. 117th Ave., Broomfield, CO 80020, Tel: 303-469-5231, 800-821-6327, Telex: 45-4540; Empl.: 12; *Sls. Mgr.:* Andy Zeidler .... 3•1192, 1193

Multimeter Rep List

AL	Trussville, Adams & Assocs.	205-681-5162
CA	Campbell, Olsheski & Assoc.	408-378-6003
CA	Sun Valley, Tequni-Rep. Assoc.	213-768-4223
FL	Lake Worth, Adams & Assocs.	305-588-7630
GA	Marietta, Adams & Assocs.	404-973-0853
KS	Wichita, Maury Bettis	316-265-8250
KS	Olathe, Maury Bettis	913-764-0621
IN	Indianapolis, DeVoe Co.	317-842-3246
IL	Chicago, Industrial Reps.	312-647-7755
LA	Kenner, Gunn & Assocs.	504-443-5072
MA	Norwood, MacInnis Corp.	617-762-8090
MI	Livonia, Harvey Sls.	313-476-1974
MN	Bloomington, Northport Engineer	612-854-5556
MO	St. Louis, Maury Bettis	314-429-2099
NY	Whitestone, Jack Brown Elect.	212-767-1977
NY	Kew Gardens, Jack Brown Elect.	212-846-5130
NC	Greensboro, Adams & Assocs.	919-272-6838
OH	Cleveland, Kirik Sls.	216-581-7722
OK	Oklahoma City, Gunn & Assocs.	405-721-9400
PA	Wynnewood, Stinson Assocs.	215-896-7278
TN	Memphis, Hicks Sls.	901-386-5725
TX	Carrollton, Gunn & Assocs.	214-733-1222
TX	Houston, Gunn & Assocs.	713-466-8673
TX	San Antonio, Gunn & Assocs.	512-655-1041
WA	Seattle, Pacific Mktg. Grp.	206-485-1888

Recorder Rep List

AL	Huntsville, Newcombe Assocs.	201-837-3233
CA	Martinez, Rotech	415-372-6007
CA	Woodland Hills, Friedman & Assoc.	213-702-0665
CO	Arvada, Air-Row Entprs.	303-421-4204
IL	Rolling Meadows, Commodore 1	312-394-5441
IL	Fairview Heights, Delta Inst.	618-939-7755
IA	Coralville, Delta Inst.	319-626-6794
KS	Wellington, Delta Inst.	316-326-6398
MA	West Roxbury, Reptek	617-469-3311
MD	Wheaton, Brimberg Sls.	301-946-2670
MI	Hazel Park, TIBY Company	313-547-3550
NC	R.T.P., Newcomb Assocs.	919-549-0486
NY	Rochester, L-Tron	716-436-4410
NY	Albany, L-Tron	518-482-1987
NY	Roslyn Heights, Penzias Assocs.	516-621-8522
OH	Cleveland, TIBY Co.	216-371-5335
OR	Portland, Westcon	503-283-0132
PA	Philadelphia, DANA Scientific	215-969-8550
TX	Austin, Acudata	512-346-4033
TX	Houston, Acudata	713-580-2451
TX	Plano, Acudata	214-424-3567

Multimeter Distributors

AL	Dothan, Carmichael Elect.	205-793-7066
AL	Mobile, Arnolds Inst.	205-478-3230
AL	Mobile, Brownell-Electro	205-479-8581
AL	Mobile, Breard-Gardner	205-476-6174
AK	Anchorage, Alaska Electr. Sup.	907-563-3774
AK	Juneau, Juneau Elctrns.	907-586-2260
AZ	Phoenix, Arizona Whls. Supp.	602-258-7901
AZ	Phoenix, Parts Elect. of Arizona	602-968-6231
AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Scottsdale, Beta Distrs.	602-947-7841
CA	Alameda, Alameda Elctrn. Dist.	415-523-6933
CA	Berkley, Al Lasher's Elctrns.	415-843-5915
CA	Burbank, Elctrn. City	213-842-5275
CA	Chatsworth, Intl. TV Cor	213-700-0900
CA	Costa Mesa, Marvac Elctrns.	714-540-3280
CA	Costa Mesa, Wesco Elect. Supp.	714-556-8788
CA	El Segundo, WASSCO	213-772-8171
CA	Fullerton, Specialized Prods.	714-773-9555
CA	Hawaiian Gardens, Carson Elctrns.	213-421-3786
CA	Hayward, Alameda Elect. Dist.	415-786-1400
CA	Hollywood, Yale Elctrns.	213-465-4169
CA	Inglewood, Inglewood Elctrns.	213-674-2366
CA	Los Angeles, Radio Equip. Dist.	213-664-1948
CA	Los Angeles, Intl. TV Corp.	213-776-8830
CA	Los Angeles, Intl. TV Corp.	213-388-0621
CA	Los Angeles, Rexanne Prods.	213-663-3261
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Panorama City, Panorama Elect.	213-894-2248
CA	Pasadena, Dow Radio	818-793-1195
CA	Sacramento, H.S.C. Elect. Supp.	916-338-2545
CA	Sacramento, Sacramento Elect. Supp.	916-441-4821
CA	San Diego, Southland Elect. Supp.	619-283-3941
CA	San Diego, Western Radio Elect.	619-239-0361
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Mateo, San Mateo Elect. Supp.	415-341-8731
CA	Santa Ana, Advanced Computor Prod.	714-558-8813
CA	Santa Clara, Anchor Elctrns.	408-727-3693
CA	Sunnyvale, Com-Kyl	800-547-9768
CA	Sunnyvale, Tool Kit Spec.	408-745-6020
CA	Sunnyvale, Sunnyvale Elctrns.	408-745-6020
CA	Sunnyvale, Halted Specialties	408-732-1573
CA	Torrance, Torrance Elctrns.	213-328-2501
CA	Van Nuys, Hurley Elctrns.	213-781-8410
CO	Arvada, Air-Row Instrs.	303-421-4204
CO	Aurora, Anixter	303-371-6992
CO	Aurora, R&R Instrument	303-340-8728
CO	Englewood, Beta Distrs.	303-779-4494
CT	Norwalk, Park Distrib.	800-243-5006
FL	Hialeah, Kimball Elect Lab	305-822-5792
FL	Miami, Brownell Electro	305-591-3215
FL	Orlando, Brownell Electro	305-843-6770
GA	Atlanta, Brownell Electro	404-762-5181
GA	Atlanta, Wholesale Ind. Elect.	404-447-8431
HI	Honolulu, Integrated Cir.	808-841-4175
IN	East Chicago, Acro Elect.	219-397-8681
IN	Evansville, Electro-Lab	812-423-5211
IN	Indianapolis, Graybar	317-631-1411
IN	Indianapolis, MAR Elctrns.	317-875-4510
IN	Indianapolis, Graham Elctrns.	317-634-8202
LA	Baton Rouge, Breard-Gardner	504-272-4420
LA	Baton Rouge, Barnhill Assoc.	504-924-6826
LA	New Orleans, WB Allen Sup.	504-525-8222
MD	Rockville, Capitol Radio Whsle.	301-881-2270
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Boston, Hub Matl.	617-542-7531
MA	Cambridge, Kaufman Co.	617-491-5500
MA	N. Billerica, AST Servo Sys.	617-667-8541
MA	Newtonville, Security Sup. Serv.	617-965-3400
MA	Waltham, Calibron Instr.	617-894-6440
MA	Woburn, Brownell Electro	617-935-7820
MI	Detroit, Elctrn. Parts Co.	313-891-7400
MI	East Detroit, Elctrn. Parts Co.	313-773-0030
MN	Barnville, Atrix Tool	612-894-6154
MS	Jackson, Ellington Electr.	601-355-0561
MS	Meridian, Hooper Electr. Sup.	601-693-2668
MO	Rolla, Show-Me Elctrns.	314-364-1515
MO	St. Louis, Van Sickle Radio Elect.	314-621-5000
MT	Helena, D. N. Latus & Co.	406-442-3940
NV	Las Vegas, Hurley Elctrns.	702-384-5666
NJ	Bergenfield, Schirmer Nat'l.	201-385-1200
NJ	North Caldwell, Hosica Labs	201-256-7724
NJ	Raritan, Masters Elect. Supp.	201-725-3533
NJ	S. Plainfield, Brownell Electro	201-753-4600
NJ	Trenton, Jackson Distrs.	609-392-4141
NM	Albuquerque, Barnhill Assoc.	505-299-7658
NY	New York, Taft Elctrns.	212-575-5194
NY	New York, Brownell Electro	212-691-1171
NC	Charlotte, Brownell Electro	704-597-1270
NC	Fayette, Eastern Radio Supp.	919-485-2161
NC	Raleigh, Brownell Electro	919-876-6524
NC	Raleigh, Meter Metrics	800-446-7230
OH	Cleveland, Christie Labs	216-651-4100
OK	Enid, Enid Walker Elect.	405-234-2218
OK	Tulsa, Inotek Corp.	918-627-1500
OK	Tulsa, Tri-State Instr. Lab	918-836-0286
OR	Beaverton, Eicher-Richards Co.	503-221-1123
OR	Lake Oswego, Com-Kyl	800-538-1578
OR	Medford, United Radio Supp.	503-779-7933
OR	Portland, United Radio Supp.	503-223-5341
PA	Plymouth Meeting, Techni-Tool	215-825-4990
RI	Pawtucket, Jabbour Elect. Supp.	401-728-4600
SC	Charlestown, Whsle. Ind. Elect.	803-577-6388
SC	Greenville, Whsle. Ind. Elect.	803-235-8334
TN	Chattanooga, Curle Elctrns.	615-266-4727
TN	Knoxville, Brownell Electro	615-966-3441
TN	Memphis, Bluff City Electr.	901-345-9500
TN	Memphis, Brownell Electro	901-795-8487
TN	Nashville, Bluff City Elect.	615-242-8000
TN	Nashville, Brownell Electro	615-889-8230
TX	Austin, Beta Distrs.	512-452-0199
TX	Brownsville, Rio Radio Supp.	512-546-2492
TX	Corpus Christie, Leader Elctrns.	512-884-5527
TX	Dallas, Inotek Corp.	214-243-7000
TX	Dallas, Specialized Prods.	214-358-4663
TX	Ft. Worth, Inotek Corp.	817-877-5100
TX	Harlingen, Rio Radio Supp.	512-423-1959
TX	Houston, Specialized Prods.	713-789-6610
TX	Houston, Gilbert Elctrns.	713-225-0107
TX	Houston, Beta Distrs.	713-688-9971
TX	Houston, Angie Elctrns.	713-659-8386
TX	Houston, Brownell Electro	713-699-1981
TX	Houston, Inotek Corp.	713-688-7000
TX	McAllen, Rio Radio Supp.	512-682-5524
TX	Richardson, Beta Distrs.	214-783-1065
TX	San Antonio, Sherman Elect. Supp.	512-224-1001
UT	Salt Lake City, Beta Distrs.	801-973-4455
UT	Salt Lake City, Standard Sup.	800-662-7537
VT	Roanoke, Peoples Elect. Supp.	703-342-8933
VA	Richmond, Meter Metrics	800-552-7952
WA	Bellevue, United Radio Supp.	206-451-9396
WA	Seattle, Eicher-Richards Co.	206-523-7888

BBK, INC., 75 Travis Ave., Binghamton, NY 13904, Tel: 607-772-8119; *Sls. Mgr.:* Jerome Kunze

B-D CRYSTAL ENTPRS., INC., 1727 W. Galbraith Rd., Cincinnati, OH 45239, Tel: 513-522-3300, Telex: 21-4545; *Sls. Mgr.:* Janet Wood, Charles Fithen

BDS COMPUTER CORP., 800 Maude Ave., Mountain View, CA 94043, Tel: 415-964-2115, TWX: 910-373-2005; *Sls. Mgr.:* Dave Lester

BEAD ELCTRNS., Div. Bead Chain Mfg. Co., 110 Mountain Grove St., Bridgeport, CT 06605, Tel: 203-334-4124; Empl.: 175

BEA ELECTRO-OPTICS, INC., 690 First Ave., Des Plaines, IL 60016, Tel: 312-298-1420; *Sls. Mgr.:* George E. Magerl; *Dist. Mgr.:* Vic Halkyn

BEAM TUBE CORP., 11 Beach St., Milford, MA 01757, Tel: 617-473-0660

BEAN RUBBER MFG. CO., 1623 S. 10th St., San Jose, CA 95112, Tel: 408-293-2790; FSC No.: 18545; *Sls. Mgr.:* Kris Mosher

BEARING INSPECTION, 10041 Shoemaker Ave., Santa Fe Springs, CA 90670, Tel: 213-944-6251; Empl.: 31

BEAU PRODUCTS DIV., Box 10, Laconia, NH 03247, Tel: 603-524-5101, TWX: 710-364-1843; Empl.: 230; *Sls. Mgr.:* John Jansen; *Dist. Mgr.:* Larry Murphy .... **2**•1164-1166

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AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, The Knight Co.	602-582-8506
CA	Los Angeles, The Knight Co.	213-670-2833
CA	Santa Clara, Nova-Tronix Elec. Sls.	408-727-9530
CO	Denver, W.J. Purdy Co.	303-777-1411
FL	Orlando, Cartwright & Bean	305-422-4531
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Lisle, W-G Controls	312-963-5954
LA	Kenner, Cartwright & Bean	504-466-0020
MA	Needham, R. Perron & Co.	617-449-6162
MI	Lathrup Village, R.C. Nordstrom Co.	313-559-7373
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MS	Jackson, Cartwright & Bean	601-981-1170
MO	Kansas City, Forristal-Young Sls. Co.	816-358-6771
NH	Dover, R. Perron & Co.	603-742-2321
NJ	West Caldwell, Grimm, Siegel Assoc.	201-575-9300
NM	Albuquerque, C.T. Carlberg & Assoc.	505-883-3883
NY	Buffalo, Rudell-Merrifield Assoc	716-634-4300
NC	Charlotte, Cartwright & Bean	704-377-5673
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OK	Oklahoma City, Erickson Sls.	405-682-2947
PA	Broomall, L.D. Lowery	215-356-5300
PA	Pittsburgh, Jim Finnegan	412-561-4687
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Dallas, Erickson Sls.	214-739-5833
WA	Medina, Henry Paulman Sls. Co.	206-455-3311

BEAU TECH, P.O. Box 523, Portland, ME 04122, Tel: 207-775-6139; Empl.: 9

BEAVER LABS, P.O. 1290, Framingham, MA 01701, Tel: 617-653-2025; Empl.: 5

BEC INC., 2709 N. Broad St., Philadelphia, PA 19132, Tel: 215-229-9800; *Sls. Mgr.:* Bob Kandel

BECKMAN INSTRS., 2500 Harbor Blvd., Fullerton, CA 92634, Tel: 714-871-4848, Telex: 06-7413; Empl.: 12000

BECKMAN INSTRS., Cedar Grove Opers., 89 Commerce Rd., Cedar Grove, NJ 07009, Tel: 201-239-6200, TWX: 710-994-5781

BECKMAN INSTRS., Electro-Prods. Grp., 2500 Harbor Blvd., Fullerton, CA 92634, Tel: 714-871-4848, Telex: 06-78413, TWX: 910-592-1260; FSC No.: 73138; Empl.: 3700; *Sls. Mgr.:* M. P. Crugnale

BECKMAN INSTRS., HELIPOT DIV., See Beckman Instrs., Electro-Prods. Grp.

BEECHWOOD MFG., 310 S. Ohmer, Indianapolis, IN 46219, Tel: 317-356-2493; *Sls. Mgr.:* Robt. Cox

BEEDE ELECTRICAL INSTR. CO., S. Main St., Penacook, NH 03303, Tel: 603-753-6362, TWX: 710-364-6977; Empl.: 500; *Sls. Mgr.:* Mike Harbour

BEHLMAN DIV., CALIFORNIA INSTRS., Div. of Norlin Inds., 5150 Convoy St., San Diego, CA 92111, Tel: 619-279-8620, Telex: 695-047; FSC No.: 16067; Empl.: 90

BEHLMAN ENGINEERING CORPORATION, 1142 Mark Ave., Carpinteria, CA 93013, Tel: 805-684-8311; FSC No.: 53636; *Sls. Mgr.:* Edward C. Bertolet .... **3**•1834-1839

Local Sales Offices & Reps

AZ	Phoenix, R. L. Davis	602-955-2266
CA	Cupertino, T. Louis Snitzer	408-257-8333
CA	Del Mar, T. Louis Snitzer	714-226-0305
CA	Los Angeles, T. Louis Snitzer	213-836-6170
FL	Satellite, Reynolds & Assocs.	305-773-4700
GA	Atlanta, Reynolds & Assocs.	404-252-5360
MD	Rockville, Farrell Assocs.	301-424-9460
MA	Needham, Addelco	617-444-4754
MN	St. Paul, Dytec No.	612-645-5816
EXP	CA, Los Angeles, Hanex	213-556-3807

BEI MOTION SYSTEMS CO., Corporate Off., 681 Market St., Ste. 741, San Francisco, CA 94105. Tel: 415-974-1275 .... **1B**•1832

Local Sales Offices & Reps

CA	Santa Ana, BEI Motion Sys. Co.	714-973-8510
CA	Santa Clara, BEI Motion Sys. Co.	408-986-9006
CO	Boulder, BEI Motion Sys. Co.	303-440-7240
GA	Lawrenceville, BEI Motion Sys. Co.	404-963-0673
IL	Rockford, BEI Motion Sys. Co.	815-968-9528
MA	Wakefield, BEI Motion Sys. Co.	617-245-3851
MI	Plymouth, BEI Motion Sys. Co.	313-451-0359
OH	Cincinnati, BEI Motion Sys. Co.	513-321-1121
PA	King of Prussia, BEI Motion Sys. Co.	215-337-9228
TX	Euless, BEI Motion Sys. Co.	817-267-9351
WA	Bellevue, Thorson Co. Northwest	206-455-2300

BEI MOTION SYS. CO., Computer Prod. Div., 1755 B La Costa Meadows Dr., San Marcos, CA 92069, Tel: 619-471-2600; *Sls. Mgr.:* Everett McElroy .... **1B**•1832

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., Digital Prods. Div., P.O. Box 3838, Little Rock, AR 72203, Tel: 501-851-4000, TWX: 910-722-7384; Empl.: 506; *Sls. Mgr.:* H. O. Tyler .... **1B**•1832

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., General Control Systems Div., 564 Alpha Dr., Pittsburgh, PA 15238, Tel: 412-963-0515; *Sls. Mgr.:* Chic Sweeney .... **1B**•1832

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., Industrial Encoder Div., 7230 Hollister Ave., Goleta, CA 93117, Tel: 805-968-0782; *Sls. Mgr.:* Glenn Avolio .... **1B**•1832

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BEI MOTION SYS. CO., Position Controls Div., 819 Reddick Ave., Santa Barbara, CA 93103, Tel: 805-966-1538, TWX: 910-334-4903; *Sls. Mgr.:* K. Capps .... **1B**•1832

Refer to BEI Motion Sys. Co., Corporate Off., San Francisco, CA for sales office information.

BELDEN, Electronic Wire & Cable, P.O. Box 1980, Richmond, IN 47375, Tel: 317-983-5200, TWX: 810-345-1393; Empl.: 2180; *Sls. Mgr.:* Bill Donahoe .... **2**•1934, 1946-1985

Regional Sales Offices

CA	Irvine	714-474-1200
IN	Richmond	317-983-5200
MA	Framingham	617-872-7846
TX	Dallas	214-788-4300

Local Sales Reps.

AZ	Scottsdale, W. Atkins	602-998-7355
CA	Huntington Beach, E. Kerezsi	714-848-2157
CA	Newark, R. Tribendis	415-490-0838
CA	Northridge, J. Duffin	213-993-8919
CA	Orange, K. Wales	714-750-9066
CA	San Jose, S. Landis	408-723-7117
CA	Tustin, W. Caughlin	714-832-5278
CO	Aurora, S. Groves	303-695-8466
CT	South Bury, L. Kerchief	212-264-8012
FL	Boca Raton, G. Pedigo	305-482-1279
FL	Longwood, J. Vandemark	305-774-0959
GA	Marietta, J. Fienning	404-973-6212
IL	Schaumburg, M. Peterschmidt	312-490-9244
IL	Wheaton, M. Davis	312-653-0695
IN	Indianapolis, L. Brown	317-849-1945
IN	Richmond, J. Daggy	317-962-6103
LA	Kenner, K. Ingram	504-469-9154
MD	Columbia, E. Wunder	301-997-4480
MA	Framingham, A. Harris	617-872-2066
MA	Franklin, S. LaRocco	617-528-1896
MI	Southfield, W. Bryant	313-559-1944
MN	Mound, J. Hughes	612-472-7545
MN	Robbinsdale, J. Stanley	612-522-9183
MO	Clayton, F. Lane	314-725-1488
NY	Northport, LI, L. Thompson	516-754-9038
NY	Rochester, T. Centofonti	716-461-0818
NY	Sunnyside, E. Mammone	212-361-0993
NC	Raleigh, A. Hatcher	919-848-3342
OH	Medina, H. Flanders	216-725-4285
OR	Lake Oswego, D. Clicquennoi	503-638-0271
PA	Norristown, B. Easley	215-272-8044
SC	Columbia, G. Owen	803-781-9739
TX	Austin, M. Mullery	512-345-5204
TX	Dallas, M. McQuistion	214-341-3424
TX	Houston, M. Masucci	713-721-6023
TX	Houston, E. Cheney	713-729-1259
TX	Houston, C. Amonett	713-350-2271
TX	Richardson, D. Berg	214-349-7712
WA	Bellevue, S. Abernethy	206-885-5808
WI	Milwaukee, M. Lucky	414-355-4986

BELDEN, Fiber Optics, 2000 S. Batavia Ave., Geneva, IL 60134, Tel: 312-232-8900, TWX: 910-237-1681

BEL FUSE, 198 Van Vorst St., Jersey City, NJ 07302, Tel: 201-432-0463, TWX: 710-730-5301; Empl.: 225; *Sls. Mgr.:* A. Sutta .... **1A**•1454-1465; **1B**•1260-1262

Local Sales Offices & Reps

Delay Lines

AL	Huntsville, EMA Inc.	205-830-4030
AZ	Scottsdale, SMS & Assocs.	602-998-0831
CA	Cupertino, Thresum Assocs.	408-996-9889
CA	Escondido, Cirolia Elctrn. Sls.	619-743-3015
CA	Los Angeles, Corcoran	213-823-4589
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Branford, L.J.M. Assocs.	203-488-4244
FL	Altamonte Springs, Semtronics Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Fort Lauderdale, Semtronics Assoc.	305-731-2484
IL	Chicago, MGA	312-775-1151
IN	Indianapolis, Insul-Reps	317-842-5203
MA	Wellesley Hills, Sturdy Co.	617-235-2330
MI	Bloomfield Hills, Enco Mktg.	313-642-0203
NJ	East Brunswick, Winch Sls. Assocs.	201-828-4615
NY	East Syracuse, Nycom	315-437-8343
NC	Apex, FBD Sls.	919-362-4091
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
PA	Bala Cynwyd, Friedman & Assocs.	215-667-1838
SC	Mauldin, FBD Sales	803-288-2323
TN	Knoxville, Insul-Reps	615-691-7586
TX	Austin, Oeler & Menelaides	512-453-0275
TX	Dallas, Oeler & Menelaides	214-361-8876
TX	Houston, Oeler & Menelaides	713-772-0730
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Chesapeake, FBD Sls.	804-484-3162
WA	Kent, R & R Assocs.	206-251-5396
PR	Hato Rey, M. Anderson Co.	809-751-2026

Fuses

AL	Huntsville, EMA Inc.	205-830-4030
CA	Los Altos, Landia	415-490-5651
CA	Los Angeles, Corcoran Assoc.	213-823-4589
CA	Huntington Beach, Corcoran Assoc.	714-841-4759
CO	Boulder, Front Range Mkt.	303-443-4780
CT	North Haven, Coakley, Boyd & Abbett	203-239-6217
IL	Chicago, MGA Assoc.	312-775-1151
IN	Indianapolis, Insul-Reps	317-842-5203
MA	Needham Heights, Coakley, Boyd & Abbett	617-444-5470
MI	Bloomfield Hills, ENCO Mktg.	313-642-0203
MN	Minnetonka, Beta Engrg.	612-544-1800
NH	Plaistow, Coakley, Boyd & Abbett	603-382-9234
NM	Albuquerque, Syntech	505-266-7951
NY	Hempstead, Kahgan Sls.	516-538-2300
NC	Cary, FBD Sls.	919-467-7595
PA	Narbeth, Samuel Jeffries Inc.	215-664-8500
SC	Mauldin, FBD Sls.	802-288-2323
TN	Knoxville, Insul-Reps	615-691-7586
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Chesapeake, FBD Sls.	804-484-3162
WA	Kent, R & R Assoc.	206-251-5396

Local Distributors

Delay Lines

CA	Inglewood, Force Elctrns.	213-776-1324; 800-421-5880
CA	San Jose, Force Elctrns.	408-943-1324
NH	Hudson, C & H Elctrns.	603-882-1133

Fuses

AZ	Phoenix, Lion Elctrns.	602-869-9611
CA	City of Industry, Ital Elctrns.	213-968-8515
CA	Costa Mesa, Deco Elctrns.	714-754-1322
CA	Hayward, KEA Elctrns.	415-887-2900
CA	San Diego, Sigma Elctrns.	619-763-0545
CO	Aurora, Jet Elctrn. Supp. Co.	303-364-1000
CT	Norwalk, Cobra Comps.	203-847-6442
FL	Boca Raton, D & R Assocs.	305-395-2341
MA	Woburn, Elctrn. Packaging Comps.	617-935-0400
NH	Hudson, C & H Elctrns.	603-882-1133
NY	Bohemia, Key Comps.	516-567-7500
OH	Columbus, Seneca Fuse	614-895-2631
PA	Cornwells Heights, Reliance Merchandising	215-638-8200
TX	Dallas, Fuses Inc.	214-341-6407
WA	Kent, Shannon Ltd.	206-763-0545

BELL, FLOYD, ASSOCS., INC., 897 Higgs Ave., Columbus, OH 43212, Tel: 614-488-3193, TWX: 810-482-1763; FSC No.: 56493; *Sls. Mgr.:* Tom Shain .... 3•1026-1028

Local Sales Offices & Reps

CA	Pasadena, Paul Nurches Co.	213-681-8957
CA	Redwood City, Hickey Indl. Sls. Corp.	415-368-3849
CO	Denver, Moss Mktg.	303-455-7205
FL	Casselberry, Barrett & Assocs.	305-699-0311
FL	Melbourne, Barrett Assocs.	305-727-2491
FL	Miami, Barrett Assocs.	305-681-4957
FL	Palm Harbor, Barrett Assocs.	813-785-1954
GA	Marietta, Dahlcom Sls.	404-424-8909
IL	Mt. Prospect, Robert Adams Sls. Co.	312-297-8733
KY	Edgewood, ELECCO	606-341-0330
MD	Columbia, Tyler Griffin Co.	301-995-1215
MA	Scituate, New England Area Reps.	617-545-6327
MI	Jenison, R.C. Nordstrom	616-457-5762
MI	Lathrup Village, R.C. Nordstrom	313-559-7373
MN	Minneapolis, A.J. Warner Co.	612-729-7371
NJ	Ocean, P. Saftler Assocs.	516-593-7880
NM	Albuquerque, Moss Mktg.	505-298-4275
NY	Fulton, P. Saftler Assocs.	315-592-7184
NY	Lynbrook, P. Saftler Assocs.	516-593-7880
OH	Cleveland, ROC Assocs.	
OH	Worthington, ROC Assocs.	614-885-1057
OR	Aloha, Elctrn. Comp. Sls.	503-245-2342
PA	Paoli, Tyler Griffin Co.	215-647-1550
TX	Dallas, Jim D. Gray & Assocs.	214-341-7190
UT	Bountiful, Moss Mktg.	801-292-8660
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301

BELL, F. W., INC., 6120 Hanging Moss Rd., Orlando, FL 32807, Tel: 305-678-6900, TWX: 810-853-3115; FSC No.: 18479; *Dist. Mgr.:* Edward S. Wilush .... 3•1194-1197

Local Sales Offices & Reps

CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CA	Pasadena, Jim Robins Assoc.	818-795-9118
CO	Denver, Moss Mktg.	303-455-7205
FL	Indian Rock Beach, Par Assoc.	813-596-8841
GA	Atlanta, Par Assoc.	404-448-4181
IL	Downers Grove, Splon Assoc.	312-963-7011
KS	Overland Park, Ramsey Assocs.	913-649-6996
MA	Needham Hgts., Shain Assoc.	617-449-4380
MI	Royal Oak, Dave Ray & Assocs.	313-280-0000
MO	Maryland Hgts., Ramsey Assocs.	314-878-5042
NM	Albuquerque, Moss Mktg.	505-298-4275
NY	White Plains, Cane Tech. Sls.	914-694-9240
OH	Chagrin Falls, RPM Indl. Sls.	216-247-3295
PA	Paoli, T. Griffin Co.	215-644-7710
TX	Carrollton, Seaton Corp.	214-380-0414

Local Distributors

AZ	Phoenix, Jensen Tools & Alloys	602-968-6231
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CA	Pasadena, Jim Robins Assoc.	818-795-9118
CA	Pasadena, Pasadena Elctrns.	213-796-5844
CO	Denver, Moss Mktg.	303-455-7205
FL	Palm Bay, EIL Instrs.	305-725-8300
GA	Atlanta, Process Meas. Co.	404-696-7481
IL	Downers Grove, Splon Assocs.	312-963-7011
IL	Rolling Meadows, Commodore-1	312-394-5441
MA	Needham Hgts., Shain Assocs.	617-449-4380
MO	Maryland Hgts., Ramsey Assocs.	314-878-5042
NY	White Plains, Cane Tech. Sls.	914-694-9240
OH	Chagrin Falls, RPM Indl. Sls.	216-247-3295
OH	Dayton, National Instr. Distrs.	513-435-4503
PA	Paoli, Tyler Griffin Co.	215-644-7710
TN	Chattanooga, Edwin Bohr Elctrns.	615-877-8207
TX	Houston, Quality Instr. Lab.	713-524-0528

BELL & HOWELL/CEC DIV., 360 Sierra Madre Villa, Pasadena, CA 91109, Tel: 213-796-9381, Telex: 67-5415, TWX: 910-582-3205; Empl.: 500

BELL AUDIO SYS., 994 Freeway Drive North, Columbus, OH 43229, Tel: 614-846-2766; Empl.: 20; *Sls. Mgr.:* Thomas A. Curran

BELL CO., INC., 106 Morrow Ave., Box 92E, Trussville, AL 35173, Tel: 205-655-2135; Empl.: 19; *Sls. Mgr.:* R. Bell; *Dist. Mgr.:* Neil H. Bell

J. W. Miller Division
BELL INDUSTRIES

BELL INDS., J. W. Miller Div., 19070 Reyes Ave., P.O. Box 5825, Rancho Dominguez, CA 90224, Tel: 213-537-5200, TWX: 910-346-6740; FSC No.: 76493; Empl.: 55 .... **1A**•1224-1229

Local Sales Offices & Reps

AZ	Phoenix, Moore Sls.	602-274-4558
AR	El Dorado, D. Bellew Sls.	501-863-8325
CA	Santa Clara, Logan Sls. Co.	408-496-0660
CO	Denver, Wm. J. Purdy Co.	303-777-1411
FL	Ft. Lauderdale, Hutto-Hawkins-Peregoy	305-971-5750
FL	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
GA	Atlanta, Millar Elctrns.	404-261-6160
HI	Gardena, CA, Bidwell Sls. Assoc.	213-770-0300
IL	Chicago, Ken Levy & Assocs.	312-763-5000
IN	Indianapolis, Elctrn. Reps.	317-894-1414
IN	South Bend, Elctrn. Reps.	219-277-4565
MD	Columbia, Par-Nell Sls. Co.	301-992-5454
MA	N. Scituate, W. A. Hendrickson Co.	617-545-0652
MI	Detroit, Burcaw Co. & Assoc. Inc.	313-533-7700
MI	Wyoming, Burcaw Co. & Assoc. Inc.	616-532-2756
MN	Minneapolis, Electro Mark, Inc.	612-881-3306
MO	Raytown, Marty Taraski Sls. Co.	816-358-1442
NJ	Englewood, Baum & Epstein Assoc.	201-569-7600
NM	Albuquerque, Wm. J. Purdy Co.	505-266-7959
NY	Syracuse, Pl'Tronics, Inc.	315-455-7346
NC	Raleigh, Millar Elctrns.	919-787-9564
OH	St. Marys, T. Shelby & Co.	419-394-3377
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Langhorne, Par-Nell Sls. Co.	215-750-0380
TN	Memphis, D. Bellew Sls.	901-452-1468
TX	Ft. Worth, Chet Wells & Co.	817-284-0261
UT	Salt Lake City, Wm. J. Purdy Co.	801-486-8557
WA	Seattle, Earl & Brown Co.	206-284-1121
EXP	NY, New York, Roburn Agencies	212-989-5939

Local Distributors

AZ	Tempe, Circuit Specialists	602-966-0764
AZ	Tempe, Bell Industries/EDD	602-966-7800
CA	Buena Park, RPS Elctrns.	714-521-5230
CA	Garden Grove, Bell Industries/EDD	714-220-0681
CA	Gardena, Bell Industries/EDD	213-515-1800
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	San Diego, Bell Industries/EDD	619-268-1277
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Sunnyvale, Bell Industries/EDD	408-734-8570
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Denver, Bell Industries/EDD	303-424-1985
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	New Haven, Greene-Shaw Co.	203-397-0710
CT	Wallingford, Sager Elctrcl. Supp.	203-265-4600
FL	West Palm Beach, Nurmi Elctrns.	305-684-0320
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Industries/EDD	312-982-9210
IL	Palatine, Ohm/Elctrns, Inc.	312-359-5500
IN	Fort Wayne, Graham Elect./Div. Bell Ind.	219-423-3422
IN	Indianapolis, Graham Elect./Div. Bell Ind.	317-634-8202
IA	Cedar Rapids, Bell Industries/EDD	319-395-0730
LA	New Orleans, Wm. B. Allen Supp.	504-525-8222
MD	Rockville, MS Elctrns.	301-340-6400
MA	Hingham, Sager Elctrcl. Supp.	617-749-6700
MA	Newton, Greene-Shaw Co.	617-969-8900
MN	Minneapolis, Ind. Comps., Inc.	612-831-2666
MO	Saint Louis, Olive Elctrns.	314-426-4500
NJ	Camden, General Radio	609-964-8560
NJ	East Hanover, State Elctrn. Parts	201-887-2550
NM	Albuquerque, Bell Industries/EDD	505-292-2700
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit Elctrns.	716-887-2800
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rome, Rome Elctrns.	315-337-5400
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Columbus, Hughes-Peters, Inc.	614-294-5351
OH	Dayton, Bell Industries/Micro-Mil Div.	513-434-8231
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Bell Industries/EDD	503-241-4115
PA	Allentown, P. A. Peters, Inc.	215-434-5237
PA	Braddock, Leff Elctrns.	412-351-5000
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Willow Grove, Resco Elctrns.	215-659-4575
TN	Chattanooga, Techni-Tronics, Inc.	615-875-5449
TX	Dallas, Wholesale Elctrns./Ind. Div.	214-824-3001
TX	Fort Worth, TTI, Inc.	817-831-0441
TX	Houston, Lenert Co.	713-225-1465
UT	Salt Lake City, Bell Industries/EDD	801-972-6969
VA	Charlottesville, Virginia Radio	804-296-4184
WA	Bellevue, Bell Industries/EDD	206-747-1515
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Milwaukee, Bell Industries/EDD	414-547-8879

BELLOFRAM CORP., A Rexnord Co., 30 Blanchard Rd., Burlington, MA 01803, Tel: 617-272-2100, 800-225-1031, Telex: 94-9457; Empl.: 350; *Sls. Mgr.:* James L. Diegnan; *Dist. Mgr.:* James L. Diegnan

BELL PA PRODS., See Bell Audio Sys.

BELTING INDS. CO. INC., 20 Boright Ave., Kenilworth, NJ 07033, Tel: 201-272-8591, Telex: 138045; Empl.: 125; *Sls. Mgr.:* Harry K. Denaker

Local Sales Offices & Reps

CO	Boulder	303-443-8512
FL	Jacksonville, Quinn Indl. Inc.	904-268-3062
GA	Norcross	404-449-5616
IL	Addison, Eng. Sls. Co.	312-832-8425
MN	St. Paul, Vikeland Sls. Inc.	612-645-4647
NJ	Kenilworth, Belting Inds. Co. Inc.	201-272-8591
NY	Sodus, Warner Woven Belting	315-483-9490

Local Distributors

MI	Detroit, Michiean Indl. Belting Co.	313-584-1652

BEMAN MFG., P.O. Box 370, New Cumberland, PA 17070, Tel: 717-938-1451, TWX: 510-650-3539; Empl.: 300; *Sls. Mgr.:* D. Fortenbaugh

BEMCO, 9908 San Fernando Rd., Pacoima, CA 91331, Tel: 818-899-5296, TWX: 910-496-1520; Empl.: 45; *Sls. Mgr.:* John Riddle; *Dist. Mgr.:* Brian Duggan

BENDIX CORP., Electrical Comps. Div., Sidney, NY 13838, Tel: 607-563-5324, Telex: 932 456, TWX: 510-261-7550; FSC No.: 77820; Empl.: 3000; *Dist. Mgr.:* G. Anderson

BENDIX CORP., Electric Power Div., Hwy. 35, Eatontown, NJ 07724, Tel: 201-542-2000, Telex: 132-444 , TWX: 710-722-6686; FSC No.: 83298; Empl.: 875; *Sls. Mgr.:* H. I. Nadler; *Dist. Mgr.:* Cal Schrum

BENDIX CORP., Electrodynamics Div., 11600 Sherman Way, N. Hollywood, CA 91605, Tel: 818-765-1010, TWX: 910-499-2151; Empl.: 1200

BENDIX CORP., MOTOR COMPS. DIV., See Facet Entprs.

BENDIX CORP., Test Systems Div., Teterboro, NJ 07608, Tel: 201-288-2000, TWX: 710-990-6136; Empl.: 1,077

BENJAMIN ELECTROPRODUCTS, INC., Robins Div., 80 Smith St., Farmingdale, NY 11735, Tel: 516-293-7744, Telex: 12-7908; Empl.: 100

BENSON, INC., 2690 Orchard Parkway, P.O. Box 32059, San Jose, CA 95152-2059, Tel: 408-945-1000, Telex: 176887 BENSON SNJ, TWX: 9103382069 BENSON SNJ; Empl.: 400; *Sls. Mgr.:* Larry Maguire

BENTHOS, INC., Edgerton Dr., N. Falmouth, MA 02556, Tel: 617-563-5917, Telex: 94-0884; Empl.: 110; *Sls. Mgr.:* R. D. Jones

BENTLY NEVADA CORP., P.O. Box 157, Minden, NV 89423, Tel: 702-782-3611, Telex: 354437

BERG, W. M., INC., 499 Ocean Ave., East Rockaway, NY 11518, Tel: 516-599-5010; Empl.: 150; *Sls. Mgr.:* C. Keenan

BERG ELCTRNS., Du Pont Co., 30 Hunter La., Camp Hill, PA 17011, Tel: 800-237-BERG, TWX: 510-650-3538; *Sls. Mgr.:* J. McAluney; *Dist. Mgr.:* P. Raudensky

BERGER-LAHR CORP., Fitzgerald Dr., Jaffrey, NH 03452, Tel: 603-532-7701, Telex: 92-8445; Empl.: 50; *Sls. Mgr.:* Wolfgang Hartert

BERGQUIST, 5300 Edina Ind'l., Minneapolis, MN 55435, Tel: 612-835-2322, TWX: 910-576-2423; FSC No.: 55285; Empl.: 45; *Sls. Mgr.:* Bob Savage

BERGQUIST SWITCH, INC., Bergquist Co., 5300 Edina Indl. Blvd., Edina, MN 55435, Tel: 612-835-2322, TWX: 910-576-2423; *Sls. Mgr.:* Lamar Popp

BNC

DIGITAL DELAY AND LIGHT PULSE GENERATORS

BERKELEY NUCLEONICS CORP., 1198 Tenth St., Berkeley, CA 94710, Tel: 415-527-1121, Telex: 677-1167; Empl.: 30; *Sls. Mgr.:* E. J. Buchs .... **3**•1203

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BERKSHIRE TRANSFORMER CORP., Route 341, Kent, CT 06757, Tel: 203-927-3541

BERK TEK, INC., Box 60, RD 1, Reading, PA 19607, Tel: 215-376-8071; TWX: 510-651-0511; Empl.: 185; *Sls. Mgr.:* P. J. Parrelli; *Dist. Mgr.:* P. J. Parrelli

BERMAR CORP., 6300 Westgate Rd., Raleigh, NC 27612, Tel: 919-821-5993; *Sls. Mgr.:* M. Conland

BA

BERTAN ASSOCIATES, INC

BERTAN ASSOCS., 121 New South Rd., Hicksville, NY 11801, Tel: 516-433-3110, TWX: 510-221-2144; FSC No.: 6130; Empl.: 140; *Sls. Mgr.:* Howard Bertan .... **3**•1506, 1507

Local Sales Offices & Reps

AZ	Phoenix, Sigma Engrg. Sls. Co.	602-241-1334
CA	Encino, King-Way Assoc.	213-788-4124
CA	Los Altos, Cain-White & Co.	415-948-6533
CO	Boulder, H. Bass Assocs.	303-530-7509
CT	Madison, Dave Minshall	203-421-4561
FL	DeBary, DJE Assocs.	305-668-6827
GA	Lawrenceville, Electramark	404-963-4793
IL	Arlington Hgts., Coombs Assocs.	312-439-9810
IN	Fort Wayne, Coombs Assocs.	219-747-4017
IA	Cedar Rapids, Coombs Assocs.	319-362-4116
MD	Randallstown, Beacon North	703-591-1300
MI	Farmington, Carter, McCormic & Peirce	313-477-7700
MN	St. Paul, John J. Exon Co.	612-636-5533
MO	Bridgeton, Electro Mechanical Assoc.	314-291-8661
NM	Albuquerque, Thorson Co.	505-293-8555
NY	Fairport, NACO Elctrns. Corp.	716-223-4490
NY	Syracuse, NACO Elctrns. Corp.	315-699-2651
NY	Utica, NACO Elctrns. Corp.	315-732-1801
NC	Raleigh, Barker Assocs.	919-876-0282
OH	Cleveland, Geotronix	216-526-2535
OR	Portland, Showalter Instrs.	503-224-8487
PA	Audubon, Holmes Assocs.	215-666-0636
TX	Dallas, Automated Motion Control	214-340-4192
TX	Denton, Automated Motion Control	817-382-4159
UT	Bountiful, H. Bass Assoc.	801-295-7100
VA	Fairfax, Beacon North	703-591-1300
WA	Bellevue, Showalter Instrs.	206-746-6032
WI	Milwaukee, Coombs Assocs.	414-351-6123

BERTSCH U.S.

BERTSCH U.S., Sycamore Resch. Ctr., 2142F Industrial Ct., Vista, CA 92083, Tel: 619-727-7420; Empl.: 20; *Sls. Mgr.:* S. W. Linko .... **1B**•1132-1134

BEST ELECTRICS DIV., 400 Boren Ave. North, Seattle, WA 98109, Tel: 206-382-1300, TWX: 910-444-2154; Empl.: 8 .... **1B**•1794

Local Sales Offices & Reps

CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assocs.	303-426-0890

BETA TRANSFORMER TECHNOLOGY CORP., One Comac Loop, Ronkonkoma, NY 11779, Tel: 516-588-2505

BG ELCTRNS., 30 South St., Mt. Vernon, NY 10551, Tel: 914-664-5591, Telex: 6818048; FSC No.: 33791; Empl.: 36

B-G INSTRUMENTS, P.O. Box 67, Alta Loma, CA 91701, Tel: 714-989-4802, 980-2826, Telex: 910-581-2792; *Sls. Mgr.:* John Baum .... **3**•1071

Local Sales Offices & Reps

WA	Spokane	509-238-4757

B. G. LABORATORIES, INC., 75 Travis Ave., Binghampton, NY 13904, Tel: 607-722-2376

B. H. ELCTRNS., 331 Bremer Bldg., St. Paul, MN 55101, Tel: 612-228-6463, Telex: 297080; FSC No.: 3677; Empl.: 300; *Sls. Mgr.:* Fred LaMarche .... **1A**•2136, 2137

Local Sales Offices & Reps

CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
MN	Osseo, Gaffney Sls. Co.	612-425-5484
NJ	Dunellen, J. A. Maguire	201-752-8480
NY	Syracuse, C & L Sales	315-451-7810
WA	Redmond, Halbar Assocs.	206-882-0990
WI	Theinsville, TFL Assoc.	414-242-6800

B.H. INDS., INC., 5784 Venice Blvd., Los Angeles, CA 90019, Tel: 213-937-4763; Empl.: 6

BICC-VERO ELCTRNS., INC., 171 Bridge Rd., Hauppauge, NY 11788, Tel: 516-234-0400, TWX: 510-227-8890; Empl.: 25; *Sls. Mgr.:* Joseph Lago; *Dist. Mgr.:* Larry Spenceley

Local Sales Offices & Reps

AL	Huntsville, Raycom	205-859-2017
CA	Anaheim, Bicc-Vero Elctrns.	714-630-2030
CT	Milford, Todino Engrg.	203-874-6643
FL	Melbourne, Star-Tec	305-727-2247
GA	Duluth, Raycom	404-446-9015
IL	Ithasca, L-Tec	312-773-2900
IN	Indianapolis, Harrison Blind & Assocs.	317-291-0860
KS	Overland Park, Barnes-Midwest Sls.	913-341-9317
MD	Lutherville, J. A. Dougherty Sls.	301-321-7890
MA	Needham Hgts., Todino Engrg.	617-444-7925
MI	Jackson, Norwood Scroggs	517-750-1170
MN	St. Paul, Proud Inds.	612-646-9428
NM	Albuquerque, Alliance Elctrns.	505-292-3360
NY	Kingston, P.R.M. Elctrns.	914-331-0872
NC	Raleigh, Raycom	919-847-8276
OH	Chesterland, K-T Mktg.	216-729-3588
PA	Hatboro, Rep Force	215-441-4178
TX	Garland, Texport	214-681-1376
TX	Houston, Texport Elctrn. Sls. Co.	713-777-1443
UT	Salt Lake City, Chuck Fields & Assocs.	801-277-4859

Local Distributors

CA	Los Angeles, Dyna Svc.	213-268-8531
CT	Wallingford, Mid-State Elect.	203-265-9900
FL	Dania, Summit Distr.	305-920-6253
IL	Arlington Hgts., Redel Labs	312-253-5000
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
MD	Baltimore, Resco	301-823-0070
MA	Framingham, NOW Elctrns.	617-872-5876
MI	Lansing, Demco Controls	517-321-1700
MI	Madison Heights, McNaughton-McKay Electric Co.	313-399-7500
NJ	Springfield, Route Elctrns.	201-467-0166
NY	Buffalo, Summit Distr.	716-884-3450
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Rochester, Summit Distr.	716-442-3494
NC	Raleigh, Resco	919-781-5700
OH	Cleveland, Roberts Elctrns.	216-238-1711
OR	Portland, Dunn Elctrns.	503-285-0214
PA	Braddock, Leff Elctrs.	412-351-5000
TX	Houston, City Elctrns.	713-621-1060
WI	Mequon, Taylor Elctrns.	414-241-4321

BICRON ELCTRNS., Box 807, Barlow St., Canaan, CT 06018, Tel: 203-824-5125; Empl.: 100; *Sls. Mgr.:* Peter B. Kent

BIDDLE INSTRUMENTS, A Thorn EMI Co., 510 Township Line Rd., Blue Bell, PA 19422, Tel: 215-646-9200, Telex: 83-4423 BIDDLE PMTG

BIKOR

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BIKOR, 1504 W. 228th St., Torrance, CA 90501, Tel: 213-539-6320, TWX: 910-349-6667; Empl.: 50; *Sls. Mgr.:* Dave Jenest .... **3**•1508

Local Sales Offices & Reps

CA	Santa Clara, Electro Venture North	408-727-1553
FL	Orlando, Gra-Mar	305-894-3351
MN	Minnetonka, Chris-Tek	612-934-1334
MO	St. Louis, B & H Assocs.	314-434-4425
NH	Nashua, Bell Controls	603-882-6984
NJ	Haddonfield, Tritek Sls.	609-429-1551
NJ	Hasbrouck Hgts., Comp. Tech. Sls.	201-288-7400
NY	Rochester, Tae-Rep	716-586-8710
OH	Mentor, Depco	216-951-3998
TX	Garland, Tesco	214-681-1376
WA	Kirkland, Electro Venture N.W.	206-823-1708
WI	Brookfield, Sumer	414-784-6641

Local Distributors

CA	Buena Park, RPS Elctrns.	714-521-5230
CA	Burlingame, Rose Elctrn. Distbg. Co.	415-348-2740
NJ	Hasbrouck Hgts., Tory Sls.	201-288-7400

BINDICATOR, P.O. Box 9, 1915 Dove St., Port Huron, MI 48060, Tel: 313-987-2700; *Sls. Mgr.:* Rick Secord; *Dist. Mgr.:* Rick Secord

BIO-IMAGING RESEARCH, #1 Bio-Imaging Plaza, 425 Barclay Blvd., Lincolnshire, IL 60069, Tel: 312-564-3190; *Sls. Mgr.:* J. G. Close

BIOSPHERICAL INSTRS., INC., 4901 Morena Blvd. #1003, San Diego, CA 92117, Tel: 619-270-1315; *Sls. Mgr.:* Dennis Bryan

BIRD, RICHARD H., & CO., INC., 1 Spruce St., Waltham, MA 02154, Tel: 617-894-0160, Telex: 923-441; FSC No.: 17706; Empl.: 50; *Sls. Mgr.:* R.J. Cameron

BIRD ELCTRN., 30303 Aurora Rd., Cleveland, OH 44139, Tel: 216-248-1200, Telex: 706898 Bird Elec. UD; FSC No.: 70998; Empl.: 250; *Sls. Mgr.:* W. L. Yochum; *Dist. Mgr.:* Greg Johns

Local Sales Offices & Reps

CA	Ojai	805-646-7255

BIRTCHER

BIRTCHER CORP., 4501 N. Arden Dr., El Monte, CA 91731, Tel: 818-575-8144, Telex: 4720899 BIRTCHER ELM; Empl.: 200; *Sls. Mgr.:* H. Robert Sproul .... **2**•1015-1017

Local Sales Offices & Reps

AL	Huntsville, Mar-Tec.	205-883-5910
AZ	Scottsdale, Mercury Eng. Sls.	602-949-5054
CA	Brea, M. A. Stolaroff Co.	714-529-0866
CA	Los Angeles, M. A. Stolaroff Co.	213-295-7781
CA	Santa Clara, Nova Tronix	408-243-9530
CO	Broomfield, Connors, Inc.	303-466-9628
FL	Ft. Lauderdale, Hutto-Hawkins-Peregoy	305-971-5750
IL	Rolling Meadows, Heartland Tech. Mktg.	312-577-9222
KS	Mission, Midland Eng. Sls.	913-262-6565
MD	Baltimore, Burgin Kreh Assoc.	301-265-8500
MA	Burlington, Conti-Younger Assoc.	617-273-1582
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NJ	Haddonfield, Tritek Sls.	609-429-1551
NY	Great Neck, Tylinski Assoc.	516-466-9070
NY	Syracuse, I. A. Hotze Assoc.	315-479-6641
NC	Raleigh, Burgin Kreh Assoc.	919-781-1100
OH	Cincinnati, Jim Finnegan Co.	513-321-6370
OH	Cleveland, Jim Finnegan Co.	216-238-5905
OR	Beaverton, Barrett-Squibb Assoc.	503-644-2550
TX	Dallas, Forner Sales	214-241-2166
VA	Lynchburg, Burgin Kreh Assoc.	804-239-2626
WA	Redmond, Barrett-Squibb Assoc.	206-885-6991

Local Distributors

CA	Manhattan Bch., Prime Electro Prods.	213-379-3642
CA	San Jose, Bisco Industries	408-946-8980

CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CO	Aurora, Jet Elctrns. Supp.	303-364-1000
FL	Dania, Summit Distrs.	305-920-6253
IL	Elk Grove, Dot-Tronics	312-593-0282
MA	Winchester, Rush Inds.	617-729-5800
MN	Minneapolis, Stark Elctrns.	612-322-1325
NY	Bohemia, Car Lac Indl. Sls.	516-567-4200
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Rochester, Summit Elctrns.	716-334-8110
OH	Englewood, Argent Industries	513-836-8633
TX	Ft. Worth, Industrial Elctrns.	817-731-7321
TX	Houston, Solid State Electronics	713-772-8483
WA	Redmond, Murphy Elctrns.	206-881-1234
Can	Mississauga, Ont., Rush Elctrns.	416-677-7280

BISHOP GRAPHICS, INC., 5388 Sterling Center, Westlake Village, CA 91359, Tel: 818-991-2600, Telex: 66-2400 BISHOP WKVG; Empl.: 160; *Sls. Mgr.:* Fred Kern

BIVAR, INC., 4 Thomas, Irvine, CA 92714, Tel: 714-951-8808; FSC No.: 32559; Empl.: 22; *Sls. Mgr.:* E. M. Muldoon 2•1018

Local Sales Offices & Reps

AZ	Mesa, Tempe Assocs.	602-829-1901
CA	San Diego, Qualtronics Co.	619-560-8955
CO	Westminster, D. Barth	303-427-8679
FL	Plymouth, Duay Entprs.	305-889-2249
GA	Peachtree City, Spyraflo	404-487-7600
IL	Chicago, Berndt Assocs. Inc.	312-283-0713
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
KS	De Soto, Midtec Assocs.	913-441-6565
MA	Newtonville, C. Segel	617-969-6900
MI	Milford, Dodsworth	313-875-5755
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Berkeley Heights, Cambridge-Allen	201-464-0203
NY	Syracuse, T-Squared Elctrns.	315-463-8592
NC	Bethania, Lee, Ltd.	919-924-8245
OH	Cincinnati, Tri-State Mktg.	513-761-7993
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
OR	Portland, Eclipse Mktg. Grp.	503-644-2550
PA	Elkins Park, K. B. Erdman Co.	215-224-1833
TX	Richardson, Draper Co.	214-680-1650
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991
WI	Milwaukee, Berndt Assocs.	414-545-8400

Local Distributors

AZ	Phoenix, Kachina Elctrn. Distr.	602-269-6201
AZ	Phoenix, EKO Sales	602-275-7501
CA	Fountain Valley, Components Ctr.	714-979-0433
CA	Mountain View, Vic/Tal Sls.	415-964-6254
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	Santa Clara, Components Ctr.	408-988-3751
CA	Santa Fe Springs, F T R Fasteners	714-957-0202; 213-946-6464
CA	Temple City, Fastening Sys.	213-579-4600
CA	Westlake Village, R. C. Dudek	213-707-1310
CO	Englewood, Indus. Elctrns.	303-694-9444
CT	Milford, Plastic & Metal Comps. Co.	203-877-2723
GA	Peachtree City, Spyraflo Inc.	404-487-7600
IL	Chicago, Waldom Elctrns.	312-585-1212
IL	Chicago, EMF	800-621-0080
IL	Hillside, Miltex Sls.	312-449-0420
IL	Lisle, Components, Inc.	312-852-7707
MD	Gaithersburg, Capitol Fasteners	301-948-9310
MA	Burlington, Contact East	617-272-5051
MA	Marlboro, Hardware Specialty Co.	617-481-8622
MA	Waltham, Electronic Fasteners	617-890-7780
MA	Winchester, RUSH	617-729-5800
MI	Southfield, LSI Marketing	313-356-7002
MI	Zeeland, Tubergen & Assoc.	616-772-1548
MN	Eden Prairie, S. W. Anderson Co.	612-941-4108
NH	Goffstown, New Hampshire Fasteners	603-497-4151
NH	Londonderry, E.P.E. Corp.	603-669-9181
NJ	Kenilworth, Federated Purchaser	201-376-8900
NY	Central Islip, Domino Components	516-582-3050
NY	Johnson City, Gold Crest Elctrns.	607-797-2380
NY	Long Island City, Empire Fasteners	212-728-3900
NY	Long Island City, Hardware Specialty Co.	212-361-9393
NY	Mt. Vernon, QAR Elctrns.	914-699-2224
NY	Plainview, Tower Fastener Co.	516-349-7670
NC	Raleigh, Century Elctrn. Comps.	919-755-0537
NC	Raleigh, Century Fasteners	919-787-1800
OH	Englewood, Argent Inds.	513-836-8633
OH	Solon, REH/Electra	216-248-1636
OR	Beaverton, Murphy Elctrns.	503-642-2001
OR	Beaverton, Component Resources	503-641-8488
PA	Norristown, Century Elctrns.	215-631-5400
PA	Pittsburgh, Alder-Tronics	412-821-5565
WA	Redmond, Murphy Elctrns.	206-881-1234
WA	Seattle, Pacific Elctrns.	206-575-1050

BIW CABLE SYS., INC., 65 Bay St., Dorchester, MA 02125, Tel: 617-265-2102, Telex: 94-0604; FSC No.: 71102; Empl.: 600; *Sls. Mgr.:* E. McCormick

BLACK & WEBSTER, 281 Winter St., Waltham, MA 02154, Tel: 617-890-9100, Telex: 951102; Empl.: 80

BLACK BOX CORP., Micom Sys., P.O. Box 12800, Pittsburgh, PA 15241, Tel: 412-746-5500, Telex: 510-697-3125; *Sls. Mgr.:* Peter Highberg

BLACKHAWK NETWORKS CORP., 14 N. Parker Dr., P.O. Box 919, Janesville, WI 53545, Tel: 608-752-8701; FSC No.: 12724; Empl.: 10

BLANCK, A. R., CO., Box 249, Rutherford, NJ 07070, Tel: 201-933-2091; Empl.: 6; *Sls. Mgr.:* Dr. A. R. Blanck; *Dist. Mgr.:* Dr. A. R. Blanck

BLATEK INDS., Box 574, Bellefonte, PA 16823, Tel: 814-355-4910; Empl.: 20; *Sls. Mgr.:* Linda C. Feltman 1B•1835

Local Sales Offices & Reps

CA	Burbank, Mo'Dco	213-848-2215
CO	Littleton, McCarthy Co.	303-773-0643
CT	Woodbridge, Elctrn. Mktg.	203-397-1461
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282
MI	Benton Harbor, McNabb & Assocs.	616-925-2166

BLH ELCTRNS., 42 Fourth Ave., Waltham, MA 02254, Tel: 617-890-6700, Telex: 92-3413, TWX: 710-324-0683; FSC No.: 03089; Empl.: 350; *Sls. Mgr.:* D. Erikson

BLILEY ELEC. CO., 2545 W. Grandview Blvd., Erie, PA 16506, Tel: 814-838-3571, TWX: 510-696-6886; FSC No.: 71034; Empl.: 170; *Sls. Mgr.:* H. A. Yocum 1A•1316-1323

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher Co.	205-882-6050
CA	Los Angeles, Elsner-Rambo Co.	213-664-2928
CA	Mountain View, Gene C. Woempner Co.	415-964-5454
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Altamonte Springs, R. W. Mitscher Co.	305-788-6844
FL	Boca Raton, R. W. Mitscher Co.	305-482-5649
GA	Lawrenceville, R. W. Mitscher Co.	404-923-3239
MD	Laurel, R. W. Mitscher Co.	301-498-6090
MA	Needham, Sturgeon Co.	617-444-6603
NY	Bainbridge, R. W. Mitscher Co.	607-967-7192
NY	Buffalo, R. W. Mitscher Co.	716-633-7970
NY	N. Syracuse, R. W. Mitscher Co.	315-458-1321
NY	Pittsford, R. W. Mitscher Co.	716-586-4012
NY	Red Hook, R. W. Mitscher Co.	914-758-8375
NY	Rochester, R. W. Mitscher Co.	716-227-0839
NY	West Hempstead, Schmitt Indl. Mktg. Corp.	516-486-3510
NC	Charlotte, R. W. Mitscher Co.	704-598-8644
NC	Raleigh, R. W. Mitscher Co.	919-848-0941
OR	Portland, Dussault & Assocs. Inc.	503-641-8780
TN	Johnson City, R. W. Mitscher Co.	615-929-7258
TX	Richardson, Vector Sls. Co.	214-234-4291
VA	Midlothian, R. W. Mitscher Co.	804-744-4676
WA	Seattle, Dussault & Assocs., Inc.	206-527-5454
EXP	CT, Stamford, Dage Corp.	203-324-3123

® BLUE M

BLUE M, A UNIT OF GENERAL SIGNAL, 138th & Chatham Sts., Blue Island, IL 60406, Tel: 312-385-9000, TWX: 910-689-3398; Empl.: 300; *Sls. Mgr.:* H. G. Mathews 3•1173

Local Sales Offices & Reps

AZ	Tempe	602-894-2305
CA	El Monte	818-442-6672
CA	Sunnyvale	408-734-8734
DE	Wilmington	302-478-6983
FL	Winter Park	305-671-6655
GA	Atlanta	404-455-3452
MA	Natick,	617-651-1616
MI	Taylor	313-281-2107
NY	Nanuet	914-623-0900
NY	Syracuse	315-437-0192
NC	Charlotte	704-527-2492
OH	Cincinnati	513-821-6278
OH	Hudson	216-656-1177
TX	Garland	214-272-2509
TX	Houston,	713-778-1146
WA	Seattle	206-763-1030

BLUM, JULIUS & CO., INC., Box 292, Carlstadt, NJ 07072, Tel: 201-438-4600, Telex: 13-3491; Empl.: 40

BMS DATA HANDLING, INC., 12155 Magnolia, Riverside, CA 92503, Tel: 714-359-8820; Empl.: 16; *Sls. Mgr.:* Richard Mestler

BODINE ELEC. CO., 2500 W. Bradley Pl., Chicago, IL 60618, Tel: 312-478-3515, Telex: 25-3646; *Sls. Mgr.:* R. E. Ford 1B•1135

Local Sales Offices & Reps

CA	Los Angeles, C. E. Mello	213-626-9159
CA	San Jose, E. W. Duemmlein	408-243-4800
KS	Shawnee Mission, J. S. Gleeson & Assocs.	913-362-4422
MA	Andover, L. R. Cascino	617-470-0050
MI	Grosse Ile, Steve Cavender	313-676-2724
NY	Massapequa, D. V. Mayorga	516-541-1611
NY	Rochester, Application Specialists	716-586-6226
NY	Syracuse, Application Specialists	315-437-2813
OH	Hudson, J. H. Basten	216-656-4226
OR	Portland, D. E. Johnson	503-246-3131
TX	Richardson, General Power Equip.	214-783-8371
VA	McLean, J. S. Hsia	703-734-1739
EXP	IL., Chicago, Export Dept., Bodine Elec.	312-478-3515

Local Distributors

AL	Mobile, Brownell Electro	205-479-5405
AK	Anchorage, Airport Machinery Co	907-272-0544
AZ	Phoenix, Minarik Elec. Co.	602-233-3000
AR	Fort Smith, Dagwell-Dixie Arkansas	501-646-8028
CA	Carson, Power Trans. Specialties	213-631-7502
CA	Los Angeles, Minarik Elec. Co.	213-624-3161
CA	Mountain View, King Bearing Inc.	415-968-8316
CA	San Diego, Minarik Elec. Co.	619-560-6632
CA	San Jose, Republic Supp. Co.	408-279-2202
CA	San Jose, King Bearing Inc.	408-998-5464
CA	San Leandro, Republic Supp. Co.	415-357-2211
CA	Santa Clara, Minarik Elec. Co.	408-727-0575
CO	Denver, Wazee Elec. Co.	303-892-7004
CT	Berlin, B & B Motor & Control	203-828-8550
CT	Hartford, Machine Drives & Controls	203-728-0403
CT	Norwalk, Machine Drives & Controls	203-846-2007
FL	Miami, Brownell Electro	305-591-3215
FL	Orlando, Brownell Electro	305-843-6770
GA	Hapeville, Brownell Electro	404-762-5181
IL	Chicago, Excel Elec. Svc. Co.	312-421-7220
IL	Chicago, Harris & Lee	312-372-7272
IL	Rockford, Harris & Lee	815-398-0606
IL	St. Charles, Harris & Lee	312-584-5000
IL	Waukegan, Harris & Lee	312-662-0372
IN	Indianapolis, B & B Motor & Control	317-248-0396
IA	Cedar Rapids, Precision Bearing Co.	319-365-5276
IA	Des Moines, Precision Bearing Co.	515-265-9811
KS	Kansas City, Kornfeld Thorp Elec.	913-321-7070
MA	Medford, Empire Elctrl. Co.	617-395-5000
MA	Somerville, Electro Sls. Co., Inc.	617-666-0500
MI	Detroit, Howard Elec. Co.	313-923-0430
MN	Minneapolis, Boustead Elec. & Mfg.	612-544-9131
MO	St. Louis, Zeller Elec. Inc.	314-638-9641
NE	Omaha, Precision Bearing Co.	402-444-3939
NV	Reno, Republic Supp. Co.	702-677-1761
NJ	Cherry Hill, Jos. T. Fewkes & Co.	609-424-5810
NJ	Piscataway, B & B Motor & Control	201-572-0500
NY	Binghamton, K. J. Elec. Corp.	607-772-1760
NY	East Syracuse, K. J. Elec. Corp.	315-437-2826
NY	Long Island City, B & B Motor & Control	212-784-1313
NY	Rochester, B & B Motor & Control	716-424-7040
NC	Charlotte, Mize Co., Inc.	704-375-5761
NC	Charlotte, Brownell Electro	704-597-1270
OH	Cleveland, Reserve Elec. Co.	216-771-5764
OH	Dayton, Thal Mor Assoc., Inc.	513-298-9939
OK	Oklahoma City, Dagwell Dixie Co.	405-232-7671
OK	Tulsa, Southwest Drives, Inc.	918-834-4231
OR	Portland, Campbell Ind. Supp.	503-231-4820
PA	Pittsburgh, Braunlich-Roessle	412-471-6995
SC	Taylors, B & B Motor & Control	803-268-5702
TN	Memphis, Brownell Electro	901-795-8487
TN	Nashville, Tennessee Machinery Co.	615-244-8150
TX	Dallas, Motion Industries	214-351-2211
TX	Fort Worth, Motion Industries	817-335-8131
TX	Houston, Research Designs, Inc.	713-995-8591
TX	Houston, B & B Motor & Control	713-820-7931
TX	Houston, B & B Motor & Control	713-820-7931
VA	Richmond, Ind. Supp.	804-355-8041
WA	Seattle, Industrial Elec.	206-329-3900
WA	Seattle, Campbell Ind. Supp.	206-447-7100
WA	Spokane, Campbell Ind. Supp. Co.	509-828-8288
WA	Tacoma, Campbell Ind. Supp. Co.	206-383-2431
WI	Milwaukee, Trester Svc. Elec.	414-264-8170
WI	New Berlin, Elec. Sls. & Engrg.	414-782-2400

BOEING MICROELECTRONICS, PCB OPNS., M/S: 88-34, Box 24666, Seattle, WA 98124, Tel: 206-773-1083, Telex: 32-9430, TWX: 910-423-1563; Empl.: 120; *Sls. Mgr.:* M.A. Schalk

BOKER'S, INC., 3104 Snelling Ave., Minneapolis, MN 55406, Tel: 612-729-9365

BOMAR CRYSTAL, 201 Blackford Ave., Middlesex, NJ 08846, Tel: 201-356-7787, 800-526-3935, TWX: 710-480-4560; Empl.: 75; *Sls. Mgr.:* Phil Casciano

BOMCO, See MuShield Co.

BONUS-BILT, INC., Hofmann Inds., 1096 Air Way, Glendale, CA 91201, Tel: 818-245-9177, 800-692-8888; Empl.: 100; *Sls. Mgr.:* Robert J. Grimm

BOONTON

BOONTON ELCTRNS. CORP., 791 Route 10, Randolph, NJ 07869, Tel: 201-584-1077, TWX: 710-986-8215 BOONTRONICS; FSC No.: 04901; Empl.: 180; *Sls. Mgr.:* J. Garthwaite ....3•1204

Local Sales Offices & Reps

AL	Huntsville, Sci. Devices	205-536-1969
AZ	Phoenix, Aztec Entprs.	602-943-8178
CA	North Hollywood, O'Halloran Assocs.	213-877-0173
CA	Palo Alto, O'Halloran Assocs.	415-326-1493
CO	Littleton, Aztec Entprs.	303-795-0250
CT	Mt. Carmel, Sci. Devices	203-248-9361
FL	Orlando, Sci. Devices	305-841-8180
FL	Shalimer, Sci. Devices	904-651-4407
GA	Marietta, Sci. Devices SE	404-427-8660
IL	Schaumburg, K. W. Meyers	312-882-4808
IN	Indianapolis, K. W. Meyers	317-243-6681
IA	Cedar Rapids, K. W. Meyers	319-363-8987
KS	Overland Park, Ramsey Assoc.	913-649-6996
MD	Silver Spring, Sel-Tronics	301-589-3391
MA	Lexington, R. J. Sickles	617-862-5100
MN	Minneapolis, K. W. Meyers	612-920-7080
MO	Maryland Hgts., Ramsey Assoc.	314-878-5042
NJ	Englewood Cliffs, Sci. Devices	201-871-3916
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Rochester, Sci. Devices	716-334-2445
NC	Winston-Salem, Sci. Devices	919-765-5776
OH	Centerville, Micro Sls.	513-433-8171
OH	N. Olmsted, Micro Sls.	216-734-3080
OR	Portland, Sci. Devices	503-292-6934
PA	Melrose Park, R. Meyers	215-224-1663
TX	Austin, Testech	512-327-7033
TX	Houston, Testech	713-956-0837
TX	Richardson, Testech	214-644-5010
UT	Ogden, Aztec Entprs.	801-621-1655
WA	Bellevue, Sci. Devices	206-747-5169
WI	Brookfield, K. W. Meyers	414-784-3790

BORG-WARNER THERMOELECTRICS, BORG-WARNER CORP., See TECA, ThermoElectric Cooling America Corp.

BOSCH, ROBERT, CORP., 2800 S. 25th Ave., Broadview, IL 60153, Tel: 312-865-5200, Telex: 23-5563; *Sls. Mgr.:* Dieter Bloecks; *Dist. Mgr.:* Dave Robson ....1B•1310, 1311

10TH Anniversary 1974-1984

BOSCHERT INC., 384 Santa Trinita Ave., Sunnyvale, CA 94086, Tel: 408-732-2440, TWX: 910-339-9241; Empl.: 600; *Sls. Mgr.:* Ed Bennett; *Dist. Mgr.:* Bill Sabetti ....3•1510, 1511

Local Sales Offices & Reps

AZ	Scottsdale, Fred Board Assocs.	602-994-9388
CA	Los Alamitos, Santana Sls.	714-827-9100
CA	San Diego, Harvey King	619-566-5252
CA	Santa Clara, Criterion	408-988-6300
CA	Sunnyvale, Boschert	408-732-2440
CO	Aurora, Electrodyne	303-695-8903
FL	Clearwater, Dyne-A-Mark	813-441-4702
FL	Ft. Lauderdale, Dyne-A-Mark	305-771-6501
FL	Maitland, Dyne-A-Mark	305-831-2097
FL	Palm Bay, Dyne-A-Mark	305-727-0192
GA	Atlanta, Elctrn. Mktg.	404-448-1215
GA	Huntsville, Elctrn. Mktg.	205-837-7363
IL	Arlington Hgts., Micro Sls.	312-956-1000
IN	Indianapolis, SAI Mktg.	317-241-9276
IA	Cedar Rapids, Stan Clothier	319-395-0245
MA	Framingham, Eastern Micro	617-620-1616
MI	Brighton, SAI Mktg.	313-227-1786
MN	Minneapolis, Stan Clothier Co.	612-944-3456
MO	St. Louis, Design Solutions	314-961-7170
NJ	Cherry Hill, Datronix	609-424-6622
NJ	Clifton, Boschert	201-478-4659
NM	Albuquerque, Alliance Elctrns.	505-292-3360
NY	Huntington, Morgan Elctrns.	516-549-5180
NC	Raleigh, Elctrn. Mktg.	919-847-8800
OH	Centerville, SAI Mktg.	513-435-3181
OH	Shaker Hgts., SAI Mktg.	216-751-3633
OR	Hillsboro, Olson, Ferree & Assoc.	503-640-9660
SC	Greenville, Elctrn. Mktg.	803-233-4637
TX	Austin, O. M. Sales	512-452-1838
TX	Dallas, O. M. Sales	214-241-3876
TX	Houston, O. M. Sales	713-789-4426
UT	Salt Lake City, Electrodyne	801-486-3801
WA	Bellevue, Olson, Ferree & Assoc.	206-883-7792
WI	Brookfield, Micro Sls.	414-782-1171

Local Distributors

AL	Huntsville, Marshall	205-881-9236
AL	Huntsville, Pioneer/Wash	205-837-9300
AZ	Tempe, Anthem	602-244-0900
AZ	Tempe, Marshall Inds.	602-968-6181
CA	Canoga Park, Marshall Inds.	213-999-5001
CA	Chatsworth, Anthem	213-700-1000
CA	El Monte, Marshall Inds.	213-442-7204
CA	Irvine, Marshall Inds.	714-556-6400
CA	San Diego, Anthem	619-453-9005
CA	San Diego, Marshall Inds.	619-578-9600
CA	San Jose, Anthem	408-946-8000
CA	Sunnyvale, Marshall Inds.	408-732-1100
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Tustin, Anthem	714-730-8000
CO	Denver, Marshall Inds.	303-427-1818
CO	Englewood, Anthem	303-790-4500
CT	Norwalk, Pioneer-Harvey Elctrns.	203-853-1515
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Altamonte Springs, Pioneer/Wash	305-834-9090
FL	Ft. Lauderdale, Pioneer/Wash	305-771-7520
FL	Orlando, Marshall Inds.	305-841-1878
GA	Norcross, Pioneer/Wash	404-448-1711
GA	Norcross, Marshall Inds.	404-923-5750
IL	Elk Grove Vlg., Pioneer-Standard	312-437-9680
IL	Schaumberg, Marshall	312-490-0155
IN	Indianapolis, Pioneer-Standard	317-849-7300
MD	Gaithersburg, Pioneer/Wash	301-948-0710
MD	Gaithersburg, Marshall Inds.	301-840-9450
MA	Burlington, Marshall Inds.	617-272-8200
MA	Lexington, Pioneer-Harvey Elctrns.	617-861-9200
MI	Livonia, Marshall	313-525-5850
MI	Livonia, Pioneer-Standard	313-525-1800
MN	Minnetonka, Pioneer-Standard	612-935-5444
MN	Plymouth, Marshall	612-559-2211
NJ	Fairfield, Marshall Inds.	201-882-0320
NJ	Mt. Laurel, Marshall Inds.	609-234-9100
NJ	Pine Brook, Pioneer-Harvey Elctrns.	201-227-1262
NY	Endwell, Marshall	607-754-1570
NY	Fairport, Pioneer-Harvey Elctrns.	716-381-7070
NY	Hauppauge, Marshall Inds.	516-273-1515
NY	Rochester, Marshall	716-235-7640
NY	Vestal, Pioneer-Harvey Elctrns.	607-748-8211
NY	Woodbury, Pioneer-Harvey Elctrns.	516-921-8700
NC	Charlotte, Pioneer/Wash	704-572-8188
OH	Cleveland, Pioneer-Standard	216-587-3600
OH	Dayton, Marshall	513-236-8088
OH	Dayton, Pioneer-Standard	513-236-9900
OR	Beaverton, Marshall	503-644-5050
PA	Horsham, Pioneer/Wash	215-665-6778
PA	Pittsburgh, Pioneer-Standard	412-782-2300
TX	Austin, Marshall	512-458-5654
TX	Austin, Pioneer-Standard	512-835-4000
TX	Dallas, Pioneer-Standard	214-386-7300
TX	Dallas, Marshall Inds.	214-233-5200
TX	Houston, Pioneer-Standard	713-988-5555
TX	Houston, Marshall Inds.	713-789-6600
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Marshall Inds.	206-747-9100
WA	Redmond, Anthem	206-881-0850

BOSTON SYSTEMS OFFICE, 469 Moody St., Waltham, MA 02154, Tel: 617-894-7800, TWX: 710-324-0760; Empl.: 60; *Sls. Mgr.:* Francis X. O'Brien; *Dist. Mgr.:* Debra DellaCamera (International)

BOURNS, INC., Resistive Components Group, 1200 Columbia Ave., Riverside, CA 92507, Tel: 714-781-5050, TWX: 910-332-1252; Empl.: 4000; *Sls. Mgr.:* R. A. Sickler; *Dist. Mgr.:* Dennis Lause ....1A•1804-1807, 2022-2035

Local Sales Offices & Reps

AL	Huntsville, CSR Elctrns.	205-533-2444
AZ	Phoenix, Shefler-Kahn	602-257-9015
CA	Encino, Great American Rep Co.	213-990-4870
CA	San Diego, SR Elctrns.	619-560-8330
CA	San Jose, QuadRep Inc.	408-946-4000
CA	Tustin, Great American Rep Co.	714-832-8113
CO	Parker, Parker Webster	303-841-4888
FL	Altamonte Springs, Dyne-A-Mark	305-831-2097
FL	Clearwater, Dyne-A-Mark	813-441-4702
FL	Ft. Lauderdale, Dyne-A-Mark	305-771-6501
FL	Palm Bay, Dyne-A-Mark	305-727-0192
GA	Atlanta, CSR Elctrns.	404-396-3720
ID	Boise, Intermountain Technlg.	208-322-5022
IL	Elk Grove Village, John G. Twist Co.	312-593-0200
IN	Carmel, Technlg. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, Technlg. Mktg. Corp.	219-432-5553
IA	Cedar Rapids, REP Assocs. Corp.	319-373-0152
KY	Louisville, Technlg. Mktg. Corp.	502-499-7808
MD	Baltimore, Micro-Comp.	301-247-0400
MA	Lexington, John E. Boeing Co.	617-862-2500
MI	Detroit, Rathsburg Assoc.	313-882-1717
MN	Edina, Mel Foster	612-941-9790
MO	Bridgeton, Centech	314-291-4230
MO	Raytown, Centech	816-358-8100
NJ	Bellmawr, Thomas Assoc.	609-933-2600
NM	Albuquerque, Shefler-Kahn Co.	505-296-0749
NY	Ithaca, B. Dean	607-257-1111
NY	Melville, Comtronic Assocs.	516-249-0505
NY	Wappingers Falls, Bourns	914-297-1180
NC	Raleigh, CSR Electronics	919-878-9200
OH	Richfield, Bear Mktg.	216-659-3131
OK	Oklahoma City, Ammon & Rizos	405-942-2552
OR	Portland, J. J. Backer	503-297-8744
OR	Salem, J. J. Backer	503-362-0717
TX	Austin, Ammon & Rizos	512-454-5131
TX	Dallas, Ammon & Rizos	214-233-5591
TX	Houston, Ammon & Rizos	713-781-6240
UT	Salt Lake City, Parker Webster	801-487-5911
VA	Huddleston, Micro-Comp	301-247-0400
WA	Seattle, J. J. Backer	206-285-1300

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AL	Huntsville, Pioneer/Washington	205-837-9300
AL	Huntsville, Schweber	205-882-2200
AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Phoenix, Cetec Elctrns.	602-272-7951
AZ	Phoenix, Schweber Elctrns.	602-997-4874
AZ	Phoenix, Elctrn. Parts Co.	602-277-7281
AZ	Tempe, Elctrn. Supp.	602-258-4769
AZ	Tempe, Acacia Sls.	602-894-2874
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Acacia Sales	303-232-2882
AZ	Tempe, Hamilton/Avnet	602-231-5100
CA	Canoga Park, Schweber Elctrns.	213-999-4702
CA	Chatsworth, Avnet Elctrns.	213-700-2600
CA	Citrus Hts, Hall-Mark Elctrns.	916-443-7282
CA	Compton, Harper S.I.D.	213-979-5090
CA	Costa Mesa, Hamilton Elctrns.	714-641-4100
CA	Costa Mesa, Avnet Elctrns.	213-558-2313
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Culver City, Hamilton Electro Sls.	213-558-2883/84
CA	Culver City, Hamilton Electro Sls.	213-558-2121
CA	El Segundo, Hall-Mark Elctrns.	213-643-9101
CA	Garden Grove, Bell Inds.	213-444-0301
CA	Gardena, Bell Inds.	213-515-1800
CA	Irvine, Schweber Elctrns.	714-863-0261
CA	Irvine, Cetec Elctrns.	714-250-4141
CA	Irvine, Acacia Sls.	714-549-0954
CA	Irvine, Schweber Elctrns.	714-556-3880
CA	Oakland, Brill Elctrns.	415-834-5888
CA	Riverside, Elctrn. Supp. Corp.	714-787-9220
CA	Roseville, Bell Inds.	916-969-3100
CA	Sacramento, Schweber Elctrns.	916-929-9732
CA	Sacramento, Hamilton/Avnet	916-920-3150
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Acacia Sls.	619-565-4365
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	San Diego, Cetec Elctrns.	619-278-5020
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Elctrn. Supp.	619-278-5020
CA	San Diego, Hamilton/Avnet	619-571-7500
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	Santa Ana, Teknopak	714-558-8840
CA	Santa Clara, Schweber Elctrns.	408-748-4700
CA	Santa Clara, Schweber Elctrns.	408-496-0200
CA	Southgate, Cetec Elctrns.	213-773-6521

CA	Sunnyvale, Acacia Sales	408-745-7200
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Sunnyvale, Hamilton/Avnet	408-743-3300
CA	Tustin, Hall-Mark Elctrns.	714-669-0681
CA	Woodland Hills, Avnet Elctrns.	213-884-3322
CO	Denver, Newark Elctrns.	303-757-3351
CO	Englewood, Hall-Mark Elctrns.	303-694-1662
CO	Englewood, Hamilton/Avnet	303-779-9998
CO	Lakewood, Acacia Sales	303-232-2882
CO	Wheat Ridge, Bell Inds.	303-424-1985
CT	Danbury, Hamilton/Avnet	203-797-2856
CT	Danbury, Schweber Elctrns.	203-792-3500
CT	Hamden, Almo Elctrns. Corp.	203-288-6556
CT	Norwalk, Pioneer Standard	203-853-1515
CT	Wallingford, Midan Elctrns.	203-265-2077
FL	Altamonte Springs, Pioneer Standard	305-834-9090
FL	Altamonte Springs, Schweber Elctrns.	305-331-7555
FL	Clearwater, Hall-Mark Elctrns.	813-530-4543
FL	Dania, Summit Distrs.	305-920-6253
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Ft. Lauderdale, Pioneer/Washington	305-771-7520
FL	Ft. Lauderdale, Hamilton/Avnet	305-971-2900
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Hollywood, Schweber Elctrns.	305-927-0511
FL	Largo, Graham Elctrns.	813-541-4434
FL	Orlando, Hall-Mark	305-855-4020
FL	Orlando, Pioneer/Orlando	305-834-9090
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	St. Petersburg, Hamilton/Avnet	813-576-3930
FL	St. Petersburg, Hall-Mark Elctrns.	813-576-8691
FL	Winter Park, Hamilton/Avnet	305-628-3888
GA	Norcross, Hammond Elctrns.	404-449-1996
GA	Norcross, Pioneer/Washington	404-448-1711
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Schweber Elctrns.	404-449-9170
GA	Norcross, Hamilton/Avnet	404-447-7500
IL	Bensenville, Hamilton/Avnet	312-860-8523
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, Schweber Elctrns.	312-364-3750
IL	Elk Grove Village, Pioneer Standard	312-437-9680
IL	Palatine, Ohm Electronics	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IN	Carmel, Hamilton/Avnet	317-844-9333
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Pioneer Standard Elctrns.	317-849-7300
IN	Lafayette, Graham Elctrns.	317-423-5564
IA	Cedar Rapids, Schweber Elctrns.	319-373-1417
IA	Cedar Rapids, Bell Inds.	319-395-0730
KS	Lenexa, Hall-Mark Elctrns.	913-888-4747
KS	Overland Park, Schweber Elctrns.	913-492-2921
KS	Overland Pk., Hamilton/Avnet Elctrns.	913-888-8900
LA	New Orleans, Wm B Allen Supp.	504-525-8222
MD	Baltimore, Radio Elec. Svc. Co.	301-823-0070
MD	Beltsville, Radio Elec. Svc. Co.	202-937-9100
MD	Columbia, Hamilton/Avnet	301-995-3500
MD	Columbia, Hall-Mark Elctrns.	301-796-9300
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MD	Gaithersburg, Schweber Elctrns.	301-840-5900
MD	Rockville, Almo Elctrns. Corp.	301-251-1161
MA	Bedford, Schweber Elctrns.	617-275-5100
MA	Burlington, Lionex Corp.	617-272-9400
MA	Canton, Almo Elctrns. Corp.	617-821-1450
MA	Lexington, Pioneer Standard	617-863-1200
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Wilmington, RC Comps.	617-273-1860
MA	Woburn, Hall-Mark Elctrns.	617-935-9777
MA	Woburn, Hamilton/Avnet	617-273-7500
MI	Flint, RS Elctrns.	313-762-5800
MI	Grand Rapids, Hamilton/Avnet	616-243-8805
MI	Grand Rapids, RS Elctrns.	616-241-3483
MI	Kalamazoo, RS Elctrns.	616-381-5470
MI	Livonia, Schweber Elctrns.	313-525-8100
MI	Livonia, RS Elctrns.	313-525-1155
MI	Livonia, Hamilton/Avnet	313-522-4700
MI	Livonia, Pioneer Standard Elctrns.	313-525-1800
MI	Roseville, RS Elctrns.	313-779-2450
MI	Wyandotte, RS Elctrns.	313-AV2-5880
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Eden Prairie, Schweber Elctrns.	612-941-5280
MN	Edina, Schweber Elctrns.	612-941-5280
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	Minnetonka, Hamilton/Avnet	612-932-0600
MN	Minnetonka, Pioneer Standard Elctrns.	612-935-5444
MO	Earth City, Schweber Elctrns.	314-739-0526
MO	Earth City, Hamilton/Avnet	314-344-1200
MO	Maryland Hts, Hall-Mark Elctrns.	314-291-5350
NH	Hudson, C&H Elctrns.	603-882-1133
NH	Manchester, Schweber Elctrns.	603-625-2250
NJ	Camden, General Radio	609-964-8560
NJ	Cherry Hill, Hamilton/Avnet	609-424-0110
NJ	Cherry Hill, Hall-Mark Elctrns.	609-424-7300
NJ	Clifton, J-Mar Elctrns.	201-772-6400
NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Fairfield, Hamilton/Avnet	201-575-3390
NJ	Fairfield, Schweber Elctrns.	201-227-7880
NJ	Fairfield, Lionex	201-227-7960
NJ	Pine Brook, Pioneer Std.	201-227-1262
NM	Albuquerque, Elctrn. Parts	505-293-6161
NM	Albuquerque, Bell Inds.	505-292-2700
NM	Albuquerque, Elctrn. Parts Co.	505-293-6161
NM	Albuquerque, Hamilton/Avnet Elctrns.	505-765-1500
NM	Las Cruces, Elctrn. Parts Co.	505-523-4578
NY	Buffalo, Summit Distrs.	716-884-3450
NY	E. Syracuse, Hamilton/Avnet	315-437-2647
NY	Fairport, Pioneer-Harvey	716-381-7070
NY	Hauppauge, Pioneer-Harvey	516-231-9200
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NY	Rochester, Summit Distrs.	716-334-8110
NY	Rochester, CAM/RPC	716-865-2080
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NY	Rochester, Hamilton/Avnet Elctrns.	716-475-9130
NY	Ronkonkoma, Hall-Mark Elctrns.	516-737-0600
NY	Vestal, Pioneer Std.	607-748-8211
NY	Westbury, Schweber Elctrns.	516-334-7474
NY	Woodbury, Pioneer-Harvey	516-921-8700
NC	Charlotte, Pioneer/Washington	704-527-8188
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Greensboro, Pioneer/Washington	919-273-4441
NC	Raleigh, Hall-Mark Elctrns.	919-873-0712
NC	Raleigh, Schweber Elctrns.	919-876-0000
NC	Raleigh, Hamilton/Avnet	919-878-0819
NC	Raleigh, Hall-Mark Elctrns.	919-872-6286
NC	Raleigh, Hamilton/Avnet Elctrns.	919-829-8030
OH	Beachwood, Schweber Elctrns.	216-464-2970
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, Hall-Mark Elctrns.	513-563-5980
OH	Cleveland, Hamilton/Avnet	216-831-3500
OH	Cleveland, Pioneer Std.	216-587-3600
OH	Cleveland, CAM/Ohio	216-461-4700
OH	Columbus, Graham Elctrns.	614-895-1590
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Bell Inds.	513-434-8213
OH	Dayton, Schweber Elctrns.	513-439-1800
OH	Dayton, Pioneer Std.	513-236-9900
OH	Dayton, Hamilton/Avnet	513-433-0610
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OH	Solon, Hall-Mark Elctrns.	216-349-4632
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
OK	Tulsa, Schweber Elctrns.	918-622-8000
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OR	Lake Oswego, Bell Inds.	503-241-4115
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PA	Horsham, Pioneer/Washington	215-674-4000
PA	Horsham, Lionex Corp.	215-443-5150
PA	Lancaster, CAM/RPC	717-392-8141
PA	McKean, Advacom Inc.	814-476-7774
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
PA	Pittsburgh, Schweber Elctrns.	412-782-1600
PA	Pittsburgh, CAM/RCP	412-782-3770
PA	Pittsburgh, Almo Elctrns. Corp.	412-931-5990
PA	Pittsburgh, Pioneer Standard Elctrns.	412-782-2300
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Nashville, Graham Elctrns.	615-242-2682
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TX	Austin, Schweber Elctrns.	512-458-8253
TX	Austin, Hamilton/Avnet	512-837-8911
TX	Austin, Pioneer Standard Elctrns.	512-835-4000
TX	Dallas, Hall-Mark Elctrns.	214-343-5000
TX	Dallas, Harrison Equip. Co.	214-239-2750
TX	Dallas, Hall-Mark Elctrns.	214-341-1147
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TX	Dallas, Schweber Elctrns.	214-661-5010
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TX	Houston, Harrison Equip. Co.	713-879-2600
TX	Houston, Hamilton/Avnet	713-975-3501
TX	Houston, Pioneer Standard Elctrns.	214-386-7300
TX	Irving, Hamilton/Avnet	214-659-4100
TX	Stafford, Harrison Equip.	713-879-2600
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WA	Bellevue, Hamilton/Avnet	206-643-3950
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BOURNS INSTRS., INC., Technical Prods. Grp., 6135 Magnolia Ave., Riverside, CA 92506, Tel: 714-781-5433; *Sls. Mgr.:* Ken Pinkham; *Dist. Mgr.:* Ken Pinkham

BOURNS INSTRS., INC., Industrial Div., 1960 Chicago Ave., Unit F, Riverside, CA 92503, Tel: 714-781-5147, Telex: 676401, TWX: 910-332-1281; *Sls. Mgr.:* Tom McCarthy

BOURNS MAGNETIC DIV., Technical Products Group, Box 1398, Romoland, CA 92380, Tel: 714-657-5195, TWX: 910-332-1304; Empl.: 120; *Sls. Mgr.:* Dennis Dalbeck

BOWMAN INDUSTRIES, 9300 Hall Rd., Downey, CA 90241

BOWMAR/ALI, Bowmar Instr. Corp., 531 Main St., Acton, MA 01720, Tel: 617-263-8365, TWX: 710-347-1441; Empl.: 170; *Sls. Mgr.:* Cliff Lewis

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BOWMAR INSTRUMENT CORP., Aerospace Div., 8000 Bluffton Rd., Ft. Wayne, IN 46809, Tel: 219-747-3121, TWX: 810-332-1510; FSC No.: 99479; Empl.: 215; *Sls. Mgr.:* Herb Black .....**1B**•1762, 1763; **3**•1124

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BRAILSFORD & CO., 670 Milton Rd., Rye, NY 10580, Tel: 914-967-1820; Empl.: 25

BRAND DIELECTRICS, INC., Route 203, N. Windham, CT 06256, Tel: 203-423-6321; Empl.: 5; *Sls. Mgr.:* Philip Harvey

BRANDEN, T. G., CORP., 5565 S.E. Intl. Way, Portland, OR 97222, Tel: 503-659-9366; Empl.: 8; *Sls. Mgr.:* Ted Brandt

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Local Sales Offices & Reps

AZ	Phoenix, M/R Engrg. Sls. Inc.	602-956-4670
CA	San Jose, Brand-Rex	408-247-9811
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MI	Farmington Hills, Joseph H. Clark Sales Co.	313-553-0610
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MO	Chesterfield, Durnin & Assocs.	314-532-9774
NJ	Dunellen, J. A. Maguire & Co.	201-752-8480
NJ	Pennsauken, J. A. Maguire & Co.	609-665-5136
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Pittsford, Kirby Mktg.	716-248-8750
OH	Chagrin Falls, Joseph H. Clark Sls.	216-247-7848
OR	Portland, Barrett, Squibb & Assocs.	503-644-2550
SC	Greenwood, Bamco	803-229-6801
TN	Knoxville, Insul-Reps	615-691-7586
TX	Richardson, C. J. Tellier Co.	214-231-6348
VA	Portsmouth, J. A. Maguire & Co.	804-398-0202

Local Distributors

AZ	Phoenix, Storm Prods.	602-269-3485
CA	Inglewood, Storm Prods.	213-649-6141
CA	Santa Clara, Storm Prods.	408-749-9400
CO	Broomfield, Storm Prods.	303-466-1991
FL	Ft. Lauderdale, K.S.M. Elctrns.	305-971-5900
IL	Hinsdale, Storm Prods.	312-323-9121
MA	Woburn, Pacer Elctrns.	617-935-8330
MN	Minneapolis, Bergquist Co.	612-835-2322
NY	Fairport, Pacer Elctrns.	716-377-0462
NY	Farmingdale, Vertx Elctrns.	516-293-9800
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PA	Folcroft, Delphi Elctrns.	215-534-3900
TX	Dallas, Storm Prods.	214-330-1381
WA	Redmond, Storm Prods.	206-883-4666

BRANDT ELCTRNS., INC., 1220 Alderwood Ave., Sunnyvale, CA 94086, Tel: 408-734-8310, TWX: 910-339-9560; FSC No.: 57837; *Sls. Mgr.:* Frank D. Brandt

BRANSON CORP., Box 147, Newton, NJ 07860, Tel: 201-383-3132, TWX: 710-988-2298; FSC No.: 99928; Empl.: 40; *Sls. Mgr.:* James A. Witzler

BRAXTON MFG., Echo Lake Rd. N., Watertown, CT 06795, Tel: 203-274-6781, TWX: 710-477-0621; Empl.: 100; *Sls. Mgr.:* Mark W. Ritucci

BREEZE-ILLINOIS, TransTechnology Corp., Main & Agard Sts., P.O. Box 368, Wyoming, IL 61491, Tel: 309-695-2511, TWX: 510-390-3691; Empl.: 180; *Sls. Mgr.:* Patrick Banakis ...... **2**•1986, 1987

Local Sales Offices & Reps

CA	Redwood City, Ault Assocs.	415-367-1710
CA	Woodland Hills, Cal Ward Sls.	213-883-2202
CO	Longmont, Todd & Fry Assocs.	303-776-7331
FL	St. Petersburg, Tech. Reps. Assocs.	813-577-2779
IL	Berkeley, Balhorn & Roeser	312-449-3900
KS	Desoto, Midtec Assocs., Inc.	913-441-6565
MD	Ellicott City, Tech. Sls., Inc.	301-461-2400
MA	Milton, Naton Assocs.	617-698-0670
MI	Madison Heights, Pine Sls., Inc.	313-589-0350
MN	Bloomington, Merrill Franklin	612-854-9446
MO	Florissant, Technical Sls., Inc.	314-837-5200
NY	Great Neck, Trionic Assocs.	516-466-2300
OH	Chagrin Falls, Pine Sls., Inc.	216-247-6198
PA	Pittsburgh, Pine Sls., Inc.	412-456-7471
TX	Bedford, DeArmond Enterprises	817-267-2048
WA	Bellevue, Lehr Assocs.	206-453-9993

BRELONIX, 106 No. 36th St., Seattle, WA 98103, Tel: 206-633-1964; Empl.: 10; *Sls. Mgr.:* A. L. DeVore

BREN-TRONICS, INC., 10 Brayton Ct., Commack, NY 11725, Tel: 516-499-5155, Telex: 220883 TAUR; FSC No.: 51828; Empl.: 90; *Sls. Mgr.:* R. Mainzer; *Dist. Mgr.:* R. Mainzer ...... **3**•1404-1406

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AZ	Phoenix, Fetty/Schoenduve	602-241-9009
CA	El Segundo, Fetty/Schoenduve	213-322-4991
CA	San Diego, Fetty/Schoenduve	619-292-5136
CA	San Francisco, Fetty/Schoenduve	415-962-8330

BREVEL MOTORS, INC., Sub. Vernitron Corp., Broad & 16th Sts., Carlstadt, NJ 07072, Tel: 201-933-0220; *Sls. Mgr.:* Jack Dominice ...... **1B**•1136

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AR	El Dorado, Industrial Control Assoc.	501-862-2051
CA	Los Angeles, Electric Motor Engr.	213-469-7393
CO	Denver, West Inc.	303-773-8180
CT	Old Saybrook, M. L. Assoc.	203-388-9718
FL	Altamonte Springs, Machine Controls	305-788-6607
IL	Chicago, Jerry Gooten Co.	312-792-1991
KS	Prairie Village, Darco Sls.	913-381-7913
MA	Ashland, M. L. Assoc.	617-485-6190
MI	Livonia, Electrolines	313-591-2428
MN	St. Paul, Vikeland Sls.	612-645-4647
NJ	Teaneck, Herbert Rude & Assoc.	201-836-6778
NY	Penfield, Upstate Comps.	716-381-6070
NC	Raleigh, Leigh Sls.	919-872-1484
OH	Bucyrus, Sissler & Assoc.	419-562-9311
OH	Columbus, Sissler & Assoc.	614-488-4455
PA	Exton, Kiley Elec. Co.	215-363-8550
TN	Cleveland, Hicks Sls.	615-472-7398

Local Distributors

AZ	Phoenix, Johnstone	602-269-9354
CA	Baldwin Park, Johnstone	213-962-7138
CA	Los Angeles, Minarik	213-624-3161
CO	Denver, Johnstone	303-573-5626
CT	New Haven, Star Supply Co.	203-772-2240
FL	Ft. Lauderdale, Johnstone	305-971-9350
GA	Norcross, Johnstone	404-446-0400
ID	Boise, Johnstone	208-377-1600
IL	Chicago, Harry Alter	312-376-3505
KS	Wichita, Johnstone	316-267-3629
LA	New Orleans, Harry Alter Co.	504-488-4435
MD	Rockville, Johnstone	301-251-0281
MA	Medford, Empire	617-395-5000
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BRIDGE COMPUTER CO., Sea Data Corp., 1 Bridge St., Newton, MA 02158, Tel: 617-244-8190, Telex: 951107; *Sls. Mgr.:* Elaine Doll

BRIGGS, C. A., CO., P.O. Box 151, Glenside, PA 19038, Tel: 215-885-2244, Telex: 83-4753; Empl.: 10; *Sls. Mgr.:* C. A. Briggs, Jr.

BRIM ELCTRNS., 120E Home Pl., Lodi, NJ 07644, Tel: 201-796-2886; FSC No.: 57834 ...... **2**•1988-1995

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MA	Millis, R G Assocs.	617-376-2044
MA	Stow, R G Assocs.	617-897-7146
EXP	NY, N.Y.C., Roburn Agencies	212-989-5939

Local Distributors

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CA	Canoga Park, Tim-Co. Sls.	213-992-5040
CA	San Diego, Shanks & Wright	619-239-0176
CT	Manchester, IMS	203-649-4415
CT	Waterbury, Suburban Supp.	203-757-1251
GA	Marietta, Atlanta Elec. Wire & Cable	404-955-6800
LA	New Orleans, Radio Parts	504-581-5959
MA	Billerica, Eastern Video Sys.	617-667-0009
MA	Lexington, Wholesale Elect. Supp.	617-862-3590
MA	Springfield, Electro-Term	413-734-6469
MA	Waltham, Linear Elect.	617-894-7300
MI	Troy, Northern Wire & Cable	313-589-0510
NH	Dover, American Radio Corp.	603-742-6800
NJ	Hackensack, Milcor	201-489-1313
NY	LIC, H.L. Dalis	212-361-1100
NY	N.Y.C., Center Indl.	212-YU9-6363
OK	Tulsa, Radio	918-587-9123
PA	Philadelphia, Spectrum Elec.	215-748-3010
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WA	Seattle, Amateur Radio Supp.	206-767-3222

BRISTOL BABCOCK INC., 40 Bristol St., Waterbury, CT 06708, Tel: 203-575-3000, Telex: 962417, TWX: 203-754-1477; Empl.: 600; *Sls. Mgr.:* Don Grice

BRISTOL SAYBROOK, 97 Coulter St., Old Saybrook, CT 06475, Tel: 203-388-3414, Telex: 966-435; Empl.: 125; *Sls. Mgr.:* George S. Willis

Local Sales Offices & Reps

CA	Los Angeles, C.E. Mello Co.	213-626-9159
CT	Old Saybrook, M-L Assoc.	203-388-9718
FL	Largo, Kirk Sls, Inc.	813-595-7353

Local Distributors

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BROOKS MFG. CO., 2016/24 Amber St., Philadelphia, PA 19125, Tel: 215-425-3395, 800-523-0130; Empl.: 35; *Sls. Mgr.:* G. Brooks; *Dist. Mgr.:* G. Brooks

BROWN BOVERI ELEC., Norristown Rd., Spring House, PA 19477, Tel: 215-628-7400, TWX: 510-661-0168; Empl.: 3,500

BROWN BOVERI ELECTRIC, INC., 167 Overland Drive, P.O. Box 648, West Columbia, SC 29171, Tel: 803-796-9502

BRUEL & KJAER INSTRS. INC., 185 Forest St., Marlboro, MA 01752, Tel: 617-481-7000, TWX: 710-347-1187 ...... **1B**•1836, 1837; **3**•1205

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AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Phoenix, Aztec Ent., Inc.	602-944-9185
CA	Los Alamitos, Sci. Dvcs. West	213-598-7678
CA	Los Altos, Jay Stone Assocs.	415-948-4563
CA	San Diego, Sci. Dvcs. West	619-573-0157
CO	Denver, Aztec Entprs.	303-779-5285
FL	Bradenton, Saber Assocs.	800-432-6288
FL	Melbourne, Saber Assocs.	800-432-6288
GA	Griffin, Saber Assocs.	800-327-0853
IL	Chicago, EIA, Inc.	312-298-2290
IN	Indianapolis, EIA, Inc.	317-257-7231
KS	DeSoto, Midtec Assocs.	913-441-6565
LA	Baton Rouge, SESCO	504-928-4951
MD	Cockeysville, SCI-REP	301-321-1411
MA	Waltham, McBar Assocs.	617-890-0233
MN	Minneapolis, Prairie Assocs.	612-559-7550
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Englewood Cliffs, Sci. Dvcs. East, Inc.	201-871-3916
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Fayetteville, Andrews Co.	315-637-3144
NC	Clayton, Saber Assocs.	800-327-0853
OH	Dayton, Hocker Assocs.	513-298-8638
OK	Tulsa, SESCO	918-622-3868
PA	Springhouse, Sci. Dvcs. East.	215-643-3335
SC	Columbia, Saber Assocs.	800-327-0853
TX	Austin, SESCO	512-892-2490
TX	Dallas, SESCO	214-231-9364
TX	Houston, SESCO	713-999-3510
UT	Ogden, Aztec Ent., Inc.	801-621-1655
VA	McLean, Creative Mktg. Assoc. Ltd.	703-442-9100
WA	Seattle, Datacom Assocs.	206-285-2525

CALIFORNIA MICRO DEVICES, INC., 215 Topaz Street, Milpitas, CA 95035, Tel: 408-263-3214

CALIFORNIA MICROWAVE, 990 Almanor Ave., Sunnyvale, CA 94086, Tel: 408-732-4000, Telex: 35-2016, TWX: 910-339-9231; Empl.: 1200

CALIFORNIA MINICOMPUTER SYS., 5534 Westlawn Ave., Los Angeles, CA 90066, Tel: 213-640-2930, TWX: 910-343-6489; Empl.: 50; *Dist. Mgr.:* R. D. Mowry

CALLYER INSULATED WIRE CO., 100 Higginson Ave., Lincoln, RI 02865, Tel: 401-723-7800

CALMARK
CORPORATION

CALMARK CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 213-287-0451, TWX: 910-589-1540; FSC No.: 52094; Empl.: 70; *Sls. Mgr.:* R. L. Rosenthal; *Dist. Mgr.:* R. L. Rosenthal ....**2**•1021

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Tempe, Delta Elctrn. Sls.	602-224-1601
CA	San Diego, Noo Rep. Tech. Sls.	619-483-4861
CA	Santa Clara, Calmark Corp.	408-984-2618
CO	Littleton, West Mark	303-979-3720
FL	Clearwater, WMM Assoc.	813-461-7074
GA	Atlanta, Remco	404-447-6937
ID	Boise, Quest Mktg.	208-343-9969
IL	Elk Grove, Martec	312-956-8090
KS	DeSoto, Midtec Assoc.	913-441-6565
MA	Westboro, Tech. Mktg. Svcs. Co.	617-366-6655
MN	Minneapolis, Comps. Grp.	612-374-1250
MO	Florissant, Midtec Assoc.	314-837-5200
NH	Windham, Tech. Mktg. Svcs.	603-434-2716
NJ	Madison, Livera-Polk Assoc.	201-377-3220
NY	Cooperstown, Fitzelle Assocs.	607-547-9333
NY	Glen Head, Livera-Polk Assoc.	516-759-9300
NC	Raleigh, Remco	919-847-5079
OH	Cleveland, Comps., Inc.	216-243-9200
OH	Miamisburg, Comps., Inc.	513-866-0661
OR	Beaverton, Quest Mktg.	503-644-8077
PA	Horsham, Dalbrook Corp.	215-441-8380
PA	Pittsburgh, Comps., Inc.	412-824-1600
TX	Richardson, Zonk Assoc.	214-238-7651
WA	Renton, Quest Mktg.	206-223-1541
EXP	San Gabriel, CA, Calmark Corp.	213-287-0451

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MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

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Local Distributors

AZ	Phoenix, Aero-Space Computer Supps.	602-861-1785
AZ	Phoenix, Scottsdale Tool & Supp.	602-273-7376
CA	Anaheim, Henry Mann West	213-995-3900
CA	Fremont, Terminal Sls. Corp.	415-656-7722
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, Cypress Elctrns.	213-533-6005
CO	Denver, Solder Tec.	303-922-6214
FL	Longwood, Intertec Comps.	305-834-7777
IL	Elk Grove, Martec Assoc.	312-956-8090
MA	Waltham, Etchomatic	617-893-2020
MA	Westboro, TMSC Elctrn. Supp.	617-366-8462
MN	Minneapolis, Aero-Space Computer Supp.	612-884-4725
NJ	Collingswood, Index	609-429-4055
NJ	Nutley, Nationwide Circuit Prods.	201-667-1333
NY	Elmsford, Multimetrics Co.	914-347-3667
PA	Huntingdon Valley, Henry Mann, Inc.	215-355-7200
TX	Dallas, Cypress Elctrns.	214-869-1435
TX	Richardson, Zec Sls.	214-238-7651
UT	Salt Lake City, Solder Tec	801-974-0444
EXP	CA, San Gabriel, Calmark Corp.	213-287-0451
EXP	Cappoquin, Ireland, Calmark-Killeen Ltd.	058-54205
EXP	Osaka, Japan, Settsu Metal Indust.	06-992-2331
EXP	Ramat-Gan, Israel, Shaham Electronics	03-700303
EXP	Singapore, Singapore, Mazda Electronics	2987851
Intl	Eng., Stoke-on-Trent, Tekdata Elctrns.	0782 813631

CAL-METEX CORP., See Shielding Techn.

CAL-POWER CORP., 140 Kansas St., El Segundo, CA 90245, Tel: 213-772-2171, TWX: 910-348-6678; Empl.: 30

CAL-R®, INC.

CAL-R, INC., P.O. Box 1397, Santa Monica, CA 90406, Tel: 213-450-1761, TWX: 910-343-6966; FSC No.: 14193; Empl.: 130; *Sls. Mgr.:* J. F. Catrambone ....**1A**•1829-1831; **1B**•1795-1797

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assoc.	602-277-1453
CA	Cupertino, F & F Assocs.	408-446-2349
CT	Woodbridge, Electronic Mktg. Co.	203-397-1461
IN	South Bend, Schillinger & Assoc.	219-291-6258
MN	Minneapolis, Bill Deming & Assocs.	612-888-5000
PA	Rydal, Espy Sls.	215-576-0780
TX	Dallas, Delta Comps.	817-572-1195
TX	Houston, Delta Comps.	713-785-3238
EXP	CA, Santa Monica, Trans-World Trade	213-472-0444

CAL-TEK ENGRG., 29 Pemberton Rd., Wayland, MA 01778, Tel: 617-653-0355; Empl.: 5

CAMBION DIV., See Midland-Ross, Cambion Div.

CAMBRIDGE DIGITAL SYS., Compumart, P.O. Box 568, 65 Bent St., Cambridge, MA 02139, Tel: 617-491-2700, Telex: 92-1401 COMPUMART/CAM; *Sls. Mgr.:* James O. Tropp

CAMBRIDGE FILTER CORP., P.O. Box 4906, Syracuse, NY 13221, Tel: 315-457-1000, Telex: 937311; *Sls. Mgr.:* Sam Stenger

CAMBRIDGE PRODS., Hi-G, Inc., 244 Woodland Ave., Bloomfield, CT 06002, Tel: 203-243-1761; Empl.: 32; *Sls. Mgr.:* A. Horowitz

CAMBRIDGE TECHNOLOGY, INC., 2464 Massachusetts Ave., Cambridge, MA 02140, Tel: 617-876-0891; *Sls. Mgr.:* Bruce Rohr ....**3**•1207

CAMBRIDGE THERMIONIC CORP., 445 Concord Ave., Cambridge, MA 02138, Tel: 617-491-5400

C.A.M. GRAPHICS CO., INC., 145 Toledo St., Farmingdale, NY 11735, Tel: 516-694-1315, TWX: 510-224-6181; FSC No.: 63203; *Sls. Mgr.:* Manny Cardinale

CANBERRA IND., One State St., Meriden, CT 06450, Tel: 203-238-2351, Telex: 643251, TWX: 710-461-0192; Empl.: 600; *Sls. Mgr.:* Peter Devecchis; *Dist. Mgr.:* Peter Devecchis

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Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Scottsdale, Sls. Engrg.	602-994-3230
AR	Little Rock, Beacon Elctrns.	501-224-5449
CA	Los Altos, Ewing-Foley	415-941-4525
CA	Los Angeles, Universal Comps.	213-641-4255
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Glastonbury, Barton Assoc.	203-633-9417
FL	Boca Raton, Beacon Elctrns.	305-392-3500
FL	Clearwater, Beacon Elctrns.	813-796-2378
FL	Maitland, Beacon Elctrns.	305-647-3498
FL	Melbourne, Beacon Elctrns.	305-724-8010
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Elk Grove Vlg., Control Sls.	312-595-2110
IN	Carmel, Technlg. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, Technlg. Mktg. Corp.	219-432-5553
KY	Louisville, Technlg. Mktg. Corp.	502-499-7808
MD	Randallstown, Beacon North	703-591-1300
MA	Ludlow, Gerber Sls. Corp.	413-589-9817
MA	Newton Upper Falls, Gerber Sls. Corp.	617-969-2620
MI	Brighton, AP Assocs.	313-229-6550
MN	Minnetonka, Gibb Elctrns.	612-935-4600
MO	Bridgeton, Dy-Tronix	314-731-5799
MO	Independence, Dy-Tronix	816-373-6600
NJ	W. Berlin, Quality Comps.	609-428-6266
NM	Albuquerque, Reptronix	505-292-1718
NY	Babylon, Astrorep	516-422-2500
NY	Latham, L-Tron Corp.	518-785-5032
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Beachwood, Thompson & Assocs.	216-831-6277
OH	Dayton, Thompson & Assocs.	513-435-7733
OR	Beaverton, LD Elctrns.	503-649-6177
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Fairfax, Beacon North	703-591-1300
VA	Forest, Beacon North	804-239-8486
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Thiensville, Control Sls.	414-242-4580

CANOGA DATA SYS., 6740 Eton Ave., Canoga Park, CA 91303, Tel: 213-888-2003, Telex: 182341

CANON U.S.A., Elctrn. Comps. Div., One Canon Plaza, Lake Success, NY 11042, Tel: 516-488-6700, Telex: 96-1333; Empl.: 500; *Sls. Mgr.:* P. Specter ....**1B**•1138

Local Sales Offices & Reps

AL	Birmingham, Motion Technlg.	404-972-4040
AZ	Phoenix, Thor Engrg.	602-437-1463
AR	El Dorado, Industrial Control Assocs.	501-863-2051
CA	Los Angeles, Motion Dynamics	818-345-2127
CA	San Jose, J.T. McFarland Assoc.	408-286-9333
CO	Denver, Qudrum 3 Sls. Grp.	303-696-8480
CT	Wolcott, Vanguard Elctrns.	203-879-9310
FL	Orlando, Motion Technology	404-972-5050
GA	Lilburn, Motion Techn.	404-972-5050
IL	Elgin, JHS & Assocs.	312-741-9070
IL	Glenview, JHS Assocs.	312-998-1960
IN	Ft. Wayne, J&B Engrg.	219-483-2813
IN	Indianapolis, J & B Engrg.	317-842-2681
MA	Needham Hgts., Vanguard Elctrns.	617-449-5578
MI	Farmington Hills, W. R. Hummon & Associates	313-474-0661
MN	Minneapolis, Components Grp.	612-374-1250
NJ	Wayne, SHL Assocs.	201-790-1714
NY	E. Rochester, A & D Devices	716-385-2778
NY	Sidney, A & D Devices	607-563-8488
NC	Charlotte, Motion Technology	704-525-9855
OH	Galion, Retronics	419-468-3253
OR	Portland, Controltek	503-641-0877
PA	Wayne, Technical Indl. Sls.	215-688-0220
TX	Dallas, Blackburn Assocs.	214-692-8885
TX	Houston, Blackburn Assocs.	713-463-1356
WA	Spokane, Controltek	509-922-2971
WI	Milwaukee, EMCO	414-242-0800

CANRAD-HANOVIA, 100 Chestnut St., Newark, NJ 07105, Tel: 201-589-4300, Telex: 13-8531; Empl.: 250; *Sls. Mgr.:* George Bachar

CANYON electronics

CANYON ELCTRNS., 2001 W. North Lane, Phoenix, AZ 85021, Tel: 602-944-4421; *Sls. Mgr.:* George J. Mitlak .... **1B**•1030

CAPACITOR SPECIALIST, See CSI Capacitors

CAPACITOR TECHNOLOGY, INC., 5015 Speedway Dr., Ft. Wayne, IN 46825, Tel: 219-484-9054 .... **1A**•1015

CAPAR COMPONENTS CORP., Div. of Diplomat Electronics, 25 Dubon Ct., Farmingdale, NY 11735, Tel: 516-454-6390, Telex: 221794; *Sls. Mgr.:* Abe Kosakowsky .... **1A**•1016-1019, 1828, 2092

Local Sales Offices & Reps

AL	Huntsville, South Eastern Mktg.	205-882-1633
AZ	Phoenix, Howe & Howe Sls. Inc.	602-264-7971
AR	Hot Springs, Automation Supplies	501-525-4588
CA	Carlsbad, Addem	619-729-9216
CA	Los Alamitos, Santana Sales	714-827-9100
CA	Redwood City, Hickey Industrial Sls.	415-368-3849
CA	Santa Ana, Caper West	714-547-7034
CT	Woodbury, Lindco Assoc. Inc.	203-263-0629
FL	Carl Springs, H A I Electronics	305-752-7520
IL	Downers Grove, Momak Sales	312-963-6400
IN	Indianapolis, Willson Technical Sls.	317-298-3345
MA	Tyngsboro, Comptech, Inc.	617-649-3030
NJ	Perth Amboy, Astrorep Corp.	201-826-8050
NY	Babylon, Astrorep Corp.	516-422-2500
NC	Raliegh, Hi-Tech Assocs.	919-781-4139
OH	Akron, B. J. Davis Corp.	216-645-0517
TX	Plano, B & R Electrnc. Sls. Corp.	214-985-0028
UT	Salt Lake City, Aspen Sales	801-467-2401
WA	Redmond, Doran Sls. Assocs.	206-885-1885

Western states call Capar West at 714-547-7034 for distributor information.

All other states call Capar West at 516-454-6390 for distributor information.

CAPCO, Box 1028, Grand Junction, CO 81502, Tel: 303-243-8751, TWX: 910-929-6989; Empl.: 200

CAPINTEC INSTRS., 6 Arrow Rd., Ramsey, NJ 07446, Tel: 201-825-9500, Telex: 642375; FSC No.: 6666; Empl.: 150; *Sls. Mgr.:* R. J. Kanzler

CAPITOL MACHINE & SWITCH CO., Box 890, Danbury, CT 06810, Tel: 203-744-3300; FSC No.: 01548; Empl.: 90; *Sls. Mgr.:* E. P. DiMarco

CAPITOL MAGNETIC PRODS., 6902 Sunset Blvd., Hollywood, CA 90028, Tel: 213-461-2701, Telex: 67-3271, TWX: 910-321-3500; Empl.: 700

CAPITOL TEMPTROL, 5 Coulton Rd., Old Lyme, CT 06371, Tel: 203-739-4421; FSC No.: 4100; *Sls. Mgr.:* James M. Kronick

CAPTOR CORP., 5040 S. County Rd. (25A), Tipp City, OH 45371, Tel: 513-667-8484; FSC No.: 23939; Empl.: 80; *Sls. Mgr.:* Omer B. Bruns

CARBONE-FERRAZ, INC., Eastmans Rd., Parsippany, NJ 07054, Tel: 201-428-8400, 800-526-9067, Telex: 136045; *Sls. Mgr.:* John Harper

CARBONE LORRAINE INDS., 400 Myrtle Ave., Boonton, NJ 07005, Tel: 201-DE4-0700, Telex: 136407; Empl.: 450

CARBONE USA CORP., Carbone Lorraine Inds. Corp., 402 Myrtle Ave., Boonton, NJ 07005, Tel: 201-334-0700, Telex: 136407; *Sls. Mgr.:* Norman Carver; *Dist. Mgr.:* Norman Carver

CARBORUNDUM

CARBORUNDUM CO., Electric Prods. Div., Box 339, Niagara Falls, NY 14302, Tel: 716-278-2383, Telex: 91 555; Empl.: 250; *Sls. Mgr.:* Joe Cox .... **1A**•1832-1835; **1B**•1798, 1799

Local Sales Offices & Reps

CA	El Segundo, Varigon Assocs.	213-322-1120
CA	San Diego, Varigon Assocs.	619-576-0100
CT	Greenwich, Crane & Egert Corp.	203-964-0111
FL	Cocoa Beach, Reynolds & Assocs.	305-784-4700
IL	Highland Pk., Thomas B. Hunter Assocs.	312-433-7000
NY	Elmont, Crane & Egert Corp.	516-872-0800
OH	Dayton, R.R.M. Assocs.	513-433-7761
TX	Arlington, EPR	817-467-0377

CARBORUNDUM CO., Semiconductor Prods. Div., 3425 Hyde Park Blvd., Niagara Falls, NY 14302, Tel: 716-276-2731 .... **1A**•1020

CARDINAL CONTROL CO., 110 Kensington Rd., Kensington, CT 06037, Tel: 203-828-6379; *Sls. Mgr.:* L.E.P. Beatman; *Dist. Mgr.:* L.E.P. Beatman

CARDION ELCTRNS., Div. of Gen. Sig. Conts., Inc. Unit of Gen. Sig. Corp., Long Island Expwy., Woodbury, NY 11797, Tel: 516-921-7300, Telex: 221683 CARD, TWX: 510-221-2179; FSC No.: 12909; Empl.: 680; *Sls. Mgr.:* J. J. Murphy

CARDON CORP., P.O. Box 2371, Boston, MA 02107, Tel: 617-357-5898

CAREY ELCTRN. ENGRG. CO., 1880 Clifton Ave., Springfield, OH 45505, Tel: 513-323-6300; Empl.: 10-25

CARLINGSWITCH, INC., 505 New Park Ave., W. Hartford, CT 06110-0641, Tel: 203-233-5551, TWX: 710-425-0034; Empl.: 1200; *Sls. Mgr.:* Mark Facey .... **1B**•1548, 1549

Local Sales Offices & Reps

Call toll free 1-800-243-8556 for locations of Representatives and Distributors

AL	Huntsville, CSR Elctrn.	205-533-2444
AR	Hot Springs, Automation Supplies	501-525-4588
AZ	Phoenix, Robert Anderson Co.	602-266-2070
CA	Fullerton, Dave Berryman	213-791-4404
CA	San Rafael, Wright & Assoc.	415-457-9940
CA	Westlake Village, Scott Johnson	818-708-0478
CO	Denver, Quorum 3	303-696-8480
CT	Clinton, Berkshire Elect.	203-669-0752
FL	Orlando, OEM Mktg.	305-299-1000
GA	Atlanta, CSR Elect.	404-396-3720
IL	Schiller Park, Jim Hannan	312-678-1997
IN	Indianapolis, D-M Assoc.	317-842-4424
KS	Mission, Merdens Co.	913-432-9323
LA	Metairie, Automation Supplies	504-831-2183
MD	Woodbine, Naudain Assoc.	301-442-2270
MA	Hopkinton, Berkshire Elctrns.	617-435-6025
MI	Smithfield, R. C. Nordstrom	313-559-7373
MN	Edina, Monroe-Hanna Assoc.	612-925-5700
MO	Clayton, Mertens Co.	314-993-6600
NJ	Burlington, VDE Elctrns.	609-387-9331
NJ	Union, Pacent Engrg.	201-687-7197
NY	Great Neck, Pacent Engrg.	516-482-4678
NY	Rochester, VDE Elctrns.	716-473-5015
NC	Raleigh, Crossroads Elctrns.	919-362-4009
OH	Miamisburg, Gerry Bryant	614-294-7103
OR	Aloha, Elctrn. Comp. Sls.	503-245-2342
PA	Carnegie, Brown-Yates	412-279-1101
SC	W. Columbia, Crossroads Elctrns.	919-362-4099
TX	Dallas, Control Comps.	214-458-8877
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WI	Mequon, Wm. Bolles Assoc.	414-241-3320

Local Distributors

CA	Anaheim, Electro Comps.	213-628-2844
CA	Los Angeles, Electric Switches	213-660-1310
CA	San Leandro, Electro Comps.	415-352-5210
CA	Van Nuys, Pacific Switch Controls	213-873-4802
CT	Hartford, Atlantic Switch Controls	203-527-7705
FL	Lakeland, Switch Controls	813-644-7564
IL	Carol Stream, Conectrix	312-653-1460
MI	St. Clair Shores, Spemco	313-771-2700
MN	Minneapolis, Carl Bergquist Co.	612-835-2322
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Mt. Laurel, Jerseyswitch	609-778-8190
NY	Rochester, Simcona Elctrns. Corp.	716-328-3230
NY	Woodside, Switches Unltd.	212-478-5000
OH	Columbus, Ohioswitch	614-885-0319
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Dallas, Texaswitch	214-357-1768

CAROL CABLE CO. WEST, 2665 E. Del Amo Blvd., Rando Dominquez, CA 90221, Tel: 213-537-8050

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Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, J. R. Morgan	602-268-3464
CA	Aptos, West Cal Sls./Ind.	408-688-6568
CA	Costa Mesa, Berman-Gravley	714-549-2122
CA	San Francisco, Technical Sls.	415-467-1434
CO	Denver, William J. Purdy Co.	303-777-1411
FL	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
GA	Atlanta, Cartwright & Bean	404-233-2939
HI	Honolulu, Snider, Campbell & Sutton	808-845-9937
IL	Chicago, IRI, Inc.	312-647-7755
IN	Indianapolis, Mktg. Engrs.	317-872-5665
KS	Shawnee Mission, Lowell-Kangas	913-631-3515
LA	Kenner, Cartwright & Bean	504-466-0020
MD	Mt. Airy, Lowery & Assoc.	301-831-5827
MA	Seekonk, Rudolph Mktg.	617-399-6270
MI	E. Detroit, J. M. Thorpe	313-779-6363
MN	Edina, Mel Foster Tech. Sls.	612-941-9790
MO	St. Louis, Lowell-Kangas	314-821-4050
NJ	Cedar Grove, Legtronics	201-239-4098
NY	Rochester, Apex Assocs.	716-254-6050
NY	Tuckahoe, L-C-A Sales	914-961-4700
NC	Raleigh, Cartwright & Bean	919-781-6560
OH	Cleveland, Marlow Assoc.	216-991-6500
OK	Oklahoma City, J. Y. Schoonmaker Co.	405-685-4477
OR	Beaverton, Wm. J. Purdy Co.	503-641-9373
PA	Broomall, L. D. Lowery	215-356-5300
TN	Knoxville, Cartwright & Bean	615-693-7450
TX	Dallas, J. Y. Schoonmaker Co.	214-349-1650
TX	Houston, J. Y. Schoonmaker Co.	713-686-0371
UT	Salt Lake City, W. J. Purdy Co.	801-531-0182
VA	Charlottesville, Lowery & Assoc.	804-973-6672
WA	Redmond, William J. Purdy Co.	206-882-3144
WI	Milwaukee, IRI, Inc.	414-259-0966

CAROLINA STEEL & WIRE, I-20 & S.C. 6, Lexington, SC 29072, Tel: 803-359-5501, Telex: 573355; FSC No.: 72954; Empl.: 125

CARPENTER MFG. CO., INC., Fairgrounds Dr., P.O. Box 188, Manlius, NY 13104-0188, Tel: 315-682-9176; *Sls. Mgr.:* Jack Henderson

CARPENTER TECHN., Box 662, Reading, PA 19603, Tel: 215-371-2000; Empl.: 4500; *Sls. Mgr.:* W.M. Detterer

CARROLL TOUCH TECHNOLOGY, P.O. Box 1309, Round Rock, TX 78680, Tel: 512-244-3500; *Sls. Mgr.:* Alan Hochman .... **3**•1072, 1073

CARSON MFG. CO., 5453 N. Rural St., P.O. Box 20464, Indianapolis, IN 46220, Tel: 317-257-3191; Empl.: 75

CARTER MFG., Sugar Rd., Bolton, MA 01740, Tel: 617-779-5501; FSC No.: 03929; Empl.: 30; *Sls. Mgr.:* L. W. Tedstone

CARTER MOTOR, 2707 W. George St., Chicago, IL 60618-7898, Tel: 312-588-7700

CASSO-SOLAR, 3 Pearl Ct., Allendale, NJ 07401, Tel: 201-825-4600, Telex: 475-4099; Empl.: 50; *Sls. Mgr.:* Rolf Kates

CASTALL, INC., Weymouth Indl. Park, E. Weymouth, MA 02188, Tel: 617-337-6075; Empl.: 30

CATALYST RESEARCH, 1421 Clarkview Rd., Baltimore, MD 21209, Tel: 301-296-7000, Telex: 87-768; Empl.: 400; *Sls. Mgr.:* J. Wesley Kulp; *Dist. Mgr.:* Edward Hatch .... **3**•1407

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
CA	Mountain View, M.T.S.R. & Co.	415-966-6446
FL	Lighthouse Point, R. C. Simon & Co.	305-941-2757
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Hinsdale, Willtech Corp.	312-655-4850
MD	Annapolis, Vince Iorio Assocs.	301-261-1716
MI	Detroit, W. R. Hummon & Assoc. Inc.	313-474-0661
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NY	Jamaica, S-J Assocs.	212-291-3232
NC	Cary, Montgomery Mktg.	919-467-6319

OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
PA	Pittsburgh, J. C. Hofstetter Co.	412-327-1410
TX	Austin, Kruvand Assocs.	512-458-9204
TX	Dallas, Kruvand Assocs.	214-691-4592
TX	Houston, Kruvand Assocs.	713-780-9710

CATEL TELECOMMUNICATIONS, United Scientific Corp., 4800 Patrick Henry Dr., Santa Clara, CA 95054, Tel: 408-988-7722, TWX: 910-338-2263; *Sls. Mgr.:* Dick Old; *Dist. Mgr.:* Dick Old

CATON CONNECTOR CORP., Jones River Indl. Pk., 20 Wapping Rd., Kingston, MA 02364, Tel: 617-585-4315, TWX: 710-391-7546; FSC No.: 52196; Empl.: 25; *Sls. Mgr.:* D. Galambos ....**2**•1167

Local Sales Offices & Reps

CA	Van Nuys, ISI	714-773-0411
MD	Baltimore, Jack Onore	301-355-0474
OH	Dayton, Delta Sales	513-271-5444

CATRONIX CORP., 120 Ralph McGill Blvd. N.E., Ste. 800, Atlanta, GA 30308, Tel: 404-872-2300; *Sls. Mgr.:* Terence R. Binion

CATV DIV., GTE Communications Prods. Corp., 1790 Lee Trevino Dr., El Paso, TX 79936, Tel: 915-594-3555, 800-351-2345, Telex: 74 9337

C-COR ELCTRNS., 60 Decibel Rd., State College, PA 16801, Tel: 814-238-2461, TWX: 510-670-3513; FSC No.: 12775; Empl.: 600; *Sls. Mgr.:* S. Dance

CDS - COLORADO DATA SYS., 3301 W. Hampden, Unit C, Englewood, CO 80110, Tel: 303-762-1640, TWX: 910-933-0193; Empl.: 35; *Sls. Mgr.:* Louis Klahn

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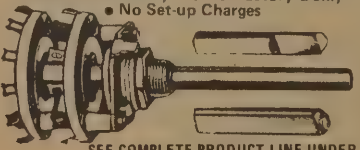

SEE COMPLETE PRODUCT LINE UNDER SWITCHES -- SECTION 5100
FREE LINECARD AND CATALOG ON REQUEST

Local Sales Offices & Reps

CA	Anaheim, Moxon Elctrns.	714-635-7600
FL	Pompano Beach, Saber Assocs.	305-973-3804
IL	Arlington Heights, Dytec/Central	312-394-3380
MA	Boston, Scientific Devices, N.E.	617-890-2252
MN	Eden Prairie, Scientific Devices, Minneapolis	612-944-3515
MO	St. Louis, Dytec South	314-569-2990
NJ	Englewood Cliffs, Scientific Devices, East	201-871-3916
NM	Albuquerque, Odyssey 1	505-883-4019
NY	Rochester, Scientific Devices, New York	716-334-2445
OH	Dayton, WKM Associates	513-434-7500
TX	Dallas, Data Mktg.	214-661-0300
VA	McLean, Creative Mktg. Assoc.	703-442-9100
WA	Bellevue, Showalter Instrs.	206-455-4922

CEA DIVISION OF BERKLEONICS, INC., 1 Aerovista Pk., San Luis Obispo, CA 93401, Tel: 805-544-5454, TWX: 910-351-6705; FSC No.: 04932; Empl.: 120; *Sls. Mgr.:* Jerry Satuloff ....**3**•1515

Local Sales Offices & Reps

CA	Inglewood, Basic Sys. Corp.	213-673-4300
CA	San Diego, Basic Sys. Corp.	619-268-8000
CA	Santa Clara, Basic Sys. Corp.	408-727-1800
FL	Melbourne, Jack McGirr	305-773-4313
IL	Rolling Meadows, Sieger Assocs.	312-991-6161
KS	Wichita, Electro-Mechanical Assocs.	316-682-9433
MD	Wheaton, Brimberg Sls., Inc.	301-792-8661
MA	Dover, George Urban Assocs.	617-329-4068
MI	Farmington Hills, KRW Sls.	614-464-1861
MO	Independence, Electro-Mechanical Assocs.	816-373-8539
NY	Congers, LRC Assocs.	914-268-4435
NY	Liverpool, Precision Sls.	315-451-3480
NY	Pittsford, Precision Sls.	716-381-2821
OH	Columbus, KRW Sls.	614-464-1861
PA	Broomall, Sapinosa Assocs.	215-353-7267
PA	Oakmont, KRW Sls.	614-464-1861
TN	Greenville, Lamons Sls. Co.	615-638-4320
TX	Grapevine, Elctrns. Mktg. Assocs.	817-481-7502
TX	Houston, Elctrns. Mktg. Assocs.	713-498-8120
WA	Lynnwood, IEI Inc.	206-775-3516

CEAG ELEC. CORP., Power Supply Div., 1324 Motor Pkwy., Hauppauge, NY 11788, Tel: 516-582-4422, TWX: 510-227-4904; FSC No.: 57973; *Dist. Mgr.:* G. Roger Preisick

C-E ELGIN ELCTRNS., 5533 New Perry Hwy., Erie, PA 16509-3570, Tel: 814-864-4921, TWX: 510-699-6870; Empl.: 500; *Sls. Mgr.:* J. D. Neff; *Dist. Mgr.:* J. M. Tenglund

CELANESE PLASTICS, 26 Main St., Chatham, NJ 07928, Tel: 201-635-2600; *Sls. Mgr.:* L. F. Bond

CELCO, 70 Constantine Dr., Mahwah, NJ 07430, Tel: 201-327-1123, TWX: 710-988-1018; Empl.: 35; *Sls. Mgr.:* P. S. Christaldi

CELESCO TRANSDUCER PRODS., INC., 7800 Deering Ave., Canoga Park, CA 91304, Tel: 818-884-6860, Telex: 67 3382, TWX: 910-494-1951; *Sls. Mgr.:* James P. Callahan; *Dist. Mgr.:* James P. Callahan ....**1B**•1838, 1839

Local Sales Offices & Reps

AK	Soldotna, C. Hillhouse Inc.	907-262-7340
AZ	Tempe, Trembly Assocs.	602-967-2058
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CA	Westminster, Transducer Sys.	714-840-5357
CO	Denver, Innovative Prods.	303-740-9492
FL	Indian Rocks Beach, PAR Assocs.	813-596-8841
GA	Atlanta, PAR Assocs.	404-391-9117
IL	Hindsdale, I & C Sls.	312-323-8205
LA	Baton Rouge, Charles Instrs.	504-273-3233
MA	Chestnut Hill, Reptek	617-469-3311
MI	Trenton, I & C Sales	313-671-1320
MN	Minneapolis, CMI Corp.	612-566-6930
NV	Las Vegas, Trembly Assocs.	702-739-9770
NJ	Hillsdale, C.B. Assocs.	201-664-6230
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Clarence, Trott Elctrns.	716-634-8500
NY	Rochester, Trott Elctrns.	716-586-8251
NC	Charlotte, Par Assocs., Inc.	704-375-9403
OH	Cincinnati, I & C Sales	513-772-3101
OK	Tulsa, Advance Tech. Sls.	918-664-0482
OR	Portland, Pacific N.W. Controls	503-244-3141
PA	Bridgeville, Instrument Svcs.	412-221-3601
PA	Cheltenham, Test Equip. Sls.	215-379-5431
PA	Erie, Instrument Svcs.	814-455-1969
TX	Austin, Advance Tech. Sls.	512-459-1351
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WV	Charleston, Instrument Svcs.	304-345-0348

Local Distributors

CA	Ventura, Vacumed	805-644-7461

CELESTION INDS., INC., Kuniholm Dr., Box 521, Holliston, MA 01746, Tel: 617-429-6706, Telex: 948417

CENTENT CO., 3879 S. Main St., Santa Ana, CA 92707, Tel: 714-979-6491; Empl.: 12; *Sls. Mgr.:* A. Freimanis

CENTERFLEX TECHN. CORP., 221 Seventh Ave., P.O. Box 21, Hawthorne, NJ 07507, Tel: 201-423-0505, TWX: 710-988-4147; Empl.: 50; *Sls. Mgr.:* S. C. Kellner

CENTIGRAM CORP., 155A Moffett Park Dr., Sunnyvale, CA 94086, Tel: 408-734-3222, Telex: 171-994; *Sls. Mgr.:* Leonard H. Magnuson; *Dist. Mgr.:* Paul W. Masters

CENTRALAB, INC., A North American Philips Co., 4561 Colorado Blvd., Los Angeles, CA 90039, Tel: 818-240-4880, TWX: 910-497-2282

CENTRALAB, INC., A North American Philips Co., 2566 Northwestern Ave., McClure Pk., West Lafayette, IN 47906, Tel: 317-463-2536, TWX: 810-342-1889

CENTRALAB, INC., A North American Philips Co., Hwy. 20 W., P.O. Box 858, Ft. Dodge, IA 50501, Tel: 515-573-1300, TWX: 910-520-2493

CENTRALAB, INC., A North American Philips Co., 7158 Merchant Ave., El Paso, TX 79915, Tel: 915-779-3961, TWX: 910-964-1311

CENTRALAB, INC., A North American Philips Co., 5855 N. Glen Park Rd., Milwaukee, WI 53209, Tel: 414-228-7380, TWX: 910-262-3083; Empl.: 5000; *Sls. Mgr.:* F. Funk; *Dist. Mgr.:* R. Booker

CENTRAL DATA CORP., 1602 Newton Dr., Champaign, IL 61820, Tel: 217-359-8010, Telex: 910-245-0787; *Sls. Mgr.:* N. E. Mac Gregor

CENTRAL MICROWAVE CO., Alpha Inds., Inc., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-393-1236; FSC No.: 17540; *Sls. Mgr.:* Jim Caldwell

CENTRE ENGRG., 2820 E. College Ave., State College, PA 16801, Tel: 814-237-0321, TWX: 510-670-3517; Empl.: 425; *Sls. Mgr.:* H.D. Shirey

CENTRONIC INC., 5 Eastmans Rd., Parsippany, NJ 07054, Tel: 201-233-7200, Telex: 138275; FSC No.: 7P396; Empl.: 300; *Sls. Mgr.:* Tony Green ....**1B**•1212, 1213

Local Sales Offices & Reps

AZ	Tempe, Griot Assocs.	602-968-4428
CA	Corona del Mar, Griot Assocs.	714-675-5090
CA	El Segundo, Griot Assocs.	213-322-8383
CA	Los Altos, Griot Assocs.	415-941-2533
CA	Santa Clara, Griot Assocs.	408-727-2880
FL	Melbourne Bch., Millett Assocs.	305-725-5055
GA	Roswell, Electro Comp Sls.	404-993-4253
IL	Chicago, Coomb Assocs.	312-298-4830
MA	Concord, Nortech. Engrg. Sls.	617-259-0032
MI	Jackson, Norwood Scroggs Co.	517-750-1170
MN	Minneapolis, Intl. Sls.	612-831-8423
NY	Commack, RC Engrg.	516-543-3325
OR	Beaverton, Griot Assocs.	503-646-5627
PA	Glenside, Koebert & Assocs.	215-887-2310

CENTURY DATA SYS., Xerox Corp., 1270 N. Kraemer Blvd., Anaheim, CA 92806, Tel: 714-632-7500, Telex: 655437; Empl.: 901; *Sls. Mgr.:* Richard Brechtlein; *Dist. Mgr.:* Don Wilder

Local Distributors

NY	Westbury, Schweber Elctrns.	516-334-7474

Ceramaseal

CERAMASEAL, Box 25, New Lebanon Center, NY 12126, Tel: 518-794-7800, Telex: 14-5442; FSC No.: 07601; Empl.: 80; *Sls. Mgr.:* Gene D. Sawin .... 2•1168

Local Sales Offices & Reps

AZ	Phoenix, Wadsworth/Bryant	602-275-7366
CA	Atherton, Wadsworth/Bryant	415-321-3619
CA	Hacienda Hgts., Wadsworth/Bryant	213-330-5592
CO	Golden, J. F. Hurlbut Co.	303-279-7796
IL	Mt. Prospect, Automation Equip. Co.	312-398-7550
KS	De Soto, Midtec Assocs.	913-441-6565
MD	Baltimore, R. A. Wafer Assoc.	301-744-1133
MA	Boston, P-J Engrg. Sls.	617-783-0510
MO	Florissant, Midtec Assocs.	314-837-5200
NY	Rochester, Canavan-Scanlon Assoc.	716-424-1830
NY	Syracuse, Canavan-Scanlon Assoc.	315-437-1271
NC	Charlotte, JWL Assoc.	704-523-3001
PA	Feasterville, Knowles Assocs.	215-322-7100
PA	Pittsburgh, Kurt J. Lesker Co.	412-892-2996
TN	Knoxville, C. E. Fox	615-522-4404
TX	Richardson, Spectra Sls.	214-234-3600
WA	Seattle, J. B. Jolly, Inc.	206-938-4166

CERAMIC MAGNETICS, INC., 87 Fairfield Rd., Fairfield, NJ 07006, Tel: 201-227-4222, Telex: 138 730; Empl.: 50

CERA-MITE CORP., 1327 Sixth Ave., Grafton, WI 53024, Tel: 414-377-3500

CERMETEK MICROELECTRONICS INC., 1308 Borregas Ave., Sunnyvale, CA 94089, Tel: 408-734-8150, TWX: 910-379-6931; Empl.: 130; *Sls. Mgr.:* Ken Archbold

Local Sales Offices & Reps

AZ	Scottsdale, Dar-C, Inc.	602-948-2240
CA	Garden Grove, Elsco Elctrns.	714-891-4621
CA	San Diego, Earle Assoc.	619-278-5441
CA	San Jose, H.T.S.	408-279-2443
CO	Denver, D/Z Assocs.	303-429-9369
FL	Boca Raton, Lawrence Assocs.	305-368-7373
GA	Doraville, K & E Assocs.	404-448-7025
IL	Barrington, OMNI Elctrn. Mktg.	312-381-9087
IN	Indianapolis, SAI Mktg.	317-241-9276
IA	Des Moines, Beams Co.	515-255-1148
MI	Ann Arbor, R. L. Rowe & Assocs.	313-995-8711
MN	Bloomington, Smiley Scott Assoc.	612-888-5551
NM	Albuquerque, Syntech	505-266-7951
NY	Great Neck, MOS Assoc.	516-487-3966
OK	Tulsa, Cunningham Comps. Corp.	918-492-0390
OR	Beaverton, E.S. Chase	503-641-4111
PA	L.J. Kairys, Coraopolis	412-331-6100
TX	Houston, Cunningham Co.	713-461-4197
UT	Salt Lake City, D/Z Assocs.	801-268-2876
WA	Bellevue, E.S. Chase	206-453-0765

Local Distributors

AL	Huntsville, RM Elctrns.	205-852-1550
AZ	Phoenix, R.V. Weatherford	602-272-7144
CA	Glendale, R.V. Weatherford	213-849-3451
CA	Sunnyvale, R.V. Weatherford	408-738-8694
CO	Denver, R.V. Weatherford	303-428-6900
CT	Orange, Milgray	203-795-0711
FL	Winter Park, Milgray	305-647-5747
GA	Atlanta, Milgray	404-393-9666
IL	Lombard, RM Elctrns.	312-932-5150
IN	Indianapolis, RM Elctrns.	317-247-9701
KS	Overland Park, Milgray	913-236-8800
MD	Rockville, Milgray	301-468-6400
MA	Burlington, Milgray	617-272-6800
MI	Wyoming, RM Elctrns.	616-531-9300
NJ	Marlton, Milgray	609-983-5010
NY	Farmingdale, Milgray	516-391-3000
OH	Cleveland, Milgray	216-447-1520
TX	Dallas, R.V. Weatherford	214-931-7333
WA	Seattle, R.V. Weatherford	206-575-1340
WI	New Berlin, RM Elctrns.	414-784-4420

CES ELCTRNS., 2968 Avenue Z, Brooklyn, NY 11235; Empl.: 20

CETA CORP., 160 S. Whisman Rd., Bldg. F, Mountain View, CA 94041, Tel: 415-969-5927, TWX: 910-379-5065; Empl.: 25; *Sls. Mgr.:* Tom Levenhagen .... 3•1516

CETEC RAYMER, 7315 Fulton Ave., No. Hollywood, CA 91605, Tel: 213-875-0423; Empl.: 50; *Sls. Mgr.:* Jean Hurst

CGIS, A COMSAT CO., 7701 N. Lamar Blvd., Austin, TX 78752, Tel: 512-451-7938; Empl.: 150; *Sls. Mgr.:* Jack Johannsen

CGTI, 2 Windward Ave., White Plains, NY 10605, Tel: 914-949-3719, TWX: 710-568-1305; Empl.: 270; *Sls. Mgr.:* G. N. Snider

CHABIN CORP., 890 Fortress St., Chico, CA 95926, Tel: 916-891-6410, TWX: 910-536-1001; *Sls. Mgr.:* Peter Tunis

CHADWICK-HELMUTH, 4601 N. Arden Dr., El Monte, CA 91731, Tel: 213-575-6161, Telex: 194-271; Empl.: 75; *Sls. Mgr.:* John Beach

CHA INDUSTRIES, 3565 Haven Avenue, Menlo Park, CA 94025, Tel: 415-363-8011, Telex: 334426; *Sls. Mgr.:* Jack Patten

CHALCO ENGRG., 15126 S. Broadway, Gardena, CA 90248, Tel: 213-FA1-0121, TWX: 910-346-7026; Empl.: 95

CHAMPLAIN CABLE, PO Box 7, Winooski, VT 05404, Tel: 802-655-2121, TWX: 510-299-0018; FSC No.: 05973; Empl.: 425; *Sls. Mgr.:* J. Brooks

CHANNEL INDS., 839 Ward Dr., Santa Barbara, CA 93111, Tel: 805-967-0171, Telex: 658416; Empl.: 75

CHAPMAN CORP., P.O. Box 10700, Portland, ME 04104, Tel: 207-773-4726; Empl.: 60; *Dist. Mgr.:* Elizabeth Angell

Local Sales Offices & Reps

AZ	Phoenix, Pamela Hopkins Assocs.	602-252-7119
AR	El Dorado, Indl. Controls Assocs.	501-862-2051
CA	Pico Rivera, Application Reps.	213-692-7761
CA	San Jose, Domar Group	408-268-6804
IL	Elgin, J.H.S. & Assocs.	312-741-9070
MD	Baltimore, Advanced Packaging	301-358-9444
MA	Brookline, Harman Assocs.	617-232-6687
NY	Pittsford, Noeth-Honsinger	716-585-9002
NY	Smithtown, T & K Sls.	516-724-3456
NC	Charlotte, Motion Techn.	704-525-9855
OH	Reynoldsburg, Goodwin Entprs.	614-866-0168
OR	Portland, Fry Controls	503-226-2620
PA	Downingtown, Web Access.	215-269-6511
WI	Cedarburg, R. E. Norene & Assocs.	414-377-5440

CHARTPAK, 1 River Rd., Leeds, MA 01053, Tel: 413-584-5446; Empl.: 195

CHASSIS-TRAK, P.O. Box 39100, Indianapolis, IN 46239, Tel: 317-897-7000, Telex: 27-2169; FSC No.: 06666; Empl.: 190; *Sls. Mgr.:* H. L. Crouch .... 2•1032, 1033

Local Sales Offices & Reps

AL	Huntsville, Hughes Assoc.	205-533-9108
AZ	Phoenix, Snyder Engr.	602-279-2010
CA	Fullerton, Groh Assocs.	714-738-7105
CA	Mountain View, G. Woempner	415-964-5454
CO	Boulder, R. F. Mayo Assoc.	303-499-2155
CT	Waterbury, Coakley, Boyd & Abbett	617-444-5470
FL	Lighthouse Point, J. Krutek & Assoc.	305-941-6544
GA	Atlanta, Hughes Assoc.	404-252-7486
IL	Glencoe, Howard Benjamin Assoc.	312-835-0150
IN	Noblesville, Century Elctrns.	317-849-2026
KS	Shawnee Mission, Lowell, Kangas & Assoc.	913-631-3515
MA	Needham, Coakley, Boyd & Abbett	617-444-5470
MI	Plymouth, J. Plass Assocs.	313-455-8262
MN	Bloomington, Northport Engrg.	612-854-5556
MS	Corinth, Hughes Assoc.	601-287-2915
MO	St. Louis, Lowell, Kangas & Assocs.	314-821-4050
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	Mountainside, Henry G. Richter	201-233-4615
NY	Fayetteville, H. G. Richter	315-637-6713
NC	Raleigh, Hughes Assoc.	919-782-2065
OH	Cleveland, Components	216-243-9200
OH	Miamisburg, Components	513-866-0661
OK	Tulsa, Advance Tech. Sls.	918-664-0482
PA	Doylestown, Monterio Assoc.	215-345-5855
TN	Morristown, Hughes Assoc.	615-587-2433
TX	Austin, Advance Tech. Sls.	512-459-1351
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
WA	Olympia, Bergford Assoc.	206-866-2001
EXP	IN, Indianapolis, General Devices	317-897-7000

CHATHAM CONTROLS, 33 River Rd., Chatham, NJ 07928, Tel: 201-635-8892; FSC No.: 04814; Empl.: 11

CHATSWORTH DATA CORP, Cablemaster Div., 20710 Lassen St., Chatsworth, CA 91311, Tel: 818-341-9200; Empl.: 65; *Sls. Mgr.:* Hank Boehm .... 3•1208

Local Sales Offices & Reps

MD	Silver Spring, A.R.A. Elctrns.	301-565-2585
MA	Waltham, W. M. Hague	617-899-5600
OH	Cleveland, Triad Assoc	216-248-3350
PA	Glenside, A.R.A. Elctrns.	215-887-5250
VA	Richmond, A.R.A. Elctrns.	804-285-9309
WA	Lynnwood, Sys. Specialists	206-775-6603

CHATSWORTH DATA CORP, Impact-o-Graph Div., 20710 Lassen St., Chatsworth, CA 91311, Tel: 213-341-3000; Empl.: 50 .... 3•1208

CHEM-MIXX CORP., 55 North St., Medford, MA 02155, Tel: 617-395-7270; Empl.: 9; *Sls. Mgr.:* Allen Swartz

Local Sales Offices & Reps

CA	South Gate, A. G. Barstow Co.	213-569-8125
GA	Lilburn, Georgia Airtech	404-925-3084
IN	Lawrence, American Indl.	317-897-9900
MN	Edina, Adhesive Sys. Technig.	612-944-7999
MO	Maryland Hgts., T. B. Moore Co.	314-434-6844
PA	Pittsburgh, Kurt J. Lesker Co.	412-892-2996

CHEMTRONICS INC., 681 Old Willets Path, Hauppauge, NY 11788, Tel: 516-582-3322, Telex: 968567; FSC No.: 21267; Empl.: 40; *Sls. Mgr.:* Louis Friedman; *Dist. Mgr.:* Scott Friedman

CHERRY ELECTRICAL PRODS. CORP., 3623 Sunset Ave., Waukegan, IL 60087, Tel: 312-578-3500, TWX: 910-235-1572; Empl.: 2000; *Sls. Mgr.:* Robert Terwall; *Dist. Mgr.:* George Seyk .... 1B•1551-1563, 1758, 1764-1769

Local Sales Offices & Reps

AL	Huntsville, CSR Elec.	205-533-2444
AZ	Phoenix, O'Donnell Assocs. S.W.	602-944-9542
CA	Palo Alto, Abbott Engrg. Co.	415-968-2265
CA	San Diego, O'Donnell Assocs.	619-578-1645
CA	Torrance, O'Donnell Assocs.	213-539-9664
CO	Boulder, Front Range Mktg.	303-443-4780
CT	North Haven, Coakley, Boyd & Abbett	203-239-6217
FL	Coral Springs, CBC Elctrns.	305-755-1111
FL	Longwood, CBC Elctrns.	305-831-5380
GA	Atlanta, CSR Elctrns.	404-396-3720
IL	Waukegan, Cherry Elec. Prod. Corp.	312-578-3500
IN	Ft. Wayne, Menze Sls.	219-747-5616
IA	Cedar Rapids, Dy-Tronix	319-377-8275
MA	Needham Hgts., Coakley, Boyd & Abbett	617-444-5470
MI	Grand Rapids, Miltimore Sls.	616-942-9721
MI	Novi, Miltimore Sls.	313-349-0260
MI	Southfield, Cherry Elec. Prod.	313-358-5588
MN	St. Paul, Cahill, Schmitz & Cahill	612-646-7217
MO	Bridgeton, Dy-Tronix	314-731-5799
MO	Independence, Dy-Tronix	816-373-6600
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	Pitman, Colrud Corp.	609-589-5866
NY	Rochester, Elcom Sls.	716-385-1400
NY	Syracuse, Elcom Sls.	315-685-8245
NY	W. Hempstead, Schmitt Indl. Mktg. Corp.	516-486-3510
NC	Mathews, CSR Elctrns.	704-847-1927
NC	Raleigh, CSR Elctrns.	919-878-9200
OK	Broken Arrow, Genzel Sales & Assoc.	918-258-8656
OR	Portland, Jas. J. Bacher Co.	503-297-8744
OR	Salem, Jas. J. Bacher Co.	503-362-0717
TX	Austin, Bonser-Philhower Sales	512-346-9186
TX	Houston, Bonser-Philhower Sales	713-531-4144
TX	Richardson, Bonser-Philhower Sales	214-234-8438
UT	Salt Lake City, Front Range Mktg.	801-364-6481
WA	Seattle, Jas. J. Bacher Co.	206-285-1300
WI	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

AL	Birmingham, Ack Radio Supp. Co.	205-322-0588
AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, Cetec Elctrns.	602-277-7951
AZ	Phoenix, Elctrn. Parts	602-277-7281
AZ	Temple, Fisher-Brownell	602-967-1464
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Chatsworth, Diplomat Westates Elctrns.	213-341-4411
CA	Costa Mesa, Diplomat Westates Elctrns.	714-549-8401
CA	Oakland, Brill Elctrns.	415-834-5888

CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Diego, Diplomat Westates Elctrns.	619-292-5693
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Southgate, Cetec Elctrns.	213-773-6521
CA	Sunnyvale, Diplomat Westates Elctrns.	408-744-1555
CO	Denver, Denver Wintronics	303-431-7161
CO	Denver, Integrated Elect.	303-292-6121
CT	Wallingford, Midan Elect.	203-265-2077
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Miami, ESL Elctrn. Distrs.	305-633-6973
GA	Atlanta, KSM Elctrns.	404-458-2013
GA	Atlanta, Ack Radio Supp. Co.	404-351-6340
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Indianapolis, Graham Elec.	317-634-8202
IN	Indianapolis, Genesis Elctrn.	317-637-5571
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Advent Elctrn.	319-363-0221
KS	Edwardsville, C. Tennant Sons & Co.	913-441-1801
KY	Louisville, P. I. Burks Co.	502-589-3960
MD	Savage, Pyttronic Ind.	301-792-0780
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Needham, Cronin Elect.	617-449-5000
MI	Clawson, Empire Elctrns.	313-435-0460
MI	Farmington Hills, Star-Tronic Distr.	313-477-7586
MI	Livonia, Rep-Tron Elctrns.	313-525-2700
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Walters Radio Supp.	316-531-7015
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Bellmawr, Mid-Atlantic Elec.	609-931-5303
NJ	Clifton, J-Mar Elec., Inc.	201-772-6400
NM	Albuquerque, Elctrn. Parts	505-293-6161
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Mt. Vernon, QAR Ind'l. Elctrn. Sls.	914-699-2224
NY	Rochester, Rochester Radio & Supp. Co.	716-454-7800
NY	Woodbury, C. Tennant Sons & Co.	516-364-9070
NC	Cary, Powell Elctrns.	919-467-1212
NC	Winston-Salem, Kirkman Elctrn.	919-722-9131
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Selectronics	216-621-5080
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Esco Elect.	513-226-1133
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Radar Elctrns.	503-232-3404
OR	Portland, Tekelectric Control	503-246-5451
PA	Montgomeryville, Pyttronic Ind.	215-643-2850
TX	Dallas, Wallace Elec. Co.	214-340-0400
TX	Houston, Solid State Elctrns. Co.	713-772-8483
TX	Irving, Solid State Elctrns. Co.	214-438-5700
TX	San Antonio, Sherman Elctrns. Supp.	512-224-1004
TX	Stafford, Southwest Elect.	713-491-4900
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Seattle, Radar Elctrns.	206-282-2511
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	New Berlin, R. M. Wisconsin	414-784-4420

CHERRY SEMICONDUCTOR CORP., 2000 S. County Trail, East Greenwich, RI 02818, Tel: 401-885-3600; Empl.: 200

CHESSELL CORP., Penns Trail, Newtown, PA 18940, Tel: 215-968-0660, Telex: 83-1701; Empl.: 50; *Sls. Mgr.:* D. Neal .... 3•1383

Local Sales Offices & Reps

AZ	Phoenix, Southwest Controls, Inc.	602-267-1171
CA	Fountain Valley, Yardley Instrs.	714-963-1000
CO	Lakewood, Loritz Controls	303-232-7803
FL	Orlando, Datarep, Inc.	305-843-5224
GA	Roswell, Cascade Controls	404-998-1027
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Des Plaines, Chessell Corp.	312-699-0529
IN	Ft. Wayne, Domino Unltd.	219-747-5621
KY	Louisville, Control Prods. Co.	502-452-2611
LA	Baton Rouge, Rise Inc.	504-766-4645
MA	Waltham, Techn. Entprs.	617-890-5300
MI	Royal Oak, Satullo Co.	313-549-3910
MN	Minneapolis, The Mark Co.	612-920-6280
MO	St. Louis, Adelphi, Inc.	314-821-1232
NV	Reno, Applied Indl. Controls Corp.	702-356-7401
NM	Albuquerque, Southwest Controls, Inc.	505-884-6202
NY	Rochester, Cascade Control Corp.	716-385-1410
NY	White Plains, MIT Sls.	914-946-5077
NC	Matthews, Johnston, Inc.	704-847-3107
OH	Dayton, P. J. Navin Co.	513-434-8940
OH	Willoughby, P. J. Navin Co.	216-255-1411
OK	Tulsa, Dave Allert Co.	918-743-7705
PA	Murrysville, Data Acquisition	412-327-8979
TN	Knoxville, George C. Paris	615-966-2141
TX	Arlington, Pan-Tech Controls Co.	817-640-3232
TX	Burleson, Chessell Corp.	817-572-4392
TX	Houston, Process Instruments, Inc.	713-893-3310
UT	Midvale, Bee and Tee Controls	801-566-7722
VA	Richmond, Advance Control Equip. Co.	804-270-7182
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400
WI	Brookfield, BII, Inc.	414-786-1980

Local Distributors

CA	Pasadena, J. Arthur Moore CA, Inc.	213-793-1145
DE	Newark, G. W. Smith Assocs.	302-738-7308
IL	Hinsdale, Envirocom Controls	312-920-8610
TX	Houston, Total Instrs.	713-488-2333

CHESTER CABLE, Oakland Ave., Chester, NY 10918, Tel: 914-469-2141, TWX: 510-249-4813; *Sls. Mgr.:* William R. Dungan

CHESTERFIELD PRODS., 37 Midland Ave., Elmwood Park, NJ 07407, Tel: 201-797-9655; Empl.: 35; *Sls. Mgr.:* M. Perry .... 1A•1586

Local Sales Offices & Reps

CA	Palo Alto, J M Assocs.	415-857-1260
FL	Winter Haven, Heimendinger	813-294-5815
MD	Towson, Holden Engrg.	301-823-3763
MA	Framingham, Bengal Assocs.	617-877-2639
MA	Randolph, Bengal Assocs.	617-961-4120
NJ	Elmwood Park, L & M Assocs.	201-797-0441
NY	New York, L & M Assocs.	212-243-6155
PA	Andalusia, L & M Assocs.	215-245-6658
TX	Richardson, Carl Tinch Sls. Co.	214-231-1322

CHICAGO CONDENSER CORP., 2900 West Chicago Ave., Chicago, IL 60622, Tel: 312-227-7070

CHICAGO LASER SYSTEMS, INC., 4034 N. Nashville Ave., Chicago, IL 60634, Tel: 312-282-2710, Telex: 206-647; *Sls. Mgr.:* Bernard Alpiner, V.P.

CHICAGO LOCK CO., 4311 W. Belmont Ave., Chicago, IL 60641, Tel: 312-282-7177, Telex: ITT 4994023; Empl.: 426; *Sls. Mgr.:* Don Meisinger; *Dist. Mgr.:* Dale N. Padjen .... 1B•1564

Local Sales Offices & Reps

CA	Oceanside, Sales Engineer	619-726-9499

CHICAGO SWITCH, INC., 1714 N. Damen, Chicago, IL 60647, Tel: 312-489-5500, TWX: 910-221-5252; Empl.: 250; *Sls. Mgr.:* R. Schmidt; *Dist. Mgr.:* R. Scrivner

CHLORIDE ELECTRO NETWORKS, Maple St., Caledonia, NY 14423, Tel: 716-538-4421, TWX: 510-254-0422; FSC No.: 08715; Empl.: 625; *Sls. Mgr.:* J. Joseph Cowan

Local Sales Offices & Reps

CA	San Jose, Power Supply Specialists	408-980-1677
CA	Santa Clara, Electroventure	408-727-1553
CO	Black Forest, Alan Lupton Assocs.	303-495-4707
CT	Canton, Bell Controls	203-693-8926
FL	Orlando, Perrott Assoc.	305-275-1132
IL	Downers Grove, Richmar Elctrns.	312-968-0118
NH	Nashua, Bell Controls	603-882-6984
NY	Rochester, Alan Lupton Assocs.	716-482-7700
TX	Dallas, Advance Techn. Sls.	214-340-1300

CHOMERICS, INC., 77 Dragon Ct., Woburn, MA 01888, Tel: 617-935-4850, TWX: 710-393-0173; Empl.: 500; *Sls. Mgr.:* Kevin A. Dunne

CHORUS DATA SYSTEMS, P.O. Box 810, 27 Proctor Hill Rd., Hollis, NH 03049, Tel: 603-465-7100; *Sls. Mgr.:* Bruce Monk

CHR INDS., 407 East St., P.O. Box 1911, New Haven, CT 06509, Tel: 203-777-3631, TWX: 710-465-0264; Empl.: 116

CHRISLIN INDS., 31352 Via Colinas, Westlake Village, CA 91361, Tel: 213-991-2254, TWX: 910-494-1253; Empl.: 38; *Sls. Mgr.:* John Ross; *Dist. Mgr.:* John Ross

CHRISTIANSEN RADIO INC., 1950 San Remo, Laguna Beach, CA 92651, Tel: 714-497-1506; Empl.: 5

CHRISTIE, S. D., ASSOCS. INC., 693 Locust St., Mt. Vernon, NY 10552, Tel: 212-597-1773, 914-699-7223; Empl.: 8; *Sls. Mgr.:* Sam D. Christie

CHRISTIE
ELECTRIC CORP.

CHRISTIE ELEC. CORP., 20665 Manhattan Pl., Torrance, CA 90501, Tel: 213-320-0808, TWX: 910-349-6260; FSC No.: 02294; Empl.: 200 .... 3•1517

Local Sales Offices & Reps

AZ	Phoenix, PLS Assocs.	602-246-6614
CA	Tustin, John Franek Co.	714-832-0290
CO	Englewood, PLS Assocs.	303-773-1218
FL	Orlando, Newco & Assocs.	305-422-7700
GA	Lithia Springs, Newco, Inc.	404-941-6077
MD	Laurel, CSDS	301-490-3800
MA	Needham, Shain Assocs.	617-449-4380
MO	St. Louis & Grandview, Harris-Hanson	816-763-6200; 314-432-3611
NJ	Hohokus, Hansen & Hughes	201-652-7055
NM	Albuquerque, Fry Gates Inc.	505-262-1525
NC	Charlotte, Newco, Inc.	704-527-7070
OH	Chesterland, EQS Systems	216-729-2222
PA	Philadelphia, Technical Instr. Sls. Co.	215-836-2222
SC	Florence, Newco, Inc.	803-662-4878
TX	Richardson, Carl Tinch Sls. Co.	214-231-1322
TX	Richardson, C. Tinch	214-231-1322
UT	Midvale, PLS Assocs.	801-566-0671

CHROMALOX INSTRS. & CONTROLS, 100 Heil-Quaker Blvd., Lavergne, TN 37086, Tel: 615-793-7561, Telex: 55-5129; Empl.: 110; *Sls. Mgr.:* John Cox

CHROMATICS, 2558 Mountain Indl. Bldg., Tucker, GA 30084, Tel: 404-493-7000, TWX: 810-766-8099; *Sls. Mgr.:* Donald K. McKinney

CHRONO-LOG CORP., 2 W. Park Rd., Havertown, PA 19083, Tel: 215-853-1130, Telex: 831579; Empl.: 20; *Sls. Mgr.:* David Biberman .... 3•1074

Local Sales Offices & Reps

CA	Los Angeles, Western Sci. Mktg.	213-628-8023
CA	San Diego, Western Sci. Mktg.	619-565-6699
CT	Southboro, J. J. Wild	203-264-9494
IL	Deerfield, Deerfield Sys., Inc.	312-948-8494
MA	Needham, J. J. Wild, Inc.	617-449-5600
MI	Detroit, Comtel Instrs.	313-358-2505
MO	St. Louis, Engrg. Services	314-997-1515
NH	Merrimack, J. J. Wild	603-424-4717
NJ	Union, Friedman Assocs., Inc.	201-964-6200
NY	Albany, Ossmann Instrs.	518-374-8560
NY	Rochester, Ossmann Instrs.	716-442-6990
NY	Syracuse, Ossmann Instrs.	315-437-7052
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Columbus, Comtel Instrs.	614-876-8305
PA	Pittsburgh, Comtel Instrs.	412-922-5720
VA	Arlington, H. J. Heffernan Co.	703-522-6666
WA	Seattle, Hood Engrg. Sls.	206-453-9375

CHRONOMITE LABS, 21011 S. Figueroa St., Carson, CA 90745, Tel: 213-320-9452; Empl.: 15

CHURCHILL CORP., 344 Franklin St., Melrose, MA 02176, Tel: 617-665-4700; FSC No.: 94867; Empl.: 30; *Sls. Mgr.:* W. Schermerhorn

CIMCO WIRE & CABLE, INC., See Pirelli Cimco

CINCH, See TRW Connector Div.

CINCINNATI ELCTRNS., 2630 Glendale Milford Rd., Cincinnati, OH 45241, Tel: 513-563-6000, Telex: 21-4452, TWX: 810-464-8151; FSC No.: 80045; Empl.: 1300; *Sls. Mgr.:* W. E. Wood

CINCINNATI ELECTROSYS., 469 Wards Corner Rd., Loveland, OH 45140, Tel: 513-831-4347; *Sls. Mgr.:* J. C. Privett

CINCINNATI SUB-ZERO PRODS., 2612 Gilbert Ave., Cincinnati, OH 45206, Tel: 513-751-8810, Telex: 214390 SUBZERO CIN; Empl.: 69; *Sls. Mgr.:* George Molenaar .... 3•1175

CIPHER DATA PRODS., INC., P.O. Box 85170, San Diego, CA 92138, Tel: 619-578-9108, TWX: 910-335-1251; Empl.: 1100; *Dist. Mgr.:* Ruth Lewellyn

CIPRICO INC., 2405 Annapolis La., Plymouth, MN 55441, Tel: 612-559-2034; *Sls. Mgr.:* Stu Reile ....3•1075

Local Sales Offices & Reps

AL	Birmingham, Southeastern First Rep.	205-967-7082
AZ	Scottsdale, Frontier Technlg.	602-998-4438
CA	Los Alamitos, Gemini Assocs.	213-594-9618
CA	North Hollywood	213-846-2633
CA	San Diego	619-268-1181
CA	San Jose, Data Rep	408-279-1212
CA	Sepulveda	213-891-1000
CA	Sunnyvale, Diamond Point Intl.	408-730-1187
CO	Aurora, Electrodyne	303-695-8903
FL	Kissimmee, Southeastern First Rep.	305-846-1306
FL	Melbourne, Southeastern First Rep	305-259-6373
FL	N. Palm Beach, Southeastern First Rep.	305-844-3658
HI	Honolulu, Sam O. Hirota.	808-535-9971
IL	Elmhurst, First Rep	312-530-2450
IN	Indianapolis	317-844-4175
KS	Prairie Village, Panatek	913-362-3349
MD	Silver Spring, L. G. White	301-434-1555
MA	Norwood, Northeast Peripherals.	617-769-9110
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Edina, Micro Resources	612-830-1454
NH	Londonderry, Ciprico	603-434-8909
NJ	Springfield, Gebhardt Marketing	201-376-4415
NY	New Hartford, PDQ Assocs.	315-768-8167
NY	W. Seneca, PDQ Assocs.	716-674-7816
NC	Southport, Southeastern First Rep.	919-457-4526
OH	Cleveland, Diamond Point Intl.	216-238-0200
OH	Cleveland, Pete Kovachy	216-779-5100
OH	Englewood	513-836-0951
OR	Portland, Northwest Mktg. Assoc.	503-297-2581
PA	Jenkintown, Monument Technical Assocs.	215-884-3737
PA	Pittsburgh	412-372-4415
TX	Austin, Microlog.	512-327-7033
TX	Houston, Microlog.	713-956-0837
TX	Richardson, Microlog.	214-644-5010
UT	Salt Lake City, Electrodyne.	801-486-3801
WA	Bellevue, Northwest Mktg. Assoc.	206-455-5846

CIRCLE ELECTRONICS, A Division of F-Dyne Elctrns., 3501 Electronics Way, W. Palm Beach, FL 33407, Tel: 305-844-1310; *Sls. Mgr.:* John Strickland

CIRCUIT ASSEMBLY CORP., 18 Thomas St., Irvine, CA 92714, Tel: 714-540-5490, TWX: 910-595-1971; FSC No.: 52072; Empl.: 275; *Sls. Mgr.:* William E. Corr

CIRCUITS, INC., 59 Deming Rd., Berlin, CT 06037, Tel: 203-828-3526; Empl.: 90

CIRCUIT STRUCTURES LAB., Div. D-Cemco Inc., 3200 N. San Fernando Blvd., Burbank, CA 91504, Tel: 818-849-6341, TWX: 970-498-2228; Empl.: 4

CIRCUIT TECHN., 160 Smith St., Farmingdale, NY 11735, Tel: 516-293-8686, TWX: 510-224-6555; Empl.: 400

CIRTECH, 15237 Cherry St., Stanley, KS 66223, Tel: 913-681-2801, TWX: 910-749-6806; FSC No.: 5915; Empl.: 75; *Sls. Mgr.:* John P. Parr

CITEL, INC., 3060 Raymond St., Santa Clara, CA 95050, Tel: 408-727-6562, TWX: 910-338-0540; *Sls. Mgr.:* Paul Macdonald

CLAIREX ELCTRNS., 560 S. 3rd Ave., Mt. Vernon, NY 10550, Tel: 914-664-6602, Telex: 137308; Empl.: 230 ....1B•1214-1217

Local Sales Offices & Reps

AL	Huntsville, K & E Assocs.	205-883-9720
CA	El Toro, Clairex Elctrns.	714-768-4561
CA	Sunnyvale, Schwerin & Merrill Inc.	408-735-7900
GA	Doraville, K & E Assocs.	404-448-7025
IL	Chicago, Berndt Assoc.	312-283-0713
IN	Carmel, Berndt Assoc.	317-884-0114
KS	Overland Park, Advanced Techn. Sls.	913-492-4333
MD	Silver Springs, Youth Assoc. Inc.	301-598-5740
MA	Bolton, Clairex	617-779-2780
MI	Ferndale, Hilltronics	313-398-5556
MN	Minneapolis, H.M.R.	612-920-8200
MO	St. Louis, A.T.S. Inc.	314-227-4448
NJ	Ridgefield, Rical	201-945-5250
NY	Seaford, Abbott Assoc.	516-781-5256
NC	Raleigh, Crossroads Elect. Assoc.	919-362-4099
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix Inc.	513-854-5939
PA	Media, W. Reeves	215-566-6709
TX	Austin, J. B. Guenther	512-258-0004
TX	Dallas, J. B. Guenther	214-691-8500
WA	Seattle, H. Levinson	206-323-5100
WI	Milwaukee, Berndt Assoc.	414-545-8400
EXP	NJ, Oradell, Sylvan Ginsbury	201-261-3200

Local Distributors

CA	Culver City, EV Roberts	213-870-9561
CA	Industry City, Ital Elctrn. Sls.	714-990-0922
CA	Santa Clara, Western Electromotive	408-985-0908
CT	Wallingford, Sager Elctrns.	203-265-4600
FL	Miami, Elctrn. Equip.	305-871-3500
IL	Chicago, Bell Indus.	312-982-9210
IN	Indianapolis, Graham Elctrns.	317-634-8486
MD	Rockville, All American Transistor	301-251-1205
MA	Hingham, Sager Elctrns.	617-749-6700
MA	Norwell, Bordewieck Eng. Sls.	617-659-4915
MI	Ann Arbor, Wedemeyer Elctrn.	313-665-8611
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	St. Louis, Van Sickle Radio Elect.	314-621-5000
NJ	Mt. Laurel, D.F. Assocs.	609-234-5324
NY	Buffalo, Summit Distr.	716-884-3450
NC	Charlotte, Dixie Elctrns.	704-377-4348
OH	Columbus, Hughes Peters	614-294-5351
OK	Tulsa, Altair	918-665-0523
SC	Columbia, Dixie Radio	803-779-5332
TN	Knoxville, Dixie Elctrns.	615-938-4131
TX	Houston, Altair	713-462-2410
TX	Richardson, Altair	214-231-5166
WA	Seattle, Radar Elec.	206-282-2511
Can	Willowdale, Ont., Electro Sonic	416-494-1666

CLARE RELAYS

CLARE DIVISION, General Instrument Corp., 3101 W. Pratt Blvd., Chicago, IL 60645, Tel: 312-262-7700, Telex: 25-3775; Empl.: 2400; *Sls. Mgr.:* S. N. Horowitz; *Dist. Mgr.:* S. N. Horowitz ....1B•1288, 1312-1316

Local Sales Offices & Reps

AL	Huntsville, Clare Div., Genl. Instr. Corp.	205-883-9130
AZ	Phoenix, Clare Div., Genl. Instr. Corp.	602-997-7448
AZ	Scottsdale, Summit Sls.	602-998-4850
AR	Ft. Smith, Electro-Related Prods.	501-452-4030
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MA	Woburn, Clare Div. Genl. Instr. Corp.	617-938-0666
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MO	St. Louis, Thomas L. Dowell & Assocs.	314-849-4234
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CO	Aurora, Midwest Meridian	303-341-7550
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IN	Fort Wayne, Needler Sls. Co.	219-447-2123
IN	Indianapolis, Needler Sls. Co.	317-255-8056
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LA	Dallas, Control Components, Inc.	214-458-8877
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GA	Atlanta, Conley Assocs.	404-447-6992
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EXP	CT, Stamford, Control Devices	203-322-7300

COMPONENT MFG. SVC., INC., 1 Component Park, W. Bridgewater, MA 02379, Tel: 617-580-0111, TWX: 710-390-1081; *Sls. Mgr.:* R. E. Owens; *Dist. Mgr.:* R. E. Owens

COMPONENT MARKING SYS., 90 Morse St., Norwood, MA 02062, Tel: 617-762-6908

CRC
COMPONENT RESEARCH CO.

COMPONENT RESEARCH CO. INC., 1655-26 St., Santa Monica, CA 90404, Tel: 213-829-3615, TWX: 910-343-6864; FSC No.: 12517; Empl.: 230; *Sls. Mgr.:* Sylvia Kellerman .... **1A**•1022-1063

COMPONENTS CORP., 6 Kinsey Pl., Denville, NJ 07834, Tel: 201-627-0290; Empl.: 11; *Sls. Mgr.:* W. H. Gordon

COMPONENT SPECIALTIES CORP., 9143 E. La Rosa Dr., Temple City, CA 91780, Tel: 213-283-0015; FSC No.: 28984; Empl.: 45; *Sls. Mgr.:* D.R. Heins

COMPUTER PRODUCTS™
POWER CONVERSION

COMPOWER DIV., Div. of Computer Prods., Inc., 2220 Lundy Ave., San Jose, CA 95131, Tel: 408-942-1600, Telex: PE 172760 CMPL; Empl.: 200; *Sls. Mgr.:* Lyle D. Bennett, Jr.; *Dist. Mgr.:* Tazz A. Pettebone .... **3**•1701-1704

Refer to Computer Prods., Inc., Pompano Beach, FL for sales offices and representatives and for distributor listings.

COMPUCORP, 2211 Michigan Ave., Santa Monica, CA 90404, Tel: 213-829-7453, Telex: 4720106, TWX: 910-342-6510; Empl.: 450; *Sls. Mgr.:* Joe Thorpe; *Dist. Mgr.:* Richard Venn

COMPU-LITE CORP., 711 W. 17th St. #F12, Costa Mesa, CA 92627, FSC No.: 51420; Empl.: 50; *Sls. Mgr.:* W.D. Cobben

COMPUNETICS, INC., 2000 Eldo Rd., Monroeville, PA 15146, Tel: 412-373-8110; *Sls. Mgr.:* Jerry Schmitt

Local Sales Offices & Reps

NJ	Wayne, SHL Assoc.	201-790-1714
NC	Smithfield, ADI	919-934-8136
TN	Knoxville, Data World, Inc.	615-690-6966

COMPUPRO, 3506 Breakwater Ct., Hayward, CA 94545, Tel: 415-786-0909; *Sls. Mgr.:* Jim Lanphear; *Dist. Mgr.:* Kevin Coonan

COMP-U-STAFF, 1 Investment Pl., Towson, MD 21204, Tel: 301-828-0788; Empl.: 180; *Sls. Mgr.:* Catherine Harper

COMPUTER AVIONICS, 740 Market, Mt. Carmel, IL 62863, Tel: 618-263-4343; Empl.: 24; *Sls. Mgr.:* Lee Grismore

COMPUTER CABLE & PRODS. INC., Affil. Vertex Elctrns., 147 Gazza Blvd., Farmingdale, NY 11735, Tel: 516-293-1610, Telex: 14-3155, TWX: VERTEX FDLE; FSC No.: 6T500; Empl.: 100; *Sls. Mgr.:* Don McPhee; *Dist. Mgr.:* Penny Shaw

COMPUTER COMPONENTS, INC., 629 Fifth Ave., Pelham, NY 10803, Tel: 914-738-1611; FSC No.: 12965; Empl.: 25; *Sls. Mgr.:* G. Tsokris .... **1B**•1323

COMPUTER CONVERSIONS CORP., 6 Dunton Ct., E. Northport, NY 11731, Tel: 516-261-3300, TWX: 510-226-0448; FSC No.: 51086; Empl.: 100; *Sls. Mgr.:* S. J. Renard .... **3**•1144, 1145

Local Sales Offices & Reps

CA	Buena Park, Motion Control Eng.	714-994-6952
CA	Mountain View, Leddy Assocs.	415-969-6313
CA	N. Hollywood, Crown Elctrns.	213-877-3550
CO	Denver, WH Howard Assoc.	303-426-3499
FL	Melbourne, R-Rep Co.	305-725-6993
IL	Downers Grove, GnH Sales	312-985-3764
MA	Brookline, Technology Prods. Grp.	617-731-0858
MI	Newport, Industrial Sensors, Inc.	313-289-3374
NM	Albuquerque, Fry-Gates Co.	505-262-1525
NY	Liverpool, R & D Assocs.	315-457-0100
OH	Mentor, CADS & Assoc.	216-946-9635
OR	Portland, Tek Elec. Controls	503-246-5451
TX	Dallas, Jacobson Co.	214-363-7584

COMPUTER CORP. OF AMERICA, 675 Massachusetts Ave., Cambridge, MA 02139, Tel: 617-492-8860, Telex: II 710-320-6479, TWX: 710-320-6479; *Sls. Mgr.:* Mr. Robert Roda

COMPUTER DESIGN & APPLICATIONS INC., 411 Waverly Oaks Rd., Waltham, MA 02154, Tel: 617-647-1900, Telex: 232-2240; *Sls. Mgr.:* Thomas Goliash

COMPUTER DEVICES, 25 North Ave., Burlington, MA 01803, Tel: 617-273-1550, Telex: 949398; Empl.: 314; *Sls. Mgr.:* William S. Stanger; *Dist. Mgr.:* Dick Leeman

COMPUTER DEVICES CORP., 63 Austin Blvd., Commack, NY 11725, Tel: 516-543-4220; Empl.: 50 .... **1A**•1466

Local Sales Offices & Reps

MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
EXP	NY, New Rochelle, Montclair Elctrns.	914-576-1400

COMPUTER DYNAMICS, 105 S. Main St., Greer, SC 29651, Tel: 803-877-7471; *Sls. Mgr.:* Kurt Priester

COMPUTER INSTRS., 100 Madison Ave., Hempstead, NY 11550, Tel: 516-483-8200, TWX: 510-222-4189; Empl.: 50; *Sls. Mgr.:* F. Cooper; *Dist. Mgr.:* F. Mitchell

COMPUTER MAINTENANCE CORP., 111-117 Enterprise Ave. S., Secaucus, NJ 07094, Tel: 201-866-6400; Empl.: 52; *Sls. Mgr.:* William Putnam

COMPUTER OPTICAL PRODS., INC., Sub. of Hathaway Corp., 9316 Deering Ave., Chatsworth, CA 91311, Tel: 818-882-0424; *Sls. Mgr.:* Brian Gillespie

COMPUTER
POWER INC.

COMPUTER POWER, 124E W. Main St., High Bridge, NJ 08829, Tel: 201-735-8000, Telex: 847481; FSC No.: 3643; Empl.: 145; *Sls. Mgr.:* George A. Ardolino; *Dist. Mgr.:* Stanley A. Smith, Jr. .... **3**•1847

Local Sales Offices & Reps

AL	Huntsville, Col-Ins-Co	305-423-7615, 800-327-6600
AZ	Scottsdale, Williams-Assocs.	602-947-4297

CA	Inglewood, Basic Sys. Corp.	213-673-4300
CA	San Diego, Basic Sys. Corp.	619-279-9641
CA	Santa Clara, Basic Sys. Corp.	408-727-1800
CO	Commerce City, Williams-Assocs.	303-289-5647
CT	New Milford, Power Assocs.	800-421-0011
FL	Coral Springs, Col-Ins-Co	800-432-4480, 305-423-7615
FL	Largo, Col-Ins-Co.	305-423-7615, 800-432-4480
FL	Orlando, Col-Ins-Co	305-423-7615, 800-432-4480
GA	Atlanta, Col-Ins-Co	800-327-6600, 404-491-9395
IL	Chicago, SEA, Inc.	312-255-4820
IN	Indianapolis, SEA, Inc.	317-846-2591
KY	Louisville, SEA, Inc.	502-228-5401
LA	Baton Rouge, Col-Ins-Co	800-327-6600, 305-423-7615
MD	Linthicum, K-D Assoc.	301-859-5151
MA	N. Chelmsford, Power Assocs.	617-251-7756
MI	Farmington Hills, CMP Inc.	313-477-7700
MN	Minneapolis, SEA, Inc.	612-425-4455
NJ	Marlton, Linden C.E. Kite	201-925-1899
NM	Albuquerque, Williams-Assocs.	505-255-1638
NY	Binghamton, Tae Rep., Inc.	607-772-6952
NY	Buffalo, A. Cosentino Entprs.	716-876-4172
NY	Huntington, C. E. Kite	516-266-2808
NY	Rochester, TAE-REP, Inc.	716-586-8710
NC	Raleigh, Col-Ins-Co	800-327-6600, 305-423-7615
OH	Cleveland, CMP Inc.	216-779-5100
OH	Englewood, CMP Inc.	513-836-0951
PA	Conshohocken, TEDCO	215-825-6450
PA	Monroeville, CMP Inc.	412-372-4415
SC	Greenville, Col-Ins-Co	800-327-6600, 305-423-7615
TN	Knoxville, Col-Ins-Co	800-327-6600, 305-423-7615
TX	Garland, TESCO	214-681-1376
TX	Houston, TESCO	713-777-1443
UT	Salt Lake City, Williams-Assocs.	801-485-6511
WA	Edmonds, Power Sources Unltd.	206-784-3336
WI	Milwaukee, SEA, Inc.	414-784-9379

Local Distributors

AZ	Phoenix, Keystone Electro Sls.	602-995-3005
CA	Hayward, Elsar	415-887-8550
FL	Homossassa, Bunts Auto Elec.	904-795-0069
FL	Orlando, Veytec	305-859-7340
GA	Atlanta, Encore Lodging	404-953-1724
GA	Atlanta, Corporate Data Sys.	404-952-3376
IL	Deerfield, Electrocon	312-948-0320
MA	Cohasset, Emergency Ltg. & Sys.	617-383-6500
MA	Framingham, Total Power Corp.	617-237-2024, 2025
MA	Sharon, Adcour Assocs.	617-784-8123
NJ	Bridgeton, Penn M & G Elec. Supp.	609-451-2291
NJ	Cherry Hill, UHR Electric Supply Co.	609-795-4504
NJ	Linden, Registration Electric	516-266-2808
NY	Amherst, Standard Elctrns.	716-691-3801
NY	Orchard Park, Park Electric Supply, Inc.	716-662-7070
OK	Oklahoma City, Smith Ltg. Sls., Inc.	405-521-0093
OK	Tulsa, Computer Power of OK	918-252-5406
PA	Coatesville, Penn Elec. Supp. Co.	215-647-5552
PA	Doylestown, Penn Electric Supply Co.	215-673-4450
PA	Philadelphia, Penn Electric Supply Co.	215-471-1111
TX	Austin, Computerfixx	512-282-3472
WA	Seattle, Miller Elec.	206-248-1102
EXP	Santurce, Electronic Power Systems	809-727-7960, 1062

COMPUTER PRODUCTS
POWER CONVERSION

COMPUTER PRODS. INC., Power Conversion Grp., 2981 Gateway Dr., Pompano Bch., FL 33069-4803, Tel: 305-974-5500, TWX: 510-956-3098; FSC No.: 62125; Empl.: 700; *Sls. Mgr.:* Martin L. Gross; *Dist. Mgr.:* Dale T. Raveny .... 3•1438, 1518

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech Sls. Engrg.	205-533-2100
AZ	Tempe, Elec-Com Assocs.	602-967-8644
CA	Danville, Power Conversion Grp.	415-837-8593
CA	Folsom, Manco	916-985-0370
CA	Santa Clara, Manco	408-496-6611
CO	Parker, Parker Webster Co.	303-841-4888
FL	Coral Springs, EPM Corp.	305-755-5387
GA	Atlanta, Electro-Mech Sls. Engrg.	404-447-6478
ID	Boise, Intermountain Technlg.	208-322-5022
IL	Des Plaines, Janus, Inc.	312-299-9330
IL	Glenview, Power Conversion Grp.	312-998-6715
IN	Indianapolis, Fred A. Dorsey & Assocs.	317-842-0060
KS	Overland Park, J. F. Guernsey Co.	913-381-2225
KY	Louisville, Fred A. Dorsey & Assocs.	502-426-3540
MD	Baltimore, Professional Reps.	301-653-3600
MA	Woburn, Power Conversion Grp.	617-933-0237
MI	Livonia, Lowell Wendt Mktg.	313-464-2722
MN	Bloomington, Smiley Scott Assocs.	612-888-5551
MO	Florissant, J. F. Guernsey Co.	314-921-5720
NJ	Englewood, Tecnimat	201-569-4200
NM	Albuquerque, Elec-Com Assocs.	505-898-6101
NY	Fayetteville, Power Unltd.	315-637-5291
NY	Lewiston, Power Unltd.	716-285-3295
NC	Raleigh, Electro-Mech Sls. Engrg.	919-851-8165
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-854-5939
OK	Bixby, MGR Elctrns.	918-369-5186
OR	Portland, Power Sources Unltd.	503-292-0820
PA	Ambler, Denco	215-542-9876
TN	Nashville, Electro-Mech Sls. Engrg.	615-885-0073
TX	Austin, MGR Elctrns.	512-250-0926
TX	Dallas, MGR Elctrns.	214-238-5246
UT	Salt Lake City, Parker Webster	801-266-9939
VA	Charlottesville, Professional Reps.	804-971-9650
WA	Lynnwood, Power Sources Unltd.	206-743-6641

Local Distributors

CA	Milpitas, Power Systems Distrs.	408-946-8300
CA	N. Hollywood, B. J. Wolfe Entprs.	213-877-5518
MD	Columbia, Aztech Elctrs.	301-995-1760
MA	Wilmington, RC Comps.	617-273-1860
MI	Livonia, LWC Distrs.	313-464-7700
OK	Tulsa, Norvell Elctrns.	918-663-1247
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Norvell Elctrns.	713-777-1666
Can	Concord, Ontario, Kaytronics	416-669-2262
Can	Kanata, Ontario, Kaytronics	613-592-6606
Can	Surrey, British Columbia, Kaytronics	604-581-7611
Can	Ville St. Pierre, Quebec, Kaytronics	514-367-0101

COMPUTER SYSTEM ASSOCS., 7562 Trade St., San Diego, CA 92121, Tel: 619-566-3911; Empl.: 8; *Sls. Mgr.:* Chuck Bennett

COMPUTER TALK, INC., Box 148, Morrison, CO 80465, Tel: 303-697-5485; Empl.: 20

Local Sales Offices & Reps

MN	St. Paul, Imtech, Inc.	612-646-7340

COMPUTER TERMINAL SYS., 89 Arkay Drive, Hauppauge, NY 11788, Tel: 516-435-2916, Telex: 291411, 291413, TWX: 510-224-6050; FSC No.: 33948; Empl.: 120; *Sls. Mgr.:* K. Oliver

COMPUTERVISION CORP., 201 Burlington Rd., Bedford, MA 01730, Tel: 617-275-1800

COMPUTERWISE, 4006 E 137th Terr., Grandview, MO 64030, Tel: 816-765-3330; Empl.: 20; *Sls. Mgr.:* William W. Brown; *Dist. Mgr.:* William W. Brown

COMPUTROL DIV. KIDDE AUTOMATED SYS., INC., 15 Ethan Allen Hwy., Ridgefield, CT 06877, Tel: 203-544-9371, Telex: 643358; Empl.: 85; *Sls. Mgr.:* Chuck Brewer

COMPUTYPE, INC., 2285 W. County Road "C", St. Paul, MN 55113, Tel: 612-633-0633, 800-328-0852, TWX: 910-563-3699

comstron

COMSTRON CORP., 200 E. Sunrise Hwy., Freeport, NY 11520, Tel: 516-546-9700, TWX: 510-225-3699; Empl.: 97; *Sls. Mgr.:* Stephen B. Rosenfield .... 1A•1325-1327, 1588; 3•1210, 1211

Local Sales Offices & Reps

AZ	Phoenix, Odyssey 1	602-246-8846
CA	Anaheim, Blair Assocs.	714-635-1350
CA	San Diego, Interstate Mktg. Assocs.	714-292-8117
CA	Sunnyvale, Applied Sys.	408-773-0616
CA	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
CO	Castle Rock, Odyssey I	303-688-3555
FL	Altamonte Springs, Dyne-A-Marr Corp.	305-831-2097
FL	Clearwater, Dyne-A-Marr Corp.	813-441-4702
FL	Fort Lauderdale, Dyne-A-Mark Corp.	305-944-5031
FL	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
FL	Melbourne, Reynolds Assocs.	305-259-7000
FL	Palm Bay, Dyne-A-Marr Corp.	305-727-0192
FL	St. Petersburg, Reynolds & Assocs.	813-360-1484
GA	Acworth, Reynolds & Assocs.	404-451-9558
GA	Marietta, Comstron/Southeast	404-973-3325
IL	Arlington Heights, Dytec Cen.	312-394-3380
IN	Indianapolis, Dytec Cen.	317-247-1316
KS	Lenexa, Dytec South	913-888-0215
MA	Lexington, Lancer Assocs.	617-861-1720
MI	Madison Hts., WKM Assocs.	313-588-2300
MN	St. Paul, Dytec North	612-645-5816
MO	Maryland Hts., Dytec South	314-569-2990
NJ	Englewood Cliffs, Sci. Devices East	201-871-3916
NM	Albequerque, Odyssey 1	505-265-6645
NY	Wantagh, Bytec Reps.	516-781-7400
NC	Spring Hope, Reynolds & Assocs.	305-259-7000
OH	Dayton, WKM Assocs., Inc.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
PA	Pittsburgh, WKM Assocs., Inc.	412-892-2953
PA	Spring House, Sci. Devices East	215-643-3335
TX	Dallas, Marcom	214-351-4532
TX	Richardson, Sci. Devices, S.W.	214-231-8106
VA	McLean, Creative Mktg. Assocs.	703-442-9100
WA	Vancouver, Ray Over Sls.	206-695-6179

COMTECH MICROWAVE CORP., Comtech Corp., 63 Oser Ave., Hauppauge, NY 11788, Tel: 516-435-4646, Telex: 971403 COMMIC HAUP; FSC No.: 61381; *Sls. Mgr.:* M. Javits

COM/TECH SYSTEMS, 505 Eighth Ave., New York, NY 10018, Tel: 212-594-5377; Empl.: 9

COMTEC INFOR. SYS., INC., 53 John St., Cumberland, RI 02864, Tel: 401-724-8500, TWX: 710-387-1171; Empl.: 75; *Sls. Mgr.:* R. A. Hamilton

CONCORD DATA SYSTEMS, 303 Bear Hill Rd., Waltham, MA 02154, Tel: 617-890-1394, Telex: 95-1793; Empl.: 90

Local Sales Offices & Reps

CA	Santa Ana, Concord Data Sys.	714-541-4974
IL	Wilmette, Concord Data Sys.	312-251-8336

CONCORD ELCTRNS., 30 Great Jones St., Dept. JE, New York, NY 10012, Tel: 212-777-6571, TWX: 710-581-4930; Empl.: 225; *Sls. Mgr.:* Josie Wheaton .... 2•1170-1243

CONDENSER PRODS., P.O. Box 997, Brooksville, FL 33512, Tel: 904-796-3561; Empl.: 26; *Sls. Mgr.:* Pat K. Johnson

CONDITIONING SEMICONDUCTOR DEVICES, Box 2116, Wayne, NJ 07470, Tel: 201-335-6723, Telex: 219023; FSC No.: 60644; Empl.: 20; *Sls. Mgr.:* A. G. Zimmerly; *Dist. Mgr.:* Jill Mullen

CONDOR INC.
D.C. POWER SUPPLIES

CONDOR, 201 Flynn Rd., Camarillo, CA 93010, Tel: 805-484-2851, 800-235-5929; Empl.: 220; *Sls. Mgr.:* Fred Adams .... 3•1519-1534

Local Sales Offices & Reps

AL	Huntsville, Pen-Tech	205-881-9298
AZ	Phoenix, O'Donnell Assoc.	602-944-9542
CA	Inglewood, Basic Systems Corp.	213-673-4300
CA	Irvine, Basic Systems Corp.	714-999-0300
CA	San Diego, Basic Systems Corp.	619-268-8000
CA	Santa Clara, Basic Systems Corp.	408-727-1800
CO	Denver, R. Marketing	303-455-5360
FL	Casselberry, Pen-Tech	305-645-3444
FL	Deerfield Beach, Pen-Tech	305-421-4989
GA	Marietta, Pen-Tech	404-424-1931
IL	Schaumberg, Engrg. Prods.	312-882-7640
IN	Greenfield, Engrg. Prods.	317-894-7156
IA	Coralville, Engrg. Prods.	319-354-5344
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Wayland, Daner Hayes Inc.	617-655-0888
MN	Edina, Engrg. Prods.	612-835-9022
NJ	Bellmawr, TAI	609-933-2600; 215-627-6615
NY	Yonkers, Sonkin Assoc.	914-968-7736
NC	Greensboro, Pen-Tech	919-852-6000
OH	Dayton, Thompson Assoc.	513-435-7733
PA	Mars, Thompson Assoc.	412-776-6495
TX	Dallas, Seaton Corp.	214-380-0414
UT	N. Salt Lake City, R. Marketing	801-298-2631
WA	Bellevue, Al Smith Co.	206-746-6770

Local Distributors

CA	Inglewood, Basic Systems Corp.	213-673-4300
CA	Irvine, Basic Systems Corp.	714-999-0300

CA	San Diego, Basic Systems Corp.	619-268-8000
CA	Santa Clara, Basic Systems Corp.	408-727-1800
IL	Schaumberg, Engrg. Prods.	312-882-7640
MD	Wheaton, Brimberg Sls.	301-946-2760
MI	Madison Heights, McNaughton-McKay	313-399-7500
MN	Edina, Engrg. Prods.	612-835-9022
NY	Yonkers, Kintronics	914-968-8282
Intl	Belgium, Mulder-Hardenburg	031-680032
Intl	Denmark, Danika Supply	09-432122
Intl	England, Gresham/Powerdyne	(025-672)4246
Intl	Finland, Oy Ferrado AB	0-550002
Intl	France, AK Electronique	01-5755353
Intl	Holland, Mulder-Hardenburg BV	023-319184
Intl	Norway, Powerbox AS	02-535-837
Intl	Sweden, Power Box AB	0518-11920
Can	Canada, Duncan Inst. Ltd.	416-742-4448

CONDOR PACIFIC INDS., INC., 8053 Deering Ave., Canoga Park, CA 91304, Tel: 818-347-8331, Telex: 65-1442; Empl.: 40

CONDOR SYSTEMS, INC., 2605 S. Winchester Blvd., Campbell, CA 95008, Tel: 408-866-5900, Telex: 184819 Systems SANTA; FSC No.: 62065; *Sls. Mgr.:* Dick Keenly; *Dist. Mgr.:* Ed Brown

CONDUCTIVE RUBBER TECHNLG., 1235 Coast Village Rd., Santa Barbara, CA 93108, Tel: 805-969-5805, Telex: 658-305; *Sls. Mgr.:* Robert Webb

Distributor

CONECTRIX, INC., 376 E. Gunderson St., Carol Stream, IL 60188, Tel: 312-653-1460 ....**1B**•1742

CONFORMING MATRIX, Box 5126, Pt. Pl. Sta., Toledo, OH 43611, Tel: 419-729-3777; Empl.: 35

CONKLIN INSTR. CORP., West Rd., Pleasant Valley, NY 12569, Tel: 914-635-2136; Empl.: 65

Local Sales Offices & Reps

CA	Santa Ana, Craig Martin & Assoc.	714-556-1106
CT	Bethel, Gemini Elctrn. Sls.	203-748-5506
GA	Newnan, Dolan Assocs.	404-251-1102
NJ	Kinnelon, R.J. Alvarez, Inc.	201-838-5641
OH	Howard, Denman Assocs.	614-397-6240
WA	Redmond, Control Q	206-881-7440

CONNECTICUT HARD RUBBER CO., See CHR Inds.

CONNECTICUT MICROWAVE CORP., 106 Powder Mill Rd., Box 389, Canton, CT 06019, Tel: 203-693-4247; FSC No.: 50974; Empl.: 16; *Sls. Mgr.:* S. T. Urbank

CONNECTOR CORP., 6025 N. Keystone Ave., Chicago, IL 60646, Tel: 312-539-3108, TWX: 910-221-6059 ....**2**•1244, 1245

CONNECTOR INDS. OF AMER., 639 N. Wayne, Cincinnati, OH 45215, Tel: 513-733-3680; FSC No.: 32076; Empl.: 35

Local Sales Offices & Reps

AZ	Phoenix, Southwest e/m Engrg.	602-944-1521
CA	Anaheim, Libratronix	714-534-7073
CT	Branford, W. McCoy Co.	203-488-2012
IL	Chicago, D. Dolin Sls. Co.	312-286-6200
IN	Greenwood, Valentine & Assocs.	317-888-2260
MI	Birmingham, Forand Sls. Co.	313-644-0087
MN	Bloomington, J. G. Twist	612-835-2120
NY	N. York, ABS Assoc.	201-871-0020
PA	Hatboro, Jacobsen Assocs.	215-674-2937
TX	Dallas, Kruvand Assocs.	214-691-4592

HCW

CONNOR-WINFIELD CORP., 109 Turner Ct.; POB L, W. Chicago, IL 60185, Tel: 312-231-5270, TWX: 910-230-3231; FSC No.: 21022; Empl.: 35; *Sls. Mgr.:* John Hoag ....**1A**•1329-1332

Local Sales Offices & Reps

CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Westlake Village, C.D.H. Assocs.	213-707-1970

CONOLOG CORP., 5 Columbia Rd., Somerville, NJ 08876, Tel: 201-722-8081

CONRAC CORP., System Comps. Div., 1700 S. Mountain Ave., Duarte, CA 91010, Tel: 213-359-9141, Telex: 96-5978; Empl.: 200; *Sls. Mgr.:* Albert N. Caputo

CONRAC DIV., Conrac Corp., 600 N. Rimsdale Ave., Covina, CA 91722, Tel: 213-966-3511, Telex: 67-0437; Empl.: 450

CONSELL, 463 Payne Dr., Cheshire, CT 06410, Tel: 203-272-6837; Empl.: 3; *Sls. Mgr.:* A. R. Aikman

CONSOLIDATED CONTROLS, 15 Durant Ave., Bethel, CT 06801, Tel: 203-743-6721, Telex: 969615, TWX: 710-456-0446; FSC No.: 02750; Empl.: 650; *Sls. Mgr.:* A.F. Jakubauskas

Consolidated
electronic wire & cable

CONSOLIDATED ELECTRONIC WIRE & CABLE CORP., 11044 King St., Franklin Park, IL 60131, Tel: 312-455-8830, TWX: 910-227-1705; FSC No.: 73612; Empl.: 57; *Sls. Mgr.:* Karl Rankin; *Dist. Mgr.:* Steve Boynton ....**2**•2021-2075

Local Sales Offices & Reps

AL	Birmingham, Hollingsworth & Still	205-822-2846
AR	Little Rock, Erickson Sls., Inc.	501-225-7379
CA	San Jose, O'Donnell & Assoc.	408-263-6500
CO	Parker, Parker-Webster Co.	303-841-4888
FL	Orlando, Hollingsworth & Still	305-859-9423
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Highland Park, Bramsky Sls. Co.	312-433-2375
IN	Indianapolis, Green Sls. Co.	317-291-2232
KS	Prairie Village, R. W. Kunz & Assocs.	913-648-3535
KY	Louisville, K W Elctrn. Sls.	502-451-1860
KY	Louisville, Green Sls. Co.	502-241-1212
LA	Chalmette, Erickson Sls. Inc.	504-271-1976
MD	Kensington, Forti Assocs.	301-949-1706
MA	Southboro, KSA of New England	617-485-9432
MI	Detroit, Burcaw Co. & Assoc.	313-533-7700
MI	Wyoming, Burcaw Co. & Assoc.	616-532-2756
MN	Edina, Monroe-Hanna	612-925-5700
MO	St. Louis, R. W. Kunz & Assocs.	314-966-4977
NJ	East Orange, Willgold Sls. Corp.	201-678-7700
NM	Albuquerque, Trembly & Assoc.	505-266-8616
NY	Rochester, Warren Kaufman & Assoc.	716-266-2728
NY	Schenectady, Warren Kaufman & Assocs.	518-374-0749
NC	Kernersville, Hollingsworth & Still	919-996-4622
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Heights, KW Elctrn. Sls.	216-491-9177
OH	Worthington, K W Elctrn. Sls.	614-888-0483
OK	Oklahoma City, Erickson Sls. Inc.	405-682-2947
OR	Troutdale, Comtec Int'l.	503-661-4308
PA	Allison Park, K W Elctrn. Sls.	412-487-4300
PA	Philadelphia, Samuel K. MacDonald, Inc.	215-545-1205
TX	Dallas, Erickson Sls. Inc.	214-739-5833
UT	Salt Lake City, Parker-Webster Co.	801-266-9939
UT	Salt Lake City, Cleveland Entprs. of Colorado	801-355-8424
VA	Vinton, Forti Assocs.	703-345-2505
WA	Bellevue, Comtec, Intl.	206-453-1189
WI	Cedarburg, Branksy Sls. Co.	414-377-6837
EXP	NY, Plainview, Morhan Exporting	516-293-5582

Local Distributors

AL	Huntsville, Pioneer/Huntsville	205-837-9300
AZ	Tucson, Elctrn. City	602-622-1173
CA	Concord, Pacific Radio Supp.	415-682-4700
CA	Costa Mesa, Marvac Elctrns.	714-540-3280
CA	Fullerton, Garden Elctrns.	714-526-7882
CA	Redwood City, HDB Elctrns.	415-368-1388
CT	Wallingford, Midan Elctrns.	203-265-2077
FL	Ft. Lauderdale, Pioneer/Florida	305-771-7520
GA	Atlanta, Wholesale Ind'l. Elctrns.	404-447-8431
HI	Honolulu, Electrical Equip.	808-533-3884
IL	Peoria, Klaus Radio, Inc.	309-691-4840
IL	Wheeling, Hawk Elctrns.	312-459-4030
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KY	Florence, URI Elctrns.	606-371-4423
LA	New Orleans, L. F. Gaubert	504-822-7272
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MA	Norwook, Emtel	617-769-9500
MI	Grand Rapids, SF Elctrns.	616-459-0216
MO	Maryland Heights, L-Comp	314-291-6206
NH	Manchester, Yankee Elctrn. Supp.	603-625-9746
NJ	East Hanover, State Elctrns. Parts	201-887-2550
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Genesee Radio Parts	716-873-9661
NY	Rochester, Goldcrest Elctrns.	716-266-2728
NC	Greenville, Pair Elctrns.	919-756-2292
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Beaverton, Acacia Sls.	503-646-3377
PA	Allentown, Lehigh Elctrn. Comps.	215-433-3045
SC	Charleston, Wholesale Ind'l. Elctrns.	803-722-2634
WA	Seattle, Radar Elec. Co.	206-282-2511
WI	Appleton, Appleton Radio Supp.	414-734-5767
EXP	Plainview, Morhan Exporting	516-293-5582

CONSOLIDATED PRODUCTS CORP., P.O. Box 67, Idyllwild, CA 92349, Tel: 714-659-2183

CONSOLIDATED RESISTANCE CO. AMERICA, 222 Lake Ave., Yonkers, NY 10701, Tel: 914-YO3-5900; Empl.: 20

CONSOLINK CORP., Lestronics, Inc., 1840 Industrial Cir., Longmont, CO 80501, Tel: 303-651-2014, TWX: 910-320-0786; *Sls. Mgr.:* Lisa Estabrooks; *Dist. Mgr.:* Lisa Estabrooks

CONSUMERTRONICS, 2011 Crescent Dr., Alamogordo, NM 88310, Tel: 505-434-0234; Empl.: 5; *Sls. Mgr.:* Laurie Laurencia

CONTACT, INC., 5 Elm Ave., Hudson, NH 03051, Tel: 603-883-7708; FSC No.: M07015; Empl.: 11; *Sls. Mgr.:* T. Foresta; *Dist. Mgr.:* R. Reid

CONTACT EAST, 7 Cypress Dr., Burlington, MA 01803, Tel: 617-272-5051; *Sls. Mgr.:* Kai Juel

contact **Contact Electronics Inc.**

CONTACT ELECTRONICS INC., 30 Plymouth St., Fairfield, NJ 07006, Tel: 201-575-7660, 800-221-1451, Telex: 130-216; Empl.: 50; *Sls. Mgr.:* Thomas E. Bodnar; *Dist. Mgr.:* Thomas E. Bodnar ....**2**•1169

Local Sales Offices & Reps

CA	Santa Clara, Contact Elctrns. Inc.	408-988-5400
CA	Simi Valley, Tri Electro Sls.	805-583-5124
CT	Mystic, JMG	203-572-9448
FL	Orlando, Over & Over	305-857-4057
GA	Norcross, Over & Over	404-449-6205
IL	Chicago, KGA Engrg.	312-477-8181
IN	Indianapolis, J & W Sales	317-842-3740
MD	Glendale, Electromate, Inc.	301-262-2702
MA	Norwood, JMG	617-762-5333
MI	Farmington Hills, Willis Trombley & Son	313-553-2200
MN	Fridley, Teskey & Assocs.	612-571-0876
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NJ	Mountainside, Henry G. Richter	201-233-4615
NY	Fayetteville, Henry G. Richter	315-637-6713
NC	Charlotte, Over & Over	704-527-3070
OH	Cleveland, Pressler-Weissinger Co.	216-333-7977
OR	Tigard, Electronic Sources	503-684-0040
TN	Antioch, Over & Over	615-834-0140
TX	Dallas, Blackburn Assocs.	214-692-8885
TX	Houston, Blackburn Assocs.	713-463-1354
WA	Bellevue, Elctrn. Sources	206-451-3500

Local Distributors

CA	Irvine, Ratel Elctrns.	213-637-0839
CA	Mountain View, Cornett Elctrns.	415-969-5420
CA	Mountainview, Target Elctrns.	415-961-1170
CA	S. San Francisco, Peters de Laet	408-727-9440
CA	San Jose, Ratel Elctrns.	408-946-4300
IL	Mt. Prospect, Magnuson Elctrns.	312-956-0700
MD	Beltsville, Applied Specialties Inc.	301-792-2211
MD	Frederick, Digital Sys. Inc.	301-694-9355
MA	Burlington, JV Elctrns. of Boston	617-273-4300
MA	Middleboro, Glynn Elctrns.	617-947-4262

NJ	Berlin, GCI	609-768-6767
NJ	Frenchtown, Sintec Co.	201-996-4093
NJ	Hanover, State Elctrns.	201-887-2550
NY	Hauppauge, LI, Broadline Elctrns.	516-231-4100
NY	New York, Knickerbocker Annunciator	212-964-6258
OR	Lake Oswego, Moore Elctrns.	503-684-3100
OR	Wilsonville, Zepher Indus.	503-682-2929
TX	Stafford, Southwest Elctrns., Inc.	713-491-4900
WA	Seattle, Zepher Indus.	206-241-1980

CONTEL INFO. SYS., INC., Continental Tel. Corp., 130 Steamboat Rd., Great Neck, NY 11024, Tel: 516-829-5900; Empl.: 450

CONTINENTAL DATA SYS., 131 N. Ludlow St., Dayton, OH 45402, Tel: 513-222-8626; Empl.: 4

CONTINENTAL ELECTRONICS MFG. CO., P.O. Box 270879, Dallas, TX 75227, Tel: 214-381-7161, Telex: 73-398; FSC No.: 52151; *Sls. Mgr.:* R. L. Floyd, Domestic Broadcast

CONTINENTAL RESOURCES, INC., 175 Middlesex Tpke., Bedford, MA 01730, Tel: 617-275-0850, TWX: 710-326-0833; Empl.: 275; *Sls. Mgr.:* Michael Mattleman .... 3•1212

Local Sales Offices & Reps

CA	Carson	213-638-0454
CA	Santa Clara	408-727-9870
FL	Orlando	305-855-9544
IL	Bensenville	312-860-5991
MD	Gaithersburg	301-948-4310
NJ	Scotch Plains	201-654-6900
TX	Dallas	214-458-7616

CONTINENTAL SPECIALTIES CORP., See Global Specialties Corp.

CONTOURS, INC., P.O. Box 1041, Middletown, CT 06457, Tel: 203-347-5694; FSC No.: 033501; *Sls. Mgr.:* Richard M. Nokes

CONTRAVES GOERZ CORP., 610 Epsilon Dr., Pittsburgh, PA 15238, Tel: 412-967-7700, Telex: 86-6237, TWX: 710-664-2082; FSC No.: 51261; *Sls. Mgr.:* Henry M. Voss; *Dist. Mgr.:* Ronald L. Ekas

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CONTROL CONCEPTS CORP., P.O. Box 1380, Binghamton, NY 13902-1380, Tel: 607-724-2484; Empl.: 41; *Sls. Mgr.:* Vleda I. Lawton .... 1B•1263

Local Sales Offices & Reps

AZ	Phoenix, Power Specialists	602-996-4100
CA	Los Alamitos, Power Specs.	213-594-9418
CA	Redwood City, Ault Assocs.	415-367-1710
MD	Baltimore, Scientific Assocs.	301-321-1411
MA	Needham, Shain Assoc.	617-449-4380
MI	Southfield, Comtel Instrs.	313-358-2505
NJ	Cherry Hill, Scientific Reps.	609-482-0059
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573
PA	Chalfont, Eastern Scientific Marketing	215-822-6503
PA	Pittsburgh, Comtel Instrs.	412-922-5720
VA	Fairfax, Scientific Assocs.	703-385-0600

CONTROL DATA CORP., P.O. Box O, Minneapolis, MN 55440, Tel: 1-800-828-8001 Operator 82, In Minnesota 612-921-4400; Empl.: 56,000

CONTROL ELCTRNS. CO., INC., 107-B Allen Blvd., Farmingdale, NY 11735, Tel: 516-694-0125; FSC No.: 95924; Empl.: 60; *Sls. Mgr.:* Harold Goldstein; *Dist. Mgr.:* Jack Leonard .... 1A•1467-1469

Local Sales Offices & Reps

CA	Sherman Oaks, R.T. Assocs.	213-788-7588
FL	Melbourne, VPI	305-727-3305
FL	Tampa, VPI	813-832-2041
IL	Chicago, Electro-Tech Mktg. Assoc.	312-588-4535
MD	Ellicott City, VPI	301-461-2525
MA	W. Medway, J. Gallagher	617-533-7292
MN	Fridley, Teskey & Assocs.	612-571-0876
PA	Montgomery, VPI	215-474-3200
TX	Dallas, Texas Avionics Co.	214-363-6324
EXP	FL, Hallandale, Emec	305-925-6366

CONTROL ENGRG., INC., 1686 Riverdale St., West Springfield, MA 01089, Tel: 413-781-1330; Empl.: 7; *Sls. Mgr.:* Mark Kimball

CONTROL EQUIP. CORP., 171 Lincoln St., Lowell, MA 01851, Tel: 617-459-0573; Empl.: 10

CONTROLEX/EANCO, See Fincor

CONTROL INDS. INC., 530 Burnside Ave., Inwood, NY 11696, Tel: 212-471-9800; Empl.: 40

CONTROLLED ENVIR. EQUIP. CORP., 3 Delta Drive, Westbrook, ME 04092, Tel: 207-854-9126; Empl.: 5; *Sls. Mgr.:* R. D. Peck

CONTROLLED POWER COMPANY

CONTROLLED POWER CO., 1955 Stephenson Hwy., Troy, MI 48084, Tel: 313-528-3700, TWX: 810-232-3401 .... 3•1814, 1848-1853

CONTROL MODULE, 380 Enfield St., Enfield, CT 06082, Tel: 203-745-2433, Telex: 643167; Empl.: 160; *Sls. Mgr.:* Peter C. DiMaria

CONTROL-O-MATION, INC, 7300 W. Huron River Dr., Dexter, MI 48130, Tel: 313-426-3935; Empl.: 72; *Sls. Mgr.:* Richard Lundy

CONTROL PRODUCTS, INC., 280 Ridgedale Ave., E. Hanover, NJ 07936, Tel: 201-887-9400; FSC No.: 81901; Empl.: 62; *Sls. Mgr.:* J. R. Nile

CONTROL PRODS., Devar Inc., P.O. Box 589, Bridgeport, CT 06601, Tel: 203-368-6751, Telex: 96-4234; Empl.: 80; *Sls. Mgr.:* T. W. Tomasko

CONTROL PRODS. DIV., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083, Tel: 201-964-4400, Telex: 13-8978, TWX: 710-985-4687; FSC No.: 3L154; Empl.: 275; *Sls. Mgr.:* J. Cooper .... 3•1125

Local Sales Offices & Reps

AL	Hoover, Control Prods. Agency	205-320-6197
AZ	Phoenix, Mercury Engrg. Sls.	602-244-0123
CA	Los Altos, J. Wilhoit Co.	415-961-3660
CA	San Diego, J. C. Henberger Co.	619-292-5772
CA	Tustin, Schoenbachler-Dobson Co.	714-544-1888
CO	Denver, C. Beabout Co.	303-244-3151
CT	Glastonbury, Tulimieri Assocs.	203-659-3531
FL	Deerfield Pk., Brandel-Stephens	305-427-8558
FL	Orlando, B. Stephens Co.	305-425-3202
GA	Atlanta, Control Prods. Div.	404-296-3115
HI	Miliani Town, H. C. Burgess	808-623-3118
IL	Algonquin, Control Prods. Div.	312-358-2840
IL	Woodridge, Control Prods. Div.	312-358-2840
IA	Des Moines, Jerry L. Shumway & Assocs.	515-285-0704
KS	Overland Park, Arehart-Barnds-Rains Sls. Co. (Buchanan Prods. Only)	913-649-9270
MD	Mount Airy, Strayton Assocs.	301-831-7007
MA	Norwell, Control Prods. Div.	617-659-4474
MI	Troy, George R. Peters Assoc.	313-362-1220
MN	Minneapolis, Harold Mercer Co.	612-933-7111
MS	Jackson, Welch & Doby, Inc.	601-932-5534
MO	Bridgeton, Dy-Tronix, Inc.	314-731-5799
MO	Independence, Dy-Tronix, Inc.	816-373-6600
NJ	Dunellen, Control Prods. Div.	201-964-4400
NM	Sandia Park, Sun Sls.	505-281-3373
NY	Camillus, Ontec	315-672-5626
NY	Manhasset, Control Prods. Div.	516-627-8809
NY	Rochester, Ontec	716-464-8636
NY	Wappinger Falls, Ontec	914-462-7188
NC	Greensboro, Hile Assocs.	919-288-1500
OH	Mentor, Control Prods. Div.	216-543-4233
OH	West Chester, Control Prods. Div.	513-777-2472
OR	Portland, Syscom	503-644-2505
PA	Pittsburgh, Control Prods. Div.	412-761-0581
PA	Willow Grove, Cusick Elec. Sls.	215-659-6666
TX	Bedford, Reynolds Assoc., Inc.	817-267-5635
TX	Houston, Control Prods. Div.	713-984-8128
WA	Bellevue, Syscom Sls.	206-641-5080
WV	Huntington, Lilly Electrical Sls.	304-523-3441
WI	Wauwatosa, Control Prods.	414-377-0800

CSI CONTROL SCIENCES INCORPORATED

CONTROL SCIENCES, INC., 9509 Vassar Ave., Chatsworth, CA 91311, Tel: 818-709-5510, Telex: 36-44-12 INTR; FSC No.: 53317; Empl.: 14; *Sls. Mgr.:* Rhod Zimmerman .... 3•1146-1148

Local Sales Offices & Reps

CA	Sunnyvale, Koosen Tech. Sls.	408-249-5858
CO	Boulder, Herb Bass Assocs.	303-499-7509
FL	Orlando, Gra-Mar Inc.	305-894-3351
IL	Rolling Meadows, KMA Sales	312-398-5300
IN	Ft. Wayne, J & B Engrg.	219-483-2813
MN	St. Paul, Northstar Motion & Control	612-770-5311
MO	Peculiar, PEM Sales	816-884-4784
MO	St. Louis, PEM Sales	314-427-7200
NY	Victor, A & D Devices	716-924-9171
OH	Cleveland, Geotronix	216-526-2535
OH	Columbus, Geotronix	614-457-8472
PA	Media, Homer Smith Sls.	215-543-2434
PA	Pittsburgh, Raystan/Symcon	412-734-1185
TX	Ft. Worth, Rick McDonald Assoc.	817-429-4272
TX	Richardson, McDonald Assocs.	214-238-1858
WA	Bellevue, Poggi Assocs.	206-454-2026
WI	Milwaukee, KMA	414-259-1771

CONTROLS PROTOELECTRIC, 1 Memorial Dr., Cambridge, MA 02142, Tel: 617-864-8000; *Sls. Mgr.:* S. L. Davis

CONTROLS UNLIMITED, INC., 1895 Blase-Nemeth Rd., Painesville, OH 44077, Tel: 216-354-4111; Empl.: 35

CONTROL TECHNOLOGY CO., 41-16 29th St., Long Island City, NY 11101, Tel: 212-361-2133; FSC No.: 14545; Empl.: 35; *Sls. Mgr.:* H. Cooper .... 3•1930, 1931

Local Sales Offices & Reps

CA	Claremont, W. Roth & Assocs.	714-621-1019

CONVER CORP., 10629 Bandley Dr., Cupertino, CA 95014, Tel: 408-255-0151, TWX: 910-338-2036; *Sls. Mgr.:* Matthew Winston

CONVERSION EQUIP. CORP., 1620 So. Sunkist, Anaheim, CA 92806, Tel: 714-634-9698; *Sls. Mgr.:* Mark Kato; *Dist. Mgr.:* Mark Kato

CONVERTER CONCEPTS, INC., Industrial Pkwy., Pardeeville, WI 53954, Tel: 608-429-2144, TWX: 910-280-2630; Empl.: 75; *Sls. Mgr.:* Michael J. Schoenwald; *Dist. Mgr.:* Michael J. Schoenwald .... **3**•1536-1539

Local Sales Offices & Reps

AZ	Phoenix, Thor Engrg.	602-437-1463
CA	Goleta, The Thorson Co.	805-964-8751
CA	Hayward, Pacific Mktg.	415-887-1620
CA	Signal Hill, The Thorson Co.	213-595-0361
FL	Clearwater, Perrott Assocs.	813-443-5214
FL	Orlando, Perrott Assoc.	305-298-7748
FL	Sunrise, Perrott Assocs.	305-792-2211
IL	Rolling Meadows, KMA Sales	312-398-5300
MA	Natick, Wayland Engrg. Sls.	617-655-6080
MN	Minneapolis, Jos-co/Melius	612-861-3343
NY	Syracuse, Pi-Tronics	315-455-7346
OH	Dayton, Bradcor	513-294-5477
OH	Euclid, Bradcor Elctrns.	216-261-0888
PA	Glenside, Koebert Assoc.	215-887-2310
TX	Garland, Tesco	214-681-1376
TX	Houston, Tesco	713-777-1443
WA	Linnwood, Power Sources Unltd.	206-784-3336
WI	Milwaukee, KMA Sales	414-259-1771

CONVEX CORP., P.O. Box 17225, Dulles Intl. Airport, Washington, DC 20041, Tel: 703-661-8900; Empl.: 24

COOL-AMP CONDUCTO-LUBE CO., 8621 S.W. 17th Ave., Portland, OR 97219, Tel: 503-244-2230; Empl.: 5; *Sls. Mgr.:* Audrea Dick

COONER WIRE CO., 9186 Independence Ave., Chatsworth, CA 91311, Tel: 818-882-8311; *Sls. Mgr.:* Steven W. Smith .... **2**•2076-2081

COOPER GROUP, PO Box 30100, Raleigh, NC 27622, Tel: 919-781-7200, Telex: 579497; *Sls. Mgr.:* J.J. Barrese

CO-ORD SWITCH DIV., LVC Inds., Inc., 23 Hanse Ave., Freeport, NY 11520, Tel: 516-868-1900; *Sls. Mgr.:* P. Parnicas

COORS PORCELAIN, 600 Ninth St., Golden, CO 80401, Tel: 303-278-4000, Telex: 45593; Empl.: 1700

COOSOL, 3013 Harbor Blvd., Costa Mesa, CA 92626, Tel: 714-545-2216; Empl.: 20; *Sls. Mgr.:* Aram Solomonian; *Dist. Mgr.:* Aram Solomonian

CORBY INDS. INC., P. O. Box 2838, Allentown, PA 18001, Tel: 215-433-1412, Telex: 847318 CORBYUHL; Empl.: 22; *Sls. Mgr.:* Glenn M. Matz; *Dist. Mgr.:* Lewis S. Walters

CORCOM, INC., 1600 Winchester Rd., Libertyville, IL 60048, Tel: 312-680-7400, TWX: 910-684-3269; FSC No.: 05245; Empl.: 1000 .... **1A**•1589

Local Sales Offices & Reps

AL	Huntsville, Robert O. Whitesell	205-883-5110
AZ	Phoenix, I.S.D.S.	602-971-6250
CA	Los Angeles, I.S.D.S.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, I.S.D.S.	619-571-1544
CA	Santa Ana, I.S.D.S.	714-973-2162
CA	Woodland Hills, I.S.D.S.	213-883-7130
CO	Arvada, Straube Assocs.	303-426-0890
CT	Madison, Conti-Younger Assocs.	203-245-1136
FL	Clearwater, E.I.R. Inc.	813-531-5990
FL	Fern Park, E.I.R. Inc.	305-830-9600
FL	Plantation, E.I.R. Inc.	305-581-6905
FL	Plantation, E.I.R. Inc.	305-791-8243
ID	Boise, Cascade Comps.	208-343-9886
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IN	Ft. Wayne, Robert O. Whitesell	219-432-5591
IN	Indianapolis, Robert O. Whitesell	317-359-9283
IN	Kokomo, Robert O. Whitesell	317-457-9127
KS	Overland Park, K & H Sls.	913-642-9564
KY	Louisville, Robert O. Whitesell	502-426-7696
MD	Ellicott City, Marketing Technlg.	301-465-5944
MA	Burlington, Conti-Younger Assocs.	617-273-1582
MI	Grand Rapids, Robert O. Whitesell	616-942-5420
MI	Southfield, Robert O. Whitesell	313-559-5454
MI	St. Joseph, Robert O. Whitesell	616-983-7337
MN	Edina, Mel Foster Co.	612-941-9790
NM	Albuquerque, Straube Assocs.	505-292-0428
NY	Endicott, Noeth-Honsinger Assocs.	607-754-3214
NY	Manhasset, Win-Cor Elctrn. Sls.	516-627-9474
NY	Pittsford, Noeth-Honsinger Assocs.	716-586-9002
NC	Raleigh, Zucker Assoc.	919-782-8433
OH	Cincinnati, Robert O. Whitesell	513-521-2290
OH	Cleveland, Robert O. Whitesell	216-447-9020
OH	Columbus, Robert O. Whitesell	614-888-9396
OH	Dayton, Robert O. Whitesell	513-298-9546
OK	Hillsboro, Cascade Comps.	503-640-4714
PA	Pittsburgh, Robert O. Whitesell	412-963-6161
PA	Trevose, Professional Svc. Assoc.	215-245-0513
TN	Greenville, Robert O. Whitesell	615-639-6154
TX	Austin, K & H Sls.	512-258-8841
TX	Plano, K & H Sls.	214-423-6520
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Lynchburg, Marketing Technlg.	804-384-6459
WA	Seattle, Cascade Comps.	206-433-1113
WI	Brookfield, Sumer, Inc.	414-784-6641

Local Distributors

AL	Huntsville, Pioneer	205-837-9300
AZ	Phoenix, Cetec Elctrns.	602-272-7951
CA	Canoga Park, Marshall Ind.	213-999-5001
CA	Chatsworth, Diplomat Elctrns.	213-341-4411
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Irvine, Marshall Ind.	213-443-3724
CA	San Diego, Marshall Ind.	619-578-9600
CA	San Diego, Cetec Elctrns.	619-278-5020
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	South Gate, Cetec Elctrns.	213-773-6521
CA	Sunnyvale, Marshall Ind.	408-732-1100
CA	Sunnyvale, Diplomat/Westland	408-734-1900
CO	Denver, Marshall Ind.	303-427-1818
CO	Englewood, Diplomat Elctrns.	303-740-8300
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	E. Haven, J.V. Elctrns.	203-469-2321
FL	Clearwater, Diplomat Elctrns.	813-443-4515
FL	Ft. Lauderdale, Pioneer	305-771-7520
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Pioneer	305-834-9090
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Atlanta, Marshall Ind.	404-923-5750
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Palatine, OHM Elctrns.	312-359-5500
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Pioneer	317-849-7300
MD	Baltimore, Resco	301-823-0070
MD	Beltsville, Resco/Washington	301-937-9100
MD	Gaithersburg, Pioneer	301-921-0660
MD	Savage, Pyttronic Inds.	301-792-0780
MA	Burlington, Marshall Ind.	617-272-8200
MA	Newton, Greene Shaw	617-969-8900
MA	Norwood, Gerber Elctrns.	617-769-6000
MI	Livonia, Pioneer	313-525-1800
MI	Livonia, R.S. Elctrns.	313-525-1155
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MN	St. Paul, Gopher Elctrns.	612-483-3322
MO	St. Louis, Olive Elctrns.	314-426-4500
NJ	Bellmawr, Mid Atlantic Elctrns. Corp.	609-931-5303
NJ	Totowa, Diplomat Elctrns.	201-785-1830
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Melville, Diplomat Elctrns.	516-454-6334
NY	Mt. Vernon, QAR Indl. Elctrn. Sls.	914-699-2224
NY	Rochester, Summit Distrs.	716-334-8110
NY	Rochester, Rochester Radio Supp.	716-454-7800
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Cleveland, Pioneer	216-587-3600
OH	Dayton, Pioneer	513-236-9900
OR	Beaverton, Almac Elctrns.	503-641-9070
PA	Montgomeryville, Pyttronic Inds.	215-242-6700
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
PA	Pittsburgh, Pioneer	412-782-2300
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Allen, Prime Distrbg. Co.	214-231-0170
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Pioneer	214-386-7300
TX	Ft. Worth, TTI	817-831-0441
TX	Houston, Pioneer	713-988-5555
UT	Salt Lake City, Diplomat/Alta Land	801-486-4134
WA	Bellevue, Almac Stroum Elctrns.	206-643-9992
WI	Milwaukee, Marsh Elctrns.	414-475-6000

CORNELL-DUBILIER ELECTRONICS, 150 Avenue "L", Newark, NJ 07105, Tel: 201-589-7500, Telex: 03-8366; FSC No.: 14655; Empl.: 3000; *Sls. Mgr.:* A. Cavuto

CORNELL-DUBILIER ELECTRONICS, Div. of Federal Pacific Electric Co., 1605 East Rodney French Blvd., New Bedford, MA 02744, Tel: 617-996-8561

CORNELL-DUBILIER ELCTRNS., Wayne Interchange, Plaza 1, Wayne, NJ 07470, Tel: 201-256-2000; *Sls. Mgr.:* A. Cavuto

CORNING GLASS WORKS, Main Plant, MS 2136, Corning, NY 14831, Tel: 607-974-4102, Telex: 932-499; Empl.: 30000; *Sls. Mgr.:* B. J. Lanahan

CORNING GLASS WORKS, Corning Elctrns., Houghton Pk., Bldg. A-2, Corning, NY 14830, Tel: 607-974-9000, Telex: 932481; Empl.: 8000; *Sls. Mgr.:* Ben S. Williams; *Dist. Mgr.:* Lyle E. Pirnie

CORNING GLASS WORKS, Memory Prods. Dept., 3900 Electronic Dr., Raleigh, NC 27604, Tel: 919-876-1100, TWX: 510-928-1840; Empl.: 17; *Sls. Mgr.:* A. Greenlaw

CORNING GLASS WORKS, Telecomm Prods. Dept., BH-5, Corning, NY 14830, Tel: 607-974-9000, Telex: 932498; Empl.: 28,000

CORNING MEDICAL & SCIENTIFIC, See Corning Glass Works, Corning Elctrns.

CORTEC, INC., 15811 Chemical La., Huntington Bch., CA 92649, Tel: 714-897-2529; Empl.: 35

CORTRON DIV., 400 W. Grand Ave., Elmhurst, IL 60126, Tel: 312-279-9110, TWX: 910-254-0154; Empl.: 300; *Sls. Mgr.:* Jim Powers

COSAR, 3121 Benton St., Garland, TX 75042, Tel: 214-276-9487, 800-527-1207, Telex: 730-764; FSC No.: 20891; Empl.: 50; *Sls. Mgr.:* Jerry Jarka

COSMO PLASTICS CO., 3239 W. 14th St., Cleveland, OH 44109, Tel: 216-861-5594, TWX: 810-421-8444; Empl.: 500; *Sls. Mgr.:* B. Gordon

COTO CORPORATION, 55 DuPont Drive, Providence, RI 02907, Tel: 401-943-2686, TWX: 710-381-8016; Empl.: 200; *Sls. Mgr.:* W. Poisson .... **1B**•1324-1330

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
CA	Lomita, Component Mktg. Assoc.	213-326-1460
CA	San Diego, D Squared Sls.	619-560-6266
CA	Saratoga, Testco Inc.	408-253-1900
CO	Denver, Spectrum Sls.	303-696-1601
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Downers Grove, Richmar Elctrns.	312-968-0118
IN	W. Lafayette, Richmar Elctrns.	317-846-6383
NY	Melville, Jarms Assoc.	516-752-0404
NC	Cary, Montgomery Mktg.	919-467-6319
OR	Portland, Ecco Mktg.	503-254-5588
PA	Ardmore, Manreps	215-649-6300
TX	Plano, Richmar Elctrns.	214-867-8224
WA	Seattle, Ecco Mktg.	206-364-0200
WA	Spokane, Ecco Mktg.	509-926-9950
WI	Butler, Richmar Elctrns.	414-781-1730

Local Distributors

Intl	England, Surrey, Rhopoint	08833-OX-7988

COTRONICS, 3379 Shore Pkwy., Brooklyn, NY 11235, Tel: 212-646-7996; Empl.: 15; *Sls. Mgr.:* Alan Marks

COUNTIS INDS., 2670 Lockheed Way, Carson City, NV 89701, Tel: 702-882-6123; Empl.: 12; *Sls. Mgr.:* T. J. Countis; *Dist. Mgr.:* T. J. Countis

CPS INC., 110 Wolfe Rd., Sunnyvale, CA 94086, Tel: 408-738-0530, Telex: 35-7450; FSC No.: 31640; Empl.: 80; *Sls. Mgr.:* Rick Ross .... **3**•1540

Local Sales Offices & Reps

MA	Burlington, Intersell	617-273-3844
NY	Great Neck, Industron Assocs.	516-487-2620

CRAIG SYS., 360 Merrimack St., Lawrence, MA 01842, Tel: 617-688-6961, TWX: 710-342-0765; FSC No.: 81902; Empl.: 300; *Sls. Mgr.:* Edwin C. Simas; *Dist. Mgr.:* Edwin C. Simas

CRAMER INC., 625 Adams St., Kansas City, KS 66105, Tel: 913-621-6700, TWX: 910-743-6856; Empl.: 200; *Sls. Mgr.:* Thomas R. Hyland

CRAMER COIL & TRANSFORMER CO., INC., 1121 15th Ave., Grafton, WI 53024, Tel: 414-377-7040; Empl.: 65; *Sls. Mgr.:* Philia G. Hayes

CRAMER DIVISION, Conrac Corporation, Mill Rock Rd., Old Saybrook, CT 06475, Tel: 203-388-3574, Telex: 966-453; Empl.: 250; *Sls. Mgr.:* Mktg. Mgr. J. H. Moor; *Dist. Mgr.:* E. Latourette

Local Sales Offices & Reps

CA	Anaheim, Spectrum Assocs.	714-630-6977
CA	Palo Alto, Mollard Mktg.	415-961-0456
CA	Placentia, Spectrum Assocs.	714-996-9400
CA	San Carlos, Electronic Engrg. Assoc., Inc.	415-593-2189
CA	Santa Clara, Held & Mollard	408-727-2050
IL	Elk Grove, Martec Assocs.	312-956-8090
IL	Glen Ellyn, Cramer Sls. Office	312-858-5166
IN	Indianapolis, Tech Sls. & Mktg., Inc.	317-849-6612
MI	Detroit, J.C. Hofstetter Co.	313-533-7788
MI	Farmington Hills, Anderson Elctrns., Inc.	313-553-7600
MN	St. Paul, Skor Inc.	612-426-1160
NM	Albuquerque, Vic Myers Assocs., Inc.	505-884-6878
NY	East Syracuse, Application Specialists Inc.	315-437-2813
NY	Rochester, Application Specialists Inc.	716-586-6226
OH	Dayton, RDP Corp.	513-253-6175
OH	Medina, J. C. Hofstetter	216-241-4880
PA	Bromall, White/Whiddett	215-353-6343
PA	Pittsburgh, Wainwright Tech. Sls.	412-487-5055
PA	Willow Grove, Jacabson-Rodger Assoc. Inc.	215-657-4300
TX	Austin, Sesco Inc.	512-892-2490
WA	Mercer Island, Andersen Assocs.	206-232-0484

CREATIVE PACKAGING CO., 1202 Kentucky Ave., Indianapolis, IN 46285

CRESTRON ELEC., 101 Broadway, Cresskill, NJ 07626, Tel: 201-894-0660

CRESTRONICS DIV., Applied Electro Technlg., Int., 2220 S. Anne St., Santa Ana, CA 92704, Tel: 714-556-6570, TWX: 910-595-1797; FSC No.: 52797; Empl.: 25; *Dist. Mgr.:* D. Dore

CROMEMCO, 280 Bernardo Ave., Mountain View, CA 94043, Tel: 415-964-7400, TWX: 910-379-6988; Empl.: 500; *Sls. Mgr.:* Tom Keating; *Dist. Mgr.:* Tom Keating

CROMPTON INSTRS., 1562 Parkway Loop, Units A & B, Tustin, CA 92680, Tel: 714-731-2333, Telex: 69-2309; FSC No.: 53498; *Sls. Mgr.:* J. Berger

CROMPTON INSTRS., 2763 Higgins Rd., Elk Grove Village, IL 60007, Tel: 312-593-1107, Telex: 28-0540; *Sls. Mgr.:* Tony A. Pitt

CROSS ELCTRNS., 100 Commonwealth Dr., Warrendale, PA 15086, Tel: 412-776-1591; Empl.: 35

CROSSPOINT
THE LIGHTED DISPLAY DIVISION
INFO-LITE CORPORATION

CROSSPOINT, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455; FSC No.: FSCM 52116; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli; *Dist. Mgr.:* Joseph M. Cartelli .... **1B**•1574

Local Sales Offices & Reps

CA	No. Hollywood, Crown Elctrns.	213-877-3550
CA	Redwood City, Caltronic Assocs.	415-365-2545
CT	Weston, CJA Assoc.	203-226-4317
FL	St. Petersburg, R. L. Matus & Assocs.	813-896-4133
GA	Buford, R. L. Matus & Assocs.	404-945-2946
IL	Lake Zurich, L & B Assocs.	312-438-7917

MI	Brighton, Michigan Mktg. & Sls.	313-229-6218
NJ	Wayne, GT Assocs.	201-694-6040
NY	Syracuse, Lenard Co.	315-479-9191
OH	Cleveland, A.S.A.	216-662-6080
OH	Dayton, Mohawk Intronics	513-434-8873
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415

CROUSE HINDS/SEPCO CORP., 1200 Kennedy Rd., Windsor, CT 0695, Tel: 203-683-4300

CROUZET CONTROLS, INC., 1083 State Pkwy., Schaumburg, IL 60195, Tel: 312-843-2200, Telex: 206 297; Empl.: 14; *Sls. Mgr.:* Ben Delcourt .... **1B**•1140, 1332, 1333, 1575

Local Sales Offices & Reps

AZ	Phoenix, Motion Technology.	602-991-1782
CA	Anaheim, Motion Technology	714-777-4259
CA	Chatsworth, Motion Technology.	818-993-3762
CA	San Jose, Motion Technology	408-932-0990
CA	San Rafael, Motion Technology	415-459-2171
CO	Denver, Control Agency	303-936-6641
FL	Tamarac, Davmik Sls.	305-920-2222
GA	Stone Mountain, DTM, Inc.	404-962-2530
IL	Roselle, Michael J. Koepke Assoc.	312-980-1575
IA	Des Moines, Jack Davidson Co.	515-263-8478
MA	Wellesley, Electro Kinetics	617-235-9415
MI	Royal Oak, Dave Ray & Assocs.	313-280-0000
MN	Minneapolis, Jos-Co/Melius.	612-861-3343
MO	St. Charles, C-F Electronics, Sales	314-946-8500
NY	Fairport, Tac Sls.	716-425-1070
NY	Syosset, Motion Control Sls.	516-921-5656
NC	Tryon, Halliday & Assoc.	704-894-8205
OH	Cincinnati, Tom Mulligan & Assocs.	513-574-1932
OH	Columbus, Tom Mulligan Co.	614-457-2242
PA	Bensalem, William D. Staats Co.	215-639-5231
TX	Dallas, Automated Motion Control	214-340-4192
UT	Salt Lake City, Control Agency	801-328-4305
WA	Bellevue, Sea Inc.	206-883-4999
WA	Vancouver, Sea Inc.	206-573-5161

Local Distributors

CA	Burlingame, Elec. Control Devices	415-348-0791
CA	Los Angeles, Master Distr.	213-452-1229
FL	Pembroke Pines, Donza Intl.	305-987-1122
IL	Chicago, Excel Elec.	312-421-7220
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Vonnegut Indl. Prods.	317-899-8800/8877
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Bettendorf, Custom Controls Ltd.	319-335-4787
MA	Wellesley, Electro-Mechanical Distr.	617-235-1565
MI	Comstock Park, Mor Elec.	616-784-1121
MI	Grand Rapids, S-F Electronics	616-459-0216
MI	Royal Oak, George Instr. Co.	313-280-1111
MN	St. Paul, Powermation	612-645-0781
NE	Omaha, Lakeland Engrg.	402-734-2600
NJ	Edison, Howman Applied Control Prods.	201-797-3313
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	W. Trenton, Electronic Serv. Div. (Roller Bearing Co. of America)	609-882-7400
NY	Commack, Monarch Comps.	516-499-1770
NC	Asheville, Electric Supply Co.	704-255-8899
NC	Gastonia, J.M.T. Elctrn. Supp.	704-867-4401
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
ND	Bismarck, Border States Elec.	701-258-6060
OH	Cincinatti, Hughes-Peters.	513-351-2000
OH	Cleveland, Reserve Elec. Co.	216-771-5764
OH	Columbus, Hughes-Peters.	614-294-5351
OH	Dayton, Duellman Elctrns.	513-461-5010
OK	Tulsa, Radio.	918-587-9123
OR	Portland, Mill & Power Specialties	503-228-7621
PA	Allentown, P. A. Peters	215-434-5237
PA	Philadelphia, Herbach & Rademan	215-426-1700
SC	Greenville, Holder Elec. Supp.	803-271-7111
TN	Chattanooga, Curle Elctrns.	615-266-4728
TX	Ft. Worth, Swieco.	817-335-6521
WA	Kent, Motors & Controls Corp.	206-872-8010
WA	Seattle, Eicher-Richards Co.	206-523-7888
WI	Waukesha, Powermation	414-542-2868

CROVEN CRYSTALS, 500 Beech St., Whitby, ON L1N 5S5, Canada, Tel: 416-668-3324, TWX: 610-384-2750; FSC No.: 00809; Empl.: 250; *Sls. Mgr.:* R. McCormick .... **1A**•1346

Local Sales Offices & Reps

AZ	Mesa, Sedco Sls.	602-835-6281
CA	San Mateo, Melvin Sls.	415-349-7444
CA	Van Nuys, R.L. Assocs.	213-782-7826
FL	Palm Bay, Spartech Assocs.	305-727-8045
GA	Smyrna, Spartech Assocs.	404-432-3644
MA	Milton, Naton Assoc.	617-698-0670
MO	Blue Springs, Chesco	816-229-1404
MO	St. Charles, Chesco	314-946-6677
NJ	Cherry Hill, Harry J. White	609-428-4544
NY	Melville, Carnes Assocs.	516-694-1600

OH	Englewood, Clayton-Ellier Co.	513-836-3556
TX	Arlington, W. Pat Fralia	817-640-9101
VA	Springfield, Tech Reps Inc.	703-569-6868
WI	Mequon, Artmor Ltd.	414-241-4040

CRYDOM DIVISION, Int'l. Rectifier, 1521 Grand Ave., El Segundo, CA 90245, Tel: 213-322-4987, Telex: 67-4660, TWX: 910-348-6283; Empl.: 100; *Sls. Mgr.:* John Deith; *Dist. Mgr.:* Bob Arnstein

CRYOMAGNETICS, INC., 795 Oak Ridge Tpk., Oak Ridge, TN 37830, Tel: 615-482-9551; *Sls. Mgr.:* R. M. Ennis, Jr.

CRYSTALOID ELCTRNS., Box 628, Hudson, OH 44236, Tel: 216-655-2429, Telex: 241-244; Empl.: 130; *Sls. Mgr.:* Sharon Werstler .... **1B**•1031

CRYSTEK CORP, P.O. Box 06135, Ft. Myers, FL 33906, Tel: 813-936-2109, TWX: 510-951-7448; FSC No.: 13454; Empl.: 2500

CSI Capacitors

CSI CAPACITORS, CSI Technlgs., 810 Rancheros Dr., San Marcos, CA 92069, Tel: 619-747-4000, Telex: 697832; FSC No.: 10026; Empl.: 50; *Sls. Mgr.:* H. R. Smith .... **1A**•1021

Local Sales Offices & Reps

AZ	Tempe, Cleveland Entprs. of AZ	602-820-1127
CA	San Jose, Silicon Valley Sls.	408-286-7510
CA	Tarzana, High Voltage Sls.	213-881-9194
FL	Orlando, Glenn Tech. Sls. Co.	305-299-8700
IL	Chicago, Esco Assocs.	312-763-0800
KY	Louisville, K. W. Electronic Sls.	512-451-1860
MA	Framingham, Sullivan Tech. Sls.	617-620-0195
NJ	Leonia, Peter E. Schmitt Co.	201-944-2806
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Cazenovia, S. T. Woolard	315-655-8145
OH	Dayton, K. W. Electronic Sls.	513-890-2150
PA	Washington Crossing, DVS Company	215-493-4642
TX	Dallas, Cunningham Comps. Corp.	214-233-4303
TX	Houston, Cunningham Comps. Corp.	713-461-4197

C-TEK
INCORPORATED

C-TEK INC., 4 Railroad Ave., Wakefield, MA 01880, Tel: 617-246-1720, Telex: 882485; Empl.: 15; *Sls. Mgr.:* John Vanaman .... **3**•1126, 1127

Local Sales Offices & Reps

CO	Boulder, Measurement Consits. of CO	303-499-7506
CT	Ansonia, R. H. Sturdy Co.	203-734-2186
MA	Waltham, Calibron Instrs.	617-894-6440
MA	Wellesley Hills, R. H. Sturdy Co.	617-235-2330
MI	Southfield, Fred H. Gehrke & Assocs.	313-559-5363
MN	St. Paul, Northstar Motion & Control	612-770-5311
NY	Clarence, Trott Elctrns.	716-634-8500
NY	Pittsford, Trott Elctrns.	716-586-8251
NY	Syosset, Motion Control Sls.	516-921-5656
NC	Charlotte, Jake Rudisill Assocs.	704-377-6901
NC	Charlotte, Trott Elctrns.	704-376-2237
PA	Carnegie, N. H. Andrews Co.	412-279-5335
VA	Richmond, Jake Rudisill Assocs.	804-320-0201
WA	Seattle, Eicher-Richards Co.	206-523-7888

CTI-CRYOGENICS, 266 Second Ave, Waltham, MA 02254, Tel: 617-890-9400, Telex: 92-3442; Empl.: 350; *Sls. Mgr.:* R. A. Bryce

CTS® CORPORATION*

CTS CORP., 905 North West Blvd., Elkart, IN 46514, Tel: 219-293-7511, TWX: 810-294-2167; Empl.: 6,800; *Dist. Mgr.:* J. C. Wells

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400

CA	Pleasanton, CTS Corp.	415-462-6635
CA	South Pasadena, CTS Corp.	213-682-1137
CO	Denver, ELCOM	303-337-2300
CT	North Haven, CompRep Assocs.	203-239-9762
FL	Altamonte Springs, Electrocomp Assocs.	305-331-0173
FL	Deerfield Beach, Electrocomp Assocs.	305-429-0802
FL	Melbourne, Electrocomp Assocs.	305-242-0621
FL	St. Petersburg, Electrocomp Assocs.	813-327-9677
GA	Norcross, Interep Assocs.	404-449-8680
IL	Addison, CTS Corp.	312-543-5021
IN	Indianapolis, Elctrn. Reps.	317-894-1414
IA	Cedar Rapids, Seltec Sls. Corp.	319-393-1114
KS	Overland Park, Advanced Tech. Sls.	913-642-6675
MD	Baltimore, Professional Reps.	301-653-3600
MA	Westwood, CompRep Assocs.	617-329-3454
MI	Grand Rapids, J. L. Montgomery Assocs.	616-774-9308
MI	Southfield, J. L. Montgomery Assocs.	313-358-2616
MN	Minneapolis, Robert W. Marshall Co.	612-929-0457
MO	St. Louis, Advanced Tech. Sls.	314-227-4448
NM	Albuquerque, Compass Mktg. & Sls.	505-292-7377
NY	E. Syracuse, Nycom	315-437-8343
NY	Jamaica, S-J Sales Assocs.	212-291-3232
NC	Raleigh, Zucker Assocs.	919-782-8433
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OK	Tulsa, Southern States Mktg.	918-665-8338
PA	Mars, Baehr, Greenleaf & Assocs.	412-776-2151
PA	Trevose, P.S.A. Inc.	215-245-0513
TN	Greeneville, Interep Assocs.	615-639-3491
TX	Austin, Southern States Mktg.	512-452-9459
TX	Houston, Southern States Mktg.	713-558-4900
TX	Richardson, Southern States Mktg.	214-238-7500
UT	Salt Lake City, ELCOM	801-532-7940
WA	Bellevue, SD-R^2 Prods. & Sls.	206-747-9424
EXP	Elkhart, Indiana, CTS Corp.	219-293-7511
PR	Mayaguez, CompRep de Puerto Rico	809-832-9529

CTS CORPORATION, Asheville Division, P.O. Box 100, Skyland, NC 28776, Tel: 704-684-6451, TWX: 510-935-0059; *Sls. Mgr.:* T. B. Haney

CTS® CORPORATION*
BERNE DIVISION

CTS OF BERNE, 406 Parr Rd., Berne, IN 46711, Tel: 219-589-3111, TWX: 810-323-1580; Empl.: 975; *Sls. Mgr.:* James A. Long ..... **1A**•1836-1844, 2036

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Pleasanton, CTS Corp.	415-462-6635
CA	South Pasadena, CTS Corp.	213-682-1137
CO	Denver, ELCOM	303-337-2300
CT	N. Haven, CompRep Assocs.	203-239-9762
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
FL	Melbourne, Electrocomp Assocs.	305-242-0621
FL	St. Petersburg, Electrocomp Assocs.	813-327-9677
GA	Norcross, Interep Assocs.	404-449-8680
IL	Addison, CTS Corp.	312-543-5021
IN	Elkhart, CTS Corp.	219-293-7511
IA	Cedar Rapids, Seltec Sls. Corp.	319-393-1114
KS	Overland Park, Advanced Tech. Sls.	913-492-4333
MD	Baltimore, Professional Reps.	301-653-3600
MA	Westwood, CompRep Assocs.	617-329-3454
MI	Grand Rapids, J. L. Montgomery Assocs.	616-774-9308
MI	Southfield, J. L. Montgomery Assocs.	313-358-2616
MN	Minneapolis, Robert W. Marshall Co.	612-929-0457
MO	St. Louis, Advanced Tech. Sls.	314-227-4448
NJ	Haddonfield, Tritek Sls.	609-429-1551
NM	Albuquerque, Compass Mktg. & Sls.	505-292-7377
NY	E. Syracuse, Nycom	315-437-8343
NY	Jamaica, S-J Sales Assocs.	212-291-3232
NC	Raleigh, Zucker Assocs.	919-782-8433
OH	Cincinnati, Baehr, Greenleaf & Assocs.	513-891-3827
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OR	Beaverton, SD-R^2 Prods. & Sls.	503-641-7377
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TN	Knoxville, Interep Assocs.	615-584-0191
TX	Addison, Southern States Mktg.	214-248-8600
TX	Austin, Southern States Mktg.	512-452-9459
TX	Houston, Southern States Mktg.	713-988-0991
UT	Salt Lake City, ELCOM	801-532-7940
VA	Charlottesville, Professional Reps.	804-977-0031
WA	Bellevue, SD-R^2 Prods. & Sls.	206-747-9424
PR	Mayaguez, CompRep de Puerto Rico	809-832-9529

Local Distributors

AL	Huntsville, Hall-Mark/Huntsville	205-837-8700
AL	Huntsville, RM Electronics Co.	205-852-1550
AZ	Phoenix, R. V. Weatherford Co.	602-272-7144
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Marshall Inds.	602-968-6181
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Canoga Park, Marshall Inds.	213-999-5001
CA	Chatsworth, Arrow/Los Angeles	213-701-7500
CA	El Monte, Marshall Inds.	213-442-7204
CA	Gardena, Bell Inds.	213-515-1800
CA	Glendale, R. V. Weatherford Co.	213-849-3451
CA	Hayward, Allied Elctrns.	415-487-5250
CA	Hayward, Arrow/Primary West	415-487-4300
CA	Irvine, Marshall Inds.	714-556-6400
CA	Irvine, Ratel/Irvine	714-549-8611
CA	Los Angeles, Western Electromotive	213-820-3777
CA	Newport Beach, Arrow/Newport Beach	714-851-8961
CA	San Diego, Marshall Inds.	619-578-9600
CA	San Diego, Western Electromotive/Intercon	619-271-4511
CA	San Diego, R. V. Weatherford Co.	619-695-1700
CA	San Diego, Arrow/San Diego	619-565-4800
CA	San Jose, Ratel/San Jose	408-946-4300
CA	Santa Clara, Western Electromotive	408-985-7411
CA	Sunnyvale, Arrow/Sunnyvale	408-745-6600
CA	Sunnyvale, Bell Inds.	408-734-8570
CO	Denver, Integrated Elctrns. Co.	303-534-6121
CO	Denver, Arrow/Denver	303-758-2100
CO	Englewood, R. V. Weatherford Co.	303-428-6900
CO	Englewood, Industrial Elctrns.	303-694-9444
CO	Lakewood, Ratel/Denver	303-232-8830
CT	Wallingford, Arrow/Wallingford	203-265-7741
CT	Wallingford, Midan Elctrns.	203-265-2077
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Dania, Summit Distrs.	305-920-6253
FL	Ft. Lauderdale, Arrow/Ft. Lauderdale	305-971-7160
FL	Ft. Lauderdale, Hall-Mark/Ft. Lauderdale	305-971-9280
FL	Longwood, MRP Micro Elctrns.	305-331-8787
FL	Orlando, Hall-Mark/Orlando	305-855-4020
FL	Orlando, Marshall Inds.	305-841-1878
FL	Palm Bay, Arrow/Palm Bay	305-725-1480
GA	Norcross, Arrow/Norcross	404-449-8252
GA	Norcross, Hall-Mark/Norcross	404-447-8000
IL	Bensenville, Hall-Mark/Elk Grove Vlg.	312-860-3800
IL	Chicago, Bell Inds.	312-982-9210
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Lombard, RM Electronics Co.	312-932-5150
IL	Schaumburg, Arrow/Schaumburg	312-893-9420
IN	Indianapolis, RM Electronics Co.	317-247-9701
IN	Indianapolis, Arrow/Indianapolis	317-243-9353
KS	Lenexa, Hall-Mark/Kansas City	913-888-4747
MD	Baltimore, Hall-Mark/Baltimore	301-796-9300
MD	Baltimore, RESCO/Baltimore	301-823-0070
MD	Baltimore, Arrow/Baltimore	301-247-5200
MD	Beltsville, RESCO/Washington	301-937-9100
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Woburn, Time Elctrns.	617-935-8080
MA	Woburn, Arrow/Boston	617-933-8130
MI	Ann Arbor, Arrow/Ann Arbor	313-971-8220
MI	Grand Rapids, Arrow/Grand Rapids	616-233-0912
MI	Grand Rapids, RM Electronics Co.	616-531-9300
MI	Kalamazoo, RS Electronics	616-381-5470
MI	Livonia, RS Electronics	313-525-1155
MN	Bloomington, Hall-Mark/Minneapolis	612-854-3223
MN	Edina, Arrow/Edina	612-830-1800
MN	Minneapolis, Industrial Comps.	612-831-2666
MN	Plymouth, Marshall Inds.	612-559-2255
MO	Maryland Heights, Hall-Mark/St. Louis	314-291-5350
MO	St. Louis, Arrow/St. Louis	314-567-6888
MO	St. Louis, Olive Elctrns.	314-426-4500
NE	Lincoln, Scott Elctrn. Supp.	402-466-8221
NE	Omaha, Scott Elctrn. Supp.	402-734-6750
NJ	Cherry Hill, Hall-Mark/New Jersey	215-355-7300
NJ	Fairfield, Arrow/New Jersey	201-575-5300
NJ	Fairfield, Marshall Inds.	201-882-0320
NJ	Moorestown, Arrow/Moorestown	215-928-1800
NJ	Nutley, Vantage Comps.	201-667-1840
NM	Albuquerque, Arrow/Albuquerque	505-243-4566
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Buffalo, Summit Distrs.	716-884-3450
NY	East Syracuse, Marshall Inds.	315-432-0644
NY	Endwell, Marshall Inds.	607-754-1570
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Farmingdale, Arrow Intl.	516-694-6800
NY	Hauppauge, Fairmont Elctrn. Sls.	516-231-3313
NY	Hauppauge, Arrow/Long Island	516-694-6800
NY	Jamaica, Archer Indl. Dist.	212-291-3232
NY	Liverpool, Arrow/Syracuse	315-652-1000
NY	Mount Vernon, QAR Electronics	914-699-2224
NY	Rochester, Arrow/Rochester	716-275-0300
NY	Rochester, Marshall Inds.	716-235-7620
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Rochester, Summit of Rochester	716-334-8110
NY	Rome, Rome Elctrns.	315-337-5400
NC	Raleigh, Hall-Mark/Raleigh	919-832-4465
NC	Raleigh, Arrow/Raleigh	919-876-3132
NC	Raleigh, RESCO/Raleigh	919-781-5700
NC	Winston-Salem, Arrow/Winston-Salem	919-725-8711
OH	Centerville, Arrow/Dayton	513-435-5563
OH	Cincinnati, Arrow/Cincinnati	513-761-5432
OH	Dayton, Marshall Inds.	513-236-8088
OH	Highland Heights, Hall-Mark/Cleveland	216-473-2907
OH	Solon, Arrow/Solon	216-248-3990
OH	Westerville, Hall-Mark/Columbus	614-891-4555
OK	Tulsa, Hall-Mark/Tulsa	918-665-3200
OR	Lake Oswego, Moore Elctrns.	503-635-8823
PA	McKean, Advacom	814-476-7774
PA	Monroeville, Arrow/Pittsburgh	412-351-4000
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Philadelphia, TRW Elctrns. Supp.	215-922-8900
TX	Addison, Captronics/Dallas	214-980-0123
TX	Austin, Arrow/Austin	512-835-4180
TX	Austin, Captronics/Austin	512-459-4328
TX	Dallas, Arrow/Dallas	214-386-7500
TX	Dallas, R. V. Weatherford Co.	214-980-1110
TX	Dallas, Hall-Mark/Dallas	214-341-1147
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, R. V. Weatherford Co.	713-688-7406
TX	Stafford, Southwest Elctrns.	713-491-4900
TX	Stafford, Arrow/Houston	713-491-4100
UT	Salt Lake City, Standard Supply Co.	801-486-3371
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Arrow/Seattle	206-643-4800
WA	Seattle, Zepher Elctrn. Sls. Corp.	206-241-1980
WA	Seattle, R. V. Weatherford Co.	206-575-1340
WA	Seattle, Western Electromotive	206-575-1910
WI	Oak Creek, Arrow/Wisconsin	414-764-6600
WI	Oak Creek, Hall-Mark/Oak Creek	414-761-3000

CTS ELECTRONICS CORP., PASO ROBLES DIV., Electromechanical Gp., 500 Linne Rd., Paso Robles, CA 93446, Tel: 805-238-0350, TWX: 910-351-6796; *Sls. Mgr.:* Jack Bell; *Dist. Mgr.:* Bob Tarkenton ..... **1B**•1576-1580

CTS FABRI-TEK, INC., Connector Div., 9210 Science Center Dr., Minneapolis, MN 55428, Tel: 612-533-3533, TWX: 910-576-2717; Empl.: 300; *Sls. Mgr.:* John B. McKee ..... **2**•1246-1248

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Phoenix, Compass Mktg.	602-266-5400
CA	South Pasedena, CTS Corp.	213-682-1137
CO	Denver, ELCOM, Inc.	303-337-2300
CT	Danbury, CTS Corp.	203-743-3681
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
GA	Norcross, Interep	404-449-8680
IL	Addison, CTS Corp.	312-543-5021
IN	Indianapolis, Elctrn. Rep.	317-894-1414
IA	Cedar Rapids, Seltec	319-393-1114
MD	Baltimore, Pro Representatives	301-653-3600
MI	Southfield, J. L. Montgomery	313-358-2616
MN	Minneapolis, S & R Sls.	612-559-3090
NY	Jamaica, S. J. Assocs.	212-291-3232
NY	Pittsford, Kirby Mktg.	716-248-8750
NC	Raleigh, Zucker Assocs.	919-782-8433
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OK	Tulsa, Southern States Mktg.	918-665-8338
OR	Portland, SD-R⅜¢2 Prods.	503-297-8677
PA	Trevose, PSA, Inc.	215-245-0513
TN	Knoxville, Interep Assocs.	615-584-0191
TX	Dallas, Southern States Mktg.	214-238-7500
TX	Houston, Southern States Mktg.	713-558-4900
UT	Salt Lake City, ELCOM, Inc.	801-532-7940
VA	Charlottesville, Pro Representatives	804-977-0031
WA	Bellevue, SD-R^2 Prods. & Sls.	206-747-9424

CTS FABRI-TEK, INC., 6900 Shady Oak Rd., Eden Prairie, MN 55344, Tel: 612-941-9100, TWX: 910-576-2913; FSC No.: 21542; Empl.: 1400; *Sls. Mgr.:* Bruce Richardson

CTS KNIGHTS, 400 Reimann Ave., Sandwich, IL 60548, Tel: 815-786-8411, TWX: 910-642-0860; Empl.: 500; *Sls. Mgr.:* Larry Barbary; *Dist. Mgr.:* Larry Barbary ..... **1A**•1333-1345

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Pleasanton, CTS Corp.	415-462-6635
CA	S. Pasadena, CTS Corp.	213-682-1137
CO	Denver, Elcom	303-337-2300
CT	North Haven, CompRep Assocs.	203-239-9762

FL	Deerfield Beach, Electrocomp Assocs.	305-429-0802
FL	Melbourne, Electrocomp Assocs.	305-242-0621
FL	St. Petersburg, Electrocomp Assocs.	813-327-9677
GA	Norcross, Interep Assocs.	404-449-8680
IL	Addison, CTS Corp.	312-543-5021
IN	Indianapolis, E.R.I.	317-894-1414
IA	Cedar Rapids, Seltec Sls. Corp.	319-393-1114
KS	Overland Park, Advanced Tech. Sls.	913-642-6674
MD	Baltimore, Pro Rep	301-653-3600
MA	Westwood, CompRep Assocs.	617-329-3454
MI	Grand Rapids, J. L. Montgomery Assocs.	616-774-9308
MI	Southfield, J. L. Montgomery Assocs.	313-358-2616
MN	Minneapolis, Robert W. Marshall Co.	612-929-0457
MO	St. Louis, Advanced Tech. Sls.	314-227-4448
NM	Albuquerque, Compass Mktg. & Sls.	505-292-7377
NY	E. Syracuse, Nycom	315-437-8343
NY	Jamaica, S-J Sales Assocs.	212-291-3232
NC	Raleigh, Zucker Assocs.	919-782-8433
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
TN	Greeneville, Interep Assocs.	615-639-3491
TX	Austin, Southern States Mktg.	512-452-9459
TX	Houston, Southern States Mktg.	713-558-4900
TX	Richardson, Southern States Mktg.	214-238-7500
UT	Salt Lake City, Elcom	801-532-7940
WA	Bellevue, SD-R^2 Prods. & Sls.	206-747-9424

CTS MICROELECTRONICS, INC., 1201 Cumberland Ave., W. Lafayette, IN 47906, Tel: 317-463-2565, TWX: 810-342-1882; Empl.: 505; *Sls. Mgr.:* David C. Anderson ....1A•1646-1651

Refer to CTS Corp. for distributor & sales office information

CTS HALEX, 1202 McGaw Ave., Irvine, CA 92714, Tel: 714-556-2850, TWX: 910-595-2648; Empl.: 70; *Sls. Mgr.:* Gene P. Markley

Refer to CTS Corp for distributor & sales office information.

CTS METAL PRODS., Jose Division, 660 Lenfest Rd., San Jose, CA 95113, Tel: 408-251-1600, Telex: 910-997-8006; Empl.: 500; *Sls. Mgr.:* Ed King; *Dist. Mgr.:* Charles Nadler

CUESTA SYSTEMS, INC., 3440 Roberta Ct., San Luis Obispo, CA 93401, Tel: 805-541-4160; *Sls. Mgr.:* David V. Dickey

CUPLEX, INC., 1500 E. Hwy. 66, Garland, TX 75040, Tel: 214-276-0333, TWX: 910-860-5098; *Sls. Mgr.:* Grady C. Young

CURRENTECHNOLOGY CORP., 135 Prestige Pk. Circle, E. Hartford, CT 06108, Tel: 203-289-6831, TWX: 710-425-6063; *Sls. Mgr.:* Bob Ramage

CURTIS ELECTRO DEVICES, INC., Box 4090, Mountain View, CA 94040, Tel: 415-964-3846; Empl.: 12; *Sls. Mgr.:* J. Curtis

CURTIS INDS., 8000 West Tower Ave., Milwaukee, WI 53223, Tel: 414-354-1500, TWX: 910-262-3035; Empl.: 160

CURTIS

CURTIS INSTRS., INC., 200 Kisco Ave., Mt. Kisco, NY 10549, Tel: 914-666-2971, TWX: 710-571-2163; FSC No.: 18530; Empl.: 95; *Sls. Mgr.:* Rhoda McDonald ....3•1128

Local Sales Offices & Reps

AZ	Phoenix, O'Donnell Assoc.	602-944-9542
CA	Burlingame, Polach & Bensinger	415-697-2525
CA	Seal Beach, Texel Engrg.	213-596-9411
CO	Littleton, Grifco	303-795-1989
FL	Longwood, NSL Assocs.	305-629-5226
IL	La Grange Park, Bierhaus Sls.	312-354-5100
IN	Ft. Wayne, Aktron Sls.	219-747-3650
MA	Brookline, Harman Assocs.	617-232-6687
MN	Minnetonka, S. J. Collins	612-933-7661
NY	Manhasset, WinCor Elctrn. Sls. Corp.	516-627-9474
NY	Syracuse, C & L Sales	315-451-7810
OH	Chagrin Falls, K. F. Naverz	216-338-8450
PA	Media, W. Reeves Assocs.	215-566-6709
TX	Dallas, Etron Corp.	817-430-8422
WA	Lynnwood, Blum & Assocs.	206-775-6656
WI	Milwaukee, Bierhaus Sls.	414-963-0318

CUSHMAN ELCTRNS., 2450 N. 1st St., San Jose, CA 95131, Tel: 408-263-8100, TWX: 810-338-0556; Empl.: 400; *Sls. Mgr.:* Harris Fuller

CUSTOM CABLE, 242 Butler, Westbury, NY 11590, Tel: 516-334-3600; Empl.: 13; *Sls. Mgr.:* J. Michelman; *Dist. Mgr.:* D. Pollack

CUSTOM COIL & TRANSFORMER CO., Box 2369, Zanesville, OH 43701, Tel: 614-452-6973, TWX: 810-238-2629; Empl.: 80

CUSTOM CONNECTOR, 1738 E. 30th St., Cleveland, OH 44114, Tel: 216-241-1679; Empl.: 36; *Sls. Mgr.:* Larry Weider ....2•1249

Local Sales Offices & Reps

CA	Mountain View, Westech Sls.	415-961-1422
CT	Glastonbury, Barton Assoc.	203-633-9417
FL	Longwood, Vic Murray & Assoc.	305-831-0877
IL	Arlington Hgts., Langdon Engrg.	312-364-0830
MD	Baltimore, Haacke Assoc.	301-889-7875
MA	Waban, Barton Assoc.	617-965-8590
NC	Charlotte, J.W.L. Assoc.	704-523-3001
WI	Shorewood, Werking Ind. Sls.	414-964-2225

CUSTOM CONTROL SYS., 21 E. Canon Perdido St., Santa Barbara, CA 93101, Tel: 805-965-7577; Empl.: 2; *Sls. Mgr.:* Fred Winter

CUSTOM ELCTRNS., Browne St., Oneonta, NY 13820, Tel: 607-432-3880, TWX: 510-241-8292; FSC No.: 23280; Empl.: 100; *Sls. Mgr.:* D. Hathaway

CUSTOM PRODS. GRP., Sys. Dev. Corp.-A Burroughs Co., P.O. Box 517, Paoli, PA 19301, Tel: 215-648-2241, Telex: 215-647-9961, TWX: 510-668-7243; *Sls. Mgr.:* Spiro Greenwood; *Dist. Mgr.:* Joseph Benn

CUSTOM SCI. INSTRS., 13 Wing Dr., Cedar Knolls, NJ 07927, Tel: 201-538-8500, Telex: 25-4328; Empl.: 20; *Sls. Mgr.:* Henry J. Bultman, Jr.

CUTLER HAMMER GRP., EATON CORP., Aerospace Controls/Systems Div., 2074 Whitfield Ave. East, Sarasota, FL 33578, Tel: 813-758-7726

CUTLER-HAMMER, INC., SHALLCROSS RESISTOR PRODS., See Shallcross, Inc.

CUTLER-HAMMER PRODS., See Eaton Corp./Cutler-Hammer Prods.

CVC PRODS., 525 Lee Rd., Rochester, NY 14603, Tel: 716-458-2550, Telex: 97-8269; Empl.: 160; *Sls. Mgr.:* Steven Rothstein

CYBERNETIC MICRO SYS., P.O. Box 3000, 3000 Hwy. 84, San Gregorio, CA 94074, Tel: 415-726-3000, Telex: 171-135 Attn: CYBERNETICS; *Sls. Mgr.:* K. Moty

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CYBERSONIC CORP., Box 38, Glenside, PA 19038, Tel: 215-885-1734, Telex: 83-4753; Empl.: 11; *Sls. Mgr.:* Norman Rivers

Local Distributors

CA	Los Angeles, Automation Sys. & Svcs.	213-776-2424
MA	Wellesley Hills, Electro-Mechanical Distr.	617-235-1565
MI	Royal Oak, D. T. Randall Assocs.	313-546-5707
MN	St. Paul, Power/Mation Div.	612-645-0781
OH	Cincinnati, A.T.R. Distrbg.	513-574-8500
OH	Cleveland, Adcor Engrg.	216-238-3915
WI	Waukesha, Power/Mation	414-542-2868

CYBERSYSTEMS, INC., 7540 South Memorial Pkwy., Huntsville, AL 35802, Tel: 205-883-4410; FSC No.: 66; Empl.: 25; *Sls. Mgr.:* Mike Long

CYBER SYS., INC., 2031 E. Cerritos Ave., Anaheim, CA 92806, Tel: 714-722-2051, Telex: 692-375; *Sls. Mgr.:* Charles Muhle

CYCLO-TRONICS, INC., 1345 N. Old Rand Rd., Wauconda, IL 60084, Tel: 312-526-0800; Empl.: 10

CYTEC CORP., 107 N. Washington St., E. Rochester, NY 14445, Tel: 716-381-4740; *Sls. Mgr.:* Harry Turner ....3•1213

Local Sales Offices & Reps

FL	Osprey, Dick Ridgewell Co.	813-966-4401
MA	Burlington, Tritek	617-272-4550
NY	Frankfort, Kapital Sls.	315-896-4225

DABURN ELCTRNS. & CABLE, 70 Oak St., Norwood, NJ 07648, Tel: 201-768-5400, TWX: 710-991-9856; FSC No.: 25706; *Sls. Mgr.:* Randy Hibshman ....2•2083-2093

Local Sales Offices & Reps

AR	Little Rock, Leo Barker	501-835-0978
CA	Anaheim, Galaxie Sales	714-752-1580
CA	Redwood City, Hickey Ind'l. Sls.	415-368-3840
FL	Casselberry, HA Inc.	305-695-8592
FL	Coral Springs, H A Inc.	305-752-7520
IL	Elgin, Marican Sls.	312-888-2207
IN	Indianapolis, Sukup & Cox	317-253-5501
MA	No. Scituate, W. A. Hendrickson	617-545-0652
MN	Minneapolis, RIL Sls.	612-786-5713
NY	Fairport, Paul Arness Assoc.	716-223-4923
NY	N.Y.C., Robt. Smith Assoc.	212-541-4885
NY	Plainview, R. Smith Assoc.	516-681-3155
OH	Cinn, John Olsen Co.	513-574-7711
OH	Goshen, John Olsen Co.	513-722-1497
OR	Beaverton, R & R Assocs.	503-644-8077
PA	King of Prussia, Freedman-Malta	215-337-9211
PA	Pittsburgh, John Olsen Co.	412-279-2550
TX	Richardson, Eagle Marketing	214-238-5383
VA	Arlington, Howard Golonpaul & Assoc.	703-525-5898
WA	Kent, R & R Assocs.	206-251-5396

DADEN ASSOCS., 23011 Moulton Pkwy., Ste. A12, Laguna Hills, CA 92653, Tel: 714-770-1522, TWX: 910-596-1324; FSC No.: 57032; Empl.: 21; *Sls. Mgr.:* Dennis Hook

DAICO INDUSTRIES, INC.

DAICO INDS., INC., Box 5225, Compton, CA 90224, Tel: 213-631-1143, TWX: 910-346-6741; FSC No.: 28983; Empl.: 115; *Sls. Mgr.:* James Adamson ....1A•1692-1703

Local Sales Offices & Reps

AZ	Phoenix, Faser Tech. Sls.	602-948-4404
CA	Los Altos, Cain-White & Co.	415-948-6533
CA	Los Angeles, Midwin & Olifson	213-838-3455
CA	San Diego, Midwin & Olifson, Inc.	619-571-0177
FL	Palm Bay, Spartech Assocs.	305-727-8045
GA	Smyrna, Spartech Assocs.	404-432-3644
IL	Mt. Prospect, Cain-Forlaw Co.	312-253-3578
ME	Ogunquit, Micronic Assocs.	617-933-2121
MD	Burtonsville, Eastern Instrmn.	301-384-8500
NY	Hartsdale, Spectrum Sls.	914-472-8600
OH	Lancaster, Cain-Forlaw Co.	614-654-4800
PA	Newtown Square, SWR Assocs.	215-353-6711
TX	Dallas, McDonald Assocs.	214-238-1858
TX	Ft. Worth, McDonald Assocs.	817-429-4272

DAI-ICHI SHOJI OF AMER., INC., 150 Fifth Ave., New York, NY 10011, Tel: 212-691-9050, Telex: 429120 DSANY; Empl.: 3; *Sls. Mgr.:* A. Takayama ....1A•1064; 1B•1583; 2•1254

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DALE ELECTRONICS, INC., Columbus Div., Box 609, 2064 12th Ave., Columbus, NE 68601, Tel: 402-564-3131, TWX: 910-626-8314; FSC No.: 91637; Empl.: 2800; *Sls. Mgr.:* Darrel Smejkal; *Dist. Mgr.:* Jerry Jilek ....1B•1032-1034

Local Sales Offices & Reps

AL	Huntsville, JWL Assoc.	205-536-8410
AZ	Tempe, Dale Elctrns. Sls.	602-966-0291
CA	Los Alamitos, Reed Elctrn. Mktg.	213-598-6676
CA	Redwood City, J. S. Heaton Co.	415-367-9000
CA	San Diego, Reed Elctrn. Mktg.	619-452-1456
CO	Loveland, Dale Elctrns. Sls.	303-667-7500

CT	West Hartford, Kaelber & Mack, Inc.	203-667-4514
FL	Lake Park, Graham Assocs.	305-622-4049
FL	Melbourne, Graham Assocs.	305-773-6631
FL	Winter Garden, Graham Assocs.	305-656-9369
GA	Marietta, JWL Assoc.	404-429-8010
IL	Chicago, Indl. Reps.	312-647-7755
IN	Fort Wayne, Scott Elctrns.	219-484-7865
IN	Indianapolis, Scott Elctrns.	317-897-9976
KS	Shawnee Mission, Dale Sls.	913-432-9140
MD	Millersville, Tri-Mark	301-987-9103
MA	Wakefield, Howard C. Jappe Co.	617-245-9359
MI	Plymouth, Jay Mktg. Assoc.	313-459-1200
MN	Bloomington, Merrill Franklin Co.	612-854-9446
NJ	Fairlawn, Kaelber & Mack	201-797-7782
NJ	Oakland, Kaelber & Mack, Inc.	201-337-4520
NY	Commack, Kaelber & Mack	516-499-2924
NY	Ithaca, Dale Elctrns. Sls.	607-272-6212
NC	Charlotte, JWL Assoc.	704-523-3001
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Dayton, Scott Elctrns. Inc.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
OR	Beaverton, LD Elctrns.	503-649-6177
PA	Horsham, TMI	215-441-4300
PA	Pittsburgh, Scott Elctrns.	412-963-6116
TX	Dallas, E. F. Aymond Co.	214-826-7620
TX	Houston, E. F. Aymond Co.	713-880-8229
TX	San Antonio, E. F. Aymond Co.	512-366-1526
VA	Lynchburg, Tri-Mark	804-528-0681
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883
WI	Milwaukee, Indl. Reps.	414-259-0965

Local Distributors

AL	Huntsville, Hamilton/Avnet	205-837-7210
AZ	Tempe, Acacia Sls. Inc.	602-894-2874
AZ	Tempe, T.T.I., Inc.	602-966-1616
AZ	Tempe, Hamilton/Avnet	602-231-5100
AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Avnet Elctrns.	818-700-2600
CA	Chatsworth, Shelly Elctrns.	818-998-3333
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Culver City, Hamilton Electro Sls.	213-558-2121
CA	Huntington beach, Inductor Supp. Inc.	714-891-4524
CA	Irvine, Acacia Sls.	213-971-2428
CA	N. Hollywood, T.T.I., West	213-982-0201
CA	Sacramento, Hamilton/Avnet	916-925-2216
CA	San Diego, Acacia Sls. Inc.	619-565-4365
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Diego, Hamilton/Avnet	619-571-7510
CA	San Jose, T.T.I., Inc.	408-943-9155
CA	San Jose, Shelley Elctrns.	408-942-9111
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Sunnyvale, Hamilton/Avnet	408-734-3355
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Commerce City, Waco Elctrns.	303-289-4743
CO	Denver, Newark Elctrns.	303-757-3351
CO	Englewood, Hamilton/Avnet	303-779-9998
CO	Lakewood, Acacia Sls. Inc.	303-232-2882
CT	Danbury, Hamilton/Avnet	203-797-2800
CT	Stratford, Electro/Comp.	203-375-5811
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
FL	Ft. Lauderdale, Hamilton/Avnet	305-971-2900
FL	Largo, Lodan Elctrns.	813-586-2851
FL	Orlando, T.T.I., II	305-859-1000
FL	Palm Beach Gardens, Legri S. Resistor	305-845-7101
FL	St. Petersburg, Hamilton/Avnet	813-576-3930
FL	Winter Park, Hamilton/Avnet	305-628-3888
GA	Norcross, Hamilton/Avnet	404-447-7507
IL	Bensenville, Hamilton/Avnet	312-860-7700
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Ind.	312-982-9210
IL	Crystal Lake, Sub-Sem	815-459-4139
IL	Palatine, Ohm Elctrns.	312-359-5500
IN	Carmel, Hamilton/Avnet	317-844-9333
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Graham Elec.	317-634-8202
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KS	Overland Park, Hamilton/Avnet	913-888-8900
KS	Wichita, RSC Elec.	316-267-5213
MD	Baltimore, RESCO	301-823-0070
MD	Columbia, Hamilton/Avnet	301-995-3500
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Waltham, Sterling Elctrns.	617-894-6200
MA	Woburn, T.T.I.	617-938-8800
MA	Woburn, Hamilton/Avnet	617-273-7500
MI	Grand Rapids, S-F Elctrn. Supp.	616-459-0216
MI	Grand Rapids, Newark Elec.	616-241-6681
MI	Grand Rapids, Hamilton/Avnet	616-243-8805
MI	Livonia, R-S Elctrns.	313-525-1155
MI	Livonia, Hamilton/Avnet	313-522-4700
MI	Livonia, Reptron Elctrns.	313-525-2700
MI	Oak Park, Newark Elec.	313-967-0600
MN	Minneapolis, Stark Elctrns.	612-332-1325
MN	Minnetonka, Hamilton/Avnet	612-932-0600
MO	Earth City, Hamilton/Avnet	314-344-1200
NJ	Cherry Hill, Hamilton/Avnet	609-424-0100
NJ	Cranford, G.S.I. Elec.	201-272-6400
NJ	Fairfield, Hamilton/Avnet	201-575-3390
NJ	Kenilworth, Federated Purchaser	201-272-0505
NJ	Springfield, Newark Elctrns.	201-376-9500
NM	Albuquerque, Hamilton/Avnet	505-765-1500
NY	Bohemia, L.I., T.T.I., New York	516-567-1500
NY	Buffalo, Summit Dist.	716-884-3450
NY	E. Syracuse, Hamilton/Avnet	315-437-2641
NY	Endwell, A.S.I. Elctrns.	607-754-3823
NY	Farmingdale, Command Elctrns.	516-293-1212
NY	Hauppauge, Fairmont	516-231-3313
NY	Melville, Hamilton/Avnet	516-454-6060
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Hamilton/Avnet	716-475-9130
NY	Rockville Centre, Midway Indl.	516-293-6800
NY	Rome, Rome Elctrns.	315-337-5400
NY	Valley Stream, L&S Elctrns.	516-561-2474
NY	W. Hempstead, March Elctrns.	516-486-6511
NC	Raleigh, Hamilton/Avnet	919-878-0810
NC	Raleigh, RESCO	919-781-5700
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cleveland, Pioneer Standard	216-587-3600
OH	Cleveland, Hamilton/Avnet	216-831-3500
OH	Cleveland, W. M. Pattison Supp.	216-441-3000
OH	Columbus, Camelot/Ohio	614-294-7169
OH	Dayton, Hamilton/Avnet	513-433-0610
OH	Dayton, Stotts-Friedman Co.	513-298-5555
OH	Dayton, Pioneer Standard	513-236-9900
OH	Lima, LRP Elctrns.	419-228-1220
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Beaverton, Acacia Sls.	503-646-3377
OR	Lake Oswego, Hamilton/Avnet	503-635-8831
OR	Portland, Radar Elec.	503-232-3404
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Pittsburgh, CAM/RPC	412-782-3770
PA	Reading, Barbery Elctrns.	215-376-7451
PA	York, E.C.I., Inc.	717-843-8971
TX	Austin, Hamilton/Avnet	512-837-8911
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Ft. Worth, T.T.I., Inc.	817-831-0441
TX	Houston, Hamilton/Avnet	713-780-1771
TX	Houston, Lenert Co.	713-225-1465
TX	Houston, Sterling Elctrns.	713-627-9800
TX	Irving, Hamilton/Avnet	214-659-4111
UT	Salt Lake City, Hamilton/Avnet	801-972-2800
WA	Bellevue, Hamilton/Avnet	206-453-5844
WA	Seattle, Radar Elec.	206-282-2511
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	New Berlin, Hamilton/Avnet	414-784-4510

DALE®

DALE ELECTRONICS, INC., El Paso Div., P.O. Box 26950, El Paso, TX 79926, Tel: 915-592-3253; FSC No.: 91637; Empl.: 272; *Sls. Mgr.:* Douglas Wagenknecht; *Dist. Mgr.:* Jerry Jilek ...**1A**•1846-1868

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE®

DALE ELECTRONICS, INC., Norfolk Div., 2300 Riverside Blvd., Norfolk, NE 68701, Tel: 402-371-0080, TWX: 910-623-0163; FSC No.: 91637; Empl.: 1200; *Sls. Mgr.:* Jim Filips; *Dist. Mgr.:* Jerry Jilek ....**1B**•1800, 1801

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE®

DALE ELECTRONICS, INC., Tempe Div., 1155 W. 23rd St., Tempe, AZ 85282, Tel: 602-967-7874, TWX: 910-950-1943; FSC No.: 22929; Empl.: 139; *Sls. Mgr.:* Mike Brown; *Dist. Mgr.:* Jerry Jilek ....**1A**•1348, 1349

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE®

DALE ELECTRONICS, INC., Yankton Div., E. Hwy. 50, Box 180, Yankton, SD 57078, Tel: 605-665-9301, TWX: 910-668-3605; FSC No.: 09969; Empl.: 400; *Sls. Mgr.:* Irvin Sterner; *Dist. Mgr.:* Jerry Jilek .... **1A**•1234-1242, 2139-2150; **2**•1250-1253

Refer to Dale Electronics, Inc., Columbus, NE for sales office and distributor information.

DALE WESTERN THERMISTOR DIVISION, See Dale Norfolk Division

DAMON/ELCTRNS. DIV., 80 Wilson Way, Westwood, MA 02090, Tel: 617-449-0800, TWX: 710-348-6722; Empl.: 90; *Sls. Mgr.:* Edward J. Doherty ....**1A**•1347

Local Sales Offices & Reps

AZ	Phoenix, Sanford Sls. Assocs.	602-957-3570
CA	N. Hollywood, Jewett Co.	213-789-8103
CA	Palo Alto, Waldman Assocs.	415-961-4100
DC	Washington, Stemler Assocs.	301-944-8262
FL	Melbourne, Repcom	305-254-1877
MD	Baltimore, Stemler Assocs.	301-944-8262
MA	Waltham, Del Tech Sls.	617-890-1020
NJ	Cherry Hill, Stemler Assocs.	609-966-4070
NJ	Hackensack, T.M.A. Assoc.	201-342-4008
NY	Cazenovia, S. T. Wollard Co.	315-655-8145
TX	Ft. Worth, El-Tec Sls.	817-268-2896

D & B POWER, INC.

D & B POWER, INC., 204 N. Fehr Way, Bayshore, NY 11706, Tel: 516-586-5955; FSC No.: 54337; Empl.: 25; *Sls. Mgr.:* Peggy Brock ....**3**•1542, 1543

Local Sales Offices & Reps

CA	Los Altos, Schwerin Merrill	415-961-0913
CA	Pasadena, Electro Mecha. Instrs.	213-795-7193
NY	East Setauket, Edgerton Elctrn.	516-751-7089

D & L SALES CO. INC., 296 Preakness Ave., Paterson, NJ 07502, Tel: 201-684-8223/8224; Empl.: 10

DANIELS MFG. CORP., 6103 Anno Ave., Orlando, FL 32809, Tel: 305-855-6161, Telex: 564321; FSC No.: 5120, 5180; Empl.: 150

DAN-L INC., 229 Laurel Rd., E. Northport, NY 11731, Tel: 516-757-8000; FSC No.: 28327; Empl.: 22

DANMAR INDS., 9705 Lurline Ave., Chatsworth, CA 91311, Tel: 818-882-7979/5280; FSC No.: 31690; Empl.: 6; *Sls. Mgr.:* Mukund Patel

DANTEL, 2991 N. Argyle Ave., Fresno, CA 93727, Tel: 209-292-1111, Telex: 35-5457; FSC No.: 56960; Empl.: 110; *Sls. Mgr.:* Peter Normandin

DANTRONICS, INC., 3175 Hafner Ct., St. Paul, MN 55112, Tel: 612-484-2108; Empl.: 22

DASH, STRAUS & GOODHUE, INC., 593 Massachusetts Ave., Boxboro, MA 01719, Tel: 617-263-2662; Empl.: 7; *Sls. Mgr.:* Ira Barry

DATA, INC., 7702 Emerald Ave., Box 2071, Ft. Collins, CO 80525, Tel: 303-493-1222; Empl.: 3; *Sls. Mgr.:* Sharon Shilling; *Dist. Mgr.:* Sharon Shilling

D.A.T.A., INC., Cordura Co., P.O. Box 26875, San Diego, CA 92126, Tel: 619-578-7600, TWX: 910-322-1340; Empl.: 39

DATA CAPTURE TECHNOLOGY, 5436-F South Mingo Rd., Tulsa, OK 74146, Tel: 918-627-7521, Telex: 796355; *Sls. Mgr.:* Gary DeShazer

DATA CHECK CORP., 10070 Willow Creek Rd., San Diego, CA 92131, Tel: 619-578-0101, TWX: 910-335-1596; FSC No.: 55792; *Sls. Mgr.:* Al Agent

DATACHRON INC., 3186 J Airway Ave., Costa Mesa, CA 92626, Tel: 714-751-2211, Telex: 678401; FSC No.: 56259; Empl.: 16; *Sls. Mgr.:* Clyde Davis

DATACOM, INC., Box 278, Ft. Walton Beach, FL 32548, Tel: 904-244-6121, TWX: 510-730-7693; Empl.: 50

dataCon

DATACON, INC., 60 Blanchard Rd., Burlington, MA 01803, Tel: 617-273-5800, Telex: 951651; Empl.: 400; *Sls. Mgr.:* John A. Marshall .... 3•1923

Local Sales Offices & Reps

CA	Chatsworth, DataCon	818-700-0600
CA	Mountain View, DataCon	415-967-5700
CA	Santa Clara, DC Electronics	408-980-1199
CO	Lakewood, Christee - Meade Co.	303-232-0287
FL	Orlando, Mackay Smith & Assoc.	305-277-1513
GA	Decatur, DataCon	404-373-1212
GA	Norcross, Mackay Smith	404-449-7444
IL	Lisle, W. G. Controls	312-963-5954
IL	Schaumburg, DataCon	312-529-7690
IN	Fort Wayne, Hoyle Assocs.	219-485-6433
MA	Burlington, DataCon	617-273-5800
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MN	St. Paul, Countryman Assoc.	612-645-9151
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NY	Bohemia, DataCon	516-589-1100
NC	Cary, Mackay Smith	919-467-5400
OH	Centerville, Micro Sls. Corp.	513-433-8171
PA	Newtown Square, Hagy Assocs.	215-459-0504
TN	Chattanooga, Mackay Smith	615-899-6951
TX	Bedford, DataCon	817-540-1479
TX	Richardson, Lear Assoc.	214-231-5388

DATA-CONTROL SYS., Commerce Dr., Box 860, Danbury, CT 06810, Tel: 203-743-9241, TWX: 710-456-0376; FSC No.: 08539; Empl.: 87

DATA CONVERSION, See Analogic Corp., Data Conversion Prods. Grp.

DATACOPY CORP., 1215 Terra Bella Ave., Mountain View, CA 94043, Tel: 415-965-7900, Telex: 701994 DATACOPY UO; *Sls. Mgr.:* Charles Joseph

data delay devices, inc.®

DATA DELAY DEVICES, 385 Lakeview Ave., Clifton, NJ 07011, Tel: 201-772-1106, TWX: 710-989-7008; Empl.: 38 .... 1A•1471-1482, 1592

Local Sales Offices & Reps

CA	El Toro, Martronix	714-855-6397
CA	Mountain View, Weseloh/Swanson	415-961-0565
TX	Dallas, West & Assocs.	214-661-9400

Local Distributors

CA	Mountain View, Target Elctrns.	415-961-1170

DATA-DESIGN LABS., P.O. Box 711, 7925 Center Ave., Cucamonga, CA 91730, Tel: 714-987-2511; Empl.: 1300; *Sls. Mgr.:* J. F. Nicholson, Exec. Vice Pres. (Operations)

DATA DEVICE CORP., See ILC Data Device Corp.

DATA DISPLAY PRODUCTS, Box 91072, Los Angeles, CA 90009, Tel: 213-674-5940, Telex: 664690; FSC No.: 15513; Empl.: 20; *Sls. Mgr.:* William F. Million

DATADYNE, Box 247, King of Prussia, PA 19406, Tel: 215-666-5751; FSC No.: 53032; Empl.: 23; *Sls. Mgr.:* James Riggs

DATA GENERAL, 4400 Computer Dr., Westboro, MA 01581, Tel: 617-366-8911, Telex: 920-329, TWX: 710-390-1217; Empl.: 14,750; *Sls. Mgr.:* Frank Keaney

DATA INSTRUMENTS INC., 4 Hartwell Pl., Lexington, MA 02173, Tel: 617-861-7450, TWX: 200081; Empl.: 250; *Sls. Mgr.:* Ernest C. Lutfy .... 1B•1840

Local Sales Offices & Reps

AZ	Mesa, RLS	602-892-9329
CA	Riverside, Jim Mitchell	714-684-6404
CA	San Carlos, Elctrn. Engrg. Assocs.	415-593-2189
CO	Boulder, Herb Bass Assocs.	303-530-7509
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Addison, John O'Keefe	312-628-6041
MA	Swampscott, John Snow	617-592-0511
MO	Kansas City, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NJ	Stockholm, Jim Musumeci	201-492-9097
NM	Las Cruces, SOTA-COM	505-523-4480
NC	Charlotte, B. A. Robinson Co.	704-527-4537
OH	Olmstead Falls, Ken Schleger	216-871-9047
TX	Dallas, Griffin Sls.	214-234-5013
UT	Bountiful, Herb Bass Assocs.	801-295-7100
WA	Bellevue, S.E.A. Sls.	206-883-4999
WA	Vancouver, S.E.A. Sls.	206-573-5161

DATA I/O CORP., 10525 Willows Rd. N.E., C-46, Redmond, WA 98052, Tel: 206-881-6444, Telex: 15-2167; Empl.: 400

DATAK CORP., 65 Seventy-First St., Guttenberg, NJ 07093, Tel: 201-869-2200; *Sls. Mgr.:* Theresa Pflueger .... 2•1090, 1759, 2095

Local Sales Offices & Reps

CA	Burlingame, Polach & Bensinger	415-697-2525
CA	West Covina, Don Forth Assocs.	213-919-2322
CO	Broomfield, Conners Co.	303-466-9628
FL	Bradenton, T. G. & Assocs.	813-753-5632
FL	Pompano, T.G. and Assocs.	305-781-8328
GA	Roswell, Henry W. Phillips Co.	404-992-3070
IL	Wheaton, Archie Joyner Assocs.	312-665-6662
IN	Indianapolis, Sukup & Cox	317-253-5501
MD	Annapolis, Pecore Assocs.	301-267-0328
MI	East Detroit, Jack M. Thorpe Co.	313-779-6363
MN	Minneapolis, Kodo Assoc.	612-881-1255
MO	Raytown, Marty Taraski Sls.	816-358-1442
NJ	Teaneck, Steve Fisher Sls.	201-837-1200
NY	Rochester, Warren Kaufman & Assoc.	716-266-2728
NC	Matthews, Henry W. Phillips Co.	704-882-2878
OH	Jamestown, Landro Edwards Sls.	513-675-2059
PA	Library, Landro Edwards Sls.	412-854-5727
RI	Coventry, Adams-McGregor	401-821-1320
RI	Lincoln, Adams-McGregor	401-726-1300
TX	Dallas, J & J Sls. Co.	214-328-9739
WA	Edmonds, McLaughlin Mktg.	206-743-1161

Local Distributors

AL	Birmingham, Forbes Distrbg.	205-251-4104
AK	Anchorage, Alaska Elecs. Sply.	907-563-3774
AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Tempe, Circuit Specialists	602-966-0764
CA	Berkeley, Al Lasher's Elect.	415-843-5915
CA	Canoga Park, Sandy's Elect.	213-346-8353
CA	El Cerrito, Trumbull Co.	415-525-7242
CA	Fullerton, Orvac Elect.	714-871-1020
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CO	Lakewood, D.H. Crump & Co.	303-936-4407
CT	Greenwich, Wise Comps.	203-531-4880
CT	Hartford, Hatry Elect.	203-527-1881
CT	Wallingford, Tron Town U.S.A.	203-237-5598
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Orlando, Orlando Frame & Art	305-896-7191
FL	St. Petersburg, Knapp of Florida	813-392-0406
GA	Atlanta, Ack Elctrn. Supp.	404-351-6340
HI	Honolulu, Honolulu Elect.	808-949-5564
IL	Berwyn, B-B & W Inc.	312-749-1710
IL	Mt. Prospect, Tri-State Elect.	312-255-0600
IL	Niles, Joseph Elect.	312-297-4200
IL	Northbrook, Reproduction Specialists	312-564-0404
IN	Ft. Wayne, Graham Elect.	219-423-3422
IN	Indianapolis, Graham Elect.	317-634-8202
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KS	Wichita, RSC	316-267-5213
KY	Louisville, Peerless Elect.	502-637-7674
LA	Lafayette, Ralph's	318-233-0105
LA	New Orleans, Radio Parts Inc.	504-581-5959
MD	Baltimore, A S I Elect.	301-265-5100
MD	Baltimore, RESCO Elctrns.	301-823-0070
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MA	Hingham, Sager Electrical Sply.	617-749-6700
MA	Lynn, Land Elctrns. Supp.	617-592-2220
MA	Norwood, Gerber Elect.	617-769-6000
MI	Flint, Shand Elctrns.	313-743-8940
MI	Livonia, Norwest Elect.	313-261-4551
MN	Minneapolis, Acme Elctrns.	612-338-4754
MO	Kansas City, Elctrn. Sply.	816-931-0250
MO	St. Louis, Olive Elctrn.	314-426-4500
MO	St. Louis, Van Sickle	314-621-5000
MO	St. Louis, Gateway Elect.	314-427-6116
NE	Lincoln, Scott Elect. Sply.	402-466-8221
NV	Las Vegas, Hurley Elect.	702-384-5666
NV	Reno, Elect. Distr. Co.	702-323-2766
NH	Dover, American Radio	603-742-6800
NH	Hudson, C & H Elect.	603-882-1133
NJ	Edison, William Elctrns. Supp.	201-985-3700
NY	Buffalo, Summit Distributor	716-887-2800
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	Long Island City, H. L. Dalis, Inc.	212-361-1100
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, URI Elect.	513-761-4030
OH	Columbus, Hughes-Peters	614-294-5351
OK	Oklahoma City, Trice Wholesale	405-524-4411
OR	Beaverton, Norvac Elect.	503-644-1025
OR	Portland, Portland Radio Sply.	503-228-8647
PA	Braddock, Leff Elctrns.	412-351-5000
PA	Philadelphia, A.C. Radio	215-462-9379
PA	Reading, Barbey Elctrns.	215-376-6116
PA	Willow Grove, Resco	215-659-4575
RI	Providence, W. Dandreta & Co.	401-861-2800
SC	Charleston, Wholesale Industrial Elecs.	803-722-2634
TN	Memphis, Bluff City Distr.	901-345-9500
TX	Dallas, Electrotex Elect. Corp. of TX	214-234-0433
TX	El Paso, Ideal Indl. Elec. Sply.	915-779-6647
TX	Houston, Gateway Elctrns.	713-978-6575
UT	Salt Lake City, Kimball Elect.	801-328-2075
VA	Arlington, Arlington Elect. Whlse.	703-524-2412
VA	Norfolk, Priest Elctrns.	804-855-0105
WA	Seattle, Radar Elect. Co.	206-282-2511
WV	Charleston, Elctrn. Materials Corp.	304-344-3577
WI	Milwaukee, Indl. Elctrns.	414-276-1212

DATA-MATCH CORP., 3810 Oakcliff Ind. Ct., Doraville, GA 30340, Tel: 404-441-0408; *Sls. Mgr.:* Charles L. Frazier III

DATAMETRICS CORP., Defense Products Div., 7630 Gloria Ave., Van Nuys, CA 91406, Tel: 818-989-3840, TWX: 910-495-2009; FSC No.: 19059; Empl.: 150; *Sls. Mgr.:* Jim Foti

datametrics DRESSER

DATAMETRICS • DRESSER INDS., INC., 340 Fordham Road, Wilmington, MA 01887, Tel: 617-658-5410, TWX: 710-347-7672; Empl.: 175; *Sls. Mgr.:* A. W. Siff .... 1B•1841

Local Sales Offices & Reps

AZ	Phoenix, Motion Technology	602-991-1782
CA	Anaheim, Motion Technology	714-777-4259
CA	Chatsworth, Motion Technology	818-993-3762
CA	San Jose, Motion Technology	408-923-0990
CA	San Raphael, Motion Technlg.	415-459-2171
CO	Englewood, Integrated Motion Sys.	303-762-1817
CT	Guilford, Gem Sls.	203-453-5424
IL	Rolling Meadows, KMA Sls.	312-398-5300
MI	Lamont, Xanthus	616-677-3103
MI	Troy, Xanthus	313-528-2000
MN	Minneapolis, Trask Engrg.	612-537-2434
NH	Salem, Gem Sls.	603-893-0009
NJ	Williamstown, Precision Motion Sls.	609-629-4757
NY	Clark Mills, KLM-Garner	315-853-6126
NY	Glen Cove, Precision Motion Sls.	516-676-1645
NY	N. Syracuse, KLM-Garner	315-458-6214
NY	Pittsford, KLM-Garner	716-381-8350
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
OH	Chagrin Falls, K. F. Nauerz	216-338-8450
OH	West Chester, Fehrco	513-777-4248
TX	Dallas, Automated Motion Control	214-340-4192
TX	Denton, Automated Motion Control	817-382-4159
WA	Bellevue, Al Smith Co.	206-746-6770
WA	Vancouver, Al Smith Co.	206-892-9912
WI	Milwaukee, KMA Sls.	414-259-1771

DATA PLUS, INC., 7205E Lockport Pl., Lorton, VA 22079, Tel: 800-368-3747, Telex: 901878; Empl.: 20; *Sls. Mgr.:* George E. Pritz

DATAPOINT CORP., Peripheral Operations Division, 686 West Maude Avenue, Sunnyvale, CA 94086, Tel: 408-732-7330, TWX: 910-339-9244; Empl.: 500

DATAPOWER, INC., 3328 West First St., Santa Ana, CA 92703, Tel: 714-775-2000, Telex: 683323, TWX: 910-595-1560; *Sls. Mgr.:* William O. Fordiani

Local Sales Offices & Reps

CA	Santa Clara	408-986-8322
MA	Chelmsford	617-256-2287

DATA POWER, See Beaver Labs

DATA PRECISION CORPORATION, Electronics Ave., Danvers, MA 01923, Tel: 617-246-1600, Telex: 921819; FSC No.: 51692; Empl.: 260; *Sls. Mgr.:* John P. Kelly, William Sapankevych; *Dist. Mgr.:* John Kelly ..... 3•1214, 1215

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	305-724-0920; 800-327-0853
AZ	Phoenix, Odyssey I	602-246-8846
CA	Carson, Amasco	213-516-8561
CA	Sunnyvale, Amasco	408-733-8690
CO	Castle Rock, Odyssey I	303-688-3555
FL	Melbourne, Saber Assocs.	305-724-0920; 800-327-0853
GA	Griffin, Saber Assocs.	305-724-0920; 800-327-0853
MD	Rockville, Elctrn. Mktg. Assn.	301-881-5300
MA	Danvers, John D. Seney	617-246-1600; 603-668-1096
MI	Northville, Donald C. Pickren	313-349-0233; 312-685-4544
MN	Chanhassen, Elctrn. Instr. Conslt.	612-445-7056
MO	Kansas City, E.I.R. Co.	816-452-7030
MO	Leasburg, E.I.R. Co	314-895-4100
NJ	Cedar Grove, KLS Assocs.	201-785-4450
NM	Albuquerque, Odyssey I	505-265-6645
NY	Frankfort, Kapital Instr. Sls.	207-774-6266; 800-492-8011
NC	Clayton, Saber Assocs.	305-724-0920; 800-327-0853
PA	Pittsburgh, Staples Assn.	412-881-5990
PA	Plymouth Meeting, Elctrn. Mktg. Assn.	215-248-5050; 215-828-7400
SC	Columbia, Saber Assocs.	305-724-0920; 800-327-0853
TX	Georgetown, Richard Morgenstern	512-869-1507
WA	Bellevue, Sls. & Engrg. Assn.	206-883-4999
WA	Vancouver, Sls. & Engrg. Assn.	206-573-5161

Local Distributors

AL	Huntsville, Pioneer Instrs.	205-837-9300
AL	Mobile, Brownell-Instr. & Cntrl.	205-479-5404
AZ	Phoenix, Metermaster	602-437-1425
AR	Morrilton, Tri-State Instr. Lab.	501-354-1849
CA	Arcadia, Shafer Engrg. Svc.	213-445-4127
CA	Canoga Park, G.A.G. Entprs.	213-998-6500
CA	Long Beach, Meas. Assoc.	213-433-0977
CA	Los Angeles, Metermaster	213-685-4340
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Palo Alto, Metermaster	415-968-0313
CA	San Diego, Instr. Engrs.	619-268-8344
CA	San Diego, Metermaster	619-560-4841
CA	Santa Clara, RGB Electro. Indl.	408-980-1300
CO	Denver, E.I.L. Instrs.	303-534-4160
CO	Englewood, BETA	303-779-4494
CT	Middletown, E.I.L. Instrs.	203-346-6646
FL	Hialeah, Kimball Elec. Labs.	305-822-5792
FL	Orlando, Brownell-Instr. & Cntrl.	305-843-6770
FL	Palm Bay, E.I.L. Instrs.	305-725-8300
GA	Atlanta, Brownell Electro	404-762-5181
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Elk Grove Village, Dot-Tronics, Div. of Loren Green Assoc.	312-593-0282
IL	Elk Grove Village, Pioneer Standard	312-437-9680
IL	Elk Grove Village, Metermaster	312-593-8650
L	Niles, Joseph Elctrns.	312-297-4200
L	Oak Park, Pacific Indicator	312-383-0220
N	East Chicago, Acro Elec.	219-397-8681
N	Indianapolis, Pioneer Standard	317-849-7300
N	Indianapolis, E.I.L. Instrs.	317-545-1373
N	Indianapolis, Loren Green Assocs.	317-293-9827
KY	Louisville, Peerless Elec. Equip.	502-637-7674
LA	Baton Rouge, Ind. Elec. Supply	504-357-4249
LA	Kenner N.O., Breard Gardner	504-466-3401
LA	New Orleans, Ind. Instr. Works	504-733-8355
MD	Gaithersburg, Pioneer Instrs.	301-921-0660
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Burlington, Contact East	617-272-5051
MA	Burlington, E.I.L. Instrs.	617-272-9450
MA	Woburn, Brownell Electro	617-935-7820
MI	Ferndale, Ram Meter	313-398-6767
MI	Flint, R.S. Elctrns.	313-762-5800
MI	Grand Rapids, R.S. Elctrns.	616-241-3483
MI	Kalamazoo, R.S. Elctrns.	616-381-5470
MI	Livonia, Pioneer Standard	313-525-1800
MI	Livonia, R.S. Elctrns.	313-525-1155
MI	Roseville, R.S. Elctrns.	313-779-2450
MI	Wyandotte, R.S. Elctrns.	313-282-5880
MN	Minneapolis, Loren Green Assocs.	612-571-6666
MO	St. Louis, Instr. & Control Sls.	314-535-5760
NJ	Edison, Brownell Electro	201-287-2030
NJ	Ocean, Rag Elctrns.-East	201-544-0666
NY	Clarence, Trott Elctrns.	716-634-8500
NY	Hauppauge, E.I.L. Instrs.	516-231-6333
NY	New York, Brownell Electro	212-691-1171
NY	New York, Advanced Elctrns.	212-730-7030
NY	Pittsford, Trott Elctrns.	716-586-8251
NY	Rochester, R. Baker Elctrns.	716-586-9164
NY	Rochester, E.I.L. Instrs.	716-424-5750
NC	Charlotte, Brownell Electro	704-597-1270
NC	Charlotte, Trott Elctrns.	704-376-2237
NC	Greensboro, Pioneer Instr.	919-273-4441
NC	Raleigh, Lee Assoc. of the Carolinas	800-822-8888
OH	Cleveland, Pioneer Instr.	216-587-3600
OH	Dayton, E.I.L. Instrs.	513-435-2134
OH	Dayton, Pioneer Instr.	513-236-9900
OH	Dayton, Natl. Instr.	513-435-4503
OH	Maumee, R.S. Elctrns.	419-893-0721
OK	Oklahoma City, Huston-De Pue Labs	405-235-5469
OR	Beaverton, Eicher Richards	503-221-1123
OR	Medford, Branom Instrs.	503-772-3187
OR	Portland, Branom Instrs.	503-283-2555
PA	Horsham, Pioneer Instr.	215-674-4000
PA	Philadelphia, Sunshine Sci.	215-673-5600
PA	Pittsburgh, E.I.L. Instrs.	412-731-5230
PA	Pittsburgh, Pioneer Instr.	412-782-2300
TN	Knoxville, Brownell-Electro	615-966-3441
TN	Memphis, Brownell-Electro	901-795-8483
TN	Nashville, Brownell-Electro	615-889-8230
TX	Dallas, E.I.L. Instrs.	214-931-1236
TX	Dallas, R.E. Davis Co.	214-653-1041
TX	Dallas, Pioneer Instr.	214-386-7300
TX	Garland, Metermaster	214-271-5671
TX	Houston, Quality Instrs.	713-524-0528
TX	Houston, E.I.L. Instrs.	713-271-3100
VA	Alexandria, E.I.L. Instrs.	703-354-4330
VA	Richmond, Metermetrics	804-275-1431
VA	Vienna, Elctrn. Equip. Bank	703-938-3350
VA	Virginia Beach, E.I.L. Instrs.	804-499-3746
WA	Seattle, Eicher Richards	206-523-7888
WA	Seattle, E.I.L. Instrs.	206-762-0880
WA	Seattle, Branom Instrs.	206-762-6050

DATAPROBE, 110 Palisades Blvd., Palisades Park, NJ 07650, Tel: 201-947-9500, Telex: 642-165; Empl.: 12

Local Sales Offices & Reps

AZ	Scottsdale, Westorn Sade	602-998-9585
CA	Los Angeles, Mark Assocs.	216-641-1840
NH	Concord, Concord Communications Inc.	603-228-8627
TX	Seabrook, Q Max Inc.	713-474-2233
VA	Falls Church, Data Comm. Sys.	703-241-7803

DATAPRODUCTS, 6200 Canoga Ave., Woodland Hills, CA 91365, Tel: 213-887-8000, Telex: 67-4734; Empl.: 4300; *Sls. Mgr.:* James B. Towell; *Dist. Mgr.:* L. Bowne

DATA PRODS. NEW ENGLAND, Barnes Park N. Caller Box 30, Wallingford, CT 06492, Tel: 203-265-7151, TWX: 710-476-3427

DATAPROFITS CORP., 2260 Distributors Dr., Indianapolis, IN 46241; Empl.: 5

DATARAM CORP., Princeton-Highstown Rd., Cranbury, NJ 08512, Tel: 609-799-0071, TWX: 510-685-2542; Empl.: 225; *Sls. Mgr.:* John F. Gilligan

Local Sales Offices & Reps

AL	Huntsville, Col-Ins Co.	800-327-6600
AZ	Phoenix, Cherry Assocs.	602-242-1922
CA	Irvine, Dataram Corp.	714-261-1622
CA	Mountain View, Thorson West	415-964-9300
CO	Denver, Westek Data Prods.	303-232-2250
FL	Orlando, Col-Ins-Co.	800-432-4480
GA	Atlanta, Col-Ins-Co.	800-327-6600
IL	Oak Brook, Dataram Corp.	312-789-3710
LA	Baton Rouge, Col-Ins-Co.	800-327-6600
MD	Rockville, Technical Sls. Assocs.	301-340-0600
MA	Waltham, Dataram Corp.	617-891-7090
MN	Eden Prairie, First Rep Co. of Minnesota	612-944-2097
NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
NM	Sante Fe, Unique Sys. Electronics Inc.	505-984-0262
NY	Rochester, RG Engrg.	716-442-5631
NC	Raleigh, Col-Ins-Co.	800-327-6600
OH	Columbus, SelTech Mktg.	614-451-3865
SC	Greenville, Col-Ins-Co.	800-327-6600
TN	Knoxville, Col-Ins-Co Inc.	800-327-6600
TX	Austin, Thorson Southwest	512-451-7527
TX	Dallas, Thorson Southwest	214-233-5744
TX	Houston, Thorson Southwest	713-771-3504

DATA RAY CORP., 8401 Baseline Rd., Boulder, CO 80303, Tel: 303-494-4444; FSC No.: 303-494-8107; *Sls. Mgr.:* Jerry Garrett

DATA RENTALS/SLS., INC, P. O. Box 3257, Culver City, CA 90230, Tel: 213-559-3822; Empl.: 51; *Sls. Mgr.:* Steven Beaver

DATAROYAL, 235 Main Dunstable Rd., Nashua, NH 03061, Tel: 603-883-4157, TWX: 710-228-1077; *Sls. Mgr.:* George Bouchard

DATA SIGNAL CORP., 149 California St., Newton, MA 02158, Tel: 617-926-5080

DATASPAN SYSTEMS INC., 120 W. Palisades Blvd., Palisades Park, NJ 07650, Tel: 201-461-3337; *Sls. Mgr.:* Sy Weiss

DATA SPECIALTIES, INC., 3455 Commercial Ave., Northbrook, IL 60062, Tel: 312-564-1800, Telex: 206230; Empl.: 110; *Sls. Mgr.:* John H. Kindsvater, Jr.

DATA TECH, DIV. OF PENRIL CORP., 3110 W. Segerstrom, Santa Ana, CA 92704, Tel: 714-546-7160, TWX: 910-595-1570; Empl.: 125; *Sls. Mgr.:* James K. Way; *Dist. Mgr.:* James K. Way

DATATEX CORP., 10935 S. Wilcrest Dr., Houston, TX 77099, Tel: 713-495-3100; Empl.: 100; *Sls. Mgr.:* Glenn Messerschmitt; *Dist. Mgr.:* K. Pelletier

DATATRAN LABS, P.O. Box 384, Sussex, NJ 07461, Tel: 914-856-4313; Empl.: 18; *Sls. Mgr.:* Richard E. Johnson

DATA TRANSLATION, 100 Locke Dr., Marlboro, MA 01752, Tel: 617-481-3700, Telex: 4430109; Empl.: 110; *Sls. Mgr.:* Andrew Davis

DATATRON, INC., 2942 Dow Ave., Tustin, CA 92680, Tel: 714-544-9970, TWX: 910-595-1589; Empl.: 125

"Refer to Shelly Assocs. Datatron Inc. for Sales Office and distributor information"

DATATRONIC SYSTEMS CORP., Computer Sciences Div., P.O. Box 44128, Panorama City, CA 91402, Tel: 818-988-5290; Empl.: 150

DATAWARE SYS. LEASE, INC., 30 Bay St., Staten Island, NY 10301, Tel: 212-447-4911, Telex: 421394, TWX: 710-588-6738; *Sls. Mgr.:* Ben Welwart

DATAWEST, 7333 E. Helm Dr., Scottsdale, AZ 85260, Tel: 602-948-3280, TWX: 910-950-1289; Empl.: 25; *Sls. Mgr.:* Jim Buckley

DATEC, INC., 200 Eastowne Dr., Ste. 116, Chapel Hill, NC 27514, Tel: 919-929-2135; Empl.: 75; *Sls. Mgr.:* Albert J. Jenks, Jr.

DA-TECH CORP., 92 Steamwhistle Dr., Ivyland, PA 18974, Tel: 215-322-9410; *Sls. Mgr.:* Bradford W. Bentz

DATEL

DATEL, 11 Cabot Blvd., Mansfield, MA 02048, Tel: 617-339-9341, Telex: 95-1340, TWX: 710-346-1953; Empl.: 650; *Sls. Mgr.:* H. Batchelder ... 3•1076, 1105, 1150-1152, 1323, 1545

Local Sales Offices & Reps

AZ	Phoenix, Tech. Sales	602-246-1614
CA	Santa Ana, Datel	714-835-2751
CA	Sunnyvale, Datel	408-733-2424
CO	Denver, Cleveland Entprs. of Colo.	303-751-3252
CT	Hamden, JBL Assocs.	203-281-3161
FL	Coral Springs, H. A. Inc.	305-752-7520
HI	Honolulu, Adtech.	808-941-0708
IL	Elmhurst, Sector Engrg. Sls.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
IA	Davenport, Ensco-Rep, Inc.	319-386-6600
KS	Overland Park, Ensco-Rep, Inc.	913-381-7557
MA	Mansfield, Datel	617-339-9341
MI	Livonia, Electro Sls. Assoc.	313-474-7320
MN	Minneapolis, J.R. Assoc.	612-559-5673
MO	Maryland Heights, Ensco-Rep, Inc.	314-423-3935
NJ	Perth Amboy, Astrorep, Inc.	201-826-8050
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Babylon, Astrorep	516-422-2500
NY	Liverpool, R & D Assocs.	315-457-0100
NC	Winston-Salem, Comp. Concepts	919-765-3484
OH	Cleveland, Instrmn. Sys.	216-845-8800
OH	Dayton, Instrmn. Sys.	513-294-2838

OR	Aloha, Hood Engrg.	503-642-3591
PA	Pittsburgh, Instrmn. Sys.	412-243-1111
TX	Carrollton, Tech. Mktg.	214-387-3601
TX	Houston, Tech. Mktg.	713-777-9228
UT	Salt Lake City, Cleveland Entprs. of Colo.	801-355-8424
VA	Arlington, H. J. Heffernan	703-522-6666
WA	Bellevue, Hood Engrg. Co.	206-453-9375
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280

DATOTEK, INC., 13740 Midway Rd., Dallas, TX 75234, Tel: 214-233-1030, Telex: 73-0558; Empl.: 130; *Sls. Mgr.:* T. Peddicord

DATRON INSTRS., INC., 3401 SW 42nd Ave., Stuart, FL 33497, Tel: 305-283-0935, Telex: 525724; Empl.: 120

Local Sales Offices & Reps

AL	Huntsville, Scientific Dvcs.	205-536-1969
AZ	Phoenix, Zeus Elctrns.	602-263-6022
CA	Redondo Beach, Ward Davis Assoc.	213-973-7772
CA	San Diego, Ward Davis Assoc.	714-292-1000
CA	Santa Clara, Ward Davis Assoc.	408-245-3700
CO	Denver, Zeus Elctrns.	303-321-4246
CT	North Haven, Pat Jenks Assoc.	203-239-6201
FL	Orlando, Sci. Devices	305-841-8180
IL	Rolling Meadows, Commodore-I	312-394-5441
MA	Woburn, Pat Jenks Assoc.	617-938-0488
MN	St. Paul, Dytec/North, Inc.	612-645-5816
NJ	Pennsauken, Sci. Reps.	609-662-5222
NY	Fayetteville, D B Assocs.	315-446-0220
NY	Great Neck, R T I	516-829-3770
NC	Winston-Salem, Sci. Dvcs.	919-765-5776
OH	Chesterland, EQS Sys.	216-729-2222
OR	Beaverton, Northwest Test & Meas.	503-646-9966
TX	Richardson, Spectra Sls.	214-234-3600
UT	Salt Lake City, Zeus Elctrns.	801-534-0500
VA	McLean, Creative Mktg. Assocs.	703-442-9100
WA	Redmond, Northwest Test & Meas.	206-881-8857

DATRON

DATRON SYS., 20700 Plummer St., Chatsworth, CA 91311, Tel: 818-882-9616, TWX: 910-494-2787; FSC No.: 32255; Empl.: 150

Local Sales Offices & Reps

AZ	Scottsdale, Territorial Mktg.	602-994-8665
CA	Santa Barbara, Kannard Engrg., Inc.	805-492-5678
CO	Colorado Springs, Don Rondeau	303-599-3698
MD	Beltsville, Applied Engrg. Consits.	301-953-2808
MA	Lexington, Eugene Delfino Co.	617-862-1118
NJ	Holmdel, Douglas Consits.	201-741-5666
NY	Manlius, Quality Comps.	315-682-8885
TX	Garland, Carey, McMahill & Zerbe	214-681-1414

DATTILO ELECTRONICS, 11621 Electron Dr., Louisville, KY 40299, Tel: 502-267-4446; Empl.: 32

DATUM, STORAGE PRODS. DIV., 1363 State College Blvd., Anaheim, CA 92806, Tel: 714-533-6333, TWX: 910-592-1289; FSC No.: 31160; Empl.: 350; *Sls. Mgr.:* Roger Evans

datum inc

DATUM INC., Timing/Aacom Divisions, 1363 S. State College Blvd., Anaheim, CA 92806, Tel: 714-533-6333, Telex: 4722045 (Intl.), TWX: 910-592-1289; FSC No.: 31160; Empl.: 280; *Sls. Mgr.:* Charles Neumann .... 3•1154, 1155

Local Sales Offices & Reps

AL	Huntsville, Lee Assocs.	205-533-5896
AZ	Scottsdale, BFA Corp.	602-994-5400
CA	Anaheim, Datum	714-533-6333
CA	San Diego, M. Ficken	619-292-9392
CA	Santa Clara, Ward/Davis Assocs.	408-245-3700
CO	Denver, BFA Corp.	303-777-8070
CT	Mt. Carmel, Scientific Devices-New England	203-248-9361
FL	Fort Walton Beach, RAM-Z	904-862-2700
FL	Sarasota, RAM-Z	813-957-4900
FL	Sebastion, RAM-Z	305-388-0784
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MA	Waltham, Daner-Hayes	617-894-7290, 800-225-8760
MA	Waltham, Scientific Devices-New England	617-890-2252
MI	New Berlin, Marsland	414-786-6611
MI	Plymouth, Daner-Hayes	313-464-4520
MI	Plymouth, Micro Sls. Corp.	313-459-1670
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-991-1399
NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
NM	Albuquerque, BFA Corp.	505-292-1212
NM	Las Cruces, BFA Corp.	505-524-9693
OH	Centerville, Micro Sls. Corp.	513-433-8171
OH	No. Olmsted, Micro Sls. Corp.	216-734-3080
OK	Tulsa, Data Mktg. Assocs.	918-496-1457
PA	Pittsburg, Microsales	412-471-0105
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	El Paso, BFA Corp.	915-542-1762
TX	Houston, Data Mktg. Assocs.	713-780-2511
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
UT	Salt Lake City, BFA Corp.	801-466-6522
VA	McLean, Creative Mktg. Assocs.	703-442-9100
WA	Seattle, Comptronics	206-284-4842

DAVEN COMPONENTS GRP., See Armtec Inds., Inc., Daven Comps. Grp.

DAVIDSON ELCTRN. DEV. CO., 113 E. 13th St., Erie, PA 16512, Tel: 814-453-7547, Telex: 914-529; Empl.: 27

DAVIES, HARRY, MOLDING CO., 4920 Bloomingdale Ave., Chicago, IL 60639, Tel: 312-622-8966; FSC No.: 72512; Empl.: 140; *Sls. Mgr.:* Leo A. Sera; *Dist. Mgr.:* Leo A. Sera

Local Sales Offices & Reps

AZ	Mesa, Littrell Western Sls.	602-838-7300
AR	Little Rock, L. E. Offutt Co.	501-225-8192
CA	Belmont, Littrell Western Sls. Inc.	415-592-3346
CA	Monterey Park, Littrell Western Sls.	213-261-0164
CO	Wheat Ridge, Christensen Sls.	303-423-8833
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Pinellas Park, Carpenter Assoc.	813-546-8296
IL	Chicago, Druse Corp.	312-745-9073
IN	Noblesville, McCaw Sls.	317-877-5300
IA	Cedar Rapids, Clancey Co.	319-365-7141
IA	Des Moines, Clancey Co.	515-278-1331
KS	Shawnee Mission, Clancey Co.	913-432-4550
MA	Needham Heights, P. R. Sturgeon Co.	617-444-6603
MI	Detroit, Bishop-Strek & Co.	313-538-0595
MN	Bloomington, Clague Sls. Corp.	612-944-7982
MO	St. Louis, Clancey Co.	314-225-0800
NY	Wading River, Rywel Sls.	516-929-4884
NC	Matthews, Anthom, Inc.	704-847-7363
OH	Westlake, Foley Co.	216-871-8830
OR	Lake Oswego, Tri-Rep	503-635-4760
PA	Erie, H. De Paulis	814-838-7874
PA	Paoli, W. G. Walker	215-627-8146
TN	Brentwood, L. E. Offutt Co. Inc.	615-373-2951
TN	Memphis, L. E. Offutt Co.	901-396-3320
TX	Dallas, L. T. Greenwood	214-522-8718
WI	Milwaukee, Clague Sls.	414-272-1951

DAVIS, J. W., & CO., P.O. Box 26177, Dallas, TX 75226, Tel: 214-651-7341; Empl.: 42

DAVIS ELEC. CO., Box 38, Cape Girardeau, MO 63701, Tel: 314-335-5547; Empl.: 40

DAVONG SYSTEMS, INC., 217 Humboldt Ct., Sunnyvale, CA 94089, Tel: 408-734-4900, Telex: 176386; *Sls. Mgr.:* Donna Barry; *Dist. Mgr.:* Frank Jordan

DAYCO CORP., 333 W. First St., Dayton, OH 45402, Tel: 513-226-5927, Telex: 288219, TWX: 810-459-1822; Empl.: 10000

DAY-LIGHT DISPLAY CORP., 4 Barnet Rd., P.O. Box 694, Pine Brook, NJ 07058, Tel: 201-575-1045; FSC No.: 57736; Empl.: 14; *Sls. Mgr.:* P. Schneider

DAYTRONIC CORP., 2589 Corporate Pl., Miamisburg, OH 45342, Tel: 513-866-3300, TWX: 810-473-2978; Empl.: 109; *Sls. Mgr.:* John A. Perkins

D-B-DEVELOPMENTS, 7709 Kilbourne Rd., Rome, NY 13440, Tel: 315-339-1265; Empl.: 3

D-CEMCO, INC., 3200 N. San Fernando Blvd., Burbank, CA 91504, Tel: 213-849-6341, TWX: 910-498-2228; Empl.: 30

Local Sales Offices & Reps

AL	Decatur, Tenn Tech Inc.	205-350-0630
AZ	Scottsdale, Gleason Sls. Co.	602-946-3992
CA	Los Altos, Frauman Assoc.	415-941-0660
CA	San Diego, Hill & Assoc.	619-560-6368
CO	Longmont, Piper Sls. Co.	303-651-2378
FL	Maitland, Delmac Sls.	305-423-7562
IN	Fort Wayne, Jim Finnegan & Co.	219-747-9525
MA	Marlboro, O.K. Engrg. Co.	617-481-6400
MN	Minneapolis, Bitronics Sls.	612-835-7744
NJ	Fort Lee, Necco	201-461-2789
NJ	Jenkintown, Arnold Assoc.	215-742-0600
OH	Cincinnati, Jim Finnegan & Co.	513-931-1686
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OR	Portland, Jud LeBrun Co., Inc.	503-244-6805
PA	Jenkintown, Arnold Assoc.	215-742-0600
TX	Austin, Stevens Sls. Co.	512-250-5104
TX	Dallas, Stevens Sls.	214-350-2476
UT	Salt Lake City, Piper Sls. Co.	801-268-8707
VA	Reston, Boyle Assocs.	703-620-9558

DCI, INC., 720 E. Dennis, Olathe, KS 66061, Tel: 913-782-5672; FSC No.: 58677; Empl.: 9; *Sls. Mgr.:* William D. Cook .... 3•1324

Local Sales Offices & Reps

AZ	Phoenix, J. Smith & Assoc.	602-267-0981
CA	San Diego, Windsor Dynamics	714-452-1891
CA	Sherman Oaks, Windsor Dynamics	213-990-4173
CA	Woodside, N-S Assoc.	415-854-4870
CO	Colorado Springs, J. Smith & Assoc.	303-597-5343
CT	Tolland, R. G. Assoc.	203-875-4201
FL	Melbourne, EME³	305-259-2711
GA	Stone Mountain, Zelco	404-498-2181
IL	Chicago, Commodore I	312-394-5441
IN	Indianapolis, Commodore I	317-636-3318
KS	Shawnee Mission, Vertec	913-677-3200
MA	Danvers, R. G. Assocs.	617-777-3199
MI	Detroit, Michigan Valve & Fitting	313-884-9415
MN	Minneapolis, Trask Engrg.	612-537-2434
MO	St. Louis, Vertec	314-394-6242
NJ	Wayne, Ramapo	201-839-6767
NM	Albuquerque, J. Smith & Assoc.	505-265-3406
NY	Latham, L-Tron	518-785-5032
NC	Charlotte, Zelco	704-523-2961
OH	Columbus, R. D. Cloon Assoc.	614-459-2890
PA	Radnor, Roberts Engrg. Sls.	215-688-6525
TX	Richardson, Meas. Sys. & Sls.	214-644-4954

DEAK TECHNOLOGY, INC., Sainte Claire Plaza, 1121 Boyle Rd., Pittsburgh, PA 15241, Tel: 412-341-2245; *Sls. Mgr.:* David Thornburg .... 3•1216

YOUR FULL SERVICE SOURCE
DEARBORN
FOR WIRE CABLE INSULATION

DEARBORN WIRE & CABLE CO., 9299 Evenhouse Ave., Rosemont, IL 60018, Tel: 312-696-1000, TWX: 910-253-0343; Empl.: 80 .... 2•2096-2101

Local Sales Offices & Reps

CA	Chino, Dearborn West	714-591-9393
CA	San Diego, OHM Spun Elctrns.	619-695-8102
CO	Littleton, Advanced Technlg. Mktg.	303-979-8420
FL	Orlando, Admiral Sls.	305-352-0046
GA	Atlanta, Beacon Assocs.	404-256-9640
IL	Chicago, LGS Sls.	312-456-9616
IL	Wilmette, Joel Wasserman Assocs.	312-256-3566
IN	Indianapolis, Elctrn. Reps.	317-894-1414
MA	Clinton, F. J. Coleman & Co.	617-368-0116
MI	Southfield, R. C. Merchant & Co.	313-354-4300
MI	St. Joseph, R. C. Merchant & Co.	616-983-7378
MN	Golden Valley, Ambassador Indl. Mktg.	612-542-8437
MO	St. Charles, Buckman & Assocs.	314-946-6201
NJ	Livingston, Accurate Wire & Cable	201-533-0103
NJ	Medford, Jack McCoy, Inc.	609-953-0770
NY	Fairport, Net Sls.	716-467-4538
OH	Richfield, Bear Mktg.	216-659-3131
PA	Downington, Jack McCoy, Inc.	215-363-0350
TN	Memphis, Electronic Sls. Co.	901-682-2281
VA	Lynchburg, Mechanical Assocs.	804-237-6286
WA	Everett, Huntley Assocs.	206-353-1833

Local Distributors

AL	Huntsville, Chase Elctrns.	205-536-0738
AL	Madison, S.E.A. Wire and Cable	205-772-9616
CA	Chatsworth, Sonic Wire	213-701-0565
CA	Inglewood, Newark Elctrns.	213-678-0441
CO	Denver, Newark Elctrns.	303-757-3351
FL	Altamonte Springs, Royce Elctrns.	305-869-4700
FL	Ft. Lauderdale, Pacer Elctrns.	305-462-0902
FL	Ft. Lauderdale, Simcona Elctrns.	305-485-4455
IL	Bloomington, K. L. Tannehill	612-881-6700
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3220
IL	Northbrook, Classic Comps.	312-272-9650
IL	Palatine, Ohm Elctrns.	312-359-5500
IN	Carmel, Altex	317-848-1323
IN	Evansville, Hutch & Sons	812-425-7201
IN	Indianapolis, Genesis Elctrns.	317-637-5571
IA	Cedar Rapids, Deeco	319-365-7551
LA	New Orleans, Radio Parts	504-581-5959
MI	Grand Rapids, R. M. Electrns.	616-531-9300
MI	Grand Rapids, SF Elctrns.	616-459-0216
MI	Livonia, RS Elctrns.	313-525-1155
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Bloomington, K. L. Tannehill	612-881-6700
MN	Bloomington, Berquist Corp.	612-835-2322
MN	Bloomington, NWR Elctrns.	612-854-7329
MN	Hibbing, NWR Elctrns.	218-262-5228
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Dover, Electro Spec	201-361-6300
NJ	E. Brunswick, Brothers Elec.	201-238-2200
NJ	W. Collingswood Hgts., The Edge Supp.	609-456-3955
NM	Albuquerque, Walker Elctrn. Supp.	505-247-2288
NY	Binghamton, Help Elctrns.	607-729-3528
NY	Elmira, CAC Elec. Supp.	607-734-1696
NY	Fairport, Pacer Elctrns.	716-377-0462
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Troy, Trojan Elctrn. Supp.	518-274-4481
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Valley View, Newark Elctrns.	216-447-8860
PA	Harrisburg, Pyttronics	717-236-8001
PA	McKean, Advacom	814-476-7774
TX	Austin, R.S.I.	512-834-2015
TX	Dallas, Shearson Elec.	214-340-3094
TX	Garland, Newark Elctrns.	214-487-8144
TX	Houston, Newark Elctrns.	713-782-4800
UT	Salt Lake City, RA-ELCO	801-487-0571
VA	Charlottesville, Virginia Radio Supp.	804-296-4184
VA	Lynchburg, Components Unltd.	804-237-6286
WA	Seattle, Carlyle Tech. Sls.	206-575-6750
WI	Milwaukee, Marsh Elctrns.	414-475-6000

DECC DIV., See Helionetics, Inc., DECC Div.

DECISION DATA COMPUTER CORP., 100 Witmar Rd., Horsham, PA 19044

DECOM SYS., 340 Rancheros Dr., San Marcos, CA 92069, Tel: 619-744-1002, TWX: 910-322-1758; FSC No.: 55744; Empl.: 44; *Sls. Mgr.:* G. F. Tremain

Local Sales Offices & Reps

AL	Lake Guntersville, Kelley Sys. Corp.	205-582-8677
CA	Los Angeles, L. L. Stoakes, Inc.	213-640-2178
CA	Palo Alto, Egbert Engrg.	415-326-1387
CA	San Diego, L. L. Stoakes, Inc.	619-452-1600
CO	Boulder, Grady Moore Assocs.	303-494-3351
FL	Sarasota, S. Bass Assocs.	813-922-9538
IN	Indianapolis, Loren Green Associates	317-293-9827
KS	Shawnee Mission, Techn. Sls. Assocs.	913-888-3330
MD	Severna Park, Delmarva, Ltd.	301-647-8007
MA	Bedford, Claflin Assocs.	617-275-7428
MO	St. Louis, Techn. Sls. Assocs.	314-725-5361
NM	Albuquerque, Grady Moore Assocs.	505-262-1416
PA	Huntingdon, Rabal Assocs.	215-947-4825
EXP	CA, San Marcos, Decom Sys.	619-744-1002

DE COURSEY ENGRG. LAB., 11828 W. Jefferson, Culver City, CA 90230, Tel: 213-EX7-9668; Empl.: 7

DEGUSSA, Rte. 46 & Hollister, Teterboro, NJ 07608, Tel: 201-288-6500, Telex: 134610, TWX: 710-990-6143; FSC No.: 630673043; *Sls. Mgr.:* Paul M. Silberman

DEK, INC., 3480 Swenson Ave., St. Charles, IL 60174, Tel: 312-377-2575, Telex: 297284 DEK UR; Empl.: 115; *Sls. Mgr.:* L. R. Pappone

Local Distributors

AZ	Tempe, Waltronics Sls.	602-967-1020
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	Santa Clara, Waltronic Sls.	408-727-1200
IL	Addison, L-Comp	312-628-1400
MD	Hanover, Vertex-Mid Atlantic	301-796-5000
MA	No. Wilbraham, Indl. Comps. Corp.	413-596-3854
MI	Lavonia, Camelot Elctrns.	313-427-8660
MN	St. Paul, Arden Indl. Prods.	612-483-6681
MO	Maryland Heights, L-Comp	314-291-6200
NJ	East Orange, Willgold Sls. Corp.	201-678-7700
NJ	Kenilworth, Federated	201-272-0505
NY	Farmingdale, Vertex Elctrns.	516-293-9880
OH	Columbus, Elctrn. Mktg.	614-299-4161
PA	Philadelphia, Phila. Elctrns.	215-568-7400
TN	Paris, Southern States Indl. Sls.	901-642-0885
TX	Crowley, Service Assocs.	817-297-4604
TX	Dallas, Wholesale Elctrn.	214-824-3001
TX	Ft. Worth, Ft. Worth Wire & Cable	817-332-8252
UT	Ogden, Grimes Mktg.	801-546-4029
WI	Waukeshaw, Cable Comps.	414-785-1060

DELBERT BLINN CO., Box 2007, Pomona, CA 91766, Tel: 714-629-3900; Empl.: 10 .... **1A**•2093

Local Sales Offices & Reps

CA	San Carlos, Baytronic's	415-588-0958
MD	Baltimore, Callas Elctrns.	301-744-7711
NY	Commack, Kaelber & Mack	516-499-2924
WA	Woodinville, W. J. Stulgis Co.	206-486-8539

Local Distributors

MN	Minneapolis, Stark Elctrns.	612-332-1325

DELCO WIRE & CABLE, INC., 257 Rittenhouse Cir., Bristol, PA 19007, Tel: 215-785-0511, Telex: 06-964523, TWX: 510-667-0968; *Sls. Mgr.:* T. Blick

DEL ELCTRNS. CORP., 250 E. Sandford Blvd., Mt. Vernon, NY 10550, Tel: 914-699-2000, TWX: 710-562-0130; FSC No.: 01378; Empl.: 180 .... **1A**•2151; **3**•1546, 1547

Local Sales Offices & Reps

AZ	Tempe, Trembly Assocs.	602-967-2058
CA	Pasadena, A-F Sales Engrg.	213-681-5631
CA	San Carlos, Winco Sls.	415-592-0357
CO	Lakewood, Trembly Assocs.	303-233-9544
IL	Elmhurst, Scott Assocs.	312-279-5681
MA	Burlington, TriTek	617-272-4550
MI	Dearborn, Pitcher-Poulin	313-582-5450
NV	Las Vegas, Trembly Assocs.	702-739-9770
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Smithtown, T & K Sales	516-724-3456
OK	Tulsa, Barry Sales	918-749-7775
OR	Portland, Syscom Sls., Inc.	503-644-2505
PA	Ardmore, Martin Assoc.	215-649-6332
TX	Houston, Barry Sales	713-784-5860
TX	Richardson, Barry Sales	214-234-0255
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Bellevue, Syscom Sls., Inc.	206-641-5080

DELEVAN DIV., American Precision Inds. Inc., 270 Quaker Rd., E. Aurora, NY 14052, Tel: 716-652-3600, Telex: 91-293; FSC No.: 99800; Empl.: 400; *Sls. Mgr.:* R. Nareau .... **1A**•1243

Local Sales Offices & Reps

AL	Huntsville, Conley & Assocs.	205-882-0316
AZ	Phoenix, Toward Engrg.	602-955-3193
CA	Culver City, Bestronics	213-870-9191
CA	El Toro, Delevan	714-768-5522
CA	Freemont, Advanced Technlg. Sls.	415-651-0123
CA	Irvine, Bestronics	714-261-7233
CA	San Diego, Bestronics	619-452-5500
CA	Woodland Hills, Bestronics	213-704-5616
CO	Aurora, High Tech Assocs.	303-695-1990
FL	Boca Raton, Conley & Assocs.	305-395-6108
FL	Oviedo, Conley & Assocs.	305-365-3283
FL	Tampa, Conley & Assocs.	813-885-7658
GA	Doraville, Conley & Assocs.	404-447-6992
IL	Downers Grove, Momak Sls.	312-963-6400
IN	Fort Wayne, Walter W. Bieberich	219-432-2537
IN	New Albany, Walter W. Bieberich	812-945-3187
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Parker, S. W. Wollard	913-898-6552
MD	Lutherville, D. A. Dougherty Sls. Co.	301-321-7890
MA	Boston, P. J. Engrg. Sls. Co.	617-924-5950
MN	Mendota Hgts., G-II Sls.	612-454-3086
NJ	Bellmawr, TAI	609-933-2600
NJ	Parlin, Martech Assocs.	201-721-2200
NY	Endicott, Tech-Mark	607-748-7473
NY	Manhassett, Martech Assocs.	516-627-1151
NY	Mendon, Tech-Mark	716-624-3840
NY	Whitesboro, Tech-Mark	716-624-3840
NC	Raleigh, Conley & Assoc.	919-876-9862
OH	Beachwood, Electronic Salesmasters	216-831-9555
TX	Irving, Kite Elctrn. Sls. Co.	214-438-9336
WI	Milwaukee, Momak Sls.	414-963-1590

Local Distributors

CA	Chatsworth, IEC	213-998-2200
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Santa Clara, WDG/Santa Clara	408-727-2500
FL	West Palm Beach, Nurmi Elctrn. Supp. Co.	305-686-8553
IN	South Bend, Genesis Elctrns.	219-287-2911
MD	Sauage, Pyttronics Inds. Inc.	301-792-0780
MA	Boston, P. J. Engrg. Supp.	617-783-0510
NJ	New Brunswick, Brothers Elctrns.	201-238-2200
NY	Bohemia, Car-Lac	516-567-4200
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, Milgray/New York	516-420-9800
PA	Norristown, Century Elctrn. Comp.	215-631-5400
TX	Dallas, R. V. Weatherford Co.	214-931-7333
TX	Fort Worth, Patco Supply	817-429-8596
Can	Burnaby B.C., R-A-E Indl. Elctrns. Ltd.	604-291-8866
Can	Don Mills, Ontario, Saynor Elctrns. Ltd.	416-445-2347
Can	Montreal, Quebec, Prelco Elctrns. Ltd.	514-389-8051
Can	Pointe-Claire Quebec, Future Elctrn.	514-694-7710

DELTA DESIGN, 5775 Kearny Villa Rd., San Diego, CA 92123, Tel: 619-292-5000, TWX: 910-335-1215; Empl.: 150; *Sls. Mgr.:* Bob Williams

DELTA ELECTRONIC CONTROLS CORP. (DECC), See Helionetics, Inc., DECC Div.

DELTA ELECTRONIC IND. USA, Delta Elctrn. Ind. Co. Ltd., 3401 Investment Blvd., Ste. 5, Hayward, CA 94545, Tel: 415-785-5231, 415-785-5235, Telex: 4992342 DELTAITTHY; Empl.: 1000; *Sls. Mgr.:* Bruce Cheng; *Dist. Mgr.:* Bruce Cheng .... **1A**•1590, 1591

Local Sales Offices & Reps

AL	Huntsville, Technlg. Mktg. Assocs. Inc.	205-883-7893
AZ	Scottsdale, Summit Sls.	602-998-4850
CA	Mountain View, Taarcom Inc.	415-960-1550
CA	National City, Tri-Electro Sls.	619-470-1564
CA	Simi Valley, Tri-Electro Sls.	805-583-5124
CO	Aurora, Mountain View Mktg. Ltd.	303-360-9641
CT	Waterbury, Compak	203-755-5629
CT	Wethersfield, Compak	203-563-4784
FL	Atlanta, Technlg. Mktg. Assocs., Inc.	404-257-0374
FL	Melbourne, Technlg. Mktg. Assocs., Inc.	305-254-2554
FL	Orlando, Technlg. Mktg. Assocs., Inc.	305-857-3760
FL	Pompano Beach, Technlg. Mktg. Assocs., Inc.	305-942-0774
IL	Chicago, United Prods. Co.	312-631-1122
IN	Indianapolis, Electronic Sls. & Engrg., Inc.	317-849-4260
IA	Cedar Rapids, Palatine Engrg. & Sls. Inc.	319-365-8071
KS	Mission, Palatine Engrg. & Sls. Inc.	913-831-0555
KS	Wichita, Palatine Engrg. & Sls. Inc.	316-262-1020
MD	Baltimore, Burgin-Kreh Assocs. Inc.	301-265-8500
MA	Woburn, Compak	617-938-8580
MA	Woburn, Mascon Inc.	617-938-8950
MN	Edina, Monroe Hanna	612-925-5700
MO	Hazelwood, Palatine Engrg & Sls.	314-839-0800
NJ	Kenilworth, Ventronics	201-272-9262
NC	Charlotte, Robert W. Chapman & Co.	704-525-2421
NC	Greensboro, Robert W. Chapman & Co.	919-282-0740
NC	Raleigh, Robert W. Chapman & Co.	919-782-2624
OK	Tulsa, Advance Tech. Sls., Inc.	918-664-0482
OR	Portland, Jas. J. Backer & Co.	503-297-8744
OR	Salem, Jas. J. Backer & Co.	503-362-0717
SC	Greenville, Robert W. Chapman & Co.	803-288-8821
SC	W. Columbia, Robert W. Chapman & Co.	803-256-0072
TX	Austin, Advance Tech. Sls., Inc.	512-459-1351
TX	Dallas, Advance Tech. Sls., Inc.	214-340-1300
TX	Houston, Advance Tech. Sls., Inc.	713-440-3888
UT	Murray, Mountain View Mktg.	801-261-4867
VA	Lynchburg, Burgin-Kreh Assocs., Inc.	804-239-2626
WA	Seattle, Jas. J. Backer Co.	206-285-1300
PR	San Juan, Electronic Tech. Sls.	809-790-1300

Local Distributors

CA	Mountain View, Cornett Elctrns.	415-969-5420
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, Cypress Elctrns.	213-533-6005
IL	Chicago, UPCO Distrs., Ltd.	312-631-1122
IA	Cedar Rapids, Bergquist Co.	319-366-8733
MA	Wellesley Hills, Target Elctrn. Supp., Inc.	616-235-2545
MN	Minneapolis, Bergquist Co.	612-835-2322

DELTA ELCTRNS., 145 Fayette St., Winston-Salem, NC 27101, Tel: 919-725-4122; Empl.: 45; *Sls. Mgr.:* L. E. Hancock

DELTA ELECTRONICS MFG. CORP., 416 Cabot St., Beverly, MA 01915, Tel: 617-927-1060

DELTA PRODS., Box 1147, Grand Junction, CO 81501, Tel: 303-242-9000; Empl.: 35; *Sls. Mgr.:* K. D. Braa

DELTA WIRE & CABLE CO., P.O. Box 833, 1900 Marquette, North Chicago, IL 60064, Tel: 312-473-4990; Empl.: 12; *Sls. Mgr.:* Mike Golden; *Dist. Mgr.:* Matt Coleman

DELTROL CONTROLS, 2745 S. 19th St., Milwaukee, WI 53215, Tel: 414-671-6800; Empl.: 300 .... **1B**•1334, 1335, 1482, 1483

Local Sales Offices & Reps

CA	Canoga Park, Cummings & Assocs.	213-340-6035
CA	Santa Clara, Cummings & Assocs.	408-247-8656
CO	Denver, Cummings & Assocs.	303-455-6860
CT	Marion, Sands Co.	203-628-4363
FL	Lighthouse Point, J. Krutek & Assocs.	305-941-6544
HI	Honolulu, Aloha Assocs.	808-941-1574
IN	Indianapolis, Nationwide Comps.	317-872-7207
MD	Woodbine, Naudain Assocs.	301-252-5378
MI	Farmington Hills, W. R. Hummon & Assocs.	313-474-0661
MN	St. Paul, Kencotronics	612-645-7717
MO	Ellisville, Weisler & Assocs.	314-394-4543
MO	Kansas City, Weisler & Assocs.	816-421-1679
NJ	Marlton, Naudain Assocs.	609-235-1801
NY	Babylon, Astrorep.	516-422-2500
NY	Rochester, Omni Sls.	716-473-3340
NC	Charlotte, JWL Assocs.	704-364-3177
OH	Willoughby, Nationwide Comp. Reps.	216-946-3226
OR	Portland, Cummings & Assocs.	503-761-4411
PA	Philadelphia, Naudain & Assoc.	609-235-1801
TX	Garland, R. May Assocs.	214-276-5214

Local Distributors

AL	Montgomery, Southern Controls	205-277-5030
AZ	Phoenix, Elctrns. Parts Co.	602-277-7281
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Anaheim, Electro Comps. Distrs.	714-634-0222
CA	Buena Park, Control Design	714-521-5040
CA	Canoga Park, C & A Elctrns.	213-340-6022
CA	Los Angeles, Electric Switches	213-664-2125
CA	Los Angeles, Electro Comps. Distrs.	213-264-7100
CA	Mt. View, Corrnett Elctrns.	415-969-5420
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CO	Denver, Fistell's Elctrn. Supp.	303-629-1312
CO	Englewood, Industrial Elctrns.	303-771-2632
CO	Grand Junction, Radio & Elctrns. Supp.	303-243-3346
CT	Danbury, Pilgrim Elctrns.	203-792-7274
FL	Altamore Springs, Control Des.	305-788-3220
FL	Ft. Lauderdale, Peerless Radio Corp.	305-566-5966
FL	Ft. Lauderdale, SE Elctrns.	305-563-4131
FL	Jacksonville, Mitchell Elctrns.	904-356-8427
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Tampa, Leader Elctrns. Distrs.	813-870-3315
GA	Atlanta, Georgia Control Ctr.	404-876-8833
GA	Atlanta, A-C Equip.	404-451-2747
ID	Boise, Kimball Elctrns.	208-342-3559
ID	Pocatello, Kimball Elctrns.	208-232-2201
IL	Chicago, Otto Frankenbush	312-647-0755
IL	Elk Grove Village, GBL	312-593-3222
IL	Genoa, Control Design	815-784-6515
IL	Rosemont, Advent Elctrns.	312-295-4210
IN	Indianapolis, Advent Elctrns.	317-297-4910
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IN	Indianapolis, Control Design	317-788-4559
IN	Lafayette, CWY Elctrns.	317-447-4617
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IA	West Des Moines, Ramco Co.	515-225-6933
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KS	Topeka, Carroll Radio	913-234-6677
KY	Ashland, Ashland Elec. Co.	606-324-4107
KY	Bowling Green, Randolph, Hale & Meredith	502-781-1460
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KY	Paducah, Warren Radio Co.	502-442-4367
LA	Shreveport, Indl. Elec. Supp.	318-222-9459
MA	Brighton, Interstate Elctrns. Equip.	617-782-9000
MA	Newton Upper, Instock Prods.	617-964-6200
MA	Wakefield, Lorcor Elec.	617-246-1903
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MI	Flint, Roth Elec. Supp.	313-234-8661
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MO	St. Louis, Control Design	314-426-3150
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OH	Columbus, McJunkin Corp.	614-294-3711
OH	Toledo, Warren Radio Supp.	419-248-3364
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OK	Ardmore, Ardmore Elec. Supp.	405-223-3571
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OR	Portland, Dunn Elec.	503-285-0214
PA	Erie, REM Elctrns.	814-453-5626
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TX	Dallas, Dallas Instrs.	214-394-1180
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CO	Boulder, Comp. Prods. Sls.	303-530-2800
FL	Ft. Lauderdale, Cartwright & Bean	305-735-4900
FL	Orlando, Cartwright & Bean	305-422-4531
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Chicago, D. Dolin Sls.	312-286-6200
IN	Indianapolis, Elctrn. Reps.	317-894-1414
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MA	Needham, Mullin Tech. Sls.	617-444-4780
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OH	Shaker Hgts., K.W. Elctrn. Sls.	216-491-9177
OH	Worthington, K.W. Elctrn. Sls.	614-888-0483
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PA	Allison Park, K.W. Elctrn. Sls.	412-487-4300
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TN	Memphis, Cartwright & Bean	901-276-4442
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TX	Houston, Tesco	713-777-1443
UT	Salt Lake City, Comp. Prods. Sls.	801-262-0000
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WI	Milwaukee, D. Dolin Sls.	414-482-1111

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CA	Costa Mesa, Diplomat Westates	714-549-8401
CA	Gardena, Bell Indus.	213-515-1800
CA	Inglewood, Newark Elctrns.	213-671-7387
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CA	Sacramento, Sacramento Elctrns.	916-441-4821
CA	San Diego, Richey Western Elctrns.	714-565-4444
CA	San Diego, Fisher/Brownell	714-560-8545
CA	Santa Clara, Richey Western Elctrns.	408-727-7411
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Sun Valley, Richey Western Elctrns.	213-768-3800
CA	Sunnyvale, Bell Indus.	408-734-8570
CA	Sunnyvale, Time Elect.	408-734-9888
CO	Denver, Newark Denver Elctrns.	303-757-3351
CO	Denver, CSID Inc.	303-292-9594
CT	Wallingford, Sager Elctrl. Supply	203-265-4600
FL	Ft. Lauderdale, Peerless Radio	305-973-4141
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Atlanta, Specialty Dist.	404-873-2521
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Northbrook, Classic Comps. Supp.	312-272-9650
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Peoria, Klaus Radio & Elect.	309-691-4840
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IN	Indianapolis, Graham Elctrn.	317-634-8202
IN	South Bend, Genesis Elctrn.	219-287-2911
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LA	Lafayette, Ralph's of Lafayette	318-234-4507
LA	New Orleans, Southern Radio Supp.	504-524-2343
MD	Baltimore, Resco/Baltimore	301-937-9100
MD	Gaithersburg, Pioneer Wash. Elect.	301-948-0710
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
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MA	Norwood, Gerber Elctrns.	617-769-6000
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MI	Oak Park, Newark Elctrn.	313-967-0600
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MO	Kansas City, LCOMP	816-221-2400
MO	Kansas City, Walters Radio Supp.	816-531-7015
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NJ	Kenilworth, Federated Electronics	201-272-0505
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NY	Buffalo, Summit Dists.	716-884-3450
NY	Elmsford, Ancar Elctrns. Supp.	914-592-7100
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NY	Long Island City, Dalis Indl. Elect.	212-361-1100
NY	Lynbrook, Peerless Radio	516-593-2121
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NY	Rome, Rome Elctrns.	315-337-5400
NY	Woodbury, Pioneer/Harvey	516-921-8700
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Akron, Sun Radio	216-434-2171
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Cleveland, Pioneer-Cleveland	216-587-3600
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Solon, REPCO Elctrn.	216-248-8900
OK	Tulsa, Radio, Inc.	918-587-9123
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PA	Philadelphia, Almo Elctrns.	215-698-4000
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PA	Pittsburgh, Cam RPC Elect.	412-782-3770
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SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Kingsport, Radio Elec. Supp.	615-247-8111
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TX	Austin, Norvell Austin	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Newark Elctrns.	713-782-4800
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IN	Fort Wayne, J&B Engr. Sls.	219-483-2813
IA	Cedar Rapids, Feller Assoc.	319-364-0566
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MO	St. Louis, Deltron	314-869-4779
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CA	Santa Clara, Ward/Davis Assocs.	408-245-3700
CO	Englewood, Barnhill Assocs., Inc.	303-779-3600
CT	North Haven, Pat Jenks Assocs.	203-239-6201
FL	Orlando, W. A. Brown Instrs., Inc.	305-425-5505
GA	Norcross, W. A. Brown Instrs., Inc.	404-441-2980
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IL	Arlington Heights, Dytec/Central Inc.	312-394-3380
IN	Indianapolis, Dytec/Central Inc.	317-247-1316
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NM	Albuquerque, Barnhill Assocs., Inc.	505-299-7658
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NY	Utica, Naco Elctrns. Corp.	315-732-1801
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OH	Independence, WKM Assocs., Inc.	216-524-5930
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TX	Dallas, Data Marketing Assocs.	214-661-0300
TX	Houston, Data Marketing Assocs.	713-780-2511
TX	San Antonio, Data Marketing Assocs.	512-342-3031
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DIGITAL DATA SYS., 1551 N.W. 65 Ave., Plantation, FL 33313, Tel: 305-792-3290, Telex: 232 005 ATT DIGITAL; Empl.: 20; *Sls. Mgr.:* Floyd Simon; *Dist. Mgr.:* A. Gomez

DIGITAL DEV. CORP., 8650 Balboa Ave., San Diego, CA 92123, Tel: 619-278-9920, Telex: 69-54-30; Empl.: 430; *Sls. Mgr.:* Charles Theodore

DIGITAL DYNAMICS, INC., 123 Water St., Watertown, MA 02172, Tel: 617-923-4315, Telex: 9580076; Empl.: 21; *Sls. Mgr.:* Eric Kapust

DIGITAL ELCTRNS., 26142 Eden Landing Rd., Ste. 2, Hayward, CA 94545, Tel: 415-786-0520, Telex: 334422; *Sls. Mgr.:* Bob Christensen

DIGITAL EQUIP., One Iron Way, Marlborough, MA 01752

DIGITAL GRAPHIC SYS., 935 Industrial Ave., Palo Alto, CA 94303, Tel: 415-856-2500; *Sls. Mgr.:* Robert Pickthorn

DIGITAL LABS. INC., 600 Pleasant St., Watertown, MA 02172, Tel: 617-924-1680; Empl.: 15; *Sls. Mgr.:* William M. Kahn

DIGITAL MICROSYSTEMS, 1840 Embarcadera, Oakland, CA 94606, Tel: 415-261-1034, TWX: 910-366-7310; Empl.: 200; *Sls. Mgr.:* Jim Massey; *Dist. Mgr.:* Dennis Haynes

DIGITAL MEDIA, 3178 Gibraltar Ave., Costa Mesa, CA 92626, Tel: 714-751-1373; *Sls. Mgr.:* David Scott

DIGITAL PATHWAYS, INC., 1060 E. Meadow Cir., Palo Alto, CA 94303, Tel: 415-493-5544, TWX: 910-379-5034; *Sls. Mgr.:* Jan Legassick

DIGITAL POWER CORP., 686 East Gish Rd., San Jose, CA 95112, Tel: 408-288-5600, TWX: 910-338-0579; *Sls. Mgr.:* Claude Adkins ....3•1549

Local Sales Offices & Reps

CA	Palo Alto, Qualtech	415-494-9060
PA	Montgomeryville, Eastern Scientific Mktg.	215-822-6503
TX	Garland, Tesco	214-681-1376
WA	Edmonds, Power Sources	206-784-3336

DIGITAL RADIO CORP., 8901 La Cienega Blvd., Inglewood, CA 90301, Tel: 213-670-8611; *Sls. Mgr.:* Arvin L. Perry

DIGITAL TRANSMISSION TECHNIQUES, INC., P.O. Box 1847, Wayne, NJ 07470, Tel: 201-831-1615; Empl.: 3; *Sls. Mgr.:* Charles Herbst

DIGITEC CORP., 918 Woodley Rd., P.O. Box 458, Dayton, OH 45401, Tel: 513-254-6251, Telex: 6874219 W.U.I.; FSC No.: 16152; Empl.: 135 ....3•1077, 1156, 1157, 1326, 1327

Local Sales Offices & Reps

CA	Carlsbad, Elotek Sys.	714-438-4856
CA	Mountain View, IFM, Inc.	415-961-2828
CT	New Canaan, R. J. Sickles Assoc.	203-966-4630
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-924-3568
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
KS	Shawnee, Marsland Assocs.	913-631-5400
MI	Southfield, Comtel-Instr.	313-358-2505
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-878-2402
NJ	Cherry Hill, Sci. Reps.	609-482-0059
NM	Albuquerque, Fry-Gates	505-262-1525
NY	Fayetteville, M. P. Andrews, Inc.	315-637-3144
OH	Cleveland, Comtel-Instr.	216-442-8080
OH	Dayton, Comtel-Instr.	513-298-7573
PA	Pittsburgh, Comtel-Instr.	412-922-5720
TX	Houston, Adaptive Controls	713-995-9791
UT	Salt Lake City, Meas. Consits.	801-364-3174
VA	Fairfax, Scientific Reps.	703-385-0600

DIGITECH INDS., INC., 66 Grove St., Ridgefield, CT 06877, Tel: 203-438-3731, Telex: 969-623; Empl.: 80

DIGITEK INC., P.O. Box 468, Kenmore, WA 98028, Tel: 206-485-6571; *Sls. Mgr.:* Paul J. McManus; *Dist. Mgr.:* Paul J. McManus

DIGITRAN®

BECTON DICKINSON

DIGITRAN CO., 3100 New York Dr., Pasadena, CA 91107, Tel: 818-791-5600, Telex: 67-5485, TWX: 910-588-3794; Empl.: 520; *Sls. Mgr.:* M. H. Hankinson (Digital Switch Prods.)

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assoc.	205-881-5031
AZ	Scottsdale, Arcom Sls.	602-947-5745
AR	Little Rock, Beacon Elctrn. Assoc.	501-224-5449
CA	Anaheim, Westrep	213-404-3881, 714-527-2822
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Littleton, Omega, Ltd.	303-798-7040
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Clearwater, Beacon Elec. Assoc.	813-796-2378
FL	Ft. Lauderdale, Beacon Elec. Assocs.	305-491-1054
FL	Maitland, Beacon Elec. Assocs.	305-647-3498
FL	Melbourne, Beacon Elec. Assoc.	305-724-8010
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IN	Ft. Wayne, R. O. Whitesell & Assoc.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assoc.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assoc.	317-457-9127
IA	Des Moines, The Beams Co.	515-255-1148
KS	Shawnee Mission, The Beams Co.	913-631-0300
KY	Louisville, R. O. Whitesell & Assoc.	502-426-7696
MD	Silver Spring, Marktron	301-460-6100
MD	Timonium, Marktron	301-252-7111
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Grand Rapids, R. O. Whitesell & Assoc.	616-942-5420
MI	Southfield, R. O. Whitesell & Assoc.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assoc.	616-983-7337
MO	St. Louis, The Beams Co.	314-569-1060
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NJ	Hasbrouck Hgts., Comp-Tech Sls.	201-288-7400
NY	New York, Comp-Tech Sls.	516-593-2628
NY	Rochester, Ossmann Comp. Sls.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NC	Greensboro, Beacon Elctrns. Assoc.	919-275-9997
NC	Raleigh, Beacon Elec. Assoc.	919-787-0330
OH	Cincinnati, R. O. Whitesell & Assoc.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assoc.	216-447-9020
OH	Columbus, R. O. Whitesell & Assoc.	614-888-9396
OH	Dayton, R. O. Whitesell & Assoc.	513-298-9546
OR	Beaverton, Barrett-Squibb & Assoc.	503-642-1661
PA	Pittsburgh, R. O. Whitesell & Assoc.	412-963-6161
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
TX	Round Rock, Allied Comps.	512-244-1166
UT	Riverton, Omega, Ltd.	801-254-6723
VA	Charlottesville, Marktron	301-460-6100
WA	Redmond, Barrett-Squibb & Assoc.	206-885-6991
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

Local Distributors

AL	Huntsville, Powell Elec.	205-539-2731
AL	Huntsville, Comp. Distrs.	205-883-7501
AZ	Phoenix, BeSwitched	602-275-4805
AZ	Tempe, Powell Elctrns.	602-967-7538
AR	Little Rock, Comp. Distrs.	501-227-6278
CA	Cerritos, El-Com	213-404-2961
CA	Fullerton, Pyramid	714-773-0781, 213-691-0561
CA	San Diego, El-Com	619-578-0900
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Pyramid Elec.	408-727-9810
CO	Denver, CSID, Inc.	303-292-9594
CT	Hamden, Impact Elctrns.	203-281-1331
FL	Ft. Lauderdale, Comp. Distrs.	305-971-4950
FL	Ft. Lauderdale, Powell Electr./Fla.	305-972-4300
GA	Norcross, Comp. Distrs.	404-441-3320
IL	Mt. Prospect, Magnuson Elctrns.	312-956-0700
IN	Indianapolis, Graham Elec.	317-634-8202
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IN	Indianapolis, Magnuson Elctrns.	317-247-5108
MD	Columbia, Powell Electr.	301-621-4070
MD	Timonium, Zebra Elec.	301-252-6576
MA	Canton, Impact Sls. Co.	617-821-1500
MA	West Borough, Powell Electrns.	617-336-6100
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	St. Clair Shores, Specialties Mfg.	313-771-2700
MN	St. Paul, Magnuson Elec.	612-227-8495
NJ	Hasbrouck Hgts., Tory Sls.	201-288-5656
NJ	Pompton Plains, Zebra Elec.	201-839-9040
NY	Rochester, Modutex Corp.	716-647-9700
NC	Cary, Powell Elec.	919-467-1212
NC	Raleigh, Comp. Distrs.	919-834-9465
OH	Cleveland, Pioneer-Cleveland	216-587-3600
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4161
OH	Dayton, Pioneer/Dayton	513-236-9900
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Beaverton, Shannon, Ltd.	503-644-8077, 800-426-4615
OR	Wilsonville, Zepher Elec. Sls. Corp.	503-682-2929; 800-547-1853
PA	Philadelphia, Powell Electr.	215-365-1900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Houston, Pioneer/Houston	713-988-5555
TX	Irving, Powell Elctrns.	214-258-6841
WA	Kent, Shannon, Ltd.	206-763-0545
WA	Seattle, Zepher Elec. Sls. Corp.	206-241-1980; 800-562-5057
WI	Mequon, Taylor Electrns.	414-241-4321

DILLON, W. C., & CO., 2320 Airport Blvd., Santa Rosa, CA 95401, Tel: 707-527-5555; Empl.: 99

DIMCO-GRAY, 8200 S. Suburban Rd., Dayton, OH 45459, Tel: 513-433-7600, Telex: 288-367; Empl.: 150; *Sls. Mgr.:* R. Cramer

DIONICS, 65 Rushmore St., Westbury, NY 11590, Tel: 516-997-7474, TWX: 510-222-0974; Empl.: 85; *Sls. Mgr.:* Mel Geffner

DIO-REY

THE LIGHTED DISPLAY DIVISION
INFO-LITE CORPORATION

DIO-REY, Div. of Info-Lite, 422 Cliff St., Fairview, NJ 07022, Tel: 201-941-4455; FSC No.: FSCM 52116; Empl.: 13; *Sls. Mgr.:* Joseph M. Cartelli; *Dist. Mgr.:* Joseph M. Cartelli ....1B•1040-1047; 3•1159

Local Sales Offices & Reps

CA	No. Hollywood, Crown Elctrns.	213-877-3550
CA	Redwood City, Caltronic Assocs.	415-365-2545
CT	Weston, CJA Assoc.	203-226-4317
FL	St. Petersburg, R. L. Matus & Assocs.	813-896-4133
GA	Buford, R. L. Matus & Assocs.	404-945-2946
IL	Lake Zurich, L & B Assocs.	312-438-7917
MI	Brighton, Michigan Mktg. & Sls.	313-229-6218
NJ	Wayne, GT Assocs.	201-694-6040
NY	Syracuse, Lenard Co.	315-479-9191
OH	Cleveland, A.S.A.	216-662-6080
OH	Dayton, Mohawk Intronics	513-434-8873
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415

DISC INSTRS., 102 E. Baker St., Costa Mesa, CA 92626, Tel: 714-979-5300, TWX: 910-595-1987; Empl.: 175; *Sls. Mgr.:* D. Jolliff

Local Sales Offices & Reps

AZ	Phoenix, R.A. Mayes Co.	602-279-5243
CA	Costa Mesa, Disc Instrs.	714-979-5300
CA	Costa Mesa, Disc Instrs.	714-979-5300
CA	San Jose, Disc Instrs.	408-977-3019
CO	Denver, R.A. Mayes Co.	303-893-2264
FL	Casselberry, Hilco, Inc.	305-695-6208
GA	Dunwoody, Hilco, Inc.	404-393-1771
KS	De Sóto, Midtec Assocs.	913-441-6565
MI	Troy, Disc Instr.	313-649-1340
MI	Troy, Disc Instrs.	313-649-1340
MN	Edina, J. H. Hanson Co.	612-893-9960
MO	Florissant, Midtec Assoc.	314-837-5200
NM	Albuquerque, R.A. Mayes Co.	505-292-2330
NC	Charlotte, Hilco, Inc.	813-422-3908
OR	Portland, Controltek Sls. Ltd.	503-641-0877
RI	Providence, Disc Instr.	401-438-6000
SC	Mount Pleasant, Hilco, Inc.	803-883-9633
TX	Richardson, Meas. Sys. & Sls. Inc.	214-644-4954

DISPLAY DEVICES, Box 667, Encinitas, CA 92024, Tel: 619-753-0113; FSC No.: 26107

DISPLAY INTERFACE CORP., 525 Boston Post Rd., P.O. Box 250, Milford, CT 06460, Tel: 203-877-7661; *Sls. Mgr.:* Leigh H. Hickcox

DISPLAYS, INC., Mifflin Countey Indl. Pk., Rte. 4, Box 6AAA, Lewistown, PA 17044, Tel: 717-242-2541, Telex: 842540; Empl.: 50

Local Sales Offices & Reps

AZ	Phoenix, Finn-Pat Co.	602-954-0301
CA	San Diego, Power Assoc.	619-275-0641
CA	Torrance, Cutlass Elctrns.	213-324-7360
MA	Weston, Bay Colony Reps.	617-899-8800

DISPLEX, INC., Alexander Place, Glen Cove, NY 11542, Tel: 516-671-4400, Telex: 640 476, TWX: (Northills Gove); Empl.: 12; *Sls. Mgr.:* Bill Adikes; *Dist. Mgr.:* Peter Reuter ....3•1860

Local Sales Offices & Reps

CA	Gardena, Bidwell Sls.	213-532-7305
CA	Westlake Village, WEW Entprs.	213-707-1551
IL	Elmhurst, First Rep Co.	312-530-2450
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Needham, Addelco Corp.	617-444-4754
NY	Great Neck, F & F Metro	516-482-4080
OH	Cleveland Heights, Seltech	614-451-3868
OH	Columbus, Seltech	614-451-3865
OR	Portland, Belusko & Co.	503-222-4279
TN	Nashville, Computer Power Corp.	615-366-1703
PR	Casuas, Micro-Tech Sys & Controls.	809-783-0100

DISTRIBUTED COMPUTER SYS., 223 Crescent St., Waltham, MA 02154, Tel: 617-899-6619, TWX: 710-324-6476; Empl.: 32; *Sls. Mgr.:* Garry Stephens

DISTRIBUTED LOGIC CORP. (DILOG), 12800-G Garden Grove Blvd., Garden Grove, CA 92643, Tel: 714-534-8950, Telex: 681399; FSC No.: 95-3205555; Empl.: 105; *Sls. Mgr.:* Dennis Edwards; *Dist. Mgr.:* Dennis Edwards

Local Sales Offices & Reps

CA	Garden Grove	714-534-8950
NJ	Red Bank	201-530-0044

Distributor

DISTRIBUTOR SPECIALISTS, 632 Santa Monica Blvd., Santa Monica, CA 90401, Tel: 213-393-9666 ....p.700

DIVERSIFIED CASE CO., Ellis Ave., Off. 2, Whitesboro, NY 13492, Tel: 315-736-3028; *Sls. Mgr.:* John Fitzsimmons

DIVERSIFIED ELECTRONICS, INC.

DIVERSIFIED ELCTRNS., INC., Indl. Controls Div., 119 N. Morton Ave., Evansville, IN 47711, Tel: 812-426-2806; Empl.: 55; *Sls. Mgr.:* James M. Kellum ....1B•1336

Local Sales Offices & Reps

CA	Danville, Stuart Assocs.	415-837-8197
CA	Signal Hill, California Electro Sls. Co.	213-595-7427
CO	Denver, Empire Elctrl. Sls.	303-744-1776
FL	Leesburg, Diversified Elctrns.	800-874-0619
GA	Atlanta, Grady Duckett	404-451-3529
ID	Boise, Doran Sales Assocs., Inc.	208-343-9969
IL	Des Plaines, Antek/Lincoln, Hodges & Assocs.	312-297-0885
IN	Seymour, Diversified Elctrns. Inc.	812-522-1481
IA	Bettendorf, Weisler & Assocs.	319-344-0566
MD	Fulton, S. Jefferies	301-792-7452
MA	Wayland, Gilman Assocs.	617-358-7571
MO	Ellisville, Weisler & Assocs.	314-394-4543
MO	Kansas City, Weisler & Assocs.	816-421-1679
NY	Great Neck, Frank Tylinski Co.	516-466-9070
NC	Charlotte, Sentry Power	704-535-1774
OH	Cleveland, Syntron, Inc.	216-572-2848
OH	Cleveland, Arthur Baier	216-461-6161
OH	Dayton, Arthur Baier	513-276-4128
OR	Forest Grove, Doran Sls. Assoc.	503-357-3333
PA	Narberth, S. A. Jefferies	215-664-8500
TX	Houston, Weisler & Assocs.	713-467-1847
UT	Salt Lake City, Conely Engrg. Co.	801-972-5923
WA	Green Acres, Doran Sls. Assocs., Inc.	509-922-2317
WA	Redmond, Doran Sls.	206-855-1885
WI	Janesville, Antek Mktg. Assocs.	608-754-4214

Local Distributors

AL	Birmingham, MG Elctrns. & Equip., Co., Inc.	205-328-4525
AL	Mobile, Specialty Distrg. Co.	205-344-0450
AR	Rogers, Evans Elec. Motor Centers	501-636-0721
CA	Cathedral City, Consolidated Elec.	714-328-1131
CA	Danville, Cal-West Supp.	415-837-8245
CA	Fresno, Electric Motor & Supp.	209-233-1155
CA	Long Beach, Mag-Trol/Long Beach, Inc.	213-435-3451
CA	N. Hollywood, Associated Terminals & Cont.	213-875-0344
CA	Palm Springs, Lake Service	619-328-1163
CA	Palo Alto, Elctrl. Matls., Inc.	415-494-0400
CA	Redondo Beach, Elctrl. Power & Controls, Inc.	213-772-8890
CA	South El Monte, Walton Electrical Controls, Inc.	213-442-4610
CO	Denver, Control Comps, Inc.	303-371-2727
CO	Golden, Utility Control & Equip. Co.	303-425-1990
DC	Washington, Wesco	202-833-5250
FL	Ft. Lauderdale, Graybar Elec.	305-523-1453
FL	Ft. Myers, Con. Elec. Supp. Co.	813-332-1515
FL	Jacksonville, Graybar Elec.	904-356-7611
FL	Lakeland, A-A Elec.	813-665-6941
FL	Largo, Graybar Elec.	813-535-6460
FL	New Port Richey, Pasco Elec. Sup.	813-842-8405
FL	Orlando, Consolidated Elec.	305-849-6532
FL	St. Petersburg, Graybar Elec.	813-822-3851
FL	Tallahassee, Graybar Elec.	904-222-5332
FL	W. Palm Beach, Nurmi Elctrn. Supp., Inc.	305-686-8553
GA	Albany, Specialty Distrbg. Co., Inc.	912-435-1711
GA	Athens, Specialty Distrbg. Co., Inc.	404-548-1334
GA	Atlanta, Dapco, Inc.	404-458-6341
GA	Atlanta, Specialty Distrbg. Co., Inc.	404-873-2521
GA	Augusta, Specialty Distrbg. Co., Inc.	404-722-1526
GA	Brunswick, Specialty Distrbg. Co., Inc.	912-265-1927
GA	College Park, Specialty Distrbg. Co., Inc.	404-763-3828
GA	Columbus, Specialty Distrbg. Co., Inc.	404-327-7414
GA	Macon, Specialty Distrbg. Co., Inc.	912-743-5421
GA	Marietta, Specialty Distrbg. Co., Inc.	404-422-4333
GA	Norcross, A-A Electric	404-449-8670
GA	Savannah, Specialty Distrbg. Co., Inc.	912-234-1684
GA	Savannah, Graybar Elec.	912-232-1121
GA	Valdosta, Specialty Distrbg. Co., Inc.	912-242-4910
ID	Coeur d'Alene, R. C. Worst & Co., Inc.	208-664-2133
ID	Idaho Falls, Electrical Supp.	208-523-2800
ID	Pocatello, Electrical Supp.	208-233-1362
ID	Rexburg, Electrical Supp.	208-356-7282
IL	Bloomingdale, Seversen Engrg.	312-529-0501
IL	Fairfield, Precision Elec. Co.	618-842-7000
IL	Mt. Prospect, Legend Elctrl. Sls.	312-952-0090
IN	Evansville, Hutch & Son, Inc.	812-425-7201
IN	Indianapolis, Genesis Elec.	317-637-5571
IN	Vincennes, Valley Elec.	812-882-7860
KS	Salina, American Elec.	913-823-2248
KY	Louisville, Peterson Elec. Supp. Co., Inc.	502-491-5010
KY	Louisville, Peerless Elec.	502-637-7677
KY	Louisville, E & H Elec.	502-587-0991
MD	Baltimore, Infinity Sys., Inc.	301-358-8500
MD	Baltimore, Wesco	301-327-4300
MD	Salisbury, Wesco	301-742-2193
MN	Minneapolis, Texa Minn Prods.	612-861-2900
MO	St. Louis, United Elec. Supp.	314-771-5555
NE	McCook, American Elec.	308-345-3414
NE	Omaha, West Dodge Elec.	402-393-8071
NH	Manchester, Graybar Elec.	603-624-4341
NJ	Audubon, Universal Elctrns. Supp. Co.	609-547-3430
NJ	Collingswood, Universal Supp.	609-854-2220
NJ	E. Rutherford, A-A Elec.	201-777-5477
NJ	Fairlawn, Relay Specialties	201-797-3313
NY	Long Island, Graybar Elec.	212-392-2000
NY	Maybrook, Air Power House	914-457-3113
NY	Whitestone, Power Electro Supp. Co., Inc.	212-767-1447
NC	Charlotte, Southern Elec. Svc. Co.	704-372-4832
NC	Charlotte, Wesco	704-377-3471
NC	Gastonia, J. M. T. Elec.	704-867-4401
NC	Huntersville, Scott Equip. Co.	704-875-1611
NC	Jacksonville, Rapp Prods.	919-374-1754
OH	Cincinnati, Wesco	513-542-4300
OH	Cleveland, Milner Elec.	216-361-0300
OK	Oklahoma City, Evans Elec. Motor Centers	405-631-1344
OK	Tulsa, Evans Elec. Motor Centers	918-587-1566
OK	Tulsa, Cooper Supp. Co.	918-628-1500
OR	Albany, Pepco	503-926-7755
OR	Bend, North Coast Elec. Co., Inc.	503-382-6211
OR	Coos Bay, North Coast Elec. Co., Inc.	503-267-2145
OR	Coos Bay, Pepco	503-269-5011
OR	Eugene, North Coast Elec. Co., Inc.	503-343-7701
OR	Eugene, Pepco	503-484-7309
OR	Klamath Falls, North Coast Elec. Co., Inc.	503-884-4171
OR	Medford, North Coast Elec. Co., Inc.	503-772-7131
OR	Medford, Pepco	503-779-6311
OR	Portland, North Coast Elec. Co., Inc.	503-228-5111
OR	Portland, Pepco	503-243-7820
OR	Tualatin, North Coast Elec. Co., Inc.	503-620-3910
PA	Bala-Cyn-Wyd, Wesco	215-581-9314
PA	Erie, Wesco	814-454-8191
PA	Johnstown, Wesco	814-536-8761
PA	Monroeville, Wesco	412-325-1300
PA	Philadelphia, Mechanical Specialties, Inc.	215-331-5555
PA	Philadelphia, Wesco	215-238-4500
PA	Pittsburgh, Wesco	412-255-4290
PA	York, Wesco	717-843-0891
SC	Columbia, J. W. Vaughn Co.	803-779-2690
SC	Greenville, Shealy Elctrl. Whlsrs.	803-242-6880
TN	Chattanooga, Specialty Distrbg. Co., Inc.	615-267-9531
TX	Ft. Worth, Swieco, Inc.	817-335-6521
TX	Houston, Commercial Equip.	713-237-8682
TX	Huntsville, Hedco	713-224-4771
TX	Midland, Energy Sys., Inc.	915-694-9657
TX	Waco, Smith Pump Co.	817-776-0377
TX	Wichita Falls, Evans Elec. Motor Centers	817-723-7466
UT	S. Salt Lake, Engineered Control Sys., Inc.	801-487-6226
VT	White River Jct., Arrow Elctrns., Inc.	802-295-3193
VA	Alexandria, Calvert-Jones Co., Inc.	703-370-5850
VA	Chantilly, Engineered Svcs., Inc.	703-471-6310
VA	Danville, Wesco	804-826-6730
VA	Hampton, Wesco	804-826-6730
VA	Lynchburg, Wesco	804-845-0948
VA	Norfolk, Wesco	804-625-7451
VA	Petersburg, Wesco	804-732-1222
VA	Richmond, Wesco	804-353-7353
VA	Roanoke, Wesco	703-344-3271
WA	Kennewick, Pepco	509-586-3168
WA	Longview, North Coast Elec. Co., Inc.	206-423-1550
WA	Moses Lake, Inland Elctrl. Supp. Co.	509-765-1251
WA	Renton, Pepco	206-251-5055
WA	Richland, Wesco	509-783-1397
WA	Spokane, North Coast Elec. Co., Inc.	509-922-1317
WA	Spokane, Power Pump & Elec. Supp.	509-534-5616
WV	Beckley, Wesco	304-252-8633
WV	Bluefield, Wesco	304-325-6151
WV	Bridgeport, Wesco	304-624-6311
WV	Charleston, Wesco	304-768-1293
WV	Parkersburg, Wesco	304-485-6541
WI	Cedarburg, A-A Elec.	414-377-7500
WI	Green Bay, Climatic Control Co., Inc.	414-336-4060
WI	Madison, Climatic Control Co., Inc.	608-273-1717
WI	Milwaukee, Climatic Control Co., Inc.	414-259-9070
WI	Monroe, Precision Drive & Control, Inc.	608-328-5600
WY	Casper, Wesco	307-266-3740
WY	Gillette, Wesco	307-687-0014
Intl	St. Thomas, Power Sys., Inc.	809-776-0217
PR	Bayamon, Jenson Protective Devices	809-798-3264

DIVERSIFIED TECHNLG., P.O. Box 748, Ridgeland, MS 39157, Tel: 601-856-4121, Telex: 585326, TWX: 810-966-2626; Empl.: 65; *Sls. Mgr.:* Bill Long; *Dist. Mgr.:* Bill Long

DIXON INDS., 386 Metacom Ave., Bristol, RI 02809, Tel: 401-253-2000, Telex: 927706

DIXSON INSTRUMENTS

DIXSON, INC., INSTRUMENT DIV., Box 1449, Grand Junction, CO 81502, Tel: 303-242-8863, TWX: 910-929-6991; Empl.: 250; *Sls. Mgr.:* Ray Carlson ....3•1325

Local Sales Offices & Reps

AL	Birmingham, Sesco-Birmingham	205-988-8304
AZ	Phoenix, Finn-Pat Co. Inc.	602-954-0301
CA	El Segundo, Varigon Assocs.	213-322-1120
CA	Santa Clara, Ross Mktg.	408-988-811
CO	Grand Junction, Dixson Instrs.	303-242-8863
CT	Hamden, Pond Technical Sales	203-281-0005
FL	North Palm Beach, Sesco-Miami	305-832-0770
GA	Atlanta, Sesco-Atlanta	404-458-6423
IL	Bartlett, JJS Mktg. Svcs.	312-830-1670
LA	Baton Rouge, Sesco-Baton Rouge	504-928-4951
ME	W. Buxton, Pond Tech. Sls.	207-637-2200
MA	Waltham, Pond Tech. Sls.	617-890-5535
MI	Swartz Creek, JJS Mktg. Svcs.	313-635-7305
MN	Chanhassen, Elctrn. Instr. Cnslts.	612-445-7056
NY	Mt. Vernon, Sonkin Assocs.	914-668-9809
NY	North Syracuse, Naco Electronics	315-699-2651
NC	Cary, Sesco-Raleigh	918-467-7482
NC	Charlotte, Sesco-Charlotte	704-535-4920
OH	Dayton, Instrmn. Sys. Inc.	513-294-2838
OK	Tulsa, Sesco-Tulsa	918-622-3868
OR	Portland, Instr. Representatives Assoc.	503-245-6103
PA	King of Prussia, FLW of PA, Inc.	215-337-4343
PA	Pittsburgh, Instrmn. Sys. Inc.	412-243-1111
TX	Austin, Sesco-Austin	512-892-2490
TX	Dallas, Sesco-Dallas	214-231-9364
TX	Houston, Sesco-Houston	713-999-3510
WA	Seattle, Instr. Representatives Assoc.	206-762-0707

DMA SYS., 601 Pine St., Goleta, CA 93117, Tel: 805-683-3811; *Sls. Mgr.:* Don M. Minami

DOCUMATION, Box 1240, Melbourne, FL 32901, Tel: 305-725-5500, TWX: 510-959-6286; Empl.: 2800; *Sls. Mgr.:* K. Nelson; *Dist. Mgr.:* D. Carson

D. O. INDUSTRIES, 317 E. Chestnut St., E. Rochester, NY 14445, Tel: 716-385-4920, Telex: 200802; FSC No.: 716-381-7032; *Sls. Mgr.:* Gerard Morio

DOLAN-JENNER INDS., Box 1020, Woburn, MA 01801, Tel: 617-935-7444, Telex: 95-5439, TWX: 710-350-7544; Empl.: 120; *Sls. Mgr.:* S. Futran; *Dist. Mgr.:* S. Futran

DOLCH LOGIC INSTRS., 3052 Orchard Dr., San Jose, CA 95134, Tel: 408-998-5730, TWX: 910-338-2023; *Sls. Mgr.:* Ken Pine

DOLPH, JOHN C., CO., New Rd., Monmouth Junction, NJ 08852, Tel: 201-329-2333; *Sls. Mgr.:* J. E. Rooze

DONGAN ELECTRIC MFG. CO., 2987 Franklin St., Detroit, MI 48207, Tel: 313-964-3500

DONTECH INC., 601-606 Airport Indl. Blvd., Doylestown, PA 18901, Tel: 215-348-5010, Telex: 685 1155 DONTK; *Sls. Mgr.:* John Kinard

DORAN MFG. CO., 2851 Massachusetts Ave., Cincinnati, OH 45225, Tel: 513-681-5424; Empl.: 40; *Sls. Mgr.:* Russ DeMar

DORMAN BOGDONOFF CORP., Corp. Center, Willow Pond, Andover, MA 01810, Tel: 617-470-0001, Telex: 710-347-0333; *Sls. Mgr.:* Charles P. Centore

DORMEYER INDS., 3418 N. Milwaukee, Chicago, IL 60641, Tel: 312-283-4000, TWX: 910-221-3831; Empl.: 900; *Sls. Mgr.:* Larry D. Harney; *Dist. Mgr.:* Lynn Masukevich

DOTRONIX, 160 First St. SE, New Brighton, MN 55112, Tel: 612-633-1742, TWX: 910-563-3541; Empl.: 80; *Sls. Mgr.:* L. R. Lemke

Local Sales Offices & Reps

CA	Gilroy, Dotronix	408-848-2499
CA	Upland, Vidtek	714-985-6030
IL	Arlington Hts., Dotronix	312-577-6105
MA	Burlington, Conti-Younger Assoc.	617-273-1582
MN	New Brighton, Dotronix	612-633-1742
TX	Dallas, MGR	214-238-5246

DOUGLAS ELCTRNS., 718 Marina Blvd., San Leandro, CA 94577, Tel: 415-483-8770

DOUGLAS RANDALL, 6 Pawcatuck Ave., Pawcatuck, CT 02891, Tel: 203-599-2075, Telex: 6814060; Empl.: 125; *Sls. Mgr.:* N. Paulson .... **1B**•1337-1345

Local Sales Offices & Reps

AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Anaheim, Galaxie Sls. Int'l.	714-752-1580
CA	Oakland, Powermatic Assoc.	415-635-6825
CA	San Diego, Qualtronics	619-560-8955
CO	Lakewood, Trembly Assoc.	303-233-9544
CT	Mystic, JMG Inc.	203-572-9448
FL	Maitland, Ellis & Assoc.	305-645-1101
GA	Lilburn, W. A. Stancil	404-923-2416
IL	Chicago, Ropek-Cahill-Vogt	312-631-0070
MD	Oxon Hill, Schoeplein & Co.	301-292-1701
MA	Norwood, JMG, Inc.	617-762-5333
MI	Southfield, Fred H. Gehrke & Assoc.	313-559-5363
MN	Osseo, Gaffney Sls. Co.	612-425-5484
MO	Kansas City, Delltron Co. Inc.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NV	Las Vegas, Trembly Assoc.	702-739-9770
NJ	Morristown, Andrews & Andrews	201-569-8800
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Huntington, Andrews & Andrews	516-692-8686
NY	Rochester, J. G. Welch Assoc.	716-244-1100
NY	Syracuse, C. W. Floring & Assoc.	315-478-2149
NC	Raleigh, Leigh Sls.	919-872-1484
OH	Cleveland, Geotronix Mktg. Assoc.	216-526-2535
OH	Columbus, Geotronix Mktg. Assoc.	614-457-8472
OH	Trotwood, Geotronix, Inc.	513-854-5939
OR	Beaverton, Caruso & Northcutt	503-646-4973
PA	Glenside, Elcom	215-885-1715
TX	Dallas, Paramount Controls	214-341-4561
UT	Salt Lake City, Trembly Assoc.	801-486-5292
WA	Bellevue, Caruso & Northcutt	206-454-9699

Local Distributors

CA	Chatsworth, Mil-Comm Dist.	213-998-3111
CA	S. San Francisco, Steven Engrg.	415-588-9200
MA	Middleboro, Glynn Elect.	617-947-4262
OH	Cleveland, Alpha Corp.	216-526-3716
TX	Houston, Butler & Land	713-464-4662
EXP	Jerusalem, Efraim Ben Yakir	
Intl	London, England, Kynmore Eng.	01-839-2371

DOW CHEMICAL CO., 2020 Dow Center, Midland, MI 48640, Tel: 517-636-1000, Telex: 227455, TWX: 810-266-9490; Empl.: 53,300

DOW CORNING

DOW CORNING CORP., Box 1767, Midland, MI 48640-0994, Tel: 517-496-4000, Telex: 227450, TWX: 810-266-9006; Empl.: 5800 .... **2**•1080, 1081

Local Sales Offices & Reps

CA	Irvine	714-261-0800
CA	Santa Clara	408-988-1177
GA	Atlanta	404-256-2626
IL	Chicago	312-671-3100
MA	Boston	617-965-1010
MI	Detroit	313-553-0400
NJ	Parsippany	201-267-0440
NC	Greensboro	919-275-9708
OH	Beachwood	216-464-2330
TX	Dallas	214-661-0702

Local Distributors

AL	Birmingham, Brownell Electro	205-322-3374
AL	Mobile, Brownell Electro	205-479-5405
AZ	Tempe, K. R. Anderson	602-829-1898; 800-538-8712
CA	Santa Ana, K. R. Anderson Co.	714-549-1343; 800-672-1858
CA	Sunnyvale, K. R. Anderson Co.	408-736-6730; 800-538-8712
CO	Commerce City, Waco Elctrns.	303-289-4743; 800-525-0811
CT	Hartford, Brownell Electro	203-278-9000
FL	Miami, Brownell Electro	305-592-2636
FL	Orlando, Brownell Electro	305-843-6776
GA	Atlanta, Prehler Inc.	404-447-5540
IL	Chicago, Prehler Inc.	312-384-6100; 800-621-4177
MD	Linthicum, Brownell Electro	301-636-3626; 800-492-1734
MA	Woburn, Brownell Electro	617-935-7820
MN	Bloomington, Prehler Inc.	800-621-4177
MO	Bridgeton, Crown Distrbg.	314-731-3001; 816-373-6604
MO	Independence, Crown Distrbg.	816-373-6604; 314-731-3001
NJ	Livingston, Robert McKeown Co.	201-992-0700; 800-631-1125
NM	Albuquerque, Waco Elctrns.	505-268-2409; 800-525-0811
NY	New York, Brownell Electro	212-924-6000
NY	Rochester, Wolcott-Park	716-342-3120
NC	Charlotte, Brownell Electro	704-597-1270
NC	Raleigh, Brownell Electro	919-876-6524
OH	Middleburg Hgts., Prehler Electrical Insul. Co.	216-243-5510
PA	Bridgeville, Brownell Electro	412-221-0074
PA	Trevose, Brownell Electro	215-364-1400
TN	Knoxville, Brownell Electro	615-966-3441
TN	Memphis, Brownell Electro	901-795-8483
TN	Nashville, Brownell Electro	615-885-1302
TX	Dallas, Specialized Prods. Co.	214-358-4663
TX	Houston, Specialized Prod. Co.	713-789-6610
UT	Salt Lake City, Waco Elctrns.	801-485-6511; 800-525-0811
VA	Norfolk, Brownell Electro	804-582-8121
WV	Princeton, Brownell Electro	304-487-1477
WI	Milwaukee, Ellsworth Corp.	414-352-1230

DowKey®

Division of Kilovac Corporation

DOW KEY DIV., KILOVAC CORP., Box 4422-EM, Santa Barbara, CA 93103, Tel: 805-684-4560, TWX: 910-336-1141; FSC No.: 00471; Empl.: 130; *Dist. Mgr.:* Jack Dysart .... **1B**•1346, 1347

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clark	602-968-9037
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CA	West Lake Village, Hy-Tech Sls.	213-991-7491
FL	Melbourne, Saber Assocs., Inc.	305-724-0920
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Cedar Rapids, H. R. Brown Sls. Co.	319-366-0635
MD	Beltsville, Applied Engrg. Conslts.	301-792-2211
MA	Lowell, Matrix Sls., Inc.	617-458-2096
MN	St. Paul, De Beck	612-635-4649
MO	Kansas City, EIR Co.	816-452-7030
MO	Kansas City, EIR Co.	816-452-7030
MO	Leasburg, EIR Co.	314-895-4100
NM	Albuquerque, Data Handling	505-884-0284
NY	Cazenovia, S. T. Woolard Co.	315-655-8145
NY	Melville, Metro-Mics	516-433-3333
NY	Rochester, Lamb	716-323-1250
NC	Clayton, Saber Assocs.	305-724-0920
OH	Cincinnati, Delta Sls.	513-271-5444
OK	Tulsa, Norcom, Inc.	918-832-7747
OR	Portland, Components West	503-643-5588
PA	Paoli, Tyler Griffin	215-647-1550
TX	Austin, Norcom, Inc.	512-451-2757
TX	Dallas, Norcom, Inc.	214-386-4888
TX	Houston, Norcom, Inc.	713-778-0392
WA	Redmond, Components West	206-885-5880

Local Distributors

CA	Los Angeles, Henry Radio	213-820-1234
CA	Sacramento, Zackit	916-446-3131
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement	408-998-5900
CA	Santa Monica, Distr. Specialists	213-393-9666
IN	Indianapolis, Graham Elctrns.	317-634-8202
LA	New Orleans, Southern Radio Supp.	504-524-2343
MD	Rockville, Capitol Radio Wholesalers	301-792-2827; 301-881-2270
MA	Plainville, Teknis, Inc.	617-695-3591
NM	Albuquerque, Walker Radio	505-247-2288
TX	Ft. Worth, Allied Elctrns.	817-336-5401
WI	Milwaukee, Amateur Elctrn. Radio Supp.	414-442-4200

DRACON DIV., See Harris Corp., Dracon Div.

DRAKE, R. L., CO., 540 Richard St., Miamisburg, OH 45342, Tel: 513-866-2421, Telex: 28-8017; *Sls. Mgr.:* M. Brubaker

DRANETZ TECHNOLOGIES, INC., 1000 New Durham Rd., CN-91, Edison, NJ 08818, Tel: 201-287-3680, Telex: 499-7808, TWX: 710-997-9553; FSC No.: 23207; Empl.: 230; *Sls. Mgr.:* A. Orlacchio .... **3**•1218

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs.	205-837-4304
AZ	Scottsdale, Barnhill Assoc.	602-947-7841
CA	Pasadena, Jim Robins & Associates	213-795-9118
CA	Redondo Beach, Ward/Davis Assocs.	213-643-6977
CA	San Diego, Wheelock Associates	619-454-3473
CA	San Diego, Ward/Davis Assocs.	619-292-1000
CA	Santa Clara, Ward/Davis Associates, Inc.	408-245-3700
CO	Englewood, Barnhill Assoc.	303-779-3600
CT	Mount Carmel, Sci. Devices	203-248-9361
FL	Orlando, Datarep	305-843-5224
GA	Atlanta, Kemp Instrs.	404-452-8050
IL	Chicago, Memeco Sls. & Svc. Corp.	312-228-9555
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Memeco Sls. & Svc. Corp.	317-356-8098
IN	Indianapolis, Loren Green Assocs.	317-293-9827
KS	Shawnee, Atech	913-268-9644
LA	Baton Rouge, Barnhill Assoc.	504-924-6826
LA	Lafayette, Kemp Instrs.	318-269-9452
MD	Rockville, Elctrn. Mktg. Assocs.	301-881-5300
MA	Waltham, Sci. Devices	617-890-2252
MI	Brighton, Stress Analysis Svcs.	313-632-6110
MI	Farmington, Carter, McCormic & Peirce	313-477-7700
MN	Edina, Carvel Engrg. & Sls. Co.	612-835-7929
MN	Minneapolis, Loren Green Assoc.	612-571-6666
MN	Minneapolis, Arjay Sls.	612-854-4972
MO	Raytown, Power Specialties	816-353-6550
MO	St. Louis, Atech	314-576-2884
NE	Lincoln, Harry Ferris Co.	402-464-6148
NJ	Lodi, SDM Rep.	201-368-0123
NM	Albuquerque, Barnhill Assoc.	505-299-7658
NY	Rochester, SDM Rep.	716-247-8770
NC	Charlotte, Baesel & Assocs.	704-375-1044
OH	Cleveland, Carter, McCormic & Peirce	216-779-5100
OH	Dayton, Stress Analysis Svcs.	513-263-8036
OH	Englewood, Carter, McCormic & Peirce	513-836-0951
OH	Medina, Stress Analysis Svcs.	216-725-7733
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Monroeville, Carter, McCormic & Peirce	412-372-4415
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
PA	Plymouth Meeting, Elctrn. Mktg. Assoc.	215-828-7400
TX	Austin, Barnhill Assoc.	512-451-0217
TX	Houston, Barnhill Assoc.	713-688-9971
TX	Richardson, Barnhill Assoc.	214-231-2573
UT	Murray, Barnhill Assoc.	801-262-3000
WA	Bellevue, Topp Engrg. Sls.	206-747-5400

DRAWN METAL PRODUCTS, 6143 W. Howard St., Niles, IL 60648, Tel: 312-647-8941; Empl.: 60; *Sls. Mgr.:* Tom Amundson

DREEFS SWITCH INC., 3782 Hawthorn Ct., Waukegan, IL 60085, Tel: 312-662-7667, 800-323-9605, Telex: 703784; Empl.: 45; *Sls. Mgr.:* E. L. Magiera; *Dist. Mgr.:* E. L. Magiera .... **1B**•1585-1587

Local Sales Offices & Reps

CA	Costa Mesa, Electro Mech Sls.	714-642-2390
CA	San Diego, Electro Mech Sls.	714-642-2390
CA	Sunnyvale, Schwerin Merrill	408-735-7900
IL	Oak Brook, MSL & Assocs.	312-655-8977
IL	Waukegan, Dreefs Switch Inc.	800-323-9605
MN	Minneapolis, Robert W. Marshall Co.	612-929-0457
MO	Bridgeton, Centech Inc.	314-291-4230
MO	Raytown, Centech Inc.	816-358-8100
NY	Fulton, P. Saftler Assocs.	315-592-7184
NY	Lynbrook, P. Saftler Assocs.	516-593-7880
OH	Cincinnati, Jim Finnegan Co.	513-931-1686
OH	Cleveland, Jim Finnegan Co.	216-238-5905
OH	Toledo, Jim Finnegan Co.	419-865-5306
OR	Portland, Controltek, Sls.	503-641-0877

TX	Austin, Precision Technlg.	512-250-0201
TX	Richardson, Precision Technlg.	214-234-8071
WI	Milwaukee, Badgerep Inc.	414-258-6630

Local Distributors

CA	San Jose, Cypress Elctrns.	408-945-8400; 800-538-5112
CA	Torrance, Cypress Elctrns.	213-530-1900
IL	Wheeling, Hawk Elctrns.	312-459-4030
TX	McKinney, Sun Belt Elctrns.	214-542-1432
Can	Concord, Ontario, Astec Comp.	416-669-4022

DRESSEN-BARNES ELCTRNS., 1600 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-3020, TWX: 910-592-1256; FSC No.: 89321; Empl.: 220; *Sls. Mgr.:* B. Guy

DRESSER INDS., 1505 Elm St., Dallas, TX 75201, Tel: 214-746-6000, Telex: 73-2489, TWX: 910-861-4136; Empl.: 55,000

DUKANE CORP., Communications Sys. Div., 2900 Dukane Dr., St. Charles, IL 60174, Tel: 312-584-2300, Telex: 720426; Empl.: 700; *Sls. Mgr.:* Jack Hollis; *Dist. Mgr.:* Jack Hollis

DUMONT ELCTRNS., See Thomson-CSF Comps. Corp., DuMont Div.

DUMONT INSTRUMENTATION, INC., 75 Mall Dr., Commack, NY 11725, Tel: 516-864-8500, TWX: 510-226-3739; Empl.: 15,000; *Sls. Mgr.:* H. Poschmann

DUMONT OSCILLOSCOPE LABS., 40 Fairfield Pl., W. Caldwell, NJ 07006, Tel: 201-575-8666, Telex: 219236 DOLI-UR; FSC No.: 30669; Empl.: 30; *Sls. Mgr.:* John Carter, Jr.

DUNCAN ELECTRONICS, INC., 2865 Fairview Rd., Costa Mesa, CA 92626, Tel: 714-545-8261, TWX: 910-595-1128; FSC No.: 5905; Empl.: 160; *Sls. Mgr.:* J. Colligan; *Dist. Mgr.:* J. Colligan

DUNEGAN/ENDEVCO, Rancho Viejo Rd., San Juan Capistrano, CA 92675, Tel: 714-831-9131, Telex: 68-3430; Empl.: 80; *Sls. Mgr.:* B. Toffelmier

DUOTONE, 6875 S.W. 81st St., S. Miami, FL 33143, Tel: 305-665-1121; Empl.: 20; *Sls. Mgr.:* S. Nester; *Dist. Mgr.:* S. G. Nester

DUPONT DE NEMOURS, E. I., & CO., 1007 Market St., Wilmington, DE 19898, Tel: 302-773-3218; Empl.: 130,000

DUPREE, INC., 9835 Dupree St., So. El Monte, CA 91733, Tel: 818-442-4700; Empl.: 60; *Sls. Mgr.:* Beverly Bowdry

DURACELL INTL., S. Broadway, Tarrytown, NY 10591, Tel: 914-591-7000, Telex: 131548, TWX: 710-564-0810; Empl.: 4000

DURAKOOL, 1010 N. Main St., Elkhart, IN 46514, Tel: 219-264-1116, Telex: 25-8482; Empl.: 200; *Sls. Mgr.:* Darrell Wilk; *Dist. Mgr.:* F. Aitchison

DURALITH, 525 Orange St., Millville, NJ 08332, Tel: 609-825-6900, TWX: 510-687-7520; Empl.: 370

DURGIN & BROWNE, 80 Allen Rd., So. Burlington, VT 05401, Tel: 802-863-6873; Empl.: 35; *Sls. Mgr.:* Chris Riggs

DY-4 SYSTEMS INC., 888 Lady Ellen Pl., Ottawa, ON K1Z 5M1, Canada, Tel: 613-728-3711, Telex: 053-4969; *Sls. Mgr.:* Terry Black

DYLON DATA CORP., 9561 Ridgehaven Ct., San Diego, CA 92123, Tel: 619-292-5584, TWX: 910-335-1524; Empl.: 20; *Sls. Mgr.:* R. A. Comstock; *Dist. Mgr.:* Steve Komarek

DYMA ENGRG., Box 1535, Los Lunas, NM 87031, Tel: 505-865-6700; Empl.: 14

DYNACIRCUITS INC., 11230 W. Addison, Franklin Park, IL 60131, Tel: 312-451-1700; *Sls. Mgr.:* Fred Stein

DYNAGE, INC., CONTROL PRODS GRP., 135 Prestige Park Circle, E. Hartford, CT 06108, Tel: 203-289-6831, TWX: 710-425-6063; Empl.: 40; *Sls. Mgr.:* Sidney C. Oakleaf

DYNAGE, POWER SUPP. GRP., 135 Prestige Park Circle, E. Hartford, CT 06108, Tel: 203-289-6831, TWX: 710-425-6063; Empl.: 40; *Sls. Mgr.:* Sidney C. Oakleaf

DYNALOY, INC., 7 Great Meadow La., Hanover, NJ 07936, Tel: 201-887-9270, Telex: 642-033; FSC No.: 27908; Empl.: 19

Local Sales Offices & Reps

CA	Westminster, Contronic Devices	714-897-2266
FL	Ft. Lauderdale, Etchomatic	305-563-5060
MA	Manchester, Lee Thomas Assoc.	617-525-3028
MA	Waltham, Etchomatic	617-893-2020
MN	Minneapolis, International Sls.	612-831-8423

DYNAMIC MEASUREMENTS, 8 Lowell Ave., Winchester, MA 01890, Tel: 617-729-7870, TWX: 710-348-6596; Empl.: 61; *Sls. Mgr.:* Bill Schromm

DYNAMICS, Div. of Waugh Controls Corp., 9001 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-998-8281, Telex: 69-6171; Empl.: 100; *Sls. Mgr.:* Jim Moore

DYNAPAR, 1675 Delany Rd., Gurnee, IL 60031, Tel: 312-662-2666, TWX: 910-235-1865; Empl.: 130

DYNAPLEX INC., Interplex, 120-12 28th Ave., Flushing, NY 11354, Tel: 212-961-6750, TWX: 710-582-3048; *Sls. Mgr.:* Lester Zimmerman; *Dist. Mgr.:* Lester Zimmerman

DYNATECH CORP., 1225 E. Wakeham Ave., P.O. Box 1019, Dept. E, Santa Ana, CA 92702, Tel: 714-558-8755, TWX: 910-595-1951; Empl.: 340; *Sls. Mgr.:* Rick Burbank

DYNATEC INTERNATIONAL, 3594 West 1820 South, Salt Lake City, UT 84104, Tel: 801-973-9500, 800-722-7425; *Sls. Mgr.:* Robert Checketts; *Dist. Mgr.:* Robert Checketts

DYNATRONIX, INC., 105 Power St., Amery, WI 54001, Tel: 715-268-8118, 800-826-7172, TWX: 297861 DYTX UR; *Sls. Mgr.:* R. W. Kappler; *Dist. Mgr.:* R. W. Kappler, Natl. Sls. Mgr.

DYNISCO, 10 Oceana Way, Norwood, MA 02062, Tel: 617-769-6600, Telex: 092-4347; Empl.: 108

DYSAN CORP., 5201 Patrick Henry Dr., Santa Clara, CA 95050, Tel: 408-988-3472, Telex: 171551 DYSAN SNTA, TWX: 910-338-2144

DZUS FASTENER, 425 Union Blvd., W. Islip, NY 11795, Tel: 516-669-6000, Telex: 96-1454; FSC No.: 72794; Empl.: 100; *Sls. Mgr.:* George R. Davis

EAGLE ELECTRIC MFG. CO., INC., 45-31 Court Sq., L.I.C., NY 11101, Tel: 212-937-8000, Telex: ITTEAGLE 426774; *Sls. Mgr.:* Joseph Mannarino; *Dist. Mgr.:* John Chambers

EAGLE MAGNETIC COMPANY, INC., 7417 Crawfordsville Rd., P.O. Box 24283, Indianapolis, IN 46224, Tel: 317-297-1030, TWX: 810-341-3386; Empl.: 37; *Sls. Mgr.:* Dane Love 2•1905

EAGLE-PICHER INDS., INC., Elctrns. Div., Box 47, Joplin, MO 64801, Tel: 417-623-8000, TWX: 910-774-4508; Empl.: 700

EAGLE SIGNAL CONTROLS, Mfg. Div. Gulf & Western Inds., Box 16100, Austin, TX 78761, Tel: 512-837-8401; Empl.: 600; *Sls. Mgr.:* Don Benice

Local Sales Offices & Reps

CA	La Fayette	415-283-0380
CA	Studio City	213-572-8000
GA	Atlanta	404-996-4511
IL	Downers Grove	312-969-9000
NJ	Saddle Brook	201-368-2270
TX	Arlington	817-265-7790

EALING OPTICS CO., Ealing Corp., 22 Pleasant St., S. Natick, MA 01760, Tel: 617-655-7000, Telex: 948339; *Sls. Mgr.:* Peter Andreas

E & L INSTRUMENTS, INC., 61 First St., Derby, CT 06418, Tel: 203-735-8774, Telex: 963536; Empl.: 46

EAO SWITCH CORP., 198 Pepe's Farm Rd., P.O. Box 552 MO, Milford, CT 06460, Tel: 203-877-4577, Telex: 96-4347; Empl.: 19; *Sls. Mgr.:* George T. Bracci 1B•1589

Local Sales Offices & Reps

AL	Huntsville, Conley and Assocs.	205-882-0316
AZ	Scottsdale, Luscombe Engrg.	602-949-9333
AR	Little Rock, Beacon Elctrn. Assocs.	501-224-5449
CA	Campbell, Luscombe Engrg.	408-370-2020
CA	Pasadena, Luscombe Engrg.	213-684-2000
CA	San Diego, Luscombe Engrg.	619-295-4300
CO	Denver, Cleveland Entprs. of Colo.	303-751-3252
CT	Farmington, Ray Perron & Co.	203-673-4825
CT	New Milford, Ray Perron and Co.	203-354-2569
FL	Boca Raton, Conley and Assocs.	305-395-6108
FL	Oviedo, Conley and Assocs.	305-365-3283
GA	Atlanta, Conley and Assocs.	404-447-6992
GA	Tampa, Conley and Assocs.	813-885-7658
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
KS	Mission, Mertens Co.	918-432-9323
MD	Columbia, Delta 111 Assocs.	301-730-4700
MA	Needham, Ray Perron & Co.	800-225-4280; 617-449-6162
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MN	Minneapolis, OEM Elctrical Sls. Co.	612-559-2448
MO	Clayton, Mertens Co.	314-993-6600
NH	Dover, Ray Perron & Co	603-742-2321
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Rochester, Apex Assocs., Inc.	716-254-6050
NC	Raleigh, Conley and Assocs.	919-876-9862
OH	Mentor, Jay Mktg. Assocs.	216-257-5244
PA	Hatboro, Jacobsen Assoc.	215-674-2937
PA	Pittsburgh, R. W. Kneip	412-823-0169
TN	Johnson City, Beacon Elctrn. Assocs.	615-282-2421
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415
UT	Salt Lake City, Cleveland Entprs. of Colo.	801-355-8424
WA	Lynnwood, Blum & Assocs.	206-775-6656
WI	Milwaukee, Badgerep	414-258-6630

Local Distributors

AL	Huntsville, R.M. Alabama	205-852-1550
AZ	Phoenix, Minarik Electric	602-233-3000
AZ	Tempe, Fisher Brownell	602-967-1464
CA	Alhambra, Fisher Brownell	714-739-2201
CA	Burlingame, Electronic Control Devices	415-348-0791
CA	Gardena, California Switch and Signal	213-770-2330
CA	Los Angeles, Minarik Elec. Co.	213-624-3161
CA	San Diego, Minarik Elec. Co.	619-560-8545
CA	San Diego, Fisher Brownell	619-560-6632
CA	Santa Clara, Minarik Elec. Co.	408-727-0575
CA	Santa Clara, Fisher Brownell	408-988-6041
CA	Van Nuys, Patane Avionics	213-988-4455
CO	Denver, CSID	800-525-3532
CT	Hamden, Impact Sls.	203-281-1331
CT	Shelton, Century Elec. Supp.	203-736-2684
FL	Oviedo, Dixie Sales	305-365-5211
GA	Norcross, Wilshire Elctrns.	404-923-5750
IL	Arlington Hgts., Martec Assoc.	312-956-8090
IL	Lombard, R.M. Illinois	312-932-5150
IL	Rosemont, Advent Elctrns.	312-297-6200
IN	Indianapolis, R.M. Indiana	317-247-9701
KY	Louisville, Peerless Elctrns.	502-637-7674
LA	Baton Rouge, Menard Elctrns.	504-355-0323
LA	Jefferson, Gulfside Company	504-733-4481
MA	Canton, Impact Sls. Co.	617-821-1500
MI	Grand Rapids, R.M. Elctrns.	616-531-9300
MI	St. Claire Shores, SPEMCO Switches	313-771-2700
MN	Minneapolis, Electronic Ctr.	612-371-5200
NJ	Cranford, Garden State Elctrns.	201-272-6400
NJ	Roseland, Walker Engrg.	201-226-0855
NY	Buffalo, Summit Distrs.	716-887-2800
NY	New York, Martin Audio/Video	212-541-5900
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rochester, Modutex Corp.	716-424-1620
NY	Woodside, Switches Unlimited	212-478-5000
NC	Charlotte, Elctrns. Mktg. Corp.	704-394-6195
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Columbus, Electronics Mktg.	614-299-4161
OH	Highland Hgts., Electronic Mktg. Corp.	216-442-3441
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Minarik Elc. Co.	503-253-3402
PA	Harrisburg, Advacom	717-545-5674
PA	McKean, Advacom	814-476-7774
PA	Norristown, Kimberly-James Co.	215-666-7286
PA	Pittsburgh, Grant Industrial Controls	412-787-9770
TX	Dallas, R.M. Dallas	214-235-3100
TX	Garland, Indl. Equip. Co. of Dallas	214-271-5494
TX	Richardson, Fisher Brownell	214-235-3177
TX	San Antonio, Minarik Elec. Co.	512-822-7097
WA	Bellevue, Integrated Elctrns.	206-455-2727
WI	Milwaukee, Marsh Elctrns.	414-475-6000

E-A-R DIV., Cabot Corp., 7911 Zionsville Rd., Indianapolis, IN 46268, Tel: 317-872-1111, TWX: 810-341-3412; *Sls. Mgr.:* Richard W. Holub 2•1867

EASCO/K-D TOOLS, 3575 Hempland Rd., Lancaster, PA 17604, Tel: 717-665-4557, Telex: 848429; *Sls. Mgr.:* Mark Lax

EASTERN AIR DEVICES MOTOR DIV., 1 Progress Dr., Dover, NH 03820, Tel: 603-742-3330, TWX: 510-297-4454; Empl.: 200; *Sls. Mgr.:* D. Cooper 1B•1141

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
CA	Buena Park, Sales Engrs. Ltd.	213-921-0681

CA	Los Altos, Servo Data	415-964-1325
CO	Boulder, R. G. Entprs.	303-447-9211
FL	Orlando, Perrott Assoc.	305-275-1132
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
MA	Framingham, Gerald Rosen Co.	617-879-5505
MN	St. Paul, REPCO	612-488-0201
NJ	Ridgefield, Rical Assocs.	201-945-5250
NY	Rochester, Elcom Sls.	716-385-1400
NY	Syracuse, ELCOM Sls.	315-685-8245
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
PA	Paoli, ETC Sales	215-296-3527
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, MECH-TRON Mktg.	214-343-3786
WA	Seattle, Eltech	206-767-4330
WI	Milwaukee, Berndt Assocs.	414-545-8400

EASTERN DELTA CORP., 29-09 S. Broadway, Fair Lawn, NJ 07410, Tel: 201-797-4200; FSC No.: 18105; Empl.: 35

EASTERN ELECTRONICS MFG. CORP., 180 Roberts St., East Hartford, CT 06108, Tel: 203-528-9821; Empl.: 100; *Sls. Mgr.:* T. P. Dunn

EASTERN MARKING MACHINES, 422 S Franklin St., Hempstead, NY 11550, Tel: 516-483-7070, Telex: 968095; Empl.: 8; *Sls. Mgr.:* P. Coburn; *Dist. Mgr.:* L. Sherman

EASTERN MICROWAVE, 4 Gill St., Woburn, MA 01801, Tel: 617-935-8600; FSC No.: 30616; Empl.: 45; *Sls. Mgr.:* S. C. Lowe

EASTERN SMELTING & REFINING CORP., 37-39 Bubier St., Lynn, MA 01901, Tel: 617-599-9000, Telex: 940108; *Sls. Mgr.:* Donald Decareau

EASY HEAT-WIREKRAFT, 555 North Michigan St., Lakeville, IN 46536, Tel: 219-784-3011, Telex: 233159; *Sls. Mgr.:* Russell W. Riddle

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EATON CORP., Aerospace Controls/Systems Div., 2074 Whitfield Ave., East, Sarasota, FL 33578, Tel: 813-758-7726

EATON CORP., Microwave Components Div., 680 W. Maude Ave., Sunnyvale, CA 94086, Tel: 408-733-3883, TWX: 910-339-9252; FSC No.: 54987; Empl.: 30

Local Sales Offices & Reps

AZ	Tempe, Sierra Technl. Grp.	602-894-2335
CA	Costa Mesa, EBA Microwave	714-857-6079
CA	Sunnyvale, Loeswicks	408-745-6751
FL	Winter Park, Microwave Mktg.	305-678-2141
IA	Cedar Rapids, S & O Sls.	319-393-1845
KS	Merriam, Midwest Tech. Sls.	913-236-8555
ME	Ogunquit, Micronic Assocs.	617-933-2121
MD	Silver Spring, Youth-Nelson Assocs.	301-598-5740
NY	Fayetteville, R. D. Sherman & Co.	315-637-9861
PA	Huntingdon Valley, Rabal Assoc., Inc.	215-947-4825
TX	Dallas, Stevens Sls. Co.	214-350-2476
WA	Seattle, Ecco Mktg.	206-364-0200

EATON CORP., A.I.L. Div., Comac Rd., Deer Park, NY 11729, Tel: 516-595-3094, TWX: 510-227-6073; FSC No.: 00752; Empl.: 2250; *Sls. Mgr.:* H. N. Kreisberg

EATON CORP., Microwave Comps. Div., 783 Palomar Ave., Sunnyvale, CA 94086, Tel: 408-245-6810, TWX: 910-339-9230; Empl.: 120; *Sls. Mgr.:* J. R. Campbell

Local Sales Offices & Reps

AZ	Tempe, Sierra Tech. Grp.	602-894-2335
CA	Sherman Oaks, Midwin & Olifson	213-996-9093
CA	Sunnyvale, Loeswick	408-745-6751
FL	Winter Park, Microwave Mktg.	305-678-2141
KS	Merriam, Midwest Tech. Sls.	913-236-8557
MD	Silver Spring, Youth-Nelson Assocs.	301-598-5740
MA	Needham Heights, O'Sullivan & Murphy	617-449-4141
NY	Fayetteville, R. D. Sherman & Co.	315-637-9861
NY	Melville, Metro Mics	516-271-6677
OH	Dayton, Ashby Assocs.	513-252-5627
PA	Huntingdon Valley, Rabal Assoc.	215-947-4825
TX	Dallas, Stevens Sls. Co.	214-350-2476

EATON CORP., Durant Digital Instrs., 901 S. 12th St., Watertown, WI 53094, Tel: 414-261-4070, TWX: 910-260-3713; Empl.: 400; *Sls. Mgr.:* H. L. Sisson; *Dist. Mgr.:* Dennis G. Walz

EATON CORP., Elctrn. Instrmn. Div., 2070 Fifth Ave., Ronkonkoma, NY 11779, Tel: 516-588-3600, TWX: 510-228-6507; Empl.: 400

EATON CORP., Printer Prods Oper., Techn. Resch. Pk., Riverton, WY 82501, Tel: 307-856-4821, Telex: 910 949 4864; Empl.: 185; *Sls. Mgr.:* Roger Rayburn

EATON CORP., TEST SYS. DIV., Discrete Test, Precision Rd., Danbury, CT 06810, Tel: 203-744-0096, TWX: 710-456-5030; *Sls. Mgr.:* Chuck Winick

EATON CORP., TEST SYS. DIV., Memory Test Sys., 21135 Erwin St., Woodland Hills, CA 91365, Tel: 213-887-5550, Telex: 69-8489; Empl.: 200; *Sls. Mgr.:* Chuck Winick

EATON CORP, Yig-Tek Prods., 785 Palomar Ave., Sunnyvale, CA 94086, Tel: 408-737-7300, TWX: 910-339-9395; Empl.: 100

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EATON CORP./CUTLER-HAMMER PRODS., Aerospace/Commercial Controls Div., 4201 N. 27th St., Milwaukee, WI 53216, Tel: 414-449-7487, Telex: 26-716; FSC No.: 81640; *Sls. Mgr.:* W. L. Reinke; *Dist. Mgr.:* J. R. McDonough ..1B•1590-1611

Local Sales Offices & Reps

CA	Los Angeles	714-776-1910
CA	San Francisco	415-967-0606
FL	Tampa	813-985-5777
GA	Atlanta	404-939-3023
IL	Chicago	312-530-7980
KS	Kansas City	913-384-0080
MD	Baltimore	301-296-9640
MA	Boston	617-863-5427
MI	Detroit	313-354-7513
MN	Minneapolis	612-831-8668
NY	Melville	516-595-4424
OH	Cleveland	216-835-4554
OH	Dayton	513-294-1877
PA	Philadelphia	215-692-9126
PA	Pittsburgh	412-221-4420
TX	Dallas	214-386-4121
WA	Seattle	206-643-2717
WI	Milwaukee	414-327-7300

Local Distributors

AL	Huntsville, Hamilton-Avnet Elctrns.	800-633-2992
AZ	Phoenix, Dalis Elctrn. Supp.	602-254-8471
AZ	Tempe, Fisher/Brownell	206-967-1464
AZ	Tempe, Hamilton/Avnet	602-894-9600
CA	Campbell, Centrex Elctrns.	408-379-0800
CA	Costa Mesa, Avnet Elctrns.	213-558-2345
CA	Covina, Selecta Switch	213-967-4123
CA	Fountain Valley, Comp. Center	714-979-0433
CA	Glendale, Western Elctrn. Supp.	213-246-4861
CA	Los Angeles, Electric Switch	213-660-1310
CA	Los Angeles, California Switch & Signal	213-770-2330
CA	Los Angeles, Fisher/Brownell	213-289-0255
CA	Los Angeles, Western Electromotive/Shephard	213-820-3777
CA	San Diego, Fisher/Brownell	619-560-8545
CA	San Diego, Hamilton/Avnet	619-571-7500
CA	San Jose, Consolidated Parts	408-263-9521
CA	Santa Ana, Norstan Elctrns. Inc.	714-540-4165
CA	Santa Clara, Western Electromotive	408-727-7411
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Santa Fe Springs, Eurton Elec. Co.	213-946-4477
CA	Sunnyvale, Hamilton-Avnet Elctrns.	408-743-3355
CO	Denver, C.S.I.D. Inc.	303-893-9594
CO	Denver, Con. Parts	303-623-5313
CO	Denver, Newark Elctrns. Corp.	303-757-3351
CO	Englewood, Hamilton/Avnet	303-740-1000
CT	Danbury, Hamilton-Avnet Elctrns.	203-762-0361
CT	New Haven, Hatry Elec.	203-787-5921
CT	Wallingford, Sager Elctrl. Supp. Co.	203-265-4600
CT	West Hartford, Gal Elec. Co.	203-232-9880
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Ft. Lauderdale, Hamilton-Avnet Elctrns.	305-971-2900
FL	Ft. Lauderdale, Peerless	303-973-4141
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Orlando, Hammond	305-849-6060
FL	St. Petersburg, Hamilton-Avnet Elctrns.	813-576-3930
GA	Atlanta, Electro Air Corp.	404-351-3545
GA	Atlanta, Brownell Electro	404-762-5181
GA	Norcross, Hamilton-Avnet Elctrns.	404-447-7500
IL	Addison, LCOMP Chicago	312-628-1400
IL	Chicago, Revere Elec. Supp. Co.	312-738-3636
IL	Chicago, Advent Elctrns.	312-297-6200
IL	Chicago, Steiner	312-685-7000
IL	Chicago, Complete-Reading	312-547-5400
IL	Chicago, Hamilton/Avnet	312-678-6310
IL	Chicago, Ohm	312-359-5500
IL	Chicago, Newark	312-638-4411
IN	Ft. Wayne, Graham Elctrn. Supp.	219-423-3422
IN	Indianapolis, Graham Elctrn. Supp.	317-634-8202
IA	Davenport, Crescent Elec. Supp. Co.	319-323-1811
IA	West Des Moines, Ramco Co.	515-225-6933
KS	Kansas City, Hamilton/Avnet	913-888-8900
KS	Wichita, LCOMP	316-265-8501
KS	Wichita, Airtechnics	316-267-2849
KY	Louisville, Peerless Elctrn. Equip.	502-637-7674
LA	Lafayette, Ralph's of Lafayette	318-233-0105
LA	New Orleans, Long Elctrl. Supp. Co.	504-524-8383
MD	Beltsville, Treeko Sls.	301-792-0112
MD	Gaithersburg, Pioneer-Wash	301-948-0710
MD	Kensington, Marine Air	301-949-9560
MA	Boston, Hamilton-Avnet Elctrns.	617-273-7500
MA	Boston, Controller Svc.	617-269-1300
MA	Boston, Sager	617-749-6700
MA	Canton, Impact Sls. Co.	617-821-1500
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Waltham, Sterling Elctrns.	617-894-6200
MI	Detroit, Hamilton-Avnet Elctrns.	313-522-4700
MI	Detroit, R S Elctrns.	313-525-1155
MI	Detroit, Don Blackburn & Co.	313-261-9100
MI	Detroit, Spemco Switches	313-771-2700
MI	Grand Rapids, S-F Elctrns. Supp.	615-459-0216
MN	Minneapolis, H. A. Holden	612-333-5353
MN	Minneapolis, Hamilton/Avnet	612-932-0600
MN	Minneapolis, Boustead	612-544-9131
MN	Minneapolis, Newark	612-331-6350
MN	St. Paul, Ragon Elctrns.	612-642-2852
MS	Jackson, Ellington Elctrn. Supp.	601-355-0561
MO	Kansas City, LCOMP	816-221-2400
MO	St. Louis, Hamilton-Avnet Elctrns.	314-340-1200
MO	St. Louis, LCOMP	314-291-6200
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Hackensack, Nassor Elctrl. Supp. Co.	201-641-3737
NJ	Jersey City, Cuny & Guerber	201-653-0222
NJ	Manasquan, Kulka Smith	201-223-9400
NJ	Paterson, Hamilton-Avnet Elctrns.	201-575-3390
NM	Albuquerque, Walker Elctrns. Supp. Co.	505-247-2288

NM	Albuquerque, Hamilton/Avnet	505-765-1500
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit	716-884-3450
NY	Hauppauge, Hamilton-Avnet Elctrns.	516-231-9800
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Lynnbrook, Peerless	516-593-2121
NY	New York, Brownell Electro	212-924-6000
NY	Rochester, Modutex	716-647-9700
NY	Rochester, Hamilton-Avnet Elctrns.	716-475-9130
NY	Rochester, Simcona	716-328-3230
NY	Syracuse, Hamilton-Avnet Elctrns.	206-437-2641
NY	Woodside, Switches Unltd.	212-478-5000
NC	Charlotte, Brownell Electro	704-597-1270
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Hamilton/Avnet	919-829-8030
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, Schuster	513-489-1400
OH	Cleveland, Pioneer-Cleveland	216-587-3600
OH	Cleveland, Hamilton-Avnet Elctrns.	216-831-3500
OH	Cleveland, Complete-Reading	216-267-1000
OH	Cleveland, Roland	216-351-2050
OH	Dayton, Pioneer Standard Elctrns.	513-236-9900
OH	Dayton, Stotts-Friedman Co.	513-298-5555
OH	Dayton, Related Comps.	513-253-6116
OH	Dayton, Hamilton/Avnet	513-433-0610
OH	Warren, REM Elctrns. Supp. Co.	216-373-1300
OK	Oklahoma City, Electro Entprs.	405-427-6591
OK	Oklahoma City, John H. Cole Co.	405-235-1761
OK	Tulsa, Radio Inc.	918-587-9123
OR	Beaverton, Almac/Stroum	503-641-9070
PA	Altoona, Allegheny Elctrns.	814-946-0871
PA	Braddock, M. Leff Radio Parts Co.	412-351-5000
PA	Erie, Erie Indl.	814-455-8051
PA	Harrisburg, Dauphin Elec.	717-232-4201
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Philadelphia, Peak	215-293-9000
PA	Pittsburgh, Cam/R.P.C.	412-782-3770
PA	Reading, Barbey	215-376-7451
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Chattanooga, Techni-Tronics	615-875-5449
TN	Memphis, Brownell Electro	901-795-8487
TN	Nashville, Electra Distrbg. Co.	615-329-3971
TX	Addison, Computer Comps. Corp.	214-239-0271
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Austin, Hamilton-Avnet Elctrns.	512-837-8911
TX	Dallas, Fisher/Brownell	214-235-3177
TX	Dallas, Associated Aircraft	214-331-4381
TX	Dallas, Southwest Elctrns.	713-234-3050
TX	Dallas, Complete-Reading	214-827-8891
TX	El Paso, Ideal Indl. Elctrns. Sys.	915-779-6647
TX	Ft. Worth, Swieco	817-429-1107
TX	Ft. Worth, Allied	817-336-5401
TX	Houston, Southwest	713-491-4900
TX	Houston, Hamilton/Avnet	713-780-1771
TX	Irving, Hamilton-Avnet Elctrns.	214-659-4100
UT	Salt Lake City, Stuart	801-466-8605
UT	Salt Lake City, Hamilton/Avnet	801-972-2800
VA	Charlottesville, Virginia Radio Supp.	804-296-4184
VA	Richmond, Sterling Elctrns.	804-266-2190
WA	Seattle, Hamilton-Avnet Elctrns.	206-453-5844
WA	Seattle, Almac Elctrns. Corp.	206-643-9992
WI	Milwaukee, Elctrn. Expeditors	414-228-8100
WI	Milwaukee, Standard Elec.	414-272-8100

EBERHARD MFG. CO., DIV., Eastern Co., 21944 Drake Rd., Strongsville, OH 44136, Tel: 216-238-9720, Telex: 98-5301; FSC No.: 19220; *Sls. Mgr.:* Edward Hongosh

EBM INDS., INC., 525 New Britain Ave., Unionville, CT 06085, Tel: 203-674-1515, TWX: 710-423-8723; FSC No.: 62292; *Sls. Mgr.:* Edward A. Cyr ....2•1255, 1806, 1807

Local Sales Offices & Reps

AL	Huntsville, Raycom	205-859-2017
AZ	Tempe, Argus Sls.	602-968-7791
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CA	Santa Clara, Ross Mktg. Assocs.	408-988-8111
CO	Littleton, Simpson Assocs.	303-794-8381
CT	Cheshire, Selmark Assocs.	203-573-9088
FL	Orlando, Trimark Assocs.	305-859-5504
GA	Fayetteville, Raycom	404-461-4026
IL	Elk Grove, Carlson Elctrn. Sls.	312-956-8240
IN	Indianapolis, J & W Sales	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
KS	Overland Park, Web Elctrns.	913-381-2225
MD	Millersville, Tri-Mark	301-987-9103
MA	Millis, Selmark Assocs.	617-376-2914
MI	Detroit, Burcaw Co.	313-533-7700
MN	St. Paul, Arkco Sls.	612-777-7454
MO	Florissant, Web Elctrns.	314-921-5720
NH	Hopkinton, Selmark Assocs.	603-746-3299
NJ	Marlton, b.g.r. Assocs.	609-983-1020
NJ	Oakland, Robert Horne Assocs.	201-337-5200
NY	Buffalo, Rudell-Merrifield Assocs.	716-634-4300
NC	Raleigh, Raycom	919-847-8276
OH	Chesterland, Depco	216-729-3588
OK	Tulsa, Bonser-Philhower Sls.	918-496-3236
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Harrison City, Rudell-Merrifield Assocs.	412-327-0858
TX	Austin, Bonser-Philhower Sls.	512-346-9186
TX	Dallas, Bonser-Philhower Sls.	214-234-8438
TX	Houston, Bonser-Philhower Sls.	713-531-4144
UT	Midvale, Simpson Assocs.	801-566-3691
WA	Seattle, Earl & Brown Co.	206-284-1121
WI	Milwaukee, Carlson Elctrn. Sls. Co.	414-476-2790

Local Distributors

AZ	Tempe, GRQ Ltd.	602-968-5932
CA	Fullerton, Pyramid/Fullerton	714-773-0781
CA	Fullerton, Young Sls. Co.	714-871-5355
CA	Hollywood, Yale Elctrns.	213-465-3186
CA	San Diego, Deco Elctrns.	619-693-1595
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Englewood, Indl. Elctrns.	303-694-9444
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	Hamden, Impact Sls. Co.	203-281-1331
FL	Melbourne, Frankland	305-259-7988
GA	Fayetteville, Frankland	404-461-4026
IL	Rosemont, Advent Elctrns.	312-297-6200
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
MD	Baltimore, Resco/Baltimore	301-823-0070
MD	Beltsville, Resco/D.C.	301-937-9100
MA	Canton, Impact Sls. Co.	617-821-1500
MA	Middleboro, Glynn Elctrns.	617-947-4262
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Rapids, S.F. Elctrns.	616-459-0216
MN	Minneapolis, Bergquist	612-835-2322
NJ	Berlin, General Comps.	609-768-6767
NJ	Oakland, Gordon/Horne	201-337-5200
NY	Rochester, Simcona	716-328-3230
NY	Suffern, Nobel Elctrns.	914-357-4500
OH	Akron, Akron Elctrns.	216-762-8818
OH	Dayton, Related Comps.	513-253-6116
PA	Norristown, Century Elctrn. Comp. Co.	215-631-5400
TN	Chattanooga, Techni-Tronics	615-875-5449
TX	Addison, ACT Corp.	214-980-1888
UT	North Salt Lake, Integrated Elctrns.	801-298-1868
WA	Bellevue, Integrated Elctrns./Jaco	206-455-2727
WI	Mequon, Taylor Elec. Co.	414-241-4321

EBY CO., 2751 Southampton Rd., Philadelphia, PA 19154, Tel: 215-969-4200, TWX: 710-670-0452; FSC No.: 72825; Empl.: 150; *Sls. Mgr.:* C. R. Dedera ....2•1256, 1257

Local Sales Offices & Reps

AL	Huntsville, Hollingsworth & Still	800-241-5712
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Anaheim, Galaxie Sls. Intl.	714-752-1580
CA	Los Altos, J. W. Wilhoit Co.	415-961-3660
CO	Boulder, R. F. Mayo Assocs.	303-499-2155
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Chicago, Rendell Sls. Co.	312-528-9025
IN	Ft. Wayne, Given Corp.	219-432-5585
IA	Cedar Rapids, Gassner & Clark	319-393-5763
MD	Glen Burnie, Macrotech Assocs.	301-437-5588
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MI	Brighton, Electronic Sources, Inc.	313-227-3598
MN	Edina, Grayden & Flemmer	612-941-1120
MO	Ellisville, Larco Sls., Inc.	314-394-7141
NY	Fairport, Bastian Sls. Agency, Inc.	716-223-0237
NY	Melville, Comtronic Assoc.	516-249-0505
NY	Syracuse, Bastian Sls. Agency, Inc.	325-437-1482
NC	Kernersville, Hollingsworth & Still	800-241-5712
OH	Dayton, J. N. Bailey & Assoc.	513-226-0512
OR	Beaverton, Caruso & Northcutt, Inc.	503-646-4973
PA	Philadelphia, Omni Sls.	215-233-4600
SC	Columbia, Hollingsworth & Still	800-241-5712
TX	Austin, Stevens Sls. Co.	512-250-5104
TX	Dallas, Stevens Sls. Co.	214-350-2476
VA	Gladys, Ralley Entprs., Inc.	804-283-5656
WA	Bellevue, Caruso & Northcutt, Inc.	206-454-9699

Local Distributors

AL	Birmingham, American Elec. Supp. Co.	205-254-3280
AL	Huntsville, Contact Elctrns.	205-881-9321
AL	Mobile, Electronic Supp. Co.	205-478-0455
AZ	Phoenix, Lion Elctrn. Distrs.	602-869-9611
AZ	Tucson, Kachina Elec. Dist. Inc.	602-792-2223
CA	Canoga Park, Afcom	213-703-6161
CA	City of Industry, Ital Elctrn. Sls.	213-968-8515
CA	Irvine, AMC Milliken	714-549-9811
CA	San Carlos, Logan Elctrns.	415-594-0700
CA	San Jose, Afcom	408-263-0660
CA	Santa Ana, Amcotec Elec. Comp. Sales	714-957-3003
DE	Wilmington, A.M. Elctrns.	302-654-9233
FL	Casselberry, Afcom	305-831-6630
FL	W. Palm Beach, Nurmi Elctrn. Supp.	305-686-8553
GA	Atlanta, Specialty Dist. Co. Inc.	404-873-2521
GA	Atlanta, ACK Radio Supp.	404-351-6340
IL	Elk Grove, Afcom	312-228-0760
KY	Bowling Green, Randolph, Hale & Meredith	502-781-1460
KY	Hopkinsville, Randolph & Hale	502-885-5357
KY	Louisville, P.I. Burkes Co.	502-589-3960
MD	Columbia, Aztech Elctrns. Inc.	301-995-1760
MA	Woburn, Afcom	617-935-3200
MI	Grand Rapids, S-F Elctrn. Supp. Co.	616-459-0216
NJ	Clifton, Afcom	201-365-2700
NY	Albany, E.E. Taylor	518-438-7811
NY	Buffalo, Summit Elctrns.	716-887-2833
NY	Jamaica, Eby Sls. Co. of NY	212-291-3232
NY	Long Island City, Hardware Specialty Co.	212-361-9393
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rome, Rome Elctrns.	315-337-5400
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Dayton, Televox, Inc.	513-294-4499
PA	Philadelphia, Spectrum Elctrns. Inc.	215-748-3010
PA	York, Electronic Comps. for Ind.	717-843-8971
SC	Columbia, Dixie Elec.	803-779-5332
TN	Chattanooga, Indl. Elec. Dist. Inc.	615-698-3413
TN	Clarksville, Randolph, Hale & Matthews	615-647-2325
TN	Cookville, Randolph & Parks	615-526-6184
TN	Memphis, Bluff City Distrs.	901-345-9500
TN	Nashville, Randolph & Rice	615-255-5602
TN	Tullahoma, Randolph, Rice & Williams	615-455-4531
TX	Dallas, Afcom	214-238-7845
TX	El Paso, Midland Specialty Co.	915-533-9555
VA	Roanoke, Peoples Elctrn. Supp.	703-342-8933

ECD CORP., 196 Broadway, Cambridge, MA 02139, Tel: 617-661-4400, TWX: 710-320-6965; Empl.: 40

ECI COMPANY, Box 1565, Terra Haute, IN 47808, Tel: 812-232-4442; Empl.: 3

ECO INSTRS. DIV., Sea Data Corp., 1 Bridge St., Newton, MA 02158, Tel: 617-964-8360, Telex: 951107; Empl.: 40; *Sls. Mgr.:* Jill Shipman

Local Sales Offices & Reps

CA	Burlingame, BHL Assocs.	415-342-7850
CA	Yorba Linda, Western Analytical Prods.	714-558-7300
CO	Littleton, Hiltech	303-741-2536
GA	Lilburn/Atlanta, Spectrum Sci.	404-921-5235
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Des Plaines, Byron Ellis Assocs.	312-298-7626
MD	Gaithersburg, Renwar Tech.	301-949-9808
MI	W. Bloomfield, Scientific, Pittsburgh	313-851-2390
MS	Vicksburg, Sea Data Corp.	601-634-1110
NM	Albuquerque, Hiltech	505-268-1733
NY	Westbury, Kramer Assocs.	516-334-7181
OH	Cincinnati, Scientific, Pittsburgh	513-825-6994
PA	Paoli, Engleman Engrg.	215-644-8181
PA	Pittsburgh, Scientific, Pittsburgh	412-921-7700
TX	Houston, Sales Tech. Assocs.	713-723-3228
WA	Kirkland, Pelco Sci.	206-823-2290

ECONOMY FUSE, Reliance Electric, 2070 Maple St., Des Plaines, IL 60016, Tel: 312-299-2211, Telex: 726-453; FSC No.: 72076; Empl.: 200

Refer to Federal Pacific Electric Co. for sales office information.

Ectron CORPORATION®

ECTRON CORP., 8159 Engineer Rd., San Diego, CA 92111, Tel: 619-278-0600, TWX: 910-335-1259; FSC No.: 24856; Empl.: 50; *Sls. Mgr.:* W. W. Hanford ....3•1007

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Phoenix, Aztec Entprs.	602-944-9185

CA	Costa Mesa, FLW Inc.	714-751-7512
CA	Hayward, FLW Inc.	415-487-2222
CA	San Diego, FLW Inc.	619-277-0993
CA	Van Nuys, FLW Inc.	818-989-5238
CO	Littleton, Aztec Entprs.	303-795-0250
FL	Melbourne, Saber Assocs.	305-724-0920
GA	Griffin, Saber Assoc. Inc.	800-327-0853
IL	Elmhurst, Sector Engrg. Sls.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
KS	Overland Park, Ramsey Assocs.	913-649-6996
LA	Baton Rouge, Sesco	504-928-4951
MD	Rockville, Elctrn. Mktg. Assoc.	301-744-7700
MA	Needham, Addelco Corp.	617-444-4754
MI	Royal Oak, Satullo	313-549-3910
MN	Bloomington, Sector Eng. Sls. Inc.	612-888-6920
MO	Maryland Hgts., Ramsey Assocs.	314-878-5042
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	East Syracuse, Ossmann Instrs.	315-437-7052
NY	Plainview, Eastern-Metro Assoc.	516-931-1414
NY	Rochester, Ossmann Instrs.	716-442-6990
NY	Saratoga Springs, Ossmann Instrs.	518-377-8604
NC	Clayton, Saber Assocs.	800-327-0853
OH	Cleveland, Instrmn. Sys.	216-845-8800
OH	Dayton, Instrmn. Sys.	513-294-2838
OK	Tulsa, Sesco	918-622-3868
PA	Pittsburgh, Instrmn. Sys.	412-243-1111
PA	Plymouth Meeting, Elctrn. Mktg. Assoc.	215-828-7400
SC	Columbia, Saber Assoc. Inc.	800-327-0853
TX	Houston, Sesco	713-999-3510
TX	Richardson, Sesco	214-231-9364
UT	Ogden, Aztec Entprs.	801-621-1655
VA	Chesapeake, Elctrn. Mktg. Assoc.	804-482-3318
WA	Seattle, Datacom Assoc. Inc.	206-285-2525
WI	Milwaukee, Sector Eng. Sls. Inc.	414-352-8280

EDAC INC., 20 Railside Rd., Toronto, ON M3A 1A4, Canada, Tel: 416-445-2292, TWX: 610-492-1398; FSC No.: 31781; Empl.: 120; *Sls. Mgr.:* Alan Little; *Dist. Mgr.:* Alan Little .... 2•1258-1263

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Mktg. Assocs.	205-837-7363
AZ	Tempe, Cleveland Entprs. of Ariz.	602-802-1127
AR	Dallas, Allied Comps.	214-238-0408
CA	Los Angeles, Universal Comps. Co.	213-641-4255
CA	Santa Clara, Engrg. Assocs. Corp.	408-988-5001
CO	Aurora, Sage Sls.	303-750-3501
CT	Bloomfield, S.I.R. Assocs.	203-243-9343
FL	Altamonte Springs, Semtronic Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs.	305-731-2484
GA	Atlanta, Elctrn. Mktg. Assocs.	404-448-1215
HI	Honolulu, Aloha Assocs.	
ID	Portland, Earl & Brown Co.	503-245-2283
IL	Elk Grove Village, Control Sls.	312-595-2110
IA	West Des Moines, Nevco	515-225-9866
KS	North Kansas City, Nevco	816-421-1751
ME	Bedford, S.I.R. Assocs.	617-275-5550
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MA	Bedford, S.I.R. Assocs.	617-275-5550
MI	Birmingham, Favco	313-644-0173
MN	Spring Lake Park, Holmgren Assocs.	612-786-7641
MO	North Kansas City, Nevco	816-421-1751
MO	St. Louis, Nevco	314-843-7406
NV	Santa Clara, Engrg. Assocs. Corp.	408-988-5001
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Manhasset, Win-Cor Elctrn. Sls. Corp.	516-627-9474
NC	Raleigh, Elctrn. Mktg. Assocs.	919-847-8800
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Parkland, Rayco Sls.	215-757-1899
SC	Greenville, Elctrn. Mktg. Assocs.	803-233-4637
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
TX	Round Rock, Allied Comps.	512-244-1166
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, Earl & Brown Co.	206-284-1121
WI	Thiensville, Control Sls.	414-242-4580
PR	Puerto Rico, Distributronics	809-843-3321

Local Distributors

AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Heilind Elctrns.	602-243-7171
AZ	Phoenix, Second Source	602-861-1141
AZ	Tempe, Fisher-Brownell	602-967-1464
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Cerritos, El-Com	213-404-2961
CA	Sacramento, Dunlap Elctrns.	916-444-8070
CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Diego, El-Com	619-578-0900
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Santa Clara, El-Com	408-496-0880
CA	Sunnyvale, Time Elctrns.	408-734-9888
CO	Arvada, Denver Wintronics	303-431-7161
CO	Denver, Integrated Elctrns.	303-292-6121
CT	Bethel, Heilind Elctrns.	203-797-8600
CT	Hamden, Connector Co.	203-288-0044
CT	Wallingford, Midan Elctrns.	203-265-2077
FL	Altamonte Springs, Pioneer Orlando	305-834-9090
FL	Ft. Lauderdale, Pioneer	305-771-7520
GA	Atlanta, Prehler	404-447-5540
IL	Addison, Lectro Comps.	312-543-1680
IL	Chicago, Prehler	312-384-6100
IL	Northbrook, Classic Comps. Supp.	312-272-9650
MD	Beltsville, Treeko Sls.	301-937-8260
MD	Gaithersburg, Pioneer Elctrns.	301-921-0660
MD	Savage, Pyttronic Inds.	301-792-0780
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Waltham, Sterling Elctrns.	617-894-6200
MI	Farmington Hills, Prehler Elctrns.	313-473-7200
MI	Roseville, Madison Elctrns.	313-778-7640
MN	Edina, Inds. Comps.	612-831-2666
MO	Kansas City, L Comp	816-221-2400
MO	Maryland Heights, L Comp	314-291-6200
MO	St. Louis, Time Elctrns./Mid-west	314-391-6444
NH	Hudson, Heilind Elctrns.	603-883-9536
NJ	Dover, Electrospec	201-361-6300
NJ	Old Bridge, BTC Elctrn. Comps.	201-536-8000
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Mount Vernon, Q.A.R. Inds. Elctrn. Sls.	914-699-2224
NY	New York, Peerless Radio Corp.	516-593-2121
NC	Charlotte, Pioneer/Carolina Elctrns.	704-527-8188
OH	Cincinnati, Schuster Elec. Co.	513-984-1600
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Twinsburg, Schuster Elec. Co.	216-425-8134
OR	Beaverton, Almac Elctrns. Corp.	503-641-9070
OR	Salem, Zepher Elctrn. Sls.	503-399-8503
PA	Allentown, P. A. Peters	215-434-5237
PA	Harrisburg, Cumberland Elctrns.	717-232-5999
PA	Harrisburg, Pyttronic Inds.	717-236-8001
PA	Horsham, Pioneer Elctrns.	215-674-4000
PA	Montgomeryville, Pyttronic Inds.	215-643-2850
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Willow Grove, Resco Elctrns.	215-659-4440
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Dallas, Heilind Elctrns.	214-351-2050
TX	El Paso, International Elctrns.	915-598-3406
TX	Houston, Sterling Elctrns.	713-627-9800
TX	Houston, Elctrn. Packaging Comps.	713-447-5800
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, Fisher-Brownell	214-235-3177
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Diplomat Elctrns.	801-486-7227
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Almac Elctrns. Corp.	206-643-9992
WA	Seattle, Zepher Elctrn. Sls.	206-241-1980
WI	New Berlin, R. M. Wisconsin	414-784-4420
WI	New Berlin, Classic Comps. Supp.	414-786-5300

EDL INC., 385 Oser Ave., Hauppauge, NY 11787, Tel: 516-435-2808, 800-DIAL EDL, 800 342-5335; Empl.: 50; *Sls. Mgr.:* Don Polsky

EDMAC CORP., 7500 Main St., P.O. Box 750, Fishers, NY 14453-0750, Tel: 716-924-4000, TWX: 510-254-2896; Empl.: 170; *Sls. Mgr.:* Shera Banbury

EDO CORP./ELINCO DIV., 272 Main Ave., Norwalk, CT 06851, Tel: 203-847-5861, Telex: 96-5945; FSC No.: 73693; Empl.: 87

Local Sales Offices & Reps

CA	Buena Park, Rock Assocs.	714-521-6980
CA	Campbell, R & D Assocs.	408-866-6358
CO	Denver, High Plains Mktg.	303-751-7150
FL	Sarasota, H.G.L. Assocs.	813-923-2484
MA	Lexington, John E. Boeing Co.	617-862-2500
MO	St. Louis, Schutz Assocs.	314-962-2622
NY	Liverpool, Jones/Sudders	315-598-3838
NC	Charlotte, Robert W. Chapman & Co.	704-525-2421
OH	Chagrin Falls, K. F. Nauerz Co.	216-338-8450
PA	Birchrunville, Jadelectronic Assocs.	215-296-3800
TX	Lewisville, Jim Hughes Co.	214-221-1536
TX	Stafford, Jim Hughes Co.	713-343-0673

EDO WESTERN CORP., EDO Corp., 2645 South 300 W., Salt Lake City, UT 84115, Tel: 801-486-7481/7481/3846, Telex: 388-315; Empl.: 360; *Sls. Mgr.:* Doug Moore

EDWARDS CO., Signaling Prods. Div., P.O. Box 1188, Farmington, CT 06032, Tel: 203-678-0410; *Sls. Mgr.:* Al Canevari; *Dist. Mgr.:* Al Canevari

EECO INCORPORATED, 1601 E. Chestnut Ave., P.O. Box 659, Santa Ana, CA 92702-0659, Tel: 714-835-6000, Telex: 67-8420, TWX: 910-595-1550; Empl.: 625; *Sls. Mgr.:* Frank Bruder; *Dist. Mgr.:* Ken Plount .... 1B•1612-1615

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Thom Luke Sls.	602-941-1901
AR	Fort Smith, Electra Reps.	501-452-4030
CA	Fountain Valley, Bager Elctrns.	714-957-3367
CA	Los Altos, Recht Assocs.	415-964-6321
CA	San Diego, Harvey King Inc.	619-566-5252
CO	Denver, Delltron Co.	303-373-0300
CT	Farmington, Ray Perron & Co.	203-673-4825
CT	New Milford, Ray Perron & Co.	203-354-2569
FL	Pompano Beach, Ema, Inc.	305-943-3732
FL	Winter Park, EMA, Inc.	305-671-6800
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Elk Grove Village, John G. Twist Co.	312-593-0200
IN	Fort Wayne, M/S Sls. & Assoc.	219-484-1904
IA	Cedar Rapids, Palatine Sls.	319-365-8071
KS	Mission, Palatine Sls.	913-831-0555
MD	Rockville, EMA (Elctrn. Mktg. Assts.)	301-881-5300
MA	Needham, Ray Perron & Co.	617-449-6162
MI	Livonia, Lowell Wendt Mktg.	313-464-2722
MN	Bloomington, Elctrn. Sls. Agecy.	612-884-8291
MO	Hazelwood, Palatine Sls.	314-839-0800
NH	Dover, Ray Perron & Co.	603-742-2321
NJ	Englewood, Tecnimat	201-569-4200
NY	Endicott, Tech-Mark, Inc.	607-748-7473
NY	Mendon, Techmark, Inc.	716-624-3840
NY	Utica, Techmark, Inc.	315-733-0575
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc. (Engr. Mktg. Assts.)	513-433-2800
OR	Beaverton, Blair Hirsh Co.	503-641-1875
PA	Plymouth Meeting, EMA (Elctrn. Mktg. Assts.)	215-248-5050
TX	Dallas, Electra Reps. Inc.	214-387-3594
TX	Houston, Electra Reps. Inc.	713-530-2208
UT	Salt Lake City, Delltron Co.	801-268-4574
WA	Lynnwood, Blair Hirsh Co.	206-774-8151
WI	Brookfield, John G. Twist Co.	414-782-2670

Local Distributors

AL	Huntsville, Hallmark Elctrn.	205-837-8700
AZ	Tempe, Fisher-Brownell	602-967-1464
AZ	Tempe, Marshall Ind.	602-968-6181
AZ	Tucson, Marshall Inds.	602-790-5687
CA	Alhambra, Fisher Brownell	213-289-0255
CA	Canoga Park, Marshall Ind.	213-999-5001
CA	El Monte, Marshall Ind.	213-442-7204
CA	Irvine, Marshall Ind.	714-556-6400
CA	San Diego, Fisher Brownell	714-560-8545
CA	San Diego, Marshall Ind.	619-578-9600
CA	Santa Clara, Fisher Brownell	408-988-6041
CA	Sunnyvale, Time Electronics	408-734-9888
CA	Sunnyvale, Marshall Ind.	408-732-1100
CO	Denver, Marshall Ind.	303-427-1818
CO	Englewood, Hallmark Electronics	303-694-1662
CT	Wallingford, Sager Electrical Supply Co.	203-265-4600
CT	Wallingford, Marshall Ind.	203-265-3822
FL	Ft. Lauderdale, Hall-Mark	305-971-9280
FL	Orlando, Marshall Ind.	305-841-1878
FL	Orlando, Hall-Mark	305-855-4020
GA	Atlanta, Marshall Inds.	404-923-5750
GA	Norcross, Hallmark Electronics	404-447-8000
IL	Bensenville, Hall-Mark	312-860-3800
IL	Schaumburg, Marshall Ind.	312-490-0155
KS	Lenexa, Hall-Mark	913-888-4747
MD	Baltimore, Hall-Mark	301-796-9300
MD	Gaithersburg, G.S. Marshall	301-840-9450
MA	Burlington, Marshall Ind.	617-272-8200
MA	Hingham, Sager Supply	617-749-6700
MI	Livonia, LWC Distributors	313-464-7700
MN	Bloomington, Hall-Mark Elctrn.	612-854-3223
MN	Plymouth, Marshall Ind.	612-559-2211
MO	Maryland Heights, Hall-Mark Elctrn.	314-291-5350
NJ	Cherry Hill, Hall-Mark Elctrn.	609-424-7300
NJ	Fairfield, Marshall Inds.	201-882-0320
NJ	Mount Laurel, Marshall Inds.	215-627-1920
NM	Albuquerque, Int'l Elctrns.	505-345-8127
NY	Buffalo, Summit Distributors, Inc.	716-887-2800
NY	Endwell, Marshall Ind.	607-754-1570
NY	Hauppauge, Marshall Ind.	516-273-2424
NY	Lynbrook, L.I., Peerless Radio Corp.	516-593-2121
NY	Rochester, Marshall Ind.	716-235-7620
NC	Raleigh, Hall-Mark Elctrn.	919-872-0712
OH	Dayton, Marshall Ind.	513-236-8088
OH	Solon, Hall-Mark Elctrns.	216-473-2907
OH	Westerville, Hallmark Electronics	614-891-4555

OK	Tulsa, Hall-Mark Elctrn.	918-665-3200
OR	Beaverton, Almac/Electronics Corp.	503-641-9070
TX	Austin, Hall-Mark Ind.	512-258-8848
TX	Dallas, Hall-Mark Ind.	214-341-1147
TX	Dallas, Marshall Ind.	214-233-5200
TX	El Paso, Int'l Elctrns.	915-598-3406
TX	Houston, Hall-Mark Ind.	713-781-6100
TX	Houston, Marshall Ind.	713-789-6600
TX	Richardson, Fisher Brownell	214-235-3177
WA	Bellevue, Almac/Stroum	206-643-9992
WA	Bellevue, Marshall Ind.	206-747-9100
WA	Spokane, Almac/Stroum	509-838-5714
WI	Oak Creek, Hall-Mark Ind.	414-761-3000

EEMCO DIV., 4585 Electronics Pl., Los Angeles, CA 90039, Tel: 213-247-7060, TWX: 910-497-2269; FSC No.: 72121; Empl.: 350; *Sls. Mgr.:* D. Haymond; *Dist. Mgr.:* D. Haymond

EEV INC., 7 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-6050, Telex: 6818096; Empl.: 36; *Sls. Mgr.:* Tom Soldano

EFRATOM, a division of Ball Corp., 18851 Bardeen Ave, Irvine, CA 92715, Tel: 714-752-2891, Telex: 68-5635; Empl.: 105 .... **1A•1350**

Local Sales Offices & Reps

CA	Los Altos, Kolm Mktg. Assoc.	415-948-2635
CA	Los Angeles, Cain Technlg.	213-477-9054
FL	Sarasota, Bass Assocs.	813-922-9538
MA	Natick, Wayland Engrg. Sls.	617-655-6080
NJ	Pennsauken, Sci. Reps.	609-662-5222
NY	Huntington, CDB Entprs.	516-692-5200
TX	Houston, Sci. Devices	713-864-1711
TX	Richardson, Sci. Devices	214-231-8106
VA	Fairfax, Sci. Assoc.	703-385-0600

EG&G, INC., Electro-Optics Div., 35 Congress St., Salem, MA 01970, Tel: 617-745-3200, TWX: 710-347-6741; FSC No.: 25506; Empl.: 500; *Sls. Mgr.:* J. Murachver

EG & G ALMOND INSTRUMENTS, 1330 E. Cypress St., Covina, CA 91724, Tel: 818-967-9521, TWX: 910-584-1320; Empl.: 200; *Sls. Mgr.:* J. D. Cardall .... **3•1550, 1551**

Local Sales Offices & Reps

FL	Orlando, Truex Assocs.	305-859-2160
TX	Garland, Tesco	214-681-1376

EG&G GAMMA SCIENTIFIC, Div. of EG&G Inc., 3777 Ruffin Rd., San Diego, CA 92123, Tel: 619-279-8034, Telex: 697938; *Sls. Mgr.:* George Unangst

EG&G GEOMETRICS, Div. of EG&G Inc., 395 Java Dr., Sunnyvale, CA 94086, Tel: 408-734-4616, Telex: 357435; FSC No.: 34314; *Sls. Mgr.:* Ross Johnson; *Dist. Mgr.:* Fritz Faber

EG&G RETICON, Div. of EG&G, 345 Potrero Ave., Sunnyvale, CA 94086-9930, Tel: 408-738-4266, Telex: 910-339-9343; *Sls. Mgr.:* Alex Findlay

EG&G ROTRON

EG & G ROTRON, Commercial Div., Shokan, NY 12481, Tel: 914-657-6661, TWX: 510-247-9033; *Sls. Mgr.:* Michael Keating; *Dist. Mgr.:* Ralph Stevens .... **2•1800, 1808-1813**

Local Sales Offices & Reps

AL	Huntsville, Over & Over	205-837-7105
CA	Anaheim, Westrep	213-404-3881
CA	Chatsworth, Rotron Sls.	213-709-2133
CA	San Diego, Hadden Assoc.	619-565-9444
CA	Santa Clara, Westrep	408-988-8833
CO	Littleton, Lange Sls.	303-795-3600
FL	Apopka, G. Bohman	305-886-1882
HI	Honolulu, R. Clark	808-531-5897
IL	Elk Grove Village, EG&G Rotron	312-364-7050
IL	Rolling Meadows, Sumer	312-991-8500
IA	Cedar Rapids, S & O Sls.	319-393-1845
KS	Raytown, CenTech	816-358-8100
MD	Columbia, L. D. Lowery	215-356-5300
MA	Lexington, Circuit Sls.	617-861-0567
MI	Farmington, W. R. Hummon & Assoc.	313-474-0661
MN	Mendota Heights, G-11 Sales	612-454-3086
MO	Earth City, CenTech	314-291-4230
MO	Raytown, CenTech	816-358-8100
NJ	Springfield, F. Sylvester	201-376-3324
NY	Woodstock, Rotron (Commercial Div.)	914-679-2401
NC	Charlotte, Over & Over	704-527-3070
OH	Cincinnati, F. J. Campisano	513-574-7111
OH	Cleveland, Comp., Inc.	216-243-9200
OK	Oklahoma City, Ammon & Rizos	405-942-2552
PA	Columbia, L. D. Lowery	215-356-5300
TX	Dallas, Ammon & Rizos	214-233-5591
TX	Houston, Ammon & Rizos	713-781-6240
UT	Salt Lake City, Lange Sls.	801-487-0843
WA	Lynnwood, Blum & Assocs.	206-775-6656
EXP	NY, Great Neck, A. Auriema	516-487-0700

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AZ	Phoenix, Cetec Elctrns.	602-272-7951
AZ	Phoenix, R. V. Weatherford	602-272-7144
CA	Anaheim, R. V. Weatherford	714-547-0891
CA	El Segundo, Hall Mark Elctrns.	213-643-9101
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Pomona, R. V. Weatherford	714-623-1261
CA	San Diego, Cetec Elctrns.	714-278-5020
CA	San Diego, R. V. Weatherford	714-695-1700
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	Southgate, Cetec Elctrns.	213-773-6521
CA	Sunnyvale, R. V. Weatherford	408-738-8694
CA	Tustin, Hall Mark Elctrns.	714-669-0681
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Denver, R. V. Weatherford	303-428-6900
CT	Norwalk, Pioneer	203-853-1515
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	Palm Bay, Arrow Elctrns.	305-725-1480
GA	Norcross, Arrow Elctrns.	404-449-8252
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, Pioneer/Indiana	317-849-7300
KS	Lenexa, Hall-Mark Elctrns.	913-888-4747
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Columbia, Hall-Mark Elctrns.	301-988-9800
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MA	Lexington, Pioneer	617-861-9200
MA	Woburn, Hall Mark Elctrns.	617-935-9777
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Livonia, RS Elctrns.	313-525-1155
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, I.C.I.	612-831-2666
MO	Maryland Hts., Hall-Mark Elctrns.	314-291-5350
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NJ	Pinebrook, Pioneer	201-227-1267
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Buffalo, Summit Elctrns.	716-884-3450
NY	Fairport, Pioneer	716-381-7070
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Ronkonkoma, Hall Mark Elctrns.	516-737-0600
NY	Vestal, Pioneer	607-748-8211
NY	Woodbury, Pioneer	516-921-8700
NC	Raleigh, Hall-Mark Elctrns.	919-872-0712
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
PA	Marlton, Arrow Elctrns.	609-596-8000
PA	Pennsauken, Resco Elctrns.	609-662-4000
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, Hall-Mark Elctrns.	214-343-5000
TX	Houston, Pioneer/Houston	713-988-5555
TX	Houston, Hall-Mark Elctrns.	713-781-6100
WA	Bellevue, Almac Elctrns.	206-643-9992
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Seattle, R. V. Weatherford	206-575-1340
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000
WI	Oak Creek, Arrow Elctrns.	414-764-6600

EG & G ROTRON, Custom Div., Hasbrouck La., Woodstock, NY 12498, Tel: 914-679-5201, TWX: 510-247-9033; FSC No.: 82877; *Sls. Mgr.:* Mike Lyon; *Dist. Mgr.:* Andy Kozak .... **2•1814, 1815**

Local Sales Offices & Reps

AL	Huntsville, Over & Over, Inc.	205-837-7105
AZ	Tucson, Morrow & Assocs.	602-296-4719
CA	Garden Grove, Custom Div. Dist. Sls. Off.	714-898-5649
CA	San Diego, Hadden Assocs.	619-565-9444
CO	Littleton, Lange Sls., Inc.	303-795-3600
DE	Ft. Lauderdale, G. F. Bohman & Assocs.	305-979-0008
FL	Apopka, G. F. Bohman & Assocs.	305-886-1882
FL	St. Petersburg, G. F. Bohman & Assocs.	813-522-6120
GA	Norcross, Over & Over, Inc.	404-449-6205
HI	Honolulu, Roger Clark Co.	808-531-5897
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IN	Ft. Wayne, Frank J. Campisano Co.	219-747-2633
IN	Indianapolis, Frank J. Campisano Co.	317-253-7651
IA	Cedar Rapids, S & O Sales Co.	319-393-1845
MD	Towson, Custom Div. Dist. Sls. Off.	301-377-5195
MA	Lexington, Circuit Sls. Co.	617-861-0567
MI	Farmington Hills, W. R. Hummon & Assocs., Inc.	313-474-0661
MN	Mendota Heights, G-II Sales, Inc.	612-454-3086
MO	Bridgeton, Centech, Inc.	314-291-4230
MO	Raytown, Centech, Inc.	816-358-8100
NJ	Neshanic Stat, Dustom Div. Dist. Sls. Off.	201-369-5354
NY	Corona, Dustom Div. Dist. Sls. Off.	212-271-5287
NC	Charlotte, Over & Over, Inc.	704-527-3070
NC	Raleigh, Over & Over, Inc.	919-872-2262
OH	Cincinnati, Frank J. Campisano Co.	513-574-7111
OH	Cleveland, Components, Inc.	216-243-9200
OH	Cleveland, Frank J. Campisano Co.	216-749-5550
OH	Columbus, Frank J. Campisano Co.	614-876-5405
OK	Oklahoma City, Ammon & Rizos Co.	405-942-2552
PA	Coraopolis, Frank J. Campisano Co.	412-264-5151
PA	Pittsburgh, Comps., Inc.	412-824-1600
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Dallas, Ammon & Rizos Co.	214-233-5591
TX	Houston, Ammon & Rizos Co.	713-781-6240
UT	Salt Lake City, Lange Sls., Inc.	801-487-0843
WA	Lynnwood, Blum & Assocs.	206-775-6656
WI	Brookfield, Sumer, Inc.	414-784-6641

EG & G TORQUE SYSTEMS, 36 Arlington St., Watertown, MA 02172, Tel: 617-924-6000, Telex: 95-1736; Empl.: 200; *Sls. Mgr.:* W. F. O'Leary; *Dist. Mgr.:* H. D. Waddell

EG & G VACTEC, 10900 Page Blvd., St. Louis, MO 63132, Tel: 314-423-4900, TWX: 910-764-0811; Empl.: 250; *Sls. Mgr.:* D. Hartley; *Dist. Mgr.:* D. Hartley .... **1B•1253**

EG&G WAKEFIELD ENGRG., 60 Audubon Rd., Wakefield, MA 01880, Tel: 617-245-5900, TWX: 710-348-6713; Empl.: 240; *Sls. Mgr.:* Ray A. Radford; *Dist. Mgr.:* Carl Swanson

Local Sales Offices & Reps

AL	Huntsville, Over & Over, Inc.	205-882-9182
AZ	Tempe, Piper Sls. Co.	602-949-0048
CA	Anaheim, West Rep	213-404-3881
CA	Los Altos, Recht Assocs.	415-964-6321
CA	San Diego, Mesa Elctrns.	714-278-8021
CO	Longmont, Piper Sls. Co.	303-443-5337
CT	Stamford, Circuit Sls.	203-322-0240
FL	Orlando, Over & Over Inc.	305-857-4057
GA	Norcross, Over & Over, Inc.	404-449-6205
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IA	Cedar Rapids, S & O Sls. Co.	319-393-1845
MD	Columbia, Bresson Assocs.	215-664-6460
MA	Lexington, Circuit Sls.	617-861-0567
MI	Livonia, Luebbe Sls.	313-477-3130
MN	Mendota Heights, G-II Sls.	612-454-3086
MO	Raytown, Cen Tech, Inc.	816-358-8100
NY	Commack, ERA, Inc.	516-543-0510
NY	E. Rochester, Tri Tech Elctrns.	716-385-6500
NY	Fayetteville, Tri Tech Elctrns.	315-446-2881
NC	Charlotte, Over & Over, Inc.	704-527-3070
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
OH	Cleveland, Luebbe Sls. Co.	215-333-0426
OK	Oklahoma City, Ammon & Rizos Co.	405-942-2552
OR	Portland, SDR^2 Prods. & Sls.	503-641-7377
PA	Narbeth, Bresson Assocs.	215-664-6460
TN	Johnson City, Over & Over, Inc.	615-477-7700
TX	Houston, Ammon & Rizos Co.	713-781-6240
TX	Richardson, Ammon & Rizos Co.	214-644-5591
UT	Salt Lake City, Piper Sls. Co.	801-268-8707
VA	Lynchburg, Bresson, Assocs.	215-664-6460
WA	Bellevue, SDR^2 Prods. & Sls.	206-624-2621
WI	Brookfield, Sumer, Inc.	414-784-6641

E-H ELECTRONICS, Sub. E-H Intl., Inc., 7303 Edgewater Dr., Oakland, CA 94621, Tel: 415-638-5656, TWX: 910-366-7258; FSC No.: 13488; Empl.: 99; *Sls. Mgr.:* Nicholai T. Zavadsky

EHRHORN TECHNOLOGICAL OPERS., INC., P.O. Box 888, Canon City, CO 81212, Tel: 303-275-1613; *Sls. Mgr.:* Ray Heaton

EIGEN VIDEO, P.O. Box 848, Nevada City, CA 95959, Tel: 916-272-3461, Telex: 298788 EIG UR; FSC No.: 59535; Empl.: 50

EIKONIX CORP., 23 Crosby Dr., Bedford, MA 01730, Tel: 617-275-5070

Local Sales Offices & Reps

CA	Sunnyvale, Hap Baldwin	408-737-9172
FL	Singer Island, Robert Hanright	305-845-7252
NJ	Trenton, Lester Stine	609-883-4860
NY	Brooklyn, John Milby	212-284-8588
PA	Morristown, George Striker	215-539-5411
TX	Richardson, George Tallman	214-680-2728

EIP MICROWAVE INC., 2731 North First St., San Jose, CA 95134, Tel: 408-946-5700, TWX: 910-338-0155; FSC No.: 34257; Empl.: 250; *Sls. Mgr.:* Robert Loft, West Reg. Mgr.;Bill Dentinger, East Reg. Mgr.

EITEL MFG., 2835 Laguna Canyon Rd., Laguna Beach, CA 92652, Tel: 714-494-2012; Empl.: 6; *Sls. Mgr.:* H. Mengel

ELANTEC, INC., 1996 Tarob Ct., Milpitas, CA 95035, Tel: 408-945-1323, TWX: 910-997-0649; *Sls. Mgr.:* Jerry Zis .... **1A•1653**

Local Sales Offices & Reps

AZ	Scottsdale, Tusar	602-998-3688
CA	Los Altos, Elrepco, Inc.	415-962-0660
CA	Woodland Hills, Interstate Mktg.	213-883-7606
CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	Wallingford, Com-Sale	203-269-7964
IL	Arlington Heights, Micro Sales, Inc.	312-956-1000
IN	Fort Wayne, Giesting & Assoc.	219-486-1912
IN	Indianapolis, Giesting & Assoc.	317-271-5183
IA	Hiawatha, Gassner & Clark	319-393-5763
MD	Baltimore, Stemler Assocs.	301-944-8262
MA	Needham, Com-Sale	617-444-8071
MI	Coloma, Giesting & Assocs.	616-468-4200
MI	Novi, Giesting & Assocs.	313-348-3811
MN	Bloomington, High Tech Sls.	612-888-8088
MO	Grandview, R. R. Burton & Assoc.	816-763-5385
MO	Maryland Heights, R. R. Burton & Assoc.	314-434-1678
NH	Exeter, Com-Sale	603-772-3300
NJ	Cherry Hill, Stemler Assocs.	609-966-4070
NJ	Parsippany, HLM Assocs.	201-263-1535
NM	Albuquerque, Tusar	505-293-1399
NY	Northport, HLM Assocs.	516-757-1606
OH	Cincinnati, Giesting & Assocs.	513-521-8800
OH	Dayton, Giesting & Assocs.	513-293-4044
OH	Mentor, Giesting & Assocs.	216-942-3407
OR	Oloha, Micro Sales, Inc.	503-642-1818
PA	Bensalem, Stemler Assocs.	215-638-4850
PA	Pittsburgh, Giesting & Assocs.	412-963-0727
TX	Austin, Sundance Sls.	512-250-0320
TX	Houston, Sundance Sls.	713-772-4988
TX	Plano, Sundance Sls.	214-867-0592
UT	West Valley City, Thorson Rocky Mountain	801-973-7969
WA	Bellevue, Micro Sales, Inc.	206-451-0568
WI	Brookfield, Micro Sales, Inc.	414-782-1171

ELCO CORP., Electronic Connector Div., Huntingdon Ind'l. Park, Huntingdon, PA 16652, Tel: 814-643-0700, TWX: 510-691-3117; Empl.: 500; *Sls. Mgr.:* J. J. Smith; *Dist. Mgr.:* John J. Galiney, Jr.

ELCO CORP., Interconnect Systems Div., 2250 Park Pl., El Segundo, CA 90245, Tel: 213-675-3311; *Sls. Mgr.:* T. Tuttle

ELCOM INDUSTRIES, INC., 10268 Bach Blvd., St. Louis, MO 63132, Tel: 314-429-3100

Local Sales Offices & Reps

CA	Anaheim, Magna-Code, Inc.	714-821-7500
MA	Newton Highlands, Butler Assocs., Inc.	617-965-1080

ELCOM SYSTEMS, INC., 4032 Clint Moore Rd., Boca Raton, FL 33431, Tel: 305-994-1774; FSC No.: 32424; Empl.: 5; *Sls. Mgr.:* D. Pollachek

ELDEC CORP., Monitor & Control Div., 16700 13th Ave. W., P.O. Box 100, Lynnwood, WA 98036, Tel: 206-743-1313, Telex: 32-8959, TWX: 910-449-2855

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ELDEC CORP., Sensing Systems Div., 18009 Hwy. 99, P.O. Box 5110, Lynnwood, WA 98036, Tel: 206-771-7350, Telex: 32-8959, TWX: 910-449-0873

ELDORADO INSTRS., 7303 Edgewater Dr., Oakland, CA 94621, Tel: 415-638-5656, TWX: 910-366-7258; FSC No.: 54495; *Sls. Mgr.:* Paul Magnusson

ELDRE COMPS., 1500 Jefferson Rd., Rochester, NY 14623, Tel: 716-244-2570, TWX: 510-253-4347; FSC No.: 19648; Empl.: 220; *Sls. Mgr.:* Harvey Erdle

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ELECTRICAL INSTR. SVC., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35 .... **3•1296-1298**

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CO	Commerce City, Williams Assocs.	303-289-5647
DC	Washington, Whitcomb Assocs.	202-737-0763
IL	Lincolnwood, Saffro & Assocs.	312-677-9720
KS	Shawnee Mission, Comtel - Midwest	913-722-1030
MD	Baltimore, Whitcomb Assocs.	301-889-1245
MA	Lexington, Zieco	617-861-8300
MI	Southfield, Comtel Instrs. Co.	313-358-2505
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Louis, Comtel - Midwest	314-991-5363
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mount Vernon, Elctrl. Instr. Svc.	914-699-9717
OH	Cleveland, Comtel Instrs. Co.	216-442-8080
OH	Dayton, Comtel Instrs. Co.	513-298-7573
OH	Hilliard, Comtel Instrs. Co.	614-876-8305
OK	Tulsa, Data Mktg. Assocs.	918-496-1457
PA	Pittsburgh, Comtel Instrs. Co.	412-922-5720
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-780-2511
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
UT	Salt Lake City, Williams-Assocs.	801-532-7701
WI	Lake Mills, Saffro & Assocs.	414-648-2605

ELECTRICAL PLASTICS CORP., 500 Long Branch Ave., Long Branch, NJ 07740, Tel: 201-870-9500; Empl.: 50

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ELECTRIC DEVICE, PO Box 337, Canfield, OH 44406, Tel: 216-533-3060

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Distributor

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ELECTRIC TACHOMETER, 68th & Upland Sts., Philadelphia, PA 19142, Tel: 215-SA6-7723, Telex: 83-1475; FSC No.: 20049; Empl.: 50; *Sls. Mgr.:* F. M. Porter

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CA	Long Beach, Matzinger-Keegan	213-434-5794
CA	Westlake Village, Electro-Craft	213-889-3631
CO	Boulder, Electro-Craft	303-447-2754
FL	Altamonte Springs, WMM Assocs.	305-831-4530
FL	Clearwater, WMM Assocs.	813-442-3913
FL	Ft. Lauderdale, WMM Assocs.	305-772-9850
GA	Atlanta, Electro-Craft	404-452-7253
IL	Chicago, Electro-Craft Corp.	312-298-0687
IN	Indianapolis, Electro-Craft	317-872-0013
MA	Salem, Electro-Craft	603-893-5552
MN	Minneapolis, Electro-Craft	612-931-2700
NJ	Cherry Hill, Electro-Craft	609-662-0555
NJ	Monmouth Junction, Electro-Craft	201-329-6233
NY	Rochester, Ross Equip.	716-271-5660
OH	Cleveland, Electro-Craft	216-526-3995
TX	Dallas, Electro-Craft	214-980-1948
WA	Bellevue, Sweo Engrg.	206-451-0558

Local Distributors

CA	San Jose, Republic Supp.	408-279-2202
CA	San Leandro, Republic Supply, Power Transmission Div.	415-357-2211
IN	Indianapolis, B&B Motor & Control	317-248-0396
MA	Medford, Empire Electrical Co.	617-395-5000
NY	New York, B & B Motor & Control	212-966-5777
NY	Rochester, B&B Motor & Control	716-473-6640
Can	Ottawa, Ont., Electrodesign Ltd.	613-745-0541
Can	Toronto, Ont., Electrodesign Ltd.	416-787-0991
Can	LaSalle, Electrodesign Ltd.	514-636-4838
Intl.	England, Cricklewood, London, Unimatic Engineers Ltd.	01-455-0012
Intl.	Finland, Helsinki, Stig Wahlstrom OY	90-5577 x51
Intl.	France, E.R.N.	956.00.11
Intl.	Holland, Rotterdam, Van Gelder Compagnie B.V.	010-156622
Intl.	India, Hyderabad, Kashinath & Co.	36942
Intl.	Israel, Yizreel, Elex Control Sys.	065-94036
Intl.	Italy, Milano, Pamoco S.r.l.	02-800982-804615
Intl.	Japan, Tokyo 104, Midoriya Electric Co.	03-561-8851
Intl.	Spain, Barcelona, Robbins & Myers Espana S.A.	34-38934200
Intl.	Sweden, Johanneshov, L. Ostergren El.	08-815013
Intl.	W. Germany, Darmstadt, Eduard Bautz G.m.b.H.	06151/82973

ELECTROCUBE, 1710 So. Del Mar Ave., San Gabriel, CA 91776, Tel: 818-573-3300, TWX: 910-589-1609; FSC No.: 14752; Empl.: 175; *Sls. Mgr.:* E. F. Bryant; *Dist. Mgr.:* E. F. Bryant

Local Distributors

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CA	San Diego, Mock III Sls.	619-560-0515
CA	Sunnyvale, Acacia Sls.	408-745-7200
CO	Lakewood, Acacia Sls.	303-232-2882
IL	Elk Grove Village, Nu-Way Elctrns.	312-437-7120
OH	Englewood, Argent Inds.	513-836-8633
OH	Solon, Repco, Inc.	216-248-8900
PA	Pittsburgh, CAM/RPC Elctrns.	412-782-3770
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166

ELECTRO DESIGN SYS., 100 W. 35th St., Ste. S, National City, CA 92050, Tel: 619-420-2351, Telex: 182827; Empl.: 35

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ELECTRODYNAMICS, INC., A Talley Inds. Co., 1200 Hicks Rd., Rolling Meadows, IL 60008, Tel: 312-259-0740, Telex: 28-1070; FSC No.: 10236; Empl.: 250; *Sls. Mgr.:* Frank Rafferty .... **3•1129**

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CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CA	Hayward, Avionics Liaison	415-783-1131

CO	Denver, West, Inc.	303-692-0131
FL	Clearwater, Delmac Sls.	813-447-5192
FL	Orlando, Delmac Sls.	305-898-4688
FL	Tamarac, Delmac Sls.	305-726-1330
IA	Cedar Rapids, J.R. Sales Engrg.	319-393-2232
MD	Severna, Delmarva Engrg. Assocs., Ltd.	301-647-8007
MA	Winchester, FJS Assocs.	617-729-3135
MN	New Brighton, TWC Sls.	612-636-1770
MO	Maryland Hgts., Midwest Meridian Corp.	314-878-4441
NY	Binghamton, Noeth Honsinger Assocs.	607-724-4865
NY	Pittsford, Noeth Honsinger Assocs.	716-586-9002
OR	Portland, Caruso & Northcutt	503-646-4973
PA	King of Prussia, Rivco January Inc.	215-265-5211
TX	Hurst, Midwest Meridian	817-654-2132
UT	Salt Lake City, Meridian West	801-968-4177
WA	Bothwell, Caruso & Northcutt	206-454-9699

ELECTRO-DYNAMICS DEV. CO., 475 Mt. Hood Dr. S.W., Issaquah, WA 98027, Tel: 206-392-2493; *Sls. Mgr.:* W. A. Pommer

ELECTROFILM, 27727 Avenue Scott, Valencia, CA 91355, Tel: 805-257-2240, Telex: 65-1438; FSC No.: 85932; Empl.: 250; *Sls. Mgr.:* George Hulett

ELECTRO-FILMS, INC., 111 Gilbane St., Warwick Central Indl. Pk., Warwick, RI 02886, Tel: 401-738-9150, TWX: 710-382-0405; Empl.: 72; *Sls. Mgr.:* Frank Urrico .... **1A**•1870, 1871

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AL	Huntsville, BCI, Inc.	205-539-4411
CA	Santa Ana, Weatherman Assocs.	714-544-1304
CA	Sunnyvale, NES Assocs.	408-738-3259
FL	W. Melbourne, Great Southern Rep. Co.	305-724-4510
GA	Doraville, BCI, Inc.	404-455-0405
IL	Hinsdale, Willtech Corp.	312-655-4850
IN	Indianapolis, CC Electronics	317-255-1508
MA	Allston, Vector Sls.	617-787-2790
MI	Livonia, Electro Sls. Assocs.	313-474-7320
MN	Minneapolis, Comprehensive Tech. Sls.	612-888-7011
NM	Albuquerque, Grady Moore Assocs.	505-262-1416
NY	Kew Gardens, Robert Smith Assocs.	212-780-0097
NY	New York, Robert Smith Assocs.	212-541-4885
NY	Plainview, Robert Smith Assocs.	516-681-3155
NY	Syracuse, Labtronics	315-455-7314
NC	Charlotte, BCI, Inc.	704-567-0473
NC	Raleigh, BCI, Inc.	919-781-9426
OH	Cleveland, Electro Sls. Assocs.	216-261-5440
OH	Dayton, Electro Sls. Assocs.	513-426-5551
PA	Allison Park, Electro Sls. Assocs.	412-487-3801
PA	Oreland, EFW Tech. Sls.	215-887-5300
TX	Austin, J. Clay Co.	512-346-7340
TX	Dallas, J. Clay Co.	214-350-1281
TX	Houston, Elctrn. Mktg. Assocs.	713-498-8120
WA	Seattle, MARS	206-747-3292
EXP	MA, Plainville, Teknis, Inc.	617-695-3591

ELECTRO IMPULSE, Box 870, Red Bank, NJ 07701-0870, Tel: 201-741-0404, TWX: 710-722-5717; FSC No.: 91161; Empl.: 99; *Sls. Mgr.:* Mark Rubin .... **2**•1817; **3**•1220

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CA	Los Angeles, RDH Assocs.	213-396-4100
MA	Reading, Geder Assocs.	617-944-3105
NY	Greenvale, B. D. Aaron & Co.	516-621-0630
TX	Richardson, Spectra Sls. Corp.	214-234-3600
EXP	NJ, Oradell, Sylvan Ginsbury Ltd.	201-261-3200

Local Distributors

CA	Los Angeles, RDH Assocs.	213-396-4100
MA	Reading, Geder Assocs.	617-944-3105
NJ	Oradell, Sylvan Ginsbury	201-261-3200
NY	Greenvale, Bertram D. Aaron & Co.	516-621-0630
TX	Richardson, Spectra Sls.	214-234-3600

ELECTRO INDUSTRIES, Div. E.I. Elctrns. Inc., 316 Westbury Ave., Carle Place, NY 11514, Tel: 516-334-0870; Empl.: 20; *Sls. Mgr.:* S. Kagan .... **3**•1328, 1329

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ELECTRO KINETICS CO., Sub. HTL Inds., Inc., 402 E. Gutierrez St., Santa Barbara, CA 93102, Tel: 805-963-2055, TWX: 910-334-1177; FSC No.: 02101; Empl.: 260; *Sls. Mgr.:* N.G. Otis

ELECTROL

ELEC-TROL, INC., 26477 N. Golden Valley Rd., Saugus, CA 91350, Tel: 805-252-8330, Telex: 18-1151; FSC No.: 15636; Empl.: 650; *Sls. Mgr.:* Frank Cooper; *Dist. Mgr.:* Barbara J. Owens .... **1B**•1352-1362

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Assocs.	205-881-5031
AZ	Scottsdale, TC Electronics	602-944-5153
AR	Little Rock, Beacon Elctrn. Assocs.	501-224-5449
CA	Garden Grove, Elsco	714-891-4621
CA	San Jose, Jeff Mallman	408-972-9072
CO	Denver, Elcom	303-337-2300
FL	Clearwater, Beacon Elctrn. Assocs.	813-796-2378
FL	Ft. Lauderdale, Beacon Elctrn. Assocs.	305-491-1054
FL	Maitland, Beacon Elctrn. Assocs.	305-647-3498
FL	Melbourne, Beacon Elctrn. Assocs.	305-724-8010
GA	Atlanta, Beacon Elctrn. Assocs.	404-256-9640
IL	Des Plaines, Lincoln, Hodges & Assocs.	312-297-3810
IN	Granger, Gregory Sls.	219-272-9626
MA	Framingham, Stone Comps.	617-875-3266
MN	Minneapolis, Westlund & Assoc.	612-866-5002
NY	Clark Mills, KLM-Garner Co.	315-853-6126
NY	Mt. Vernon, Sonkin Assocs.	914-668-9809
NY	North Syracuse, KLM-Garner Co.	315-458-6214
NY	Pittsford, KLM-Garner Co.	716-381-8350
NC	Greensboro, Beacon Elctrn. Assocs.	919-275-9997
OH	Columbus, Mulligan & Assoc.	614-457-2242
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Birchrunville, Jadelectronics	215-296-3800
TN	Johnson City, Beacon Elctrn. Assocs.	615-282-2421
TX	Houston, Aid Elctrns.	713-955-6204
TX	Irving, Aid Elctrns.	214-259-4761
UT	Salt Lake City, Elcom	801-532-7940
WA	Seattle, Earl & Brown Co.	206-284-1121
WI	Waukesha, Lincoln, Hodges & Assocs.	414-542-3087

Local Distributors

AL	Huntsville, Component Distrs.	205-883-7501
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Anaheim, Arrow Elctrns.	714-774-5290
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Irvine, Acacia Sls.	714-549-0954
CA	San Carlos, Control Design	415-592-4806
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Diego, Acacia Sls.	619-565-4365
CA	Santa Clara, Patane/Selectronics	408-496-6151
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Van Nuys, Patane Avionics	213-988-4455
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
FL	Palm Bay, Arrow Elctrns.	305-725-1480
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IL	Itasca, Voyager Elctrns.	312-773-4900
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NY	Farmingdale, Arrow Elctrns.	516-694-6800
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NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, Simcona Elctrns. Corp.	716-328-3230
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Solon, Repco	216-248-8900
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OR	Portland, Radar Elec. Co.	503-232-3404
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Shap Elctrns.	215-969-3300
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Houston, Solid State Elctrns. Co. of Tex.	713-772-8510
TX	Irving, Solid State Elctrns. Co. of Tex.	214-438-5700
TX	Stafford, Arrow Elctrns.	713-491-4100
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WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Seattle, Radar Elec. Co.	206-282-2511
WI	Oak Creek, Arrow Elctrns.	414-764-6600

ELECTROL CO., 321 Dewey St., P.O. Box 29, York, PA 17405, Tel: 717-848-1722; Empl.: 38; *Sls. Mgr.:* Debra Dudley; *Dist. Mgr.:* Debra Dudley

ELECTROMAGNETIC INDUSTRIES, INC., Box 6440, Clearwater, FL 33518, Tel: 813-447-2511

ELECTRO-MAGNETIC PROCESSES, INC., 9616 Owensmouth Ave., Chatsworth, CA 91311, Tel: 818-882-6333, Telex: 499 2240 EMP UI; FSC No.: 51290; Empl.: 35; *Sls. Mgr.:* Arthur Sullivan

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CA	San Diego, Van Gott & Assocs.	619-286-3633
CO	Lakewood, Cristee-Meade Co.	303-232-0287
FL	Ft. Meyers, Rainbow Sls., Inc.	813-332-2210
IL	Addison, Engrd. Sls. Co.	312-832-8425
MD	Baltimore, R. P. Luce	301-752-8200
MN	St. Paul, Vikeland Sls., Inc.	612-645-4647
NJ	Piscataway, R. P. Luce	201-752-8750
NY	Buffalo, Good Comps.	716-634-4400
NY	New Hyde Park, R. P. Luce	516-437-4550
NC	Raleigh, G. P. O'Malley & Assoc., Ltd.	919-848-9865
OH	Dayton, Harvey Teplitz	513-898-4330
PA	Philadelphia, R. P. Luce & Co.	215-233-0999
TX	Dallas, Marcom	214-351-4532
WA	Vancouver, Ray Over Sls.	206-695-6179

ELECTRO-MECH COMPS., 1826 N. Floradale Ave., So. El Monte, CA 91733, Tel: 818-442-7180; FSC No.: 07150; Empl.: 75; *Sls. Mgr.:* Walter H. Trumbull; *Dist. Mgr.:* Margaret W. Ambrose .... **1B**•1618, 1619

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CO	Englewood, Franklin Sls.	303-789-2526
CT	Milford, Todino Engrg.	203-874-6643
FL	Orlando, Publicover	305-898-9361
ID	Boise, Doran Sls. Assocs.	208-343-9969
IL	Chicago, Indl. Rep.	312-647-7755
IN	Fort Wayne, Scott Elctrns.	219-484-7865
IN	Indianapolis, Scott Elctrns.	317-897-9976
MA	Needham Hgts., Todino Engrg.	617-444-7925
MI	Southfield, Component Assocs.	313-557-3232
MN	Bloomington, D. A. Case Associates	612-888-8666
NJ	Medford, Comp. Conslts.	609-654-5300
NY	Mamaroneck, Bassin Tech.	914-698-9332
NY	Vestal, SHR	717-967-2607
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Dayton, Scott Elctrns.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
OR	Forest Grove, Doran Sls.	503-357-3333
PA	Pittsburgh, Scott Elctrns.	412-963-6116
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CA	Pomona, Western Intl.	714-629-3315
CA	Tustin, Western Stitches & Controls	714-731-4333
FL	Ft. Lauderdale, Powell Elctrns.	305-972-4300
FL	Pompano Beach, Components South	305-971-0350
NY	Buffalo, Genesee Radio & Parts	716-873-9661
NY	Mamaroneck, Logi Comp Elctrns.	914-698-9332
Intl	England, Kensington, London, G.E. Elctrns.	01-727 0711/3
Intl	Israel, Holon, M.S.R. Engrg. & Dev.	847686
Intl	Switzerland, Oberengstringen, G & P Elctrns.	(01)643231/644555

ELECTRO-METRICS, 100 Church St., Amsterdam, NY 12010, Tel: 518-843-2600, TWX: 710-446-4798; FSC No.: 18581; Empl.: 105; *Sls. Mgr.:* David Cook

ELECTRO NATL., Matthews Ave., Canton, MS 39046, Tel: 601-859-5511, TWX: 810-990-0938; FSC No.: M-54208; Empl.: 40

ELECTRON, INC., P.O. Box 28640, San Diego, CA 92128, Tel: 216-681-4700, Telex: 98-0240; Empl.: 85

ELECTRONIC ARRAYS, 550 E. Middlefield Rd., Mtn. View, CA 94043, Tel: 415-964-4321, TWX: 910-379-6985; Empl.: 450; *Sls. Mgr.:* Ed Neubauer

ELECTRONIC COIL CORP., 347 New Britain Ave., Plainville, CT 06062, Tel: 203-747-1213; Empl.: 85

ELECTRONIC COMPONENTS GROUPE

ELECTRONIC COMPONENTS GROUPE, 26 N. 5th St., Minneapolis, MN 55403, Tel: 612-375-0011, TWX: 910-576-1725; *Sls. Mgr.:* Herman Sinn; *Dist. Mgr.:* Bill Magnuson .... **1B**•1621

Local Sales Offices & Reps

AZ	Phoenix, Eltron	602-266-2164
CA	Brea, Masco	714-529-0867
CA	Cupertino, F & F Assoc.	408-446-2349
CA	Los Angeles, Masco	213-295-7781
CO	Aurora, Mountain View Mktg.	303-699-1665
FL	Ft. Lauderdale, Beacon Elec.	305-491-1054
IL	Downers Grove, Richmar Elec.	312-968-0118
IN	Indianapolis, Insul-Reps	317-842-5203
MA	Newton Upper Falls, A & M Elect.	617-444-8170
MI	Brighton, A. P. Assoc.	313-229-6550
MN	Minneapolis, Comps. Representative Groupe	612-894-8055
MO	Kansas City, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co. Inc.	314-869-4779
NY	Great Neck, MOS	516-487-3966
OH	Dublin, AP Assoc.	614-766-1855
OH	Fairview Park, A. P. Assoc.	216-356-2424
OK	Tulsa, Southern States Mktg.	918-665-8338
OR	Aloha, Electronic Comp. Sls.	503-245-2342
PA	Ambler, Dalbrook Corp.	215-441-8380
TX	Austin, Southern States Mktg.	512-473-2741
TX	Houston, Southern States Mktg.	713-558-4900
TX	Richardson, Southern States Mktg.	214-238-7500
UT	Salt Lake City, Mountain View Mktg.	801-264-8488
VA	Falls Church, Beacon Elec.	703-534-7200
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301
WI	Milwaukee, Richmar Elec.	312-968-0118

Local Distributors

CA	Hollywood, Yale Radio	213-465-3186
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	Riverside, Electronic Supp.	714-683-7300
CA	San Carlos, Logan Elect.	415-594-0700
FL	Ft. Laud., KSM Elect.	305-971-5900
IL	Chicago, UPCO Dist.	312-631-1122
MD	Beltsville, PSI	301-937-4960
MD	Columbia, D. K. Electronics	301-995-1950
MN	Mpls., Glenmark, Inc.	612-941-4825
WA	Seattle, Radar Elect.	509-747-3053

ELECTRONIC CONCEPTS, INC., Box 627 E, Eatontown, NJ 07724, Tel: 201-542-7880, Telex: 7107226661; Empl.: 215; *Sls. Mgr.:* Philip N. Lepore .... **1A**•1065-1068

Local Sales Offices & Reps

CA	Colton, Elctrn. Concepts, Inc.	714-824-2525
CA	La Mirada, Select Elctrns.	714-739-8891
CA	Los Gatos, Elctrn. Concepts, Inc.	408-395-4224
CO	Aurora, Sage Sls.	303-750-3501
IL	Wheaton, Elctrn. Concepts, Inc.	312-668-8747
MA	Methuen, Elctrn. Concepts, Inc.	617-689-8318
MN	Minneapolis, Components Grp.	612-374-1250
NJ	Englewood Cliffs, Ed Glass Assocs.	201-592-0200, 212-586-8440
OR	Portland, Components West	503-643-5588
OR	St. Louis, Harris-Hanson Co.	816-763-6200
TX	Austin, Milred Assocs., Inc.	512-258-2828
TX	Houston, Milred Assocs., Inc.	713-937-0127
TX	Richardson, Milred Assocs., Inc.	214-644-6731
VT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, Components West	206-885-5880

Local Distributors

IL	Chicago, Nep Elctrns.	312-625-8400
NJ	Teterboro, Elcon Sls.	201-288-8170
TX	Dallas, R. V. Weatherford	214-931-7333
TX	Houston, R. V. Weatherford	713-688-7406
WI	New Berlin, Nep Elctrns.	414-785-9100

ELECTRONIC CONTROLS, INC., 561 Tamarack Ave., Brea, CA 92621, Tel: 714-990-0850; Empl.: 9

ELECTRONIC CONTROLS DESIGN, 13626 S. Freeman Rd., Mulino, OR 97042, Tel: 503-829-9108, Telex: 70-3874 ECDINC; *Sls. Mgr.:* Rex Breunsbach

ELECTRONIC CONVENTIONS, INC., P.O. Box 92275, Worldway Postal Ctr., Los Angeles, CA 90009, Tel: 213-772-2965; *Sls. Mgr.:* William C. Weber, Gen. Mgr.

ELECTRONIC DEV. CORP., 11 Hamlin St., Boston, MA 02127-4198, Tel: 617-268-9696, Telex: 951596 (ELECDEVCO BSN); FSC No.: 12619; *Sls. Mgr.:* Robert B. Ross .... **3**•1223-1225

Local Sales Offices & Reps

AL	Huntsville, MOCO	205-881-5968
AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CA	Costa Mesa, Feeger, Lucas, Wolf	714-751-7512
CA	Hayward, Feeger, Lucas, Wolf	415-487-2222
CA	San Diego, Feeger, Lucas, Wolf	619-277-0993
CA	Van Nuys, Feeger, Lucas, Wolf	213-989-5237
CO	Englewood, R. A. Mayes Co.	303-761-9447
FL	Winter Haven, Lee Assocs.	813-294-5815
IL	Hoffman Estates, Carvel Engrg.	312-885-8800
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Overland Park, Ramsey Assts.	913-649-6996
MD	Bethesda, Powell-Pendergraph	301-656-4535
MA	Hudson, Datarep	617-481-0333
MI	Hazel Park, Tiby Co.	313-547-3550
MN	Edina, Carvel Engrg. & Sls.	612-835-7929
MO	St. Louis, Ramsey Assocs.	314-878-5042
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	E. Syracuse, Ossmann Instrs.	315-437-7052
NY	Rochester, Ossmann Instrs.	716-442-6990
NY	Saratoga Springs, Ossmann Instrs.	518-377-8604
NY	White Plains, Cane Techn. Sls.	914-694-9240
NC	Raleigh, Lee Assocs.	919-848-8818
OH	Cleveland, Tiby Co.	216-371-5335
OH	Dayton, Tiby Co.	513-277-3822
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Willow Grove, Powell-Pendergraph	215-657-0330
TX	Dallas, Tech Rep Mktg.	214-241-2434
TX	El Paso, R. A. Mayes Co.	Enterprise 750
TX	Kemah, Hi Tech Systems	713-783-3856
UT	West Jordan, R. A. Mayes Co.	801-292-6781
VT	Burlington, Data Reps.	802-864-0933
VA	Richmond, Powell-Pendergraph	804-270-1400
WA	Bellevue, Topp Engrg. Sls.	206-747-5400
WI	New Berlin, Carvel Engrg.	414-784-7007

ELECTRONIC DEVELOPMENT LABS., See EDL Inc.

ELCTRN. DEVICES, 21 Gray Oaks Ave., Yonkers, NY 10710, Tel: 914-965-4400, TWX: 710-560-0021; Empl.: 200; *Sls. Mgr.:* Dennis Dean; *Dist. Mgr.:* Dennis Dean

ELECTRONIC ENCLOSURES, Div. Wyle Labs, 225 South Aviation Blvd., El Segundo, CA 90245, Tel: 213-643-8181, TWX: 910-348-6699; FSC No.: 09097; Empl.: 400; *Sls. Mgr.:* Richard W. Bow

ELECTRONIC ENGRG. CO. OF CAL., See EECO

ELECTRONIC HARDWARE, 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-752-1950; Empl.: 100

EI&S

ELECTRONIC INSTR. & SPECIALTY CORP., 42 Pleasant St., Stoneham, MA 02180, Tel: 617-438-5300, Telex: 948-025; FSC No.: 14908; Empl.: 180 .... **1B**•1364, 1365

Local Sales Offices & Reps

AL	Huntsville, REMCO (Raken Engr. of Mktg. Corp.)	205-533-3763
AL	Huntsville, JWL Assocs.	205-881-0413
AZ	Phoenix, Anderson Co.	602-266-2070
CA	Escondido, Cirolia Elctrn. Sls. Inc.	619-489-2452
CA	Granada Hills, C & W Comps.	213-368-4032
CA	San Diego, Cirolia Elctrn. Sls.	619-743-3015
CA	San Jose, G. R. McKnight Co.	408-942-0880
CO	Golden, J. F. Hurlbut Co.	303-279-7796
FL	Lighthouse Point, Jack Krutek & Assocs.	305-941-6544
GA	Atlanta, REMCO (Raker Engr. of Mktg. Corp.)	404-447-6937
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
MD	Woodbine, Naudain Assocs.-Southern	301-442-2270
MA	Stoneham, E I & S	617-438-5300
MI	Oak Park, A. Blumenberg Assocs., Inc.	313-968-3230
MN	Minneapolis, Peterson Sls. & Assocs.	612-944-0030
NJ	Perth Amboy, Astrorep	201-826-8050/51
NY	Babylon, Astrorep	516-422-2500
NY	Fairport, NET Sales	716-467-4538
NC	Charlotte, JWL Assocs.	704-523-3001
OH	Rocky River, Norm Case Assocs.	216-333-0400
OR	Portland, SPS Elctrns.	503-297-6919
PA	King of Prussia, R J I, Inc.	215-265-5211
PA	Norristown, Rivco-January Inc.	215-631-1414
TX	Dallas, P. J. Scanlon Co. Inc.	214-231-4661
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
WA	Redmond, SPS Elctrns.	206-323-4140
WA	Seattle, SPS Elctrns.	206-323-4140
WI	Waukesha, Brainard-Wilson Mktg.	414-547-2285

Local Distributors

CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Clara, Cypress Elctrns.	408-727-7080
CA	Torrance, Cypress Elctrns.	215-530-1900
CT	New Haven, The Greene-Shaw Co.	203-397-0710
MD	Columbia, DK Elctrns.	301-995-1950
MA	Billerica, A. W. Mayer Co.	617-229-2255
MA	Newton, The Greene-Shaw Co.	617-969-8900
MN	Minneapolis, The Joel Co.	612-545-5669
NJ	Fairlawn, Relay Specialties	201-797-3313
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Troy, Trojan Elctrn. Supp. Co.	518-274-4481
OK	Tulsa, Radio, Inc.	918-587-9123
TX	Houston, Gaumer Co.	713-460-5200

ELCTRN. INSTR. & SPEC. CORP., MC DIV., See Millen Comps.

ELECTRONIC KITS INTL., INC., 791 Redrock Rd., St. George, UT 84770, Tel: 801-628-3627; *Sls. Mgr.:* Gary Gibson; *Dist. Mgr.:* Charles Meinkey

ELECTRONIC MEASUREMENTS, 405 Essex Rd., Neptune, NJ 07753, Tel: 201-922-9300, Telex: 132-424; Empl.: 250; *Sls. Mgr.:* C. Roney ... **3**•1552, 1553

Local Sales Offices & Reps

AL	Huntsville, Sci. Devices	205-536-1969
AZ	Phoenix, Sci. Devices	602-957-0401
CA	Los Alamitos, Sci. Devices	213-598-7678
CA	San Diego, Sci. Devices	619-279-6642
CA	San Jose, Sci. Devices	408-554-0455
CO	Boulder, Sci. Devices	303-449-9466
FL	Orlando, Sci. Devices	305-841-8180
GA	Marietta, Sci. Devices	404-427-8660
IL	Chicago, Comtel	312-539-4838
IN	Indianapolis, Comtel	317-253-1681
IA	Cedar Rapids, Comtel	319-377-9434
KS	Mission, Palatine Engrg. & Sls.	913-831-0555
MD	Pikesville, Imagitron Sls. Co.	301-521-2020
MA	Winchester, FJS Assoc.	617-729-3135
MI	Southfield, Comtel	313-358-2510
MN	Wayzata, Comtel	612-476-1551
MO	Hazelwood, Palatine Engrg. & Sls.	314-839-0800
NJ	Englewood Cliffs, Scientific Dvcs.	201-871-3916
NM	Albuquerque, Sci. Devices	505-883-3668
NY	East Syracuse, Ossmann Insts.	315-437-7052
NY	Englewood Cliffs N.J., Scientific Dvcs.	201-871-3916
NC	Winston-Salem, Sci. Devices	919-765-5776
OH	Dayton, WKM Assoc.	513-434-7500
PA	Pittsburgh, WKM Assoc.	412-892-2953
TX	Austin, Alphatech	512-458-9179
WA	Bellevue, Al Smith Co.	206-746-6770
WA	Vancouver, Al Smith Co.	206-892-9912
WI	New Berlin, Comtel	414-544-6042

ELCTRN. MOLDING CORP., 96 Mill St., Woonsocket, RI 02895, Tel: 401-769-3800, TWX: 710-387-1350; FSC No.: 17117; Empl.: 300; *Sls. Mgr.:* Murry Roth; *Dist. Mgr.:* Robert Dactrechy ...... **2**•1268-1270, 1872, 1880-1886

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean of GA	205-830-1540
AZ	Phoenix, Mercury Engrg. Sales	602-244-0123
CA	Cupertino, Thresum Assocs.	408-996-9889
CA	Mountain View, West Mark Assocs.	415-969-1700
CA	Pasadena, Luscombe Engrg.	213-684-2000
CA	San Diego, Luscombe Engrg.	619-295-4300
CO	Lakewood, Christee-Meade Co.	303-232-0287
CO	Wheat Ridge, Cristee-Meade Co.	303-232-0287
FL	Ft. Lauderdale, Cartwright & Bean of FL	305-735-4900
FL	Orlando, Cartwright & Bean of FL	305-422-4531
GA	Atlanta, Cartwright & Bean of GA	404-233-2939
IL	Lisle, W.G. Controls	312-963-5954
IL	Oak Brook, Winner Co.	312-655-3545
IN	Ft. Wayne, Denton Mktg.	219-627-5525
KS	De Soto, Midtec Assocs.	913-441-6565
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
LA	Kenner, Cartwright & Bean of TN	504-466-0020
MD	Glen Burnie, Macrotech Assocs.	301-437-5588
MD	Pasadena, Macrotech Assocs.	301-437-5588
MI	Bloomfield Hills, Enco Marketing, Inc.	313-642-0203
MI	Farmington, Amtech	313-474-8300
MN	Hopkins, Kits Co.	612-933-1888
MS	Jackson, Cartwright & Bean of TN	601-981-1170
MO	Florissant, Midtec Assocs.	314-837-5200
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NJ	Haddonfield, Mills-Brown Assocs.	609-429-1005
NJ	Wayne, G.T. Assocs.	201-694-6040
NY	Binghamton, Empire Tech. Assoc.	607-772-0651
NC	Charlotte, Cartwright & Bean of GA	704-377-5673
NC	Greensboro, Blair Engrg.	919-292-8200
NC	Raleigh, Cartwright & Bean of GA	919-781-6560
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-725-4477
OK	Tulsa, Blair Engrg.	918-747-3100
OR	Portland, Jas. J. Backer Co.	503-297-8744
OR	Salem, Jas. J. Backer Co.	503-362-0717
PA	Hickory, J.C. Hofstetter Co.	412-356-2305
PA	Pittsburgh, J. C. Hofstetter Co.	412-327-1410
TN	Knoxville, Cartwright & Bean of TN	615-693-7450
TN	Memphis, Cartwright & Bean of TN	901-276-4442
TX	Austin, Blair Engrg.	512-458-3107
TX	Dallas, Blair Engrg.	214-241-5655
TX	Houston, Blair Engrg.	713-776-0011
WA	Seattle, Jas. J. Backer Co.	206-285-1300

Local Distributors

AZ	Phoenix, Kachina Elctrn.	602-269-6201
AZ	Phoenix, Heilind Elctrns.	602-243-7171
CA	Inglewood, Force Elctrn.	213-776-1324
CA	San Jose, Force Elctrn.	408-943-1324
CO	Denver, C.S.I.D.	303-292-9594
CO	Wheat Ridge, ACT	303-422-9229
CT	Bethel, Heilind Elctrns.	203-797-8600
FL	Ft. Lauderdale, Peerless Radio Corp.	305-973-4141
FL	Largo, Graham Elctrn.	813-541-4434
FL	Orlando, Aztech Elctrn.	305-291-1681
FL	Palm Bay, Action Elctrns.	305-725-4920
IL	Elk Grove Village, Nu Way Elctrns.	312-437-7120
IN	Ft. Wayne, Graham Electrn.	219-423-3422
IN	Indianapolis, Graham Electrn.	317-634-8202
IN	Lafayette, Graham Electrn.	317-423-5564
IA	Cedar Rapids, Bergquist	
MD	Columbia, Aztech Elctrn.	301-995-1760
MA	Burlington, Heilind Elctrn.	617-272-5610
MI	Grand Rapids, Calder Elctrn.	616-949-2900
MN	Minneapolis, Bergquist	612-835-2322
MN	Minneapolis, Bergquist Co.	612-835-2322
NH	Hudson, Heilind Elctrn.	603-883-9536
NJ	Pennsauken, Resco Elctrn.	609-662-4000
NM	Albuquerque, Intl. Elctrn.	505-345-8127
NY	Bohemia, Car-Lac Elctrn.	516-567-4200
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Millbrook, Villarreal Elctrn.	914-677-3447
NY	Rochester, Masline Elctrn.	716-546-5373
NY	Suffern, Nobel Elctrn.	914-357-4500
OH	Cincinnati, Graham Elctrn.	513-772-1661
OH	Cincinnati, Schuster Elctrn.	513-489-1400
OH	Columbus, Graham Elctrn.	614-895-1590
OH	Twinsburg, Schuster Elctrn.	216-425-8134
OK	Tulsa, Altair Co.	918-252-5781
TN	Nashville, Graham Elctrn.	615-242-2682
TX	Austin, Altair Co.	512-837-4970
TX	Dallas, Heilind Elctrn.	214-351-2050
TX	Houston, Heilind Elctrn.	713-988-2711
TX	Houston, Altair Co.	713-462-3029
TX	Houston, Lenert Co.	713-225-1465
TX	Richardson, Altair Co.	214-231-5166

ENI The advanced design line of power amplifiers

ELECTRONIC NAVIGATION INDS., 3000 Winton Rd. S., Rochester, NY 14623, Tel: 716-473-6900, Telex: 97-8283; FSC No.: 10226; Empl.: 200; *Sls. Mgr.:* L. A. Benedict .... **3**•1008, 1009

Local Sales Offices & Reps

AL	Huntsville, Brown Instrs.	205-883-8660
AZ	Phoenix, Sci. Devices West	602-957-0401
CA	Los Angeles, McDougall/McLaughlin Co.	213-477-8556
CA	Menlo Park, Kipp Assocs.	415-854-2855
CO	Boulder, Sci. Devices West	303-449-9466
FL	Ft. Lauderdale, Brown Instrs.	305-776-4800
FL	Melbourne, Brown Instrs.	305-723-0766
FL	Orlando, Brown Instrs.	305-425-5505
GA	Atlanta, Brown Instrs.	404-455-1035
IL	Elmhurst, Sector	312-530-7850
IN	Indianapolis, Sector	317-842-1120
KS	Overland Park, Ramsey Assocs.	913-649-6996
LA	Mandeville, Brown Instrs.	504-626-9701
MD	Silver Spring, Gawler Knoop Co.	301-589-4406
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Bloomington, Sector	612-888-6920
MO	Maryland Hgts., Ramsey Assocs.	314-878-5042
NH	Nashua, JPR Elctrn. Sls.	603-889-8285
NM	Albuquerque, Sci. Devices West	505-293-3494
NY	Great Neck, RTI, Inc.	516-829-3770
NC	Durham, Brown Instrs.	919-683-1580
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OR	Portland, Sci. Devices Northwest	503-292-6934
PA	Mechanicsville, John Bell Assoc.	215-794-7075
PA	Pittsburgh, WKM Assocs.	412-892-2953
SC	Columbia, Brown Instrs.	803-798-8070
TX	Houston, Sci. Devices-Texas	713-864-1711
TX	Richardson, Sci. Devices-Texas	214-231-8106
TX	San Antonio, Sci. Devices-Texas	512-736-3164
WA	Bellevue, Sci. Devices Northwest	206-454-0900
WI	Milwaukee, Sector	414-352-8280

epc CORPORATION

ELCTRN. PRECISION COMPS., 11 W. Sandford Blvd., Mt. Vernon, NY 10550, Tel: 914-664-2333; FSC No.: 75898; Empl.: 8 .... **1A**•1593, 1869; **3**•1226, 1227

Local Sales Offices & Reps

CA	Granada Hills, W.H. Industries Inc.	213-363-3910
CO	Denver, Midwest Meridian Corp.	303-341-7550

IL	Elk Grove Village, Midwest Meridian Corp.	312-640-9540
IA	Cedar Rapids, Midwest Meridian Corp.	319-365-6561
MA	Andover, William Crawford Assocs.	617-470-2122
MN	Prior Lake, Midwest Meridian Corp.	612-447-8222
MO	Marylan Heights, Midwest Meridian Corp.	314-878-4441
OH	Fairborn, Midwest Meridian Corp.	513-879-7100
TX	Fort Worth, Midwest Meridian Corp.	817-654-2132
WA	Kirkland, W.H. Industries	206-827-1024

ELECTRONIC PRODS. CORP., Interstate Indl. Plaza, R. D. #5, York, PA 17402, Tel: 717-767-6517; Empl.: 16; *Sls. Mgr.:* M. E. Lehman; *Dist. Mgr.:* M. E. Lehman

Local Sales Offices & Reps

IL	Downers Grove, T. E. Moore Co.	312-969-7792
MD	Greenbelt, Potomac Triad Corp.	301-441-2275
NY	Pittsford, Mill Valley	716-248-2653
PA	York, Tillotson & Tillotson	717-767-6517

ELECTRONIC RELAYS, 30 Plaza Dr., Westmont, IL 60559, Tel: 312-789-8166, TWX: 910-991-3903; FSC No.: 53087; Empl.: 29; *Sls. Mgr.:* Barbara Breibach; *Dist. Mgr.:* Barbara Breibach

ELECTRONIC RESEARCH CO., 7618 Wedd St., Overland Park, KS 66204, Tel: 913-631-6700, TWX: 910-749-6477; FSC No.: 13571; Empl.: 60; *Sls. Mgr.:* Charles Ditzler .... **1A•1351**

Local Sales Offices & Reps

Frequency Product

NJ	Riverdale, Comp-Tech Sls.	201-935-5454
NJ	Union, Comp-Tech Sls.	201-687-2484
NY	New Hyde Park, Comp-Tech Sls.	516-593-2628

ELECTRONIC SOLUTIONS, 9255 Chesapeake Drive, San Diego, CA 92123, Tel: 619-292-0242, TWX: 910-335-1169; Empl.: 50; *Sls. Mgr.:* Charles H. Henry .... **3•1106-1109**

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Tempe, Mar Tech	602-968-4944
CA	Anaheim, Qualtech South	714-639-9820
CA	Brentwood, Qualtech South	415-634-9060
CA	Los Angeles, Qualtech South	213-765-1419
CA	San Diego, Mesa Engrg.	619-278-8021
CA	Sunnyvale, Qualtech	408-732-4800
CO	Littleton, Radco	303-794-4279
CT	Canton, Bell Controls	203-693-8926
FL	Melbourne, Southeastern First Rep	305-259-6373
GA	Atlanta, Remco	404-447-6937
IL	Chicago, Marcon	312-675-6450
IA	Des Moines, The Beams Co.	515-255-1148
KS	Shawnee Mission, The Beams Co.	913-631-0300
MD	Rockville, Spectro	301-279-2010
MA	Nashua, Bell Controls	603-882-6984
MI	Livonia, Lowell Wendt	313-464-2722
MN	Minneapolis, Micro Resources	612-830-1454
MO	St. Louis, The Beams Co.	314-434-8448
NH	Nashua, Bell Controls	603-882-6984
NJ	Springfield, Gebhardt Mktg.	201-376-4415
NM	Albuquerque, Mar Tech	505-821-2775
NY	New Hartford, PDQ	315-768-8167
NC	Raleigh, Remco	919-847-5079
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-854-5939
OR	Portland, NW Mkt	503-297-2581
PA	Jenkintown, Monument Tech. Assocs.	215-884-3737
TX	Austin, Acudatix	512-346-4033
TX	Dallas, Acudata	214-424-3567
TX	Houston, Acudata	713-580-2451
WA	Bellevue, NW Mkt	206-455-5846
WI	Waukesha, Computer & System Sales	414-544-1141

Local Distributors

CT	Danbury, Pilgrim Elctrns.	203-792-7274

ELECTRONIC SPACE SYS. CORP., Old Powder Mill Rd., Concord, MA 01742, Tel: 617-369-7200, Telex: 923480 ESSCO WCRD; FSC No.: 15175; Empl.: 82; *Sls. Mgr.:* Susan M. Cuevas

ELECTRONIC SPECIALISTS, 171 South Main St., Natick, MA 01760, Tel: 617-655-1532, 800-225-4876, Telex: 955-329 ATTN: ESP; Empl.: 35; *Sls. Mgr.:* David Monahan

ELECTRONIC SPECIALTY DIV., ElecSpec Corp., 18900 N.E. Sandy Blvd., Portland, OR 97230, Tel: 503-665-0121, Telex: 360-453, TWX: 910-469-8782; FSC No.: 98927; Empl.: 250; *Sls. Mgr.:* R. Lisdero .... **1B•1348-1350**

Local Sales Offices & Reps

CA	Costa Mesa, Gabriel & Assoc.	714-957-1981
FL	Ft. Meyers, Rainbow Sls.	813-939-9150
FL	Melbourne, Rainbow Sls.	305-727-3305
KS	Wichita, Baka Corp.	316-262-0179
MI	Brighton, A.P. Assoc.	313-229-6550
NY	Glen Head, Livera-Polk Assoc.	516-759-9300
TX	Dallas, Blackburn Assoc.	214-692-8885

ELECTRONICS STAMPING CORP., Sub. of Buckbee-Mears Co., 19920 S. Alameda St., Rancho Dominguez, CA 90220, Tel: 213-639-2120, Telex: 678401; FSC No.: 57297; Empl.: 70; *Sls. Mgr.:* Robert J. Ferm

ELECTRONIC SYS. & PROGRAMMING, See Augat/ES•P, Inc.

ELECTRONIC TRANSFORMER CORP., P.O. Box 188, Totowa, NJ 07511, Tel: 201-942-2222; FSC No.: 72149; Empl.: 130; *Sls. Mgr.:* Dan Rovine

ELECTRONIC TRANSISTORS, 112-15 Northern Blvd., Flushing, NY 11368, Tel: 212-651-7200, Telex: 96-0173; FSC No.: 12045; Empl.: 45; *Sls. Mgr.:* Mike Byrnes; *Dist. Mgr.:* Mike Byrnes

ELECTRONIC TREND PRODS., 10080 N. Wolfe Rd., Ste. 372, Cupertino, CA 95014, Tel: 408-996-7401, Telex: 345516; Empl.: 3; *Dist. Mgr.:* Gene Selven

ELECTRONIC WATTMETER CO., 2275 Sixth St., Sarasota, FL 33577, Tel: 813-953-5355; Empl.: 6

ELECTRONIZED CHEMICALS CO., Div. of High Voltage Engrg., 23 Industrial Way, Wilmington, MA 01887, Tel: 617-657-8030, Telex: 68-17284

ELECTRON-MACHINE CORP., Box M, Umatilla, FL 32784, Tel: 904-669-3101, Telex: 56-4300; Empl.: 55; *Sls. Mgr.:* S. K. Kemp V.P. Mktg

ELECTRON PRODUCTS, 2084 Central Ave., Duarte, CA 91010, Tel: 818-359-8281; FSC No.: 99515; *Sls. Mgr.:* Ann Meunier; *Dist. Mgr.:* Ann Meunier

ELECTRO-NUMERICS, 1811 Reynolds, Irvine, CA 92714, Tel: 714-549-8821, Telex: 68-5612; FSC No.: 51666; Empl.: 24

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn Co.	602-257-9015
AR	El Dorado, Kemp Engrg.	501-862-5869
CA	Fremont, William Parks Assocs.	415-490-2011
CA	Santa Ana, Brooks-Moore & Assocs.	714-544-8900
CO	Boulder, Herb Bass Assocs.	303-530-7509
FL	Melbourne, Beacon Elctrn. Assocs.	305-724-8010
GA	Atlanta, Beacon Elctrn. Assocs.	404-256-9640
IL	La Grange, PVA Co.	312-579-9300
LA	Lafayette, Kemp Engrg.	318-269-9452
MD	Randallstown, Beacon North	703-591-1300
MA	West Newbury, Di-Ana Sales	617-363-5420
MI	Royal Oak, Satullo Co.	313-549-3910
MN	Hopkins, Kits Co.	612-933-1888
MO	Bridgeton, Electro-Mechanical Assoc.	314-291-8661
NM	Albuquerque, Shefler-Kahn Co.	505-296-0749
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NC	Raleigh, Beacon Electrn. Assocs.	919-787-0330
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc.	513-433-2800
OK	Tulsa, Kemp Engrg.	918-663-4501
TX	Addison, Kemp Engrg.	214-931-7100
TX	Houston, Kemp Engrg.	713-466-1465
VA	Fairfax, Beacon North	703-591-1300
WA	Redmond, Westenn Sales	206-885-2054
WI	Glendale, Stapleman Corp.	414-352-5777

ELECTRO-OPTICAL INDS., Box 3770, Santa Barbara, CA 93105, Tel: 805-964-6701, Telex: 65-8427; Empl.: 100

ELECTRO-PACIFIC, 5782 Thornwood Dr., Goleta, CA 93017, Tel: 805-964-0751; FSC No.: 29853; Empl.: 60; *Sls. Mgr.:* Kay Mahone

Local Sales Offices & Reps

CA	Del Mar, Electro-Pacific Inc.	619-481-5201

ELECTRO PHYSICS, 1910 West Birchwood Ave., Chicago, IL 60626, Tel: 312-274-9669; Empl.: 6; *Sls. Mgr.:* Abe Siegelman

ELECTROPHYSICS CORP., 48 Spruce St., Nutley, NJ 07110, Tel: 201-667-2262, Telex: 642277

ELECTRO-PREP, 30 Cayuga Ave., E. Falmouth, MA 02536, Tel: 617-477-1791; *Sls. Mgr.:* J. Anderson

ELECTRO-RACK PRODUCTS CO., 1742 S. Clementine St., Anaheim, CA 92802, Tel: 714-776-5420; FSC No.: 26073; Empl.: 25; *Sls. Mgr.:* Allen Benson

ELECTRO-RENT CORP., 4131 Van Owen Place, Burbank, CA 91505, Tel: 213-843-3131, TWX: 910-498-2238; Empl.: 100; *Sls. Mgr.:* R. Tarullo

ELECTRO SCIENTIFIC INDS., 13900 N.W. Science Pk. Dr., Portland, OR 97229, Tel: 503-641-4141, Telex: 15-1246; FSC No.: 11837; Empl.: 750; *Sls. Mgr.:* Dick Donaca;Don Hofmann

ELECTRO SPACE FABRICATORS, 300 W. High St., P.O. BOX 67, Topton, PA 19562-0067, Tel: 215-682-7181; Empl.: 205; *Sls. Mgr.:* T. Roth .... **2•1028, 1029**

Local Sales Offices & Reps

AL	Huntsville, Mackan, Smith & Assocs.	205-539-8000
CA	Irvine, Vale Assocs.	714-551-4004, 4821
CA	San Jose, Silicon Valley Sls.	408-286-7510
CT	Bridgeport, Betronic Assocs.	203-374-6404
FL	Lighthouse Point, Jack Krutek & Assocs.	305-941-6544
FL	Madeira Beach, MacKay, Smith & Assocs.	813-393-7144
FL	Orlando, MacKay, Smith & Assocs.	305-277-1513
GA	Norcross, MacKay, Smith & Assocs.	404-449-7444
IL	Northbrook, Raines & Assocs.	312-498-0890
MD	Pikesville, Imagitron Sls. Co.	800-638-3592
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Waltham, Betronic Assocs.	617-894-8400
MN	Minneapolis, Electro-Tech Assocs.	612-927-5878
NJ	Boonton, Winter Assocs.	201-334-3434
NY	Binghamton, Miles & Burke Assoc.	607-723-8397
NY	Kirkwood, Miles M. Burke & Assocs.	315-822-5916
NY	Morrisville, Promark-Electrns.	315-662-3310
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
OH	Galion, James R. Bright	419-468-3787
OK	Tulsa, Advance Techn. Sls.	918-664-0482
PA	Doylestown, Monteiro Assocs.	215-345-5855
PA	McKean, ECCO	814-476-1376
TN	Chattanooga, MacKay, Smith & Assocs.	615-899-6951
TX	Austin, Advance Techn. Sls.	512-459-1351
TX	Dallas, Advance Techn. Sls.	214-340-1300
TX	Houston, Advance Techn. Sls.	713-440-3888
WA	Auburn, Elctrn. Sls. Northwest	206-839-5808
WA	Maple Valley, Electrn. Sls. Northwest	206-432-1002

ELECTROSPACE SYS., INC., Box 1359, Richardson, TX 75080, Tel: 214-783-2004, TWX: 910-867-4768; FSC No.: 33875; Empl.: 902

ELECTRO STANDARDS LAB., INC., P.O. Box 9144, Providence, RI 02940, Tel: 401-943-1164, Telex: 697-2057 ESLAB; Empl.: 20; *Sls. Mgr.:* R. B. Sepe; *Dist. Mgr.:* R. B. Sepe

ELECTROSTATIC CONSLTG. ASSOCS., 556 Lowell Rd., Groton, MA 01450, Tel: 617-448-5485; Empl.: 5; *Sls. Mgr.:* Paul Malinaric

ELECTROSTATICS, 7718 Clairemont Mesa Blvd., San Diego, CA 92111, Tel: 619-279-1414; FSC No.: 34538; Empl.: 17

ELECTRO STYLUS, 31 Cheyenne Blvd., Colorado Springs, CO 80906, Tel: 303-633-5969; Empl.: 10; *Sls. Mgr.:* L. F. Murray; *Dist. Mgr.:* M. L. Murray

ELECTRO SWITCH, King Ave., Weymouth, MA 02188, Tel: 617-335-5200, TWX: 710-388-0377; FSC No.: 82121; Empl.: 260; *Sls. Mgr.:* H. F. Peters .... **1B•1010, 1622, 1623**

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Los Angeles, Wiley	213-666-1611

CA	Moraga, W. Nott & Co.	415-376-1922
CA	San Diego, Wiley Co.	619-571-2881
CO	Boulder, Comp. Prods. Sls.	303-530-2800
FL	Winter Park, Floritronics	305-886-4818
GA	Atlanta, Holman-Lobsinger	404-256-9120
IL	Elk Grove Village, Electro Switch	312-593-2225
IA	Bettendorf, H.J. Weisler & Assoc.	319-344-0566
MD	Woodbine, Naudain Assocs.	301-442-2270
MI	Ferndale, Hilltronics	313-398-5556
MN	St. Paul, Kencotronics	612-645-7717
MO	Ellisville, H.J. Weisler & Assoc.	314-394-4543
MO	No. Kansas City, H.J. Weisler & Assocs.	816-421-1679
NJ	Fairfield, Electro Switch	201-227-6559
NJ	Marlton, Naudain Assocs.	609-983-5300
NY	Rochester, Sweetco Assoc.	716-225-2383
NY	Utica, Sweetco Assoc.	315-797-6721
NC	Winston-Salem, L.G. White Southern	919-725-3612
OH	Columbus, Rockford Controls	614-868-5577
OH	Dayton, Rockford Controls	513-898-5452
OH	Euclid, Rockford Controls	216-731-5250
PA	Pittsburgh, R. F. Clark	412-242-9500
SC	Greenville, L.G. White Southern	803-271-0630
TX	Bellaire, Brice Co.	713-666-1788
TX	Dallas, Brice Co.	214-233-9808
UT	Salt Lake City, Comp. Prods. Sls.	801-262-0000
VA	Richmond, L.G. White Southern	804-740-7093
WA	Seattle, C.B. Parsons & Co.	206-762-7373
WI	Wauwatosa, Larsen Assoc.	414-258-0529

Local Distributors

CA	Los Angeles, Electric Switches	213-660-1310
CA	Moraga, Willard Nott & Co.	415-376-1922
FL	Ft. Lauderdale, Peerless Radio Corp. of Florida	305-973-4141
GA	Atlanta, Georgia Control Ctr.	404-876-8833
IL	Bridgeview, Midco Comp. Sls.	312-599-7777
MD	Baltimore, Automation Indl. Control	301-747-0044
MD	Kensington, Marine Air Supply	301-949-9560
MA	Sharon, Adcour	617-784-8123
MI	Grand Rapids, S-F Electronic Supply	616-459-0216
MN	St. Paul, K. D. I.	612-645-7717
NE	Omaha, West Dodge Elec. Supp.	800-228-2314
NY	Hempstead, Electronic Equip. Co.	516-538-5510
NC	Winston-Salem, General Prods. Co.	919-725-3612
OH	Euclid, Rockford Controls Ohio	216-731-5250
PA	Conshohocken, I/O Elec. Supp. Corp.	215-825-4610
PA	Pittsburgh, Clayton Engrg. Co.	412-288-0643
TX	Bellaire, Barclay Wholesale	713-666-1788
WA	Seattle, C.B. Parsons Co.	206-762-7373
WI	Milwaukee, I/O Elec. Supp. Corp.	414-963-9050

ELECTRO-TECH SYS., INC., 35 E. Glenside Ave., Glenside, PA 19038, Tel: 215-887-2196; *Sls. Mgr.:* Sharon Sandy; *Dist. Mgr.:* Stanley Weitz

ELECTRO VECTOR, INC., 6555 Covey Rd., Forestville, CA 95436, Tel: 707-887-2292, TWX: 510-746-6024; *Sls. Mgr.:* Wayne Brigden

ELECTROVERT INC., 399 Executive Blvd., Elmsford, NY 10523, Tel: 914-592-7322, Telex: 646186; *Sls. Mgr.:* Steve Vineis .... **2•**1266, 1267

Local Sales Offices & Reps

CA	Santa Ana	714-835-2033
GA	Norcross	404-441-3644
IL	Rosemont	312-678-5557
TX	Dallas	214-353-9950

ELECTROVERT USA CORP., 10969 Shady Trail, #101, Dallas, TX 75220, Tel: 214-353-9950, Telex: 4630186; Empl.: 150; *Sls. Mgr.:* Tom Gill

Local Sales Offices & Reps

CA	Santa Ana	714-835-2033
CA	Santa Clara	408-739-6015
CO	Denver	303-423-5598
GA	Norcross	404-441-3644
IL	Rosemont	312-678-5557
NH	Manchester	603-625-5877
NY	Elmsford	914-592-7322
TX	Dallas	214-353-9950

ELECTRO WEAVE, 38 Harlow St., Worcester, MA 01605, Tel: 617-752-8932, TWX: 710-340-0635; FSC No.: 54207; Empl.: 18; *Sls. Mgr.:* C. J. Nowasacki

ELFAB CORP., P.O. Box 810555, Dallas, TX 75381-0555, Tel: 214-233-3033, 800-527-0753, TWX: 910-860-5460; Empl.: 299; *Sls. Mgr.:* Kermit Dye .... **2•**1271-1274

Local Sales Offices & Reps

AL	Huntsville, Raycom	205-859-2017
AZ	Tempe, Delta Elect.	602-966-9903
CA	Escondido, Cirolia Elctrn. Sls.	619-743-3015
CA	Santa Clara, Elfab Corp.	408-988-1716
CA	Tustin, Elfab Corp.	714-731-2515
CO	Littleton, Lange Sls., Inc.	303-795-3600
FL	Orlando, Tri Mark Assocs.	305-859-5504
GA	Fayettsville, Raycom, Inc.	404-461-4026
IL	Crystal Lake, E. S. Healy & Assocs.	815-459-4386
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Hopkinton, Marathon Sls., Ltd.	617-435-6984
MI	Grand Rapids, R. P. Urban Assoc.	616-245-0511
MN	Stillwater, Tech Mktg.	612-330-3699
MO	St. Charles, C.F. Elctrns.	314-946-8500
NJ	Cherry Hill, Elfab Corp.	609-795-6262
NJ	Springfield, F. F. Sylvester Assoc.	201-376-3324
NY	N. Syracuse, Advanced Comps.	315-699-2671
NC	Raleigh, Rick Burns Assoc., Inc.	919-876-2224
OH	Beachwood, Duane Thompson & Assoc.	216-831-6277
OH	Dayton, Duane Thompson & Assocs.	513-237-9422
OK	Oklahoma City, Ammon & Rizos Co.	405-942-2552
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Dallas, Ammon & Rizos Co.	214-233-5591
TX	Houston, Ammon & Rizos Co.	713-781-6240
UT	Salt Lake City, Lange Sls., Inc.	910-925-4006
WA	Seattle, Blum & Assocs.	206-285-2590

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ELGAR CORP., 8225 Mercury Ct., San Diego, CA 92111, Tel: 619-565-1155, TWX: 910-335-1246; FSC No.: 25965; Empl.: 375 .... **3•**1854-1859

Local Sales Offices & Reps

AL	Huntsville, Pen-Tech Assocs.	205-881-9298
AZ	Tempe, Trembly Assoc.	602-967-2058
CA	Redondo Beach, Ward/Davis Assocs.	213-973-7772
CA	San Diego, Ward/Davis Assocs.	619-292-1000
CA	San Jose, D.P. Assocs.	408-296-1492
CO	Lakewood, Trembly Assocs.	303-233-9544
CT	North Haven, P. Jenks Assocs.	203-239-6201
FL	Casselberry, Pen-Tech Assocs.	305-645-3444
FL	Deerfield Beach, Pen-Tech Assocs.	305-421-4989
GA	Marietta, Pen-Tech Assocs.	404-424-1931
HI	Honolulu, Elctrn. Sls. Procurement	808-847-4300
IL	Arlington Heights, Dytec/Central	312-394-3380
IN	Indianapolis, Dytec/Central	317-247-1316
KS	Lenexa, Dytec/South	913-888-0215
MD	Rockville, Elctrn. Mktg. Assocs.	301-881-5300
MA	Woburn, P. Jenks Assocs.	617-938-0488
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	Maryland Hgts., Dytec/South	314-569-2990
NV	Las Vegas, Trembly Assocs.	702-739-9770
NJ	Hackensack, TMA	201-646-9222
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Fairport, NACO Elctrns. Corp.	716-223-4490
NY	Great Neck, RTI	516-829-3770
NY	North Syracuse, NACO Elctrns. Corp.	315-699-2651
NY	Utica, NACO Elctrns. Corp.	315-732-1801
NC	High Point, Pen-Tech Assocs.	919-883-9125
OH	Cleveland, WKM Assocs.	216-267-0445
OH	Dayton, WKM Assocs.	513-434-7500
OR	Beaverton, Northwest Test & Meas.	503-646-9966
OR	Portland, Topp Engrg.	503-244-7265
PA	Pittsburgh, WKM Assocs.	412-892-2953
PA	Plymouth Meeting, Elctrn. Mktg. Assocs.	215-828-7400
TX	Austin, Data Aids Assocs.	512-327-8600
TX	Dallas, Data Aids Assocs.	214-620-1551
TX	Spring, Data Aids Assocs.	713-353-7728
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Bellevue, Topp Engrg.	206-747-5400
WA	Redmond, Northwest Test & Meas.	206-881-8857
WI	Elm Grove, Dytec Central Inc.	414-784-9686
EXP	CA, San Diego, Elgar Intl. Corp.	619-565-1155

Local Distributors

CA	Berkeley, Northern Lights	415-540-6162
CA	Inglewood, Cal. Micro	213-671-6075
IL	Arlington Heights, Peak Distrs., Inc.	312-394-3380
MN	St. Paul, Dytec North, Inc.	612-645-5816
MO	Maryland Heights, Dytec Distrs.	314-569-2990
NJ	Hackensack, Logon, Inc.	201-646-9222
NY	North Syracuse, Naco Elctrns. Corp.	315-699-2651
NC	Greensboro, Pen-Tech Sls.	919-852-6000
OH	Centerville, National Instrs. Distrs., Inc.	513-434-7500
PA	Penllyn, Promark Distrs., Inc.	215-643-3400
TX	Springs, Data Aids Assocs.	713-353-7728
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400

ELGENCO, INC., Box 460, Hurricane, UT 84737, Tel: 801-635-4954; FSC No.: 15455; *Sls. Mgr.:* Duane Beecher .... **3•**1228-1233

Local Sales Offices & Reps

CA	Sherman Oaks, Windsor Dynamics	213-990-4173
CA	Woodside, N-S Assocs.	415-854-4870
CT	Hamden, Polytek Assoc.	203-288-5246
MA	Waban, Polytek Assoc.	617-881-4741
NJ	Marmore, Holdsworth & Co.	609-398-4340
NM	Albuquerque, Technology Mktg. Assoc.	505-345-8921
PA	Newtown Square, Holdsworth & Co.	215-356-8550

ELIN DIV., California Instrs. Co., Div. of Norlin Ind., 5150 Convoy St., San Diego, CA 92111, Tel: 619-279-8620, Telex: 695-047; FSC No.: 16067; Empl.: 90; *Sls. Mgr.:* W.W. Hanford

ELMA ENGRG., 1066 E. Meadow Circle, Palo Alto, CA 94303, Tel: 415-494-7303, Telex: 345-560; Empl.: 50; *Sls. Mgr.:* Karl W. Widl

ELMAG, 54 Clark St., Newark, NJ 07104, Tel: 201-481-1600; FSC No.: 23160; Empl.: 25

Local Sales Offices & Reps

OH	Dayton, Irving Atkind Assoc.	513-278-4160

ELM SYSTEMS, 1101 Brown St., Wauconda, IL 60084, Tel: 312-526-5003; *Sls. Mgr.:* T. A. McCollum

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ELMWOOD SENSORS, 500 Narragansett Park Drive, Pawtucket, RI 02861, Tel: 401-727-1300, Telex: 6814066 ELMWOOD, TWX: 710-381-6413; Empl.: 700; *Sls. Mgr.:* Gary Polkow .... **1B•**1802

Local Sales Offices & Reps

AL	Decatur, Tenn. Tech. Sls.	205-350-0630
AZ	Phoenix, O'Donnell SW	602-944-9542

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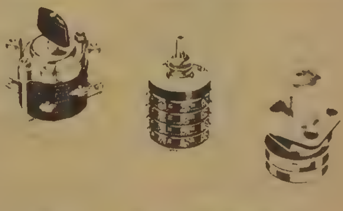

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CO	Boulder, Front Range Mktg.	303-443-4780
FL	Coral Springs, CBC Electronics	305-755-1111
GA	Atlanta, Tenn. Tech. Sls.	404-622-5784
IL	Arlington Heights, Thermek	312-577-6900
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KY	Louisville, O. Bromberg	502-245-8916
MA	Danvers, C. H. Burnham Assoc.	617-774-0111
MI	Brooklyn, Engineered Comps.	517-592-3236
MN	Minneapolis, C. Listug Sls.	612-537-6740
MO	Creve Coeur, Hill & Co.	314-432-1136
NH	Durham, C. H. Burnham Assoc.	603-868-2282
NY	Fairport, Bastian Sls.	716-223-0237
NY	Larchmont, G. M. Moch Co.	914-834-3530
NY	Latham, L-Tron Corp.	518-785-5032
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Charlotte, Tenn-Tech Sls.	704-525-6295
OH	Cincinnati, O. Bromberg	513-771-9333
OH	Cleveland, Allied Entprs.	216-779-0080
OK	Tulsa, Ion Assoc.	918-664-0186
PA	Murrysville, Allied Entprs.	412-325-3200
RI	Johnston, C. H. Burnham Assoc.	401-231-7475
TX	Austin, Ion Assocs.	512-346-7160
TX	Grand Prairie, Ion Assocs.	214-647-8225
TX	Houston, Ion Assocs.	713-977-4354
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Midlothian, Daniel E. Boehling Assocs.	804-794-5879
WA	Bellevue, Lehr Assoc.	206-453-9993
WA	Bothell, Temco Northwest	206-488-1254
WI	Milwaukee, R. Zingler	414-351-5005

ELNA AMERICA, INC., 153 E. Savarona Way, Carson, CA 90746, Tel: 213-327-6090, Telex: 68-6427, TWX: 910-346-6730; *Sls. Mgr.:* Don L. Bilsing; *Dist. Mgr.:* Isao Kikuchi

ELNETIC ELCTRNS., 1730 21st St., Santa Monica, CA 90404, Tel: 213-828-9541; FSC No.: 98460; Empl.: 25; *Sls. Mgr.:* Ernest H. Carlson, Jr.

ELNIK INSTRS., 410 Garibaldi Ave., Lodi, NJ 07644, Tel: 201-779-7388, Telex: 133429; Empl.: 8; *Sls. Mgr.:* Claus J. Joens

ELPAC COMPS., 3131 S. Standard Ave., Santa Ana, CA 92705, Tel: 714-979-4440, TWX: 910-595-1513; Empl.: 130; *Sls. Mgr.:* Rod Bolton ......**1A**•1070, 1071

Local Sales Offices & Reps

AZ	Tempe, Sunwest Mktg. Assocs.	602-838-7586
CA	Loomis, Sacremento Office	916-652-9702
CA	San Diego, Wes-K Assocs.	619-578-2040
CA	Santa Clara, I Squared.	408-988-3400
CA	Van Nuys, Wes-K Assocs.	213-989-3070
CO	Arvada, Wescom Mktg.	303-422-7619
CT	Milford, Todino Engr. Sls.	203-874-6643
FL	Orlando, OEM Mktg. Corp.	305-299-1000
IL	Highland Park, Bransky Sls.	312-433-2375
IA	Cedar Rapids, Palatine Engr. & Sls.	319-365-8071
KS	Mission, Palatine Engr. & Sls.	913-831-0555
KS	Rose Hill, Palatine Engr. & Sls.	316-776-0065
MD	Timonium, Wakefield Grp.	301-561-3221
MA	Needham Heights, Todino Engr. Sls.	617-444-7925
MI	Farmington Hills, W. R. Hummon & Assocs.	313-474-0661
MN	Bloomington, Smiley-Scott Assocs.	612-888-5551
MO	Hazelwood, Palatine Engr. & Sls.	314-839-0800
NJ	Englewood, Harold Gray Assocs.	201-894-0894
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Beaverton, Caruso & Northcutt.	503-646-4973
PA	Hickord, J. C. Hofstetter Co.	412-356-2305
TX	Dallas, Reese & Assocs.	214-638-6575
UT	Salt Lake City, Wescom Mktg.	801-466-9594
WA	Bellevue, Caruso & Northcutt.	206-454-9699
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, T.T.I.	602-861-0222
AZ	Tempe, Powell Elctrns.	602-438-1505
CA	Chatsworth, Mil-Comm	213-998-3111
CA	Costa Mesa, Powell Elctrns.	714-754-1717
CA	Garden Grove, Megacap	714-891-5176
CA	Irvine, Kelex	714-863-1230
CA	San Jose, T.T.I.	408-943-9155
CA	San Jose, Powell Elctrns.	408-943-9020
CA	San Jose, Capacitors Unltd.	408-946-7676
FL	Ft. Lauderdale, Powell Elctrns.	305-979-5000
FL	Orlando, T.T.I. Florida	305-979-5000
IL	Northbrook, Classic Components	312-272-9650
IL	Skokie, Kellner Elctrns.	312-677-1120
MD	Columbia, Powell Elctrns.	301-995-0410
MA	Westborough, Powell Elctrns.	617-366-6100
MA	Wilmington, Aved Elctrns.	617-657-8311
MA	Woburn, T.T.I., Inc. NE	617-938-8800
MN	Minneapolis, C. Tennant & Sons	612-475-7300
MO	Maryland Heights, Ensco Distribg., Inc.	314-423-3935
NJ	Englewood, Powell Elctrns.	201-894-0800
NY	Bohemia, T.T.I.	516-567-1500
NC	Cary, Powell Elctrns.	919-467-1212
OK	Tulsa, Altair Co.	918-252-5781
PA	Philadelphia, Powell Elctrns.	215-365-1900
TX	Austin, Captronics	512-459-4328
TX	Dallas, Captronics	214-340-3592
TX	Ft. Worth, T.T.I.	817-429-1440
TX	Houston, Altair Co.	713-462-3029
TX	Irving, Powell Elctrns.	214-258-6841
WA	Bellevue, Powell Elctrns.	206-641-4446
WI	Mequon, Taylor Elec. Dists.	800-558-8921
WI	New Berlin, Classic Comps.	414-786-5300
WI	Racine, Badger Elctrns.	414-637-1256; 414-933-6685

ELPAC POWER SYS., 3131 S. Standard Ave., Santa Ana, CA 92705, Tel: 714-979-4440, TWX: 910-595-1513; Empl.: 270; *Sls. Mgr.:* Patrick D'Acre; *Dist. Mgr.:* Randy Bilsley ......**3**•1554-1559

Local Sales Offices & Reps

AL	Huntsville, K&E Assoc.	205-883-9720
AZ	Phoenix, Westrep	602-997-8899
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Parker, A-5 Co.	303-841-3651
CT	Yalesville, The Newscott Co.	203-269-2654
FL	Clearwater, Gallagher & Assoc.	813-726-3187
FL	Plantation, Gallagher & Assoc.	305-473-2101
GA	Doraville, K&E Assoc.	404-448-7025
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Ft. Wayne, F. J. Campisano	219-747-2633
IN	Indianapolis, F. J. Campisano	317-253-7651
IA	Cedar Rapids, Electromec	319-362-6413
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Needham Hgts., Newscott Co.	617-444-1923
MN	Burnsville, Electromec Sls.	612-894-8200
NJ	Fairfield, TAM	201-575-4390
NY	S. Hauppauge, TAM	516-348-0800
OH	Cincinnati, F. J. Campisano	513-574-7111
OH	Cleveland, F. J. Campisano	216-749-5550
OK	Tulsa, ION Assoc	918-664-0186
OR	Beaverton, Caruso & Northcutt	503-646-4973
PA	Coraopolis, F. J. Campisano	412-264-5151
TX	Austin, Ion Assoc.	512-346-7160
TX	Grand Prairie, ION Assoc	214-647-8225
TX	Houston, Ion Assoc.	713-977-4354
WA	Bellevue, Caruso & Northcutt	206-454-9699
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

BS	Huntsville, Marshall Industries	205-881-9235
AL	Birmingham, ACK Radio Supp.	205-322-0588
AL	Huntsville, RM Elctrns.	205-852-1550
AZ	Tempe, Marshall Inds.	602-968-6181
CA	Canoga Park, Marshall Inds.	213-999-5001
CA	El Monte, Marshall Industries	213-442-7204
CA	Inglewood, Newark Elctrns.	213-678-0441
CA	Irvine, Marshall Inds.	714-556-6400
CA	San Diego, Marshall Inds.	619-578-9600
CA	Sunnyvale, Marshall Inds.	408-732-1100
CO	Denver, Marshall Inds.	303-427-1818
CT	Wallingford, Sager Elctrns.	203-265-4600
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Orlando, Marshall Inds.	305-841-1878
GA	Atlanta, ACK Radio Supply	404-351-6340
GA	Norcross, Marshall Inds.	404-923-5750
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Northbrook, Classic Components	312-272-9650
IL	Schaumburg, Marshall Inds.	312-490-0155
IN	Indianapolis, RM Elctrns.	317-247-9701
MD	Gaithersburg, Marshall Inds.	301-840-9450
MA	Burlington, Marshall Inds.	617-272-8200
MA	Burlington, QPL Elctrns.	617-229-2424
MA	Hingham, Sager Elctrns.	617-749-6700
MI	Grand Rapids, RM Elect.	616-531-9300
MI	Livonia, Marshall Industries	313-525-5850
MN	Plymouth, Marshall Inds.	612-559-2211
MO	St. Charles, Finnigan Elect.	314-946-6201
NJ	Cranford, Garden State Indl.	201-272-6400
NJ	Fairfield, Marshall Industries	201-882-0320
NJ	Mt. Laurel, Marshall Inds.	215-627-1920
NJ	Nutley, Vantage Comps.	201-667-1840
NY	Commack, Vantage Comps.	516-543-2000
NY	Endwell, Marshall Industries	607-754-1570
NY	Hauppauge, Marshall Inds.	516-273-2424
NY	Hauppauge, Broadline Elctrns.	212-895-6232
NY	Melville, Diplomat	516-454-6400
NY	Rochester, Marshall Inds.	716-235-7620
NC	Greensboro, Hammond	919-275-6391
OH	Dayton, Marshall Industries	513-236-8088
PA	Philadelphia, Shap Elctrns.	215-969-3300
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Austin, Marshall Industries	512-458-5654
TX	Dallas, RM Elctrns.	214-235-3100
TX	Dallas, Marshall Inds.	214-233-5200
TX	Houston, Marshall Inds.	713-789-6600
TX	Houston, Newark Elctrns.	713-782-4800
WA	Bellevue, Marshall Inds.	206-747-9100
WI	New Berlin, RM Elctrns.	414-784-4420
WI	New Berlin, Classic Comps.	414-786-5300

ELPA MARKETING IND., Thorens & Atlantic Ave., Garden City Park, NY 11040, Tel: 516-746-3002

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ELPOWER, 2117 S. Anne St., Santa Ana, CA 92704, Tel: 714-540-6155, Telex: 678354 ELPOWER SNA; Empl.: 200; *Sls. Mgr.:* D. Keil; *Dist. Mgr.:* Ronnie LeFevre ......**3**•1408-1410

Local Sales Offices & Reps

AZ	Phoenix, Shefter-Kahn	602-257-9015
CA	Mountain View, Gene C. Woempner Co.	715-964-5454
CO	Denver, Moss Mktg.	303-455-7205
CT	Milford, Todino Engrg. Sls. Co.	203-874-6643
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Chicago, G. Mcl. Cole Co.	312-774-3535
IN	Indianapolis, Elctrn. Mktg. Conslts.	317-253-1668
KS	Overland Park, Thomas L. Dowell & Assoc.	913-648-7373
MD	Baltimore, Component Sales	301-484-3647
MA	Needham Heights, Todino Engrg.	617-444-7925
MI	Coopersville, Electronic Salesmasters	800-321-1848
MN	Edina, Restronics	612-941-9135
MO	St. Louis, Thomas L. Dowell & Assoc.	314-849-4234
NJ	Englewood Cliffs, Masin Esco	201-569-8868
NJ	Marlton, Twin Sales	609-966-4070
NY	Chappaqua, Masin Esco	914-238-8337
NY	Syosset, Masin Esco	516-364-0310
OH	Beachwood, Electronic Salesmasters	216-831-9555
PA	Bensalem, Twin Sales	215-638-4850
TX	Dallas, R. E. Nesbitt Co.	214-357-4601
WA	Seattle, Northmar	206-524-5170

Local Distributors

AL	Huntsville, Components Distrs.	205-883-7501
CA	Cerritos, El Com	213-404-2961
CA	Fremont, Terminal Sls.	415-656-7722
CA	Gardena, Culver Elctrn. Sls.	213-538-2811
CA	Mountain View, Energy Sales	415-969-0800
CO	Denver, Hensley Battery	303-455-3643
FL	Del Rey Beach, Chapman Security Sys.	305-737-6776
GA	Atlanta, Custom Alarm Prods.	404-458-0990
IL	Downers Grove, Telecommunication Dvcs.	312-971-3460
IL	Palatine, Ohm Elctrns.	312-359-5500
IN	Indianapolis, Graham Elctrns.	317-634-8202
LA	Shreveport, Industrial Elctrn. Supp.	318-222-9459
MD	Savage, Pyttronic	301-792-0780
MA	Newtonville, Security Supp. Svc.	617-965-3400
MI	Livonia, Alarm Supp. Co.	313-591-9100
MN	Burnsville, Power Trust Grp.	612-890-1360
MO	St. Louis, Van Sickle Radio	314-621-5000
NE	Lincoln, Scott Elctrns.	402-466-8221
NY	Centereach, Air Ways Distrs.	516-698-7447
NY	Jackson Hgts., A-1 Alarmatic	212-639-8300
OR	Portland, Radar Elec.	503-232-3404
PA	Allentown, A. A. Peters	215-434-5237

UT	Salt Lake City, Standard Supply	801-486-3371
VA	Richmond, AVCC Elctrns.	804-359-6071
WA	Seattle, Radar Elec.	206-282-2511

EL-RAD MFG., 4300 N. California, Chicago, IL 60618, Tel: 312-478-7300, TWX: 910-221-0104; FSC No.: 11253; Empl.: 225; *Sls. Mgr.:* Marvin S. Christ

Local Sales Offices & Reps

AZ	Scottsdale, Memco Sales	602-241-2254
AR	Little Rock, Jard Electro Sales	214-231-6654
CA	Huntington Beach, J. J. Riley Assoc.	714-841-1411
CA	Mountain View, Westech Sls.	415-961-1422
FL	Pompano Beach, Cole-Tek	305-781-8110
IL	Elk Grove Village, I R O Co.	312-593-0644
MD	Glen Burnie, Faion Lott & Co.	301-744-4611
MD	St. Louis, Abrams & Assoc.	314-569-0447
MI	Benton Harbor, Mc Nabb & Assocs.	616-925-2166
NJ	Baltimore, Faion Lott & Co.	301-744-4611
NM	Phoenix, Memco Sls.	602-952-2254
TX	Richardson, Jaro Electro Sls.	214-231-6654

ELTEC INSTRS., P.O. Box 9610, Daytona Bch., FL 32020, Tel: 904-252-0411, TWX: 810-832-6294; Empl.: 120; *Sls. Mgr.:* Douglas S. Armstrong

EMCA, Sub. Rohm and Haas Advanced Matls. Co., 605 Center Ave., Mamaroneck, NY 10543, Tel: 914-698-8434, TWX: 710-566-1128; Empl.: 70; *Sls. Mgr.:* Dennis Hanley

Local Sales Offices & Reps

CA	Pleasant Hill, EMCA	408-998-1540
CA	Santa Clara, Mead Assocs.	408-748-1991
CA	Tustin, EMCA	714-731-4373
FL	Largo, Michael Nadreau	813-581-9113
NY	Chappaqua, Micrel Assocs.	914-238-4961
TX	Dallas, EMCA	214-321-5498

EMCO HIGH VOLTAGE CO., 556 Weddell Dr., Sunnyvale, CA 94089, Tel: 408-734-9123; Empl.: 38 .... 3•1560

EMCON INC., Sub. of Kyocera Intl., 11620 Sorrento Valley Rd., San Diego, CA 92138, Tel: 619-459-4355, TWX: 910-322-1130; Empl.: 500; *Sls. Mgr.:* Bob Goodman; *Dist. Mgr.:* George Maines

Emcor Products

EMCOR PRODUCTS, Crenlo, Inc., 1600 Fourth Ave. NW, Rochester, MN 55901, Tel: 507-289-3371, TWX: 910-565-2374; *Sls. Mgr.:* John Horton .... 2•1030

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown Instrs.	205-883-8660
AZ	Phoenix, Aztec Enterprises	602-944-9185
CA	Cupertino, T. Louis Snitzer Co.	408-257-8333
CA	Del Mar, T. Louis Snitzer Co.	714-226-0305
CA	Los Angeles, T. Louis Snitzer Co.	213-836-6170
CO	Denver, Delltron Co.	303-373-0300
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Ft. Lauderdale, W. A. Brown Instrs.	305-776-4800
FL	Melbourne, W. A. Brown Instrs.	305-723-0766
FL	Orlando, W. A. Brown Instrs.	305-425-5505
GA	Norcross, W. A. Brown Instrs.	404-441-2980
ID	Boise, N. R. Schultz Co.	208-377-8686
IL	Des Plaines, Marsland Assocs.	312-694-2262
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
LA	Mandeville, W. A. Brown Instrs.	504-626-9701
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Southfield, Comtel Instrs.	313-358-2505
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NJ	Cedar Grove, KLS Associates	201-785-4450
NM	Albuquerque, Aztec Entps.	505-262-1688
NY	Albany, Reagan/Compar Albany	518-489-4777
NY	Endwell, Reagan/Compar Albany	607-723-8743
NY	Fairport, Reagan/Compar Albany	716-271-2230
NY	New Hartford, Reagan/Compar Albany	315-732-3775
NY	New York, KLS Assocs.	201-785-4450
NC	Durham, W. A. Brown Instrs.	919-683-1580
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573
OH	Hilliard (Columbus), Comtel Instrs.	614-876-8305
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Hatboro, Jacobsen Assocs.	215-674-2937
PA	Huntingdon Valley, Jacobsen Assocs.	215-674-2937
PA	Pittsburgh, Comtel Instrs.	412-922-5720
SC	Columbia, W. A. Brown Instrs.	803-798-8070
TN	Oak Ridge, W. A. Brown Instrs.	615-482-5761
TX	Dallas, J. A. Green Co.	214-631-7450
TX	Houston, J. A. Green Co.	713-526-2959
UT	Salt Lake City, Delltron Co.	800-692-2069
VA	Alexandria, Dyna Rep Co.	703-354-1222
WA	Bellevue, N. R. Schultz Co.	206-454-0300

EMC TECHNOLOGY INC, 1971 Old Cuthbert Rd., Cherry Hill, NJ 08034, Tel: 609-429-7800, Telex: 710 896 0193; FSC No.: 24602; Empl.: 75; *Sls. Mgr.:* Peter Semitschew

EMERGENCY BEACON CORP., 15 River St., New Rochelle, NY 10801, Tel: 914-235-9400; Empl.: 25; *Sls. Mgr.:* T. E. Ziegler

EMERSON, INDL. CONTROLS DIV., 3300 Standard St., Santa Ana, CA 92702, Tel: 714-545-5581, Telex: 67-8460; Empl.: 800; *Sls. Mgr.:* R. L. Calvin

EMERSON & CUMING, W. R. Grace & Co., 59 Walpole St., Canton, MA 02021, Tel: 617-828-3300, TWX: 710-348-1324; Empl.: 500

Local Distributors

CA	Culver City, E. V. Roberts & Assoc.	213-870-9561
FL	Stuart, Southeast Resin	305-286-8955
IL	Chicago, Prehler, Inc.	312-384-6100
MD	Baltimore, Sosco Corp.	301-574-7555
MA	Burlington, Schaal Associates, Inc.	617-272-7940
MA	Peabody, Adhesive Packaging Specialists	617-531-3300
MN	Bloomington, T.C. Services, Inc.	612-881-4536
MO	Maryland Heights, Thomas B. Moore, Inc.	314-434-6844
NJ	Plainfield, Pro-Pac	201-755-4940
NY	Ronkonkoma, Plastic Products & Tooling	516-467-0960
NC	Greensboro, Whitaker Metals, Inc.	919-294-3825
OH	Westerville, John W. Blair Co.	614-882-6431
TN	Memphis, Accrabond, Inc.	601-895-4480
TX	Dallas, Roy E. Davis & Co.	214-688-0652
TX	Garland, Ipscot, Inc.	214-272-5952

EMICO INC., Box 368, Dublin, PA 18917, Tel: 215-249-9330, TWX: 510-665-9583; FSC No.: 85925; Empl.: 170; *Sls. Mgr.:* R. Jones .... 3•1330, 1331

Local Sales Offices & Reps

AZ	Scottsdale, Luscombe	602-949-9333
CA	Campbell, Luscombe Engrg.	408-370-2020
CA	Pasadena, Luscombe	213-684-2000
CO	Arvada, Arrowhead Sls. Co.	303-423-5556
FL	Pinellas Park, Chaco Sls.	813-546-6658
IL	Chicago, Ropek & Cahill	312-631-0070
IN	Carmel, S T B & Assocs.	317-844-9227
KS	Shawnee Mission, Robinson & Assocs.	913-262-1374
MD	Silver Spring, H.R. Sieber Co.	301-589-9110
MA	Braintree, Anderson Sls. Co.	617-848-9194
MN	Minneapolis, H.M.R., Inc.	612-831-7400
NJ	Marlton, B.G.R. Assocs.	609-428-2440
NY	Mt. Vernon, Sonkin Assoc.	914-MO8-9809
NY	Syracuse, Nycom, Inc.	315-437-8343
NC	Charlotte, Electro-Rep. Assocs.	704-527-2530
OH	Rocky River, Loesch Assocs.	216-333-0077
TX	Richardson, Campion Sls.	214-238-8145
WA	Redmond, Barrett-Squibb	206-885-6991
WI	Colgate, Rep I and Assocs.	414-628-4016

EMI GENCOM INC., See THORN EMI Gencom Inc.

EMI TECHNOLOGY INC., See THORN EMI Technology Inc.

E/M LUBRICANTS, INC., Div. of Great Lakes Chemical Corp., Highway 52 NW, W. Lafayette, IN 47906, Tel: 317-463-2511, Telex: 27-9428; FSC No.: 11770

Local Sales Offices & Reps

CA	Mountain View	415-961-5865
CA	North Hollywood	213-875-0101
CO	Denver	303-371-6771
CT	New Britain	203-224-9148
GA	Atlanta	404-361-2550
IL	Lombard	312-620-6808
MA	Auburn	617-792-6919
MI	Roseville	313-779-6460
MN	New Brighton	612-780-3202
OH	Dayton	513-254-8481
PA	Sharon Hill	215-461-1015
TX	Ft. Worth	817-834-8817

EMM SEMI, SUB OF EM & M, See GTE Microcircuits

EMM/SESCO, 20630 Plummer St., Chatsworth, CA 91311, Tel: 213-998-9090, Telex: 691404, TWX: 910-494-4990; *Sls. Mgr.:* Russ Summers

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EMPRO MFG. CO., INC., P.O. Box 26060, Indianapolis, IN 46226, Tel: 317-823-4478; Empl.: 25 .... 3•1234

Local Sales Offices & Reps

CA	La Canada, Lew Brooks Co.	213-790-8358
CA	Santa Ana, Lew Brooks Co.	714-544-8900
GA	Atlanta, Brownell Electro Inc.	404-762-5181
MA	Burlington, E.I.L. Instr.-Mancib Div.	617-272-9450
NJ	Belleville, D. F. Tobias & Co.	201-751-8680
OH	Cleveland, Weschler Elec. Corp.	216-238-2550
PA	Philadelphia, Sunshine Sci. Instr. Inc.	215-673-5600
TX	Houston, Ev Smith Sls.	713-649-5756

EMR DATA SYSTEMS, DIV. SANGAMO-WESTON, Box 3041, Sarasota, FL 33578, Tel: 813-371-0811, Telex: 052-890, TWX: 810-864-0406; Empl.: 1100; *Sls. Mgr.:* F. V. Hinkel

E M S DEVELOPMENT CORP., 200 Allen Blvd., Farmingdale, NY 11735, Tel: 516-694-2886, TWX: 510-224-6480; FSC No.: 51435; Empl.: 95; *Sls. Mgr.:* Ed Simkovich

EMULOGIC, 3 Technology Way, Norwood, MA 02062, Tel: 617-329-1031; *Sls. Mgr.:* Robert Smith

ENCLOSURE CORP., 4529 Adams Circle, Cornwells Hts., PA 19020, Tel: 215-638-9550; FSC No.: 32360; *Sls. Mgr.:* Gene Goldner

ENCODER DIV., LITTON SYSTEMS, INC., See Litton Encoder Div.

ENCODER PRODS., 1601B Dover Rd., Sandpoint, ID 83864, Tel: 208-263-8541, TWX: 510-776-1595; Empl.: 70; *Sls. Mgr.:* Vance Conner

ENDEVCO, 30700 Rancho Viejo Rd., San Juan Capistrano, CA 92675, Tel: 714-493-8181, Telex: 68-5608, TWX: 910-596-1415; FSC No.: 95411; Empl.: 400; *Sls. Mgr.:* B. Toffelmier

Local Sales Offices & Reps

AL	Huntsville	205-536-4454
CA	Anaheim	714-831-9200
CA	Mountain View	415-969-3212
CA	San Francisco	415-552-1763
CT	West Mystic	203-572-0571
DC	Washington	391-261-1760
FL	Orlando	305-855-4535
IL	Chicago	312-754-3888
MD	Annapolis	301-269-8800
MA	Boston	617-969-8063
MI	Charlotte	313-471-0685
NJ	Lambertville	609-397-0883
OH	Cleveland	216-659-3138
OH	Dayton	513-253-6175
TX	Houston	713-462-1971

ENDICOTT COIL, 22 E. Charlotte St., Binghamton, NY 13905, Tel: 607-797-1263, Telex: 932411; Empl.: 180; *Sls. Mgr.:* Raymond Taylor .... 1A•1244, 2152

ERG™
Endicott Research Group, Inc.

ENDICOTT RESCH. GRP., INC., 2601 Wayne St., P.O. Box 269, Endicott, NY 13760, Tel: 607-754-9187, TWX: 510-252-0155; FSC No.: 63312; Empl.: 100; *Sls. Mgr.:* Robert S. Rakowski .... 1B•1049-1051; 3•1561

Local Sales Offices & Reps

CA	Lomita, Component Mktg. Assoc.	213-326-1460
CA	Saratoga, Testco	408-253-1900

CO	Denver, West Incorporated	303-692-0131
CT	Bloomfield, SIR Assocs.	203-243-9343
FL	Pompano Beach, Cole-Tek Assocs.	305-781-8110
GA	Atlanta, Wallace Electronics	404-752-6611
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IN	Indianapolis, Carlson Elctrn. Sls.	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
KS	Wichita, PMR, Inc.	316-684-4141
MA	Bedford, SIR Assocs.	617-275-5550
MN	Minneapolis, Jos-Col Melius	612-861-3343
MO	Maryland Hts., PMR, Inc.	314-569-1220
NE	Overland Park, PMR, Inc.	913-381-0004
NJ	Livingston, Eagle Sls. Co.	201-992-2030
NY	Albany, H. C. Johnson Agencies	518-459-1239
NY	Buffalo, H. C. Johnson Agencies	716-632-7880
NY	Rochester, H. C. Johnson Agencies	716-482-3000
NY	Wadin & River, Rywel Sales Inc.	516-929-4884
NC	Kernersville, Wallace Electronics	919-996-2742
OH	Dayton, Dynel Co.	513-434-6467
PA	Glenshaw, H. C. Johnson Agencies	412-961-0414
PA	King of Prussia, Freedman-Malta Assocs.	215-279-5767
TX	Austin, Mil-Rep Associates	512-258-2828
TX	Houston, Mil-Rep Associates	713-937-0127
TX	Richardson, Mil-Rep Associates	214-644-6731
UT	Salt Lake City, West Inc.	801-466-5739
WA	Bellevue, Testco	206-454-7422
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

ENERCO, INC., 9615 W. Marginal Way S., Seattle, WA 98108, Tel: 206-762-1422; Empl.: 5; *Sls. Mgr.:* Lee Rabie

ENERGY CONCEPTS, PO Box 128, Carlsbad, CA 92008, Tel: 619-942-3144; FSC No.: 01830; Empl.: 6; *Sls. Mgr.:* Marilyn Decarlo

Local Sales Offices & Reps

CA	Mill Valley, Roy Colen Sls.	415-383-8700
CA	Sante Fe Springs, Wallace & Wallace	213-945-2908
CO	Denver, KC Marketers	303-733-5561
GA	Atlanta, Harvey Minsk and Assoc.	404-934-3272
IL	Schaumburg, Resha/Assoc.	312-397-9010
KS	Wichita, Maury Bettis Co.	316-265-8250
MA	N. Scituate, Montague & Murray	617-545-5505
OH	Aurora, GTEC	216-562-9872
TX	Dallas, The Assoc.	214-241-7190
WA	Everett, Fordco	206-258-1515

ENGELHARD CORP., 70 Wood Ave. S., Iselin, NJ 08830, Tel: 201-321-5900, Telex: 83-3147; Empl.: 8500

ENGELMANN MICROWAVE CO., KDI Pyrofilm, 60 S. Jefferson Rd., Whippany, NJ 07981, Tel: 201-887-5700, TWX: 710-986-8220; *Sls. Mgr.:* Carl Schraufnagl

EC2 engineered components company

ENGINEERED COMPS. CO., P.O. Box Y, San Luis Obispo, CA 93406, Tel: 805-544-3800; FSC No.: 32440; Empl.: 160 .... **1A**•1444, 1484-1508; **2**•1870, 1887

ENGD. PROD., Div. of Acme Elec. Corp., 40 Water St., Cuba, NY 14727, Tel: 716-968-2400, Telex: 91-6451, TWX: 510-245-2700; Empl.: 850; *Sls. Mgr.:* Dick Milne

ENGINEERING & ELCTRN. DEVICES, 1024 N. McCadden Pl., Los Angeles, CA 90038, Tel: 213-463-4175; Empl.: 4; *Sls. Mgr.:* John H. Aulbach, Jr.; *Dist. Mgr.:* Henry C. Lerner

ENGINEERING DESIGN & SLS., Rt. 2, Box 305, Danville, VA 24540, Tel: 804-685-7073; Empl.: 50; *Sls. Mgr.:* Mark Gignac

ENGLER INSTRS., Sangamo Weston, Inc., 250 Culver Ave., Jersey City, NJ 07305, Tel: 201-332-5353, TWX: 710-730-5236; FSC No.: 07446; *Sls. Mgr.:* Vic Stuart; *Dist. Mgr.:* Al Brunelli

ENI, INC., See Electronic Navigation Inds., Inc.

ENI POWER SYS., 3000 Winton Rd. S., Rochester, NY 14623, Tel: 716-473-7330, Telex: 97-8283; FSC No.: 10226; Empl.: 200; *Sls. Mgr.:* L. A. Benedict

Local Sales Offices & Reps

CA	Santa Ana, Micro-Tec West	714-547-5941
MA	Needham, NGS Associates	617-449-6777

ENTECH SYSTEMS, INC., 15 Herman Dr., Simsbury, CT 06070, Tel: 203-651-9557; *Sls. Mgr.:* A. D. Jorczak

ENTERPRISE SYS. CORP., P.O. Box 698, Dover, NH 03820, Tel: 603-742-7363; Empl.: 20; *Sls. Mgr.:* G. E. Perrine

Entran

ENTRAN DEVICES, 10 Washington Ave., Fairfield, NJ 07006, Tel: 201-227-1002, Telex: 130-361; *Sls. Mgr.:* John W. G. Budd .... **1B**•1842, 1843

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Manufacturer of Miniature Accelerometers, Pressure Transducers/Meters/Transmitters, Load Cells and Semiconductor Strain Gages for measuring static and dynamic pressures and accelerations. Full scale ranges from 5g to 10,000g, 2 psi to 30,000 psi, and 1 lb to 2500 lb. Direct output in mV/g, mV/psi, mV/lb, and 4 or 4 1/2 digit LED display. Available in sizes as small as .050″ dia. weighing as little as 1/4 gram 0.7 cr damping available. Up to .05% accuracy. Entran means Miniature.

Local Sales Offices & Reps

AZ	Phoenix, J. Smith & Assocs.	602-267-0981
CA	Long Beach, Saber Entprs.	213-595-5646
CA	San Diego, Saber Entprs.	619-271-1523
CA	Walnut Creek, Secco	415-937-1094
CO	Colorado Springs, J. Smith & Assoc.	303-597-5343
GA	Atlanta, Quantum Meas.	404-351-3531
IL	Lombard, The G.B. Hall Co.	312-858-1700
IN	Plainfield, Stress Analysis Svcs.	317-839-8235
MI	Brighton, Stress Analysis Svcs.	313-632-6110
NJ	Hopatcong, Measurements, Inc.	201-770-1281
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NC	Chapel Hill, Quantum Meas.	919-933-7408
OH	Dayton, Stress Analysis Svcs.	513-263-8036
OH	Medina, Stress Analysis Svc.	216-725-7733
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Frazer, Measurements, Inc.	215-644-7142
TX	Dallas, Technical Prods.	214-357-9603
TX	Houston, Technical Prods.	713-493-6520
VA	Fredericksburg, Measurements, Inc.	703-373-5520

ENTRELEC DIV., See Cogenel, Inc./Entrelec Div.

ENVIRONMENTAL COMM., 3150 Pullman St., Costa Mesa, CA 92627, Tel: 714-557-7800, TWX: 910-595-1781; FSC No.: 16450; Empl.: 65; *Sls. Mgr.:* Glen Underwood

ENVIRONMENTAL CONTAINER SYS., INC., 3560 Rogue River Hwy., Box 188, Grants Pass, OR 97526, Tel: 503-476-8871, TWX: 510-755-0777; FSC No.: 24995; Empl.: 135

EOTEC CORP., 200 Frontage Rd., W. Haven, CT 06516, Tel: 203-934-7961; Empl.: 24; *Sls. Mgr.:* James W. Campbell

E.P.E. CORP., P.O. Box 5238, Manchester, NH 03108, Tel: 603-669-9181, Telex: 943536; Empl.: 65; *Sls. Mgr.:* James D. Bell; *Dist. Mgr.:* Thomas S. Bell

EPIC, INC., 150 Nassau St., New York, NY 10038, Tel: 212-349-2470, Telex: 12-6531; Empl.: 8; *Sls. Mgr.:* Peter Letica

ERIE TECHNOLOGICAL PRODUCTS, 645 West 11th St., Erie, PA 16512, Tel: 814-453-5611

EPOCH ENTPR., 3541 N. Olive Rd., Tucson, AZ 85719, Tel: 602-887-1970

EPOXYLITE CORP., 1265 N. Kraemer Blvd., Anaheim, CA 92806, Tel: 714-630-7910; Empl.: 60

EPOXY TECHNOLOGY, INC., 14 Fortune Dr., P.O. Box 567, Billerica, MA 01821, Tel: 617-667-3805, Telex: 94-7140; FSC No.: 33246

Local Sales Offices & Reps

AZ	Phoenix, Wadsworth/Bryant	602-275-7366
CA	Atherton, Wadsworth/Bryant	415-321-3619
CA	Hacienda Heights, Wadsworth/Bryant	213-330-5592
CO	Boulder, Specialty Sales Co.	303-444-0954
CT	Colchester, Normell Assoc.	203-537-5555
FL	Fort Pierce, Hyber-Sem	305-464-0461
IL	Chicago, E. Przechera Sls. Co.	312-725-1933
MA	Newton, Normell Assoc.	617-969-5478
MI	Royal Oak, Murray A. Perciuau Co.	313-548-1971
NJ	Clinton, Price-Tech Inc.	201-735-9797
NY	Fair Haven, Feikert Assoc.	315-652-5577
OH	Dayton, Berberich Assoc.	513-433-0342
OR	Beaverton, Demarest Assoc.	503-643-0141
UT	West Jordan, Specialty Sales Co.	801-561-0222
WA	Seattle, Demarest Assoc.	206-523-3210

EPSCO, 920 Westwood Ave., Addison, IL 60101, Tel: 312-543-0410; FSC No.: 53003; Empl.: 8 .... **3**•1563

Local Distributors

AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	San Francisco, VWR Scientific Inc.	415-469-0100
CO	Denver, Newark Elctrns.	303-757-3351
FL	Marathon, Marathon Wholesale Electric Supply	305-743-2262
GA	Atlanta, Spec. Distr. Co.	404-873-2521
HI	Honolulu, Honolulu Elctrn.	808-949-5564
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elmhurst, McMaster-Carr Supp.	312-834-9600
IL	Skokie, Sargent-Welch Sci.	312-677-0600
IN	Indianapolis, Graham Elctrns.	317-634-8202
LA	New Orleans, Radio Parts	504-581-5959
MA	Lynn, Land Elctrns.	617-592-2220
MI	Flint, Shand Elctrns.	313-743-8940
MI	Lansing, Fulton Radio	517-394-5020
MO	Kansas City, Walters Radio Supp.	816-531-7015
MO	St. Louis, Olive Elctrn.	314-426-4500
NJ	Bridgeport, VWR Scientific Corp.	609-467-2600
NM	Albuquerque, Walker Radio	505-247-2288
NY	Buffalo, Summit Distr.	716-884-3450
OH	Dayton, Stotts-Friedman	513-298-5555
OK	Oklahoma City, Trice Whlsr.	405-524-4411
PA	Pittsburgh, Fischer Scientific Co.	412-562-8300
SC	Columbia, Dixie Radio Supp.	803-253-5333
TN	Nashville, Electra Distr. Co.	615-329-3971
TX	Dallas, Wholesale Elctrns.	214-824-3001
TX	Ft. Worth, Allied Elctrns.	817-336-5401
UT	Salt Lake City, Newark Elctrns.	801-486-1048
VA	Norfolk, Avec Elctrns.	804-627-3502
WI	Milwaukee, Industrial Elctrns. Supp.	414-276-1212

EPSCO MICROWAVE, 411 Providence Hwy., Westwood, MA 02090, Tel: 617-329-1500, TWX: 710-348-0484; FSC No.: 15894; Empl.: 185; *Sls. Mgr.:* John M. Shalhoub

EPSILON-LAMBDA ELCTRNS. CORP., 427 Stevens St., Geneva, IL 60134, Tel: 312-232-9611, TWX: 910-237-1684; Empl.: 30; *Sls. Mgr.:* Robert Knox

EQUIPTO, 225 S. Highland Ave., Aurora, IL 60507, Tel: 312-859-1000; Empl.: 300; *Sls. Mgr.:* Ralph Zettinger

EQUIPTO ELCTRNS. CORP., 351 Woodlawn Ave., Aurora, IL 60507, Tel: 312-897-4691; FSC No.: 14002; *Sls. Mgr.:* Larry Suggett .... **2**•1031

Local Sales Offices & Reps

AL	Huntsville, Hollingsworth & Still	800-241-5712
AZ	Tempe, Burland Assoc.	602-894-5564
CA	Anaheim, Spectrum Assocs.	714-630-6977
CA	Sunnyvale, Ward Elctrn. Packaging Sls.	408-730-4494
CO	Littleton, Grifco	303-795-1989
CT	Stratford, Technical Instrs.	203-368-4582
FL	Orlando, Hollingsworth & Still	800-241-5712
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Palatine, Joseph Clark Co.	312-358-5095
IN	Ft. Wayne, Scott Elctrns.	219-484-7865
MD	Silver Spring, Sel-Tronics	301-589-3391
MA	Wilmington, Technical Instrs.	617-944-3930
MI	Troy, Scott Elctrns.	313-585-7690
MO	Blue Springs, Cairns & Hayes Elctrn. Sls.	816-229-1404
MO	St. Charles, Cairns & Hayes Elctrn. Sls.	314-946-6677
NJ	Englewood, Tecnimat	201-569-4200
NM	Albuquerque, R.L.S. Instr.	505-265-4187
NY	Syracuse, Labtronics	315-455-7314
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Dayton, Scott Elctrns.	513-294-0539
PA	Valley Forge, J. E. Cuesta & Co.	215-265-5800

SC	Columbia, Hollingsworth & Still	800-241-5712
TX	Dallas, Kruvand Assocs.	214-691-4592
TX	Houston, Kruvand Assocs.	713-780-9710
WA	Seattle, S.J.I. Corp.	206-763-8981

ERA POLY-PLANAR DIV., 311 E. Park St., Moonachie, NJ 07074, Tel: 201-641-3650, TWX: 710-990-5064; Empl.: 100; *Sls. Mgr.:* John Apelian

ERA TRANSPAC DIV., Sub. Elctrn. Research Assocs., 311 B East Park St., Dept. 1202, Moonachie, NJ 07074, Tel: 201-641-3650, TWX: 710-990-5064; FSC No.: 96762; Empl.: 100; *Sls. Mgr.:* John Apelian

ERC, See Electronic Research Co.

ERICSON MFG. CO., 4215 Hamann Pkwy., Willoughby, OH 44094, Tel: 216-951-8000, Telex: 98-5390; *Sls. Mgr.:* J. E. (Jay) Ericson, Jr.

ERIE TECHN. PRODS., See Murata Erie No. Amer., Inc.

ERM, 27 Water St., Wakefield, MA 01880, Tel: 617-246-3550

ERNI COMPS. CORP., Erni Elektroapparate GMBH, 1235 E. Davis St., Arlington Heights, IL 60005, Tel: 312-577-8620, TWX: 910-687-0260; *Sls. Mgr.:* J. Garratt; *Dist. Mgr.:* G. F. Zib

Local Sales Offices & Reps

CA	Burbank, Mod-Co.	213-848-2215
CO	Littleton, Protronics Group	303-973-3096
FL	Melbourne Beach, Jack McGirr Assoc.	305-723-6678
GA	Jonesboro, Wallace Elctrn. Sls.	404-471-6297
IL	Mt. Prospect, Dombrow Co.	312-253-3326
IN	Indianapolis, Sukup & Cox	317-253-5501
MA	Dover, George Urban Assoc.	617-329-4068
MN	Bloomington, D. A. Case Assoc.	612-888-8666
MO	Lees Summit, MYA Midwest	816-865-3370
NC	Kernersville. Wallace Elctrn. Sls.	800-672-4290
PA	Southampton, Campbell Assoc.	215-322-6630
TN	Hixson, Wallace Elctrn. Sls.	615-870-2080
TX	Dallas, D & K Sales	214-247-0138
WA	Auburn, Elctrn. Sls. Northwest	206-432-1002

Local Distributors

CA	Inglewood, Force Elctrns.	213-776-1324
CA	Santa Clara, Force Elctrns.	408-739-1324
CT	Hamden, Impact Sls.	203-281-1331
GA	Atlanta, Prehler, Inc.	404-447-5540
IL	Chicago, Prehler, Inc.	312-384-6100
MA	Canton, Impact Sls.	617-821-1500
MN	Bloomington, Prehler, Inc.	612-854-6670
MN	St. Paul, Northern Automatic Assembly	612-481-0022
NH	Salem, Astrum Elctrns.	603-329-5656
NJ	Englewood Cliffs, M.G. Assoc., Co.	201-567-4900
NY	Port Washington, Connector Concepts Corp.	513-883-3800
OH	Middleburgh Heights, Prehler, Inc.	216-826-0110

ESC

ESC ELCTRNS. CORP., 534 Bergen Blvd., Palisades Pk., NJ 07650, Tel: 201-947-0400, TWX: 710-991-9780; Empl.: 120 .... **1A•1510-1520, 1594**

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-1730
AZ	Mesa, Sedco Sales	602-835-6281
CA	Culver City, Westaironics	213-641-4122
CA	Santa Clara, Rodgers Assoc.	408-984-8110
CO	Westminster, D/Z Assocs.	303-429-9369
CT	Bridgeport, Betronic Assocs.	203-374-6404
FL	St. Petersburg, QXI, Inc.	813-821-2281
FL	Tamarac, QXI, Inc.	305-485-6030
IL	Elk Grove, Carlson Elctrn. Sls. Co.	312-956-8240
IN	Indianapolis, J & W Sales	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls. Co.	319-377-6341
KS	Merriam, Midwest Tech. Sls.	913-236-8555
MA	Waltham, Betronic Assocs.	617-894-8400
MN	Minneapolis, R-J, Inc.	612-866-3661
NY	New York City, Robert Smith Assocs.	212-541-4885
NY	Plainview, Robert Smith Assocs.	516-681-3155
NC	Raleigh, Interep Assoc.	919-872-1401
NC	Raleigh, Interep Assocs.	919-872-1401
OH	Cincinnati, Makin Assocs.	513-871-2424
OR	Beaverton, Ravencraft	503-646-9261
PA	Marlton, BGR Assocs.	609-983-1020
TX	Plano, Zeus Engrg.	214-423-2027
UT	Salt Lake City, D/Z Assocs.	801-268-2876
VA	Reston, Tytronics Tech. Sls.	703-471-0440
WI	Milwaukee, Carlson Elctrn. Sls. Co.	414-476-2790
EXP	NJ, Palisades Pk., ESC Elctrns. Corp.	201-947-0400

ESE, 142 Sierra St., El Segundo, CA 90245, Tel: 213-322-2136; FSC No.: 58525; Empl.: 25; *Sls. Mgr.:* R. Mayers; *Dist. Mgr.:* R. Mayers

ESNA DIV., 2330 Vauxhall Rd., Union, NJ 07083, Tel: 201-686-6000, Telex: 1-38243, TWX: 710-985-4677; Empl.: 700

ESNA DIV., Amerace Corp., 2330 Vauxhall Rd., Union, NJ 07083, Tel: 201-686-6000, Telex: 1-38243, TWX: 710-985-4677; Empl.: 600; *Sls. Mgr.:* W. H. Riley; *Dist. Mgr.:* A. H. Wighton

ESPEY MFG. & ELECTRONICS CORP., 223-239 Ballston Ave., Saratoga Springs, NY 12866, Tel: 518-584-4100

E^2 TECHNOLOGY CORP., 1545 Morse Ave., Ventura, CA 93003, Tel: 805-644-9544, Telex: 658-480

ESSCO INDS., P.O. Box 515, Sierra Madre, CA 91024-0515, Tel: 818-355-8315; Empl.: 33

ESSEX CONTROLS, See Stancor Products

ESSEX CONTROLS DIV., ESSEX GRP., See Essex Controls, United Technologies

ESSEX GROUP, 9933 13th St., Ft. Wayne, IN. 46809, Tel: 219-478-1521; Empl.: 300-500; *Sls. Mgr.:* J. Scott

ESSEX GRP., ESSEX TERMINALS/ TERMINALS/CONNECTORS, See United Technologies, Comps. Div. Terminals

ESSEX GRP., Power Conductor Div., 2601 S. Adams, Marion, IN 46953, Tel: 317-664-6211, TWX: 317-667-6972; Empl.: 700; *Sls. Mgr.:* J. Burdick

ESTES ENGRG. CO., 930 Marine Dr., Port Angeles, WA 98362, Tel: 206-457-0904; FSC No.: 22590; Empl.: 28

E-SYSTEMS, Garland Div., Box 226118, Dallas, TX 75266, Tel: 214-272-0515, TWX: 910-860-5187; Empl.: 1927

E-SYSTEMS, Greenville Div., P.O. Box 1056, Greenville, TX 75401, Tel: 214-457-4694, Telex: 73-2392; *Sls. Mgr.:* C. L. Byrom

E-SYSTEMS, Melpar Div., 7700 Arlington Blvd., Falls Church, VA 22046

E-SYSTEMS, Memcor Div., 1320 Flaxmill Rd., Huntington, IN 46750, Tel: 219-356-4300, TWX: 810-333-1530; Empl.: 1100; *Sls. Mgr.:* Ray Vanderspool .... **1A•1872, 2037**

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
CA	Santa Ana, Cal-Tronic Sls.	714-979-4863
CA	Santa Clara, D.H. Ross	408-988-8111
CO	Denver, West, Inc.	303-692-0131
FL	Indialantic, Raycom	305-727-8860
GA	Atlanta, Murcota	404-875-2525
IL	Chicago, D. Dolin Sls.	312-286-6200
IN	Ft. Wayne, Menze Sls.	219-747-5616
MI	St. Clair Shores, J.M. Thorpe	313-779-6363
MN	Eden Praise, Bohlig & Associates	612-698-6921
MO	Blue Springs, Chesco	816-229-1404
MO	St. Charles, Chesco	314-946-6677
NH	Atkinson, Mark Rep Assoc.	603-362-4526
NJ	Englewood Cliffs, Masin Esco	201-569-8868
NY	Hauppauge, Masin Esco	516-273-3500
NY	Pittsford, Noeth-Honsinger	315-586-9002
NC	Burlington, Murcota	919-585-1577
NC	Winston-Salem, Murcota	919-723-1001
OH	Cleveland, Glover Sls.	216-842-4520
PA	Newtown Square, G.M. Conneen	215-353-2241
TX	Dallas, SW Elctrn. Ind.	214-233-9816
TX	Houston, SW Elctrn. Ind.	713-729-1670
UT	Salt Lake City, West, Inc.	801-966-0171
WA	Redmond, Barrett-Squibb	206-885-6991

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E-T-A CIRCUIT BREAKERS, 7400 N. Croname Rd., Chicago, IL 60648, Tel: 312-647-8303, Telex: 253780; Empl.: 20

Local Sales Offices & Reps

CA	Pleasanton, Moulthrop Sls.	415-463-0450
CA	Tustin, Sierra-Pacific Eng.	714-731-3411
CO	Denver, Challenge Sls.	303-450-2402
CT	East Haven, Eagle Assocs.	203-467-6542
FL	Orlando, EAB Inc.	305-898-7444
IL	Arlington Heights, Thermek	312-577-6900
IN	Ft. Wayne, Needler Sls. Co.	219-447-2123
IN	Indianapolis, Needler Sls. Co.	317-255-8056
KY	Louisville, Needler Sls. Co.	502-241-4046
MA	Boston, Eagle Assocs.	617-444-3446
MI	Detroit, Hilltronics	313-398-5556
MN	Minneapolis, Chris & Assocs.	612-432-1823
MO	Kansas City, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NY	New York, Schmitt Indl. Mktg. Corp.	516-486-3510
NY	Rochester, Robert F. Lamb Co.	716-323-1250
NY	Syracuse, Robert F. Lamb Co.	315-455-2469
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PA	Philadelphia, Techparts	215-628-3200
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TX	Austin, Delta Comps.	512-458-4288
TX	Dallas, Delta Comps.	214-287-6333
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WA	Seattle, Temco Northwest	206-488-1254
WI	Milwaukee, Star Engineering	414-645-3680

ETI ELECTRONICS, 5751 Miami Lakes Dr., Miami Lakes, FL 33014, Tel: 305-556-4000, Telex: 80-3347; *Sls. Mgr.:* R. Grossman; *Dist. Mgr.:* S. Zucker

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ETI SYSTEMS, Polaris Indl. Entprs., 215 Via Del Norte, Oceanside, CA 92054, Tel: 619-757-7770, TWX: 910-322-1396; FSC No.: 952 762672; *Sls. Mgr.:* Bill Tice; *Dist. Mgr.:* Bill Tice .... **1A•2038; 1B•1146-1149**

ETM ELECTROMATIC, 470 San Antonio Ave., Palo Alto, CA 94306, Tel: 415-494-1505; *Sls. Mgr.:* Kenneth F. Lillis

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Local Sales Offices & Reps

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AZ	Scottsdale, Luscombe Engrg.	602-949-9333
CA	Los Gatos, Nor-West	408-395-1190
CA	Pasadena, Luscombe Engrg.	213-684-2000
CA	San Diego, Bestronics	619-452-5500
CO	Boulder, Comp. Prods. Sls.	303-530-2800
CT	N. Haven, John E. Boeing Co.	203-239-5369; 800-343-4331
FL	Altamonte Springs, Semtronics Assoc.	305-831-8233
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Des Plaines, Lincoln, Hodges & Assocs.	312-297-3810
IN	Ft. Wayne, Advanced Comp. Sls.	219-484-0722
IN	Indianapolis, Advanced Comp. Sls.	317-545-6441
IA	Cedar Rapids, PMR, Inc.	319-362-9177
KS	Overland Park, PMR, Inc.	913-381-0004
KS	Wichita, PMR, Inc.	316-684-4141
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MI	Birmingham, Favco Techn. Reps.	313-644-0173
MN	Minneapolis, Milt Westlund	612-866-5002
MO	Maryland Heights, PMR, Inc.	314-569-1220
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NY	Manhasset, Win-Cor Elctrns.	516-627-9474
NY	Syracuse, C. W. Floring Assocs.	315-478-2149
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Akron, Imtech, Inc.	216-666-1185
OH	Dayton, Imtech, Inc.	513-278-6507
OK	OK, Tulsa, Nova Mktg.	918-743-6202
OR	Wilsonville, RTS, Inc.	503-638-5670
TX	Dallas, Nova Mktg.	214-750-6082
TX	Houston, Nova Mktg.	713-988-6082
UT	Salt Lake City, Comp. Prods. Sls.	801-262-0000
WA	Vancouver, RTS, Inc.	206-892-0141
WA	Vashon, RTS, Inc.	206-285-1363
WI	Waukesha, Lincoln, Hodges & Assocs.	414-542-3087

Local Distributors

AZ	Tempe, Fisher-Brownell	602-967-1464
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Fountain Valley, Comps. Ctr.	714-979-0433
CA	Irvine, Acacia Sls.	714-549-0954
CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Diego, Acacia Sls.	619-565-4365
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Sunnyvale, Acacia Sls.	408-745-7200
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Orange, Milgray Elctrns.	203-795-0711
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IN	Indianapolis, RM Elctrns.	317-247-9701
IN	Indianapolis, Advent Elctrns.	317-872-4910
KS	Overland Park, Milgray Elctrns.	913-236-8800
KS	Wichita, L-Comp	316-265-5100
MD	Rockville, MS Elctrns.	301-340-6400
MD	Rockville, Milgray Elctrns.	301-468-6400
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MI	Livonia, LWC Distrs.	313-464-7700
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NJ	Marlton, Milgray Elctrns.	609-983-5010
NY	Bohemia, Key Comps.	516-567-7500
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NY	Pittsford, Milgray Elctrns.	716-385-9330
NY	Rochester, Summit Elctrns.	716-334-8110
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PA	Montgomeryville, Pyttronics Inds.	215-643-2850
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TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Richardson, Fisher-Brownell	214-235-3177
UT	Salt Lake City, Bell Indus.	801-972-6969
VA	Charlottesville, Virginia Radio Supp.	804-296-4184
WI	Milwaukee, Indl. Elctrns.	414-276-1212
WI	New Berlin, RM Elctrns.	414-784-4420

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CO	Littleton, Radco Elctrns.	303-794-4279
IL	Decatur, Mueller Sls.	217-442-6379
IA	Cedar Rapids, Mueller Sls.	319-365-1196
LA	Baton Rouge, Allesco	504-928-1571
MA	Peabody, J S R Assocs.	617-532-0348
MN	Golden Valley, Mueller Sls.	612-544-8888
NE	Omaha, Mueller Sls.	402-571-3033
NM	Albuquerque, R L S Instrs. Co.	505-293-7931
NY	Buffalo, Seelbach & Schmitt Inc.	716-839-2300
NY	Plainview, Eastern Metro Assocs. Inc.	516-931-1414
OH	Cincinnati, Pro-Con Analytical	513-272-3300
OR	Portland, Fairman B. Lee Co.	503-283-9442
PA	Havertown, Shelby Jones	215-446-6600
TX	Dallas, Allesco	817-261-3966
TX	Houston, Allesco	713-771-0115
WA	Seattle, Fairman B. Lee Co.	
WI	Brookfield, Mueller Sls.	414-781-5310

EVERETT/CHARLES CONTACT PRODS. INC., 700 E. Harrison Ave., Pomona, CA 91767, Tel: 714-625-5551, Telex: 67-55-78, TWX: 910-581-1210; *Sls. Mgr.:* Bud Fabian

EVERETT/CHARLES TEST EQUIP. INC., 2887 N. Towne Ave., Pomona, CA 91767, Tel: 714-621-9511, TWX: 910-581-3838; Empl.: 200; *Sls. Mgr.:* Jim Malloy

EVERSHED & VIGNOLES LTD., Acton Lane, Chiswick, London, W4 5HJ, England, Tel: 01-994-3670, Telex: 22583; Empl.: 300; *Sls. Mgr.:* J. Gilpin

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NY	Copiague, Intl. Precision Mech., Inc.	516-842-6332

EV-GAME INC., See EVG, Inc.

EWALD INSTRS., Rte. 7R, Kent, CT 06757, Tel: 203-927-3278

EWC INC.

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Local Sales Offices & Reps

AZ	Mesa, Cummings & Assoc.	602-994-9027
CA	Canoga Park, Cummings & Assocs.	213-340-6035
CA	San Diego, Cummings & Assoc.	714-297-6035
CA	Santa Clara, Cummings & Assocs.	408-247-8656
CO	Denver, Cummings & Assocs.	303-455-6860
CT	Ridgefield, Phoenix Sales	203-438-9644
FL	Greenacres City, Tech-Rep. Assoc.	305-968-7792
FL	Melbourne Beach, Tech. Rep. Assoc.	305-725-4655
FL	St. Petersberg, Tech-Rep. Assoc.	813-577-2779
IL	Chicago, Electro-Tech Mktg.	312-588-4535
ME	Chelmsford, Dynamic Engrg. Corp.	617-250-0200
MD	Glen Burnie, Stinson Assoc.	301-760-8878
MA	Chelmsford, Dynamic Engrg. Corp.	617-250-0200
MN	St. Paul, Proud Inds.	612-646-9428
NJ	E. Brunswick, Winch Assoc.	201-828-4615
NY	De Ruyter, Net Sls. Co.	315-662-7996
NY	Pittsford, Net Sls. Co.	716-467-4538
NY	Roslyn Heights, Winch Assoc.	516-621-6378
NY	Troy, Net Sls. Co.	518-274-4758
OR	Portland, Cummings & Assoc.	503-761-4411
PA	Bensalem, Stemler Assoc.	215-639-9298
PA	Greensberg, Pro-Mark	412-832-3800
RI	Greensberg, Pro-Mark	412-832-3800
TX	Dallas, Associated Entprs.	214-630-7623
TX	Houston, Associated Entprs.	713-495-9767
UT	Salt Lake City, Cummings & Assoc.	801-263-8131
VT	Chelmsford, Dynamic Engrg. Corp.	617-250-0200
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Local Distributors

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CA	Woodland Hills, C & A Elctrns.	213-340-6036
CT	Norwalk, Park Dist.	203-853-2010
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IL	Arlington Heights, Reptron Elctrns.	312-593-7070
MD	Baltimore, Whitney Dist.	301-944-8080
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OR	Portland, Radar Elec.	503-233-3691
PA	McKean, Advocom Elctrns.	814-476-7774
WA	Seattle, Radar Elec.	206-282-2511

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AL	Huntsville, Pioneer Elctrns.	205-837-9300
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CA	Sunnyvale, Bell Indus.	408-734-8570
CA	Tustin, A.V.E.D.	213-770-0871
CO	Denver, Diplomat Elctrns.	303-740-8300
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	East Haven, J.V. Elctrns.	203-469-2321
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IL	Lombard, R.M. Elctrns.	312-932-5150
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, R.M. Elctrns.	317-247-9701
IA	Cedar Rapids, Deeco	319-377-5795
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Gaithersburg, Pioneer Elctrns.	301-948-0710
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MO	St. Louis, Olive Industrial Elctrns.	314-426-4500
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NJ	Totowa, Diplomat Elctrns.	201-785-1830

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NY	Port Chester, Zeus Comps.	914-937-7400
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OK	Tulsa, Radio.	918-587-9123
OR	Portland, Radar Elec.	503-233-3691
PA	Horsham, Pioneer Elctrns.	215-674-4000
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PA	Philadelphia, Almo Elctrns.	215-698-4000
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TX	Dallas, Quality Comps.	214-387-4949
TX	Houston, Quality Comp.	713-772-7100
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IL	Chicago, Solid State Elctrns. of Illinois	312-889-8033
MA	Woburn, Programmable Devices	617-935-9530
MN	Edina, P.E.C./Levi	612-944-8540
NJ	Vincentown, JRM Elctrns.	609-859-2106
NM	Albuquerque, RLS Instrs.	505-293-7931
OH	Hudson, Technical Sales	216-656-3978
OR	Beaverton, Northwest Test & Meas.	503-646-9966
TX	Dallas, Elctrn. Production Spec.	214-985-1932
WA	Redmond, Northwest Test & Meas.	206-881-8857

EXCEL SPECIALTY CORP., 6335 N. Broadway, Chicago, IL 60660, Tel: 312-262-4781; Empl.: 50

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Local Sales Offices & Reps

AR	N. Little Rock, Leo Barker Co.	501-834-2537
CA	San Diego, Uni-Rep	619-746-5131
CA	San Jose, Cerco	401-298-1918
CT	Washington, Tri-Com Assocs.	203-563-2241
FL	Coral Springs, HAI Elctrns.	305-752-7520
GA	Stone Mountain, Dixie Tech. Mktg.	404-962-2530
IL	Chicago, ESCO Assocs.	312-763-0800
MO	Independence, Engrg. Svcs. Co.	816-254-3600
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	E. Brunswick, Kong Sys.	201-828-8514
NC	Charlotte, Mackay, Smith and Assoc.	704-372-1188
OR	Portland, Frank Jackson, Assoc.	503-292-2638
TX	Dallas, Southwest Elctrn. Inds.	214-690-9881

EXIDE ELCTRNS., P.O. Box 58189, Raleigh, NC 27658, Tel: 919-872-3020, TWX: 510-928-0598; FSC No.: 31795; Empl.: 900; *Sls. Mgr.:* Richard King

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E-Z-HOOK, Div. Tektest Inc., Box 450 - 225 N. Second Ave., Arcadia, CA 91006, Tel: 818-446-6175, TWX: 910-582-1614; FSC No.: 08505; Empl.: 23; *Sls. Mgr.:* C. Haskin; *Dist. Mgr.:* P. Wood

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FAB-TEK INC., 68 Morgan Ave., Danbury, CT 06810, Tel: 203-743-3312; Empl.: 5

FACET ENTERPRISES, INC., Elmira, NY 14903, Tel: 607-737-8011, Telex: 93-2490, TWX: 510-252-1594; Empl.: 400; *Sls. Mgr.:* Gary Packard

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AL	Birmingham, Wilcox & Allen	205-254-8051
CA	Millbrae, Schriver Indl. Sls.	415-692-6836
CA	Tustin, Morgan Johnson	714-832-7282
CO	Englewood, Techna-Quip	303-779-5399
CT	Hamden, Aid Engrg. Sls.	203-434-1673
FL	Cocoa, Reynolds & Assocs.	305-784-4700
FL	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
FL	St. Petersburg, Reynolds & Assocs.	813-360-1484
GA	Atlanta, Reynolds & Assocs.	404-451-9558
IL	Northfield, Lenhart Assoc.	312-446-9320
MA	Bedford, Aid Engrg. Sls.	617-663-2225
MA	Westboro, Aid Engrg. Sls.	617-890-8181
MI	Madison Hgts., Pine Sls.	313-589-0350
MO	Kansas City, Terry & Hodges	913-722-1024
MO	St. Louis, Terry & Hodges	314-965-0746
NY	Alexander, B. H. Tollefson Assoc.	716-591-1219
NY	Auburn, B. H. Tollefson Assoc.	315-253-4109
NY	Rochester, B. H. Tollefson Assoc.	716-271-4141
NC	Charlotte, M. R. Snyder	704-527-6752
OH	Chagrin Falls, Pine Sls.	216-247-6198
OH	Cincinnati, Fremont & Lewis	513-851-1500
OR	Portland, N. Rupp	503-231-7701
PA	Bridgeville, Foster-McClinton	412-941-4800
PA	Devon, Goodall Industrial Equpt. Co.	215-964-1070
TN	Chattanooga, Willcox & Allen	615-698-7125
TX	Richardson, D. E. Harman	214-234-2021
TX	Woodlands, MJM Intl. Sls.	713-273-3126
WA	Bellevue, N. Rupp	206-455-2130
WV	Hurricane, Foster-McClinton	304-757-6645
WI	Wauwatosa, Gille Engrg. Sls.	414-258-4100

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FAIRCHILD MICROPROCESSOR DIV., Fairchild Camera & Instr. Corp., 450 National Ave., Mountain View, CA 94042, Tel: 415-962-3838, TWX: 910-379-5091

FAIRCHILD TEST SYS. GRP., Testline Instrs., 1400 White Dr., Titusville, FL 32780, Tel: 305-267-7212, TWX: 510-950-3043; Empl.: 103; *Sls. Mgr.:* Bill Wirth

FAIRCHILD WESTON, DATA RECORDERS, P.O. Box 3041, Sarasota, FL 33578, Tel: 813-371-0811, Telex: 4991610, TWX: 810-864-0406; FSC No.: GS-00K-8301-S0078; Empl.: 750; *Sls. Mgr.:* Steve Hoff .... **3**•1235

Local Sales Offices & Reps

AZ	Mesa, Vic Myers Assocs.	602-897-7378
CA	Cupertino, Fairchild Weston	408-257-1813
CA	Laguna Hills, Elotek Sys.	714-830-4856
CA	Westlake, Fairchild Weston	213-889-1057
CO	Fort Collins, Vic Myers Assocs.	303-223-8907
CT	Higganum, Intersell	203-528-5357
FL	Fort Walton Beach, RAM-Z Assocs.	904-862-2700
FL	Maitland, Wade H. Boggs	305-647-2226
ID	Rathdrum, Hood Engrg. Sls., Inc.	208-772-7235
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MD	Silver Spring, Sel-Tronics	301-589-3391
MA	Burlington, Intersell	617-273-3844
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Lovis, Marsland Assocs.	314-991-1399
NJ	Cedar Grove, KLS Assocs.	201-785-4450
NM	Albuquerque, Vic Myers Assocs.	505-884-6878
NY	Rochester, Scientific Dvcs. NY	716-334-2445
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
PA	Devon, Fairchild Weston	215-687-3220
TX	Conroe, Fairchild Weston	713-539-1315
WA	Bellevue, Hood Engrg. Sls., Inc.	206-453-9375
WI	New Berlin, Marsland Assocs.	414-786-6611

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AL	Huntsville, Macro-Mktg. Assocs.	205-883-9630
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CT	W. Hartford, R. S. Pettigrew & Assoc.	203-233-8533
FL	New Smyrna Beach, J. Wetzel	904-423-5707
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IN	Indianapolis, Frank J. Campisano Co.	317-253-7651
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MN	Bloomington, Holmes & Ladky Assocs. of Minn.	612-884-2125
NY	Hempstead, Kahgan Sales	516-538-2300
OH	Cincinnati, F. J. Campisano & Assoc.	513-574-7111
OR	Portland, Freed Assocs.	503-289-5320
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TX	Dallas, S.E.I. Inc.	214-690-9881
VA	Roanoke, A. B. Kreger & Co.	703-989-4738
WI	Milwaukee, Frank W. Ladky Assocs.	414-351-2112

F & M SYSTEMS CO., See Texas Controls

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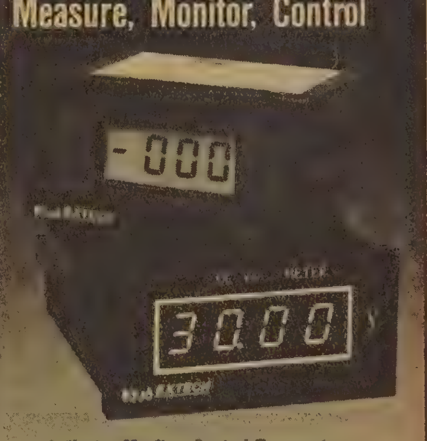

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CA	Cupertino, Codella Mktg. Grp.	408-257-2561
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CT	Southington, Andrews Airtronics	203-621-6158
FL	Boca Raton, Conley & Assocs.	305-395-6108
FL	Oviedo, Conley & Assocs.	305-365-3283
FL	Tampa, Conley & Assocs.	813-885-7658
GA	Doraville, Conley & Assocs.	404-447-6992
IL	Chicago, Century Elctrns. Corp.	312-777-9700
IN	Noblesville, Century Elctrns. Corp.	317-849-2026
IA	Cedar Rapids, Palatine Engrg. & Sls.	319-365-8071
KS	Mission, Palatine Engrg. & Sls.	913-831-0555
MD	Woodbine, Naudain Assoc. So.	301-442-2270
MA	Danvers, Andrews Airtronics	617-246-2450
MI	Ferndale, Hilltronics	313-398-5556
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Hazelwood, Palatine Engrg. & Sls.	314-839-0800
NY	Huntington, CDB Entprs.	516-692-5200
NY	Kingston, R. P. Kennedy Co.	914-876-2700
NY	Rochester, R. P. Kennedy Co.	716-271-6326
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NC	Raleigh, Conley & Assocs.	919-876-9862
OH	Cleveland, Arthur H. Baier Co.	216-461-6161
OH	Dayton, Arthur H. Baier Co.	513-276-4128
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PA	Wynnewood, Metz-Benham Assoc.	215-896-7300
TX	Arlington, W. Pat Fralia Co.	817-640-9101
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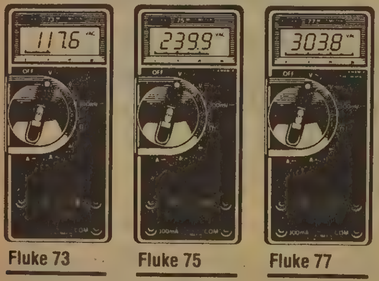

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CO	Englewood, Indl. Elctrns. Corp.	303-694-9444
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
GA	Norcross, Newark Elctrns.	404-321-0413
IL	Chicago, Newark Elctrns. Corp.	312-638-4411
IL	Elgin, Allied Elctrns.	312-697-8200
IN	Indianapolis, Graham Elctrns. Supp.	317-634-8202
MD	Beltsville, Newark Elctrns.	301-937-5085
MA	Woburn, Newark Elctrns.	617-935-8350
MI	Grand Rapids, Newark Elctrns.	616-241-6681
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Minneapolis, Stark Elec.	612-332-1325
MO	St. Louis, Olive Indl. Elec.	314-426-4500
NJ	Springfield, Newark Elctrns.	201-376-9500
NY	Buffalo, Summit Dists.	716-887-2800
NY	Huntington, CDB Dev.	516-692-5200
NY	Rochester, Summit Elctrns.	716-334-8110
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Warrensville Heights, Newark Elctrns.	216-587-1700
OK	Tulsa, Radio, Inc.	918-587-9123
PA	Wynnewood, Metz-Benham Assoc.	215-896-7300
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NY	Great Neck, Phase Four Inc.	516-482-1790
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CA	Seal Beach, Texel	213-596-9411
FL	Ft. Lauderdale, Electrocomp	305-491-4141
GA	Atlanta, L & D	404-455-3473
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IN	Columbus, Chambers Mktg.	812-362-0272
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MA	Canton, New England Elctrn. Sls.	617-828-4835
MI	Birmingham, Forand Sls.	313-644-0087
MN	St. Paul, Countryman Assoc.	612-645-9151
MO	Blue Springs, Cairns & Hayes Co.	816-229-1404
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NC	Raleigh, L & D	919-876-5301
PA	Hatboro, Joe Oberlies Co.	215-675-4226
TX	El Paso, Alexander Entprs.	915-591-3142
TX	Richardson, Jaro Elec. Sls.	214-231-6654
WA	Seattle, General Elctrns.	206-575-4030

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CA	Los Angeles, High Voltage Sales	213-881-9194
CA	Walnut Creek, W. A. Borden Co.	415-937-5196
FL	Clearwater, Brennan Assoc.	813-446-5006
GA	Atlanta, Remco	404-447-6937
IL	Skokie, Esco Assocs.	312-674-2376
MD	Beltsville, Applied Engrg.	301-953-2808
MA	Wakefield, Nerem Co.	617-245-5767
MN	Chanhassen, Barnes Sls. Assoc.	612-474-2907
NJ	Fairfield, Addem Sls. Co.	201-882-0993
NM	Albuquerque, IMEC	505-883-9010
OH	Avon, J. D. Babb Assoc.	216-934-6113
OH	Dayton, O. Penrod	513-228-4555
OR	Forest Grove, Doran Sls. Assoc.	503-357-3333
PA	Bridgeport, R. D. Freedman/Malta	215-279-5767
PA	Southampton, Campbell Assocs.	215-322-6630
PA	Thomasville, Lou Weaver	717-792-1305
TX	Richardson, Eagle Mktg.	214-238-5383

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CA	Sunnyvale, Esco Assoc.	408-745-1410
CO	Boulder, A. Bissell Co.	303-444-1173
FL	New Port Richey, Lobo Mktg. Assoc.	813-848-8578
MD	Baltimore, Bernard White & Co.	301-484-5400
MA	Westwood, O. E. M. New England	617-769-4976
MN	Bloomington, Merrill Franklin Co.	612-854-9446
NY	Melville, Carnes Assoc.	516-694-1600
OH	Kettering, J. May Assoc.	513-299-8424
TX	Bedford, De Armond Ent.	817-267-2048
WA	Vancouver, Ray Over Sls.	206-695-6179

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FL	Clearwater, WMM Assocs.	813-442-3913
FL	Ft. Lauderdale, WMM Assocs.	305-772-9850
MI	Centerline, Dietrich & Assoc.	313-754-6450
MN	Minneapolis, Scott Elctrn. Sls.	612-929-2985
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OH	Dayton, Dietrich & Assoc.	513-223-6042
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TX	Garland, Tesco	214-681-1376
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FLEX-CORE DIV., Morlan & Assocs., Inc., 6625 McVey Blvd., Worthington, OH 43085, Tel: 614-889-6152; *Sls. Mgr.:* D. Morlan .... 1A•2165

FLEX-KEY CORP., 18 Sargent St., Gloucester, MA 01930, Tel: 617-281-2040, Telex: 94-0333; FSC No.: 51163; Empl.: 50; *Sls. Mgr.:* Philip P. Bodoni .... 1B•1770, 1771

FLEXPRINT DIV, Sanders Assocs., Inc., Grenier Field, Manchester, NH 03103, Tel: 603-669-4615, TWX: 710-220-1845; Empl.: 700

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FLUKE, JOHN, MFG. CO., Box C9090, MS 250C, Everett, WA 98206, Tel: 206-356-5400, Telex: 152662, TWX: 910-445-2943; Empl.: 2645; *Sls. Mgr.:* W. Hoffman; *Dist. Mgr.:* T. Rockney

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CA	City of Industry	213-330-0680
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IL	Downers Grove	312-971-8600
NC	Charlotte	704-554-1551
OH	Cincinnati	513-563-2100
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FORK STANDARDS, INC., 666 Western Ave., Lombard, IL 60148, Tel: 312-932-9380; Empl.: 14

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AZ	Glendale, Adtek	602-931-9289
CA	Aqoura, Cal Rep	213-991-1940
CA	Mountain View, Brooks Tech. Grp.	415-960-3880
CA	Riverside, Cal Rep Branch	714-682-6762
CA	San Diego, DePierre & Assocs.	619-578-2555
CA	Tarzana, Cal Rep Branch	213-996-6745
CO	Parker, Technology Mktg. Assoc. of CO	303-841-3435
CT	Waterbury, HLM CT	203-753-9894
FL	Clearwater, Beacon	813-796-2378
FL	Ft. Lauderdale, Beacon	305-491-1054
FL	Maitland, Beacon	305-647-3498
FL	Melbourne, Beacon	305-724-8010
GA	Atlanta, Beacon	404-256-9640
IL	Rolling Meadows, Sumer	312-991-8500
LA	Mandeville, Design Mktg.	713-273-2319
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MI	Fenton Lake, McNab & Assoc.	616-925-2166
MN	Bloomington, 2 M Sales	612-890-7774
NH	Nashua, Comptech	617-649-3030
NJ	Parsippany, HLM NJ	201-263-1535
NY	Northport, HLM NY	516-757-1606
NY	Syracuse, Pitronics	315-455-7346
NC	Raleigh, Beacon	919-787-0330
OH	Akron, B.J. Davis	216-645-0517
OK	Tulsa, Design Mktg.	918-622-7387
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Southampton, Vista Sls. Assoc.	215-322-7420
TX	Dallas, Design Mktg.	214-680-9767
TX	Hurst, Design Mktg.	817-268-2004
TX	Round Rock, Design Mktg.	512-255-9896
UT	Salt Lake City, Technology Mktg. Assoc.	801-364-3296
WA	Seattle, Earl & Brown	206-284-1121
WI	Brookfield, Sumer	414-784-6641

Local Distributors

AL	Huntsville, Contact Elctrns.	205-881-9321
AZ	Phoenix, Kachina Elctrn. Dist.	602-269-6201
CA	Belmont, Arndt	415-592-8097
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Irvine, Integrated Elctrns.	714-660-1055
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Jose, Integrated Elctrns.	408-287-6488
CA	Santa Clara, Cypress	408-727-7080
CA	Santa Clara, California Capacitor	408-980-8495
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TX	Dallas, Heilind Elctrns.	713-988-2711
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NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
TX	Richardson, Lear Assocs., Inc.	910-867-4718

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FL	Melbourne, Raycom	305-259-7988
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IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
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MI	Grand Rapids, A. Blumenberg	616-456-7320
MI	Oak Park, A. Blumenberg	313-968-3230
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NJ	Carlstadt, Com-Tech Sls.	201-935-5454
NM	Albuquerque, Straube Assocs.	505-292-0428
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NY	Buffalo, H. C. Johnson Agencies	716-632-7880
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PA	Broomall, Sapinosa Assoc.	215-353-7267
PA	Glenshaw, H. C. Johnson Agencies	412-961-0414
TX	Richardson, Carl Tinch Sls.	214-231-1322
UT	Salt Lake City, Straube Assocs.	801-263-2640

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NY	Huntington Sta., E-F Techn. Sls.	516-549-1818
OH	Cleveland, Tiby Co.	216-371-5335
TX	Houston, Spectra Sls. Corp.	713-783-8333
TX	Richardson, Spectra Sls. Corp.	214-234-3600
VA	Charlottesville, Marktron	804-973-5874
EXP	NY, New York, Henley Elctrns.	212-986-5544

FREQUENCY SELECTIVE NETWORKS, INC., 69-20 Garfield Ave., Woodside, NY 11377, Tel: 212-424-7500; FSC No.: 56662; Empl.: 30; *Sls. Mgr.:* Michael L. Izzolo ....**1A•**1361

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CA	Santa Clara, F.M. Assocs.	408-733-9143
FL	Ft. Lauderdale, Donato Assoc.	305-733-3450
KS	Shawnee Mission, Elctrn. Comp. Sls.	913-764-2611
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FTS SYS., POB 158, Stone Ridge, NY 12484, Tel: 914-687-7664, TWX: 510-247-0547; Empl.: 45; *Sls. Mgr.:* T. N. Thompson, Jr.

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FL	Altamonte Springs, 'C' Assocs.	305-831-1717
FL	Pompano Beach, 'C' Assocs.	305-972-9200
GA	Lawrenceville, Tek-Rep Mktg.	404-963-1600
GA	Stone Mtn., Dixie Tech. Mktg.	404-962-2530
IL	Elk Grove Vl., John G. Twist	312-593-0200
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Noblesville, McFadden Sls.	317-877-5070
KS	Prairie Village, R. W. Kunz & Assocs., Inc.	913-648-3535
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PA	Greensburg, Pro-Mark	412-832-3800
TX	Dallas, United Comps.	214-475-0051
UT	Bountiful, Anderson Assocs.	801-292-8991
VA	Charlottesville, Component Sls., Inc.	804-979-1681
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WI	Cedarburg, Bransky Sls.	414-377-6837

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GA	Norcross, A-A Elec.	404-449-8670
GA	Stone Mountain, Control Design Supp.	404-979-3500
IL	Addison, Lectro Comps.	312-543-1680
IL	Chicago, Prehler Elctrns., Inc.	312-384-6100
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Genoa, Control Design Supp.	815-784-6519
IL	Joliet, Mainline Supp. Co.	815-436-3900
IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Indianapolis, Control Design Supp.	317-788-0551
IA	Marian, Control Design Supply, Inc.	319-373-2923
KS	Overland Park, Milgray Elctrns.	913-236-8800
ME	Portland, Rockingham Elec. Supp.	207-772-4614
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MN	Minneapolis, Bergquist	612-835-2322
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NJ	Whippany, Tonar Inds.	201-884-1400
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NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	N. Babylon, E.I.M. Intl. Mktg.	516-643-5700
NY	Pittsford, Milgray Elctrns.	716-385-9330
NC	Charlotte, Control Design Supp.	704-588-4410
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Middleburg Heights, Prehler Elctrns., Inc.	216-243-5510
OH	Solon, Repco	216-248-8900
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WI	New Berlin, NEP Elctrns.	414-785-9100
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WI	Racine, Badger Elctrn. Parts Co.	414-637-1256

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FURNAS ELEC., 1197 McKee St., Batavia, IL 60510, Tel: 312-879-6000, Telex: 72-0458; Empl.: 1360; *Sls. Mgr.:* T. W. Thornton; *Dist. Mgr.:* R. Lanser

FUSECOM, 14864 NE 95th St., Redmond, WA 98052, Tel: 206-881-2442; *Sls. Mgr.:* Bruce Barndt

GABRIEL ELCTRNS., Box 70, Scarborough Indl. Pk., Scarborough, ME 04074, Tel: 207-883-5161, Telex: 95-0113; Empl.: 135; *Sls. Mgr.:* D. B. Crisman

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MO	St. Louis, Gabriel Elctrns.	314-878-2982

GALITE, 2 Tower Dr., Wallingford, CT 06492, Tel: 203-265-7126, TWX: 710-476-0764; FSC No.: 56447; *Sls. Mgr.:* James W. Campbell, Jr.

GAMBLE, CHARLES T., INDS., 605 Perkins La., Delanco, NJ 08075, Tel: 609-461-1900; Empl.: 150; *Sls. Mgr.:* W. Snyder

GAMMA HIGH VOLTAGE RESCH. INC., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550, Tel: 914-667-5050 .... 3•1574, 1575

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NM	Albuquerque, Cleveland Entprs.	505-265-7893

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Local Sales Offices & Reps

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GAP INSTR., 110 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-273-0909, TWX: 510-227-6237; FSC No.: 00607; Empl.: 50

GARDINER ELCTRNS., 4729 North 7th Ave., Phoenix, AZ 85013, Tel: 602-274-9681

GARDINER SOLDER CO., Div. of Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, IL 60632, Tel: 312-847-0100, TWX: 910-221-2510; Empl.: 100; *Sls. Mgr.:* M. Boyle .... 2•1927

Local Sales Offices & Reps

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CA	La Mirada, Gardiner Solder	714-994-6350
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GA	Tucker, Elctrl. Concepts, Inc.	404-491-3154
IA	Princeton, Johnson Mfg.	319-289-5123
MA	Woburn, Yankee Tech Sls.	617-935-6278
MO	St. Charles, Phillips & Assocs.	314-441-0148
NJ	Englewood, Wilson Industries	201-871-4658
NJ	Scotch Plains, Gardiner Solder Co.	201-232-1965
NY	Sidney, Wingate & Assocs.	607-563-2113
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
TX	Dallas, The Mello Co.	214-241-9196
TX	Dallas, Elctrn. Production Specialists	214-422-5476
VA	Falls Church, Hyka, Inc.	703-560-6115
WA	Bellevue, Doland	206-454-4952

Local Distributors

AL	Birmingham, E.I.S., Inc.	205-252-9046
AZ	Phoenix, Lion Elctrns. Distrs.	602-869-9611
AZ	Phoenix, Elctrl. Specialty Co.	602-275-5736
CA	Anaheim, Elctrl. Specialty Co.	714-630-7050
CA	Anaheim, Advance Electrical Sls., Inc.	714-870-0300
CA	Belmont, Advance Elctrl. Sls.	415-592-4550
CA	Chino, Tracy Elctrn. Sls.	714-591-4736
CA	Glendale, Mac Donald & Co.	800-423-2453
CA	Los Angeles, Elctrl. Specialty Co.	213-724-9600
CA	Los Angeles, John Cameron Supply Co.	213-870-7403
CA	San Diego, Hi-Tech Metals Co.	619-270-8081
CA	San Diego, Elctrl. Specialty Co.	619-560-1800
CA	San Diego, Casco	619-560-9319
CA	San Francisco, Elctrl. Specialty Co.	415-589-9611
CA	Santa Clara, RGB Electro Ind. Tool	408-980-1300
CA	Simi Valley, Cal-Pacific Suppliers	213-998-4982
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Denver, Elctrl. Specialty Co.	303-321-0226
CT	Wallingford, Tech. Assocs.	203-265-4241
FL	Boca Raton, Kimco	305-994-0590
FL	Clearwater, Your Production Cupboard	813-447-2581
FL	Orlando, E.I.S., Inc.	305-855-7100
FL	Orlando, Mavidon Entprs.	305-298-7324
GA	Atlanta, E.I.S., Inc.	404-355-1651
IL	Addison, International Soldering Supplies	312-628-8083
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IN	Indianapolis, Complete-Reading Electric Co.	317-872-3710
KY	Louisville, E.I.S., Inc.	502-636-0384
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NC	Charlotte, E.I.S., Inc.	704-392-7366
NC	Raleigh, E.I.S., Inc.	919-781-4750
OH	Cincinnati, E.I.S., Inc.	513-771-4073
OH	Cleveland, Complete-Reading Elec. Co.	216-267-1000
OH	Mentor, Kimco	216-255-1992
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TX	Dallas, Complete-Reading Elec. Co.	214-827-8891
TX	El Paso, Elctrl. Specialty Co.	915-594-8251
TX	Houston, Complete-Reading Elec. Co.	713-691-0080
UT	Salt Lake City, Electrical Specialty Co.	801-972-4184
VA	Bluefield, Complete-Reading Elec. Co.	703-322-5424
VA	Richmond, E.I.S., Inc.	804-649-9221
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WI	Mequon, Complete-Reading Elec. Co.	414-241-3880
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OH	Mentor, Appliance Elctrns.	216-257-6019
WI	Thiensville, Control Sls.	414-242-4580

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GC ELCTRNS., 400 S. Wyman St., Rockford, IL 61101, Tel: 815-968-9661, Telex: 237-318, TWX: 257318 GC Elect; Empl.: 360; *Sls. Mgr.:* Owen Jackson

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NC	Kannapolis, Bass Assocs.	704-433-1672
OH	Galion, Retronics	419-468-3253
TX	Dallas, Dynamark Tech. Sls.	214-340-1800

GEC TECHNOLOGY CORP., 4430 Forest Lane, Garland, TX 75042, Tel: 214-276-1164

GECO, 145 Penn St., Millheim, PA 16854, Tel: 814-349-5555; Empl.: 11

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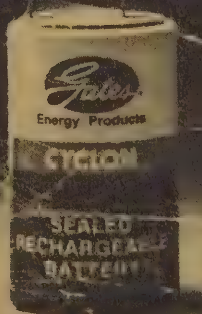

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IN	Noblesville, Century Elctrns. Corp.	317-849-2026
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LA	Vidalia, Leo Barker Co.	318-336-9565
MA	Brookline, Harman Assocs.	617-232-6687
MI	Plymouth, Jay Mktg. Assocs.	313-459-1200
MO	St. Louis, Harris Hanson Co.	816-763-6200
NY	New York, Reuse Packaging	212-939-6080
NY	Rochester, Leonard D. Allen, Inc.	716-377-3530
NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
NC	Thomasville, Jerrold Helbein & Assocs.	919-476-2365
OH	Akron, B. J. Davis Sls. Corp.	216-753-8555
OR	Beaverton, Underwood-Hanify	503-641-4463
PA	King of Prussia, Freedman-Malta Assocs.	215-337-9211
TX	Austin, J. Clay Co.	512-346-7340
TX	Dallas, J. Clay Co.	214-350-1281
UT	Salt Lake City, Medax	801-266-4545
WA	Bellevue, Underwood-Hanify	206-451-8223
WI	Wauwatosa, Larsen Assocs.	414-258-0529

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GENERAL ATRONICS CORP., 1200 E. Mermaid Lane, Philadelphia, PA 19118, Tel: 215-233-4100

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CA	Mountain View, G. Woempner Co.	415-964-5454
CO	Boulder, R. F. Mayo Assoc.	303-499-2155
CT	North Haven, Coakley, Boyd & Abbett	203-481-2828
FL	Maitland, J. Krutek	305-628-4837
FL	North Miami, J. Krutek & Assoc.	305-941-6544
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IN	Noblesville, Century Elctrns.	317-849-2026
KS	Shawnee Mission, Lowell & Kangas	913-631-3515
MA	Needham, Coakley, Boyd & Abbett	617-444-5470
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TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
WA	Olympia, Bergford & Assocs.	206-866-2001

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GENERAL ELECTRIC CO., 333 W. Seymour Ave., Cincinnati, OH 45216, Tel: 513-948-5000

GENERAL ELECTRIC CO., Battery Business Dept., P.O. Box 992, Gainesville, FL 32602, Tel: 904-462-4480, TWX: 810-836-8500; *Sls. Mgr.:* K. Edwards

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GENERAL ELECTRIC CO., Microwave Tube Operation, 1 River Road, Schenectady, NY 12345, Tel: 518-385-2211 (main NBR)

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PA	Philadelphia, Almo Elctrns.	215-689-4021
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PA	Pittsburgh, Pioneer-Standard	412-782-2300
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TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Dallas, Schweber Elctrns.	214-661-5010
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Schweber Elctrns.	713-784-3600
TX	Houston, Hamilton/Avnet Elctrns.	713-780-1771
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Irving, Hamilton/Avnet Elctrns.	214-659-4111
TX	Stafford, Arrow Elctrns.	713-491-4100
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UT	Salt Lake City, Hamilton/Avnet Elctrns.	801-972-2800
VA	Charlottesville, Virginia Radio Supp.	804-296-4184
WA	Bellevue, Almac Elctrns. Corp.	206-643-9992
WV	Charleston, McJunkin Corp.	304-348-5268
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	New Berlin, Hamilton/Avnet Elctrns.	414-784-4510

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GENERAL ELECTRIC CO., Wire & Cable, 1285 Boston Ave., Bridgeport, CT 06602, Tel: 203-382-2000, Telex: 96-4209; Empl.: 2000; *Sls. Mgr.:* D. A. Pritchard; *Dist. Mgr.:* M. Peterson

GENERAL ELECTRO-MECHANICAL CORP., 785 Hertel Ave., Buffalo, NY 14207, Tel: 716-876-9685, Telex: 91-222; Empl.: 100; *Sls. Mgr.:* Tom Speller, Jr.

GENERAL FIBER OPTICS, INC., P.O. Box 82, Caldwell, NJ 07006, Tel: 201-228-4400, Telex: 130-224; *Sls. Mgr.:* Herb Berkowitz

GENERAL HARDWARE MFG., 80 White St., New York, NY 10013, Tel: 212-431-6100, Telex: 126394 Aegis; *Sls. Mgr.:* Tom McGannon

GENERAL INDS., Taylor & Olive St., Elyria, OH 44035, Tel: 216-323-3136, TWX: 810-424-2109; Empl.: 1100

GENERAL INSTR., Discrete Semiconductor Div., 600 West John St., Hicksville, NY 11802, Tel: 516-733-3333, TWX: 510-221-1865; *Sls. Mgr.:* Tom Hurley; *Dist. Mgr.:* R. Graziano

GENERAL INSTR., Govt. Sys., 600 W. John St., Hicksville, NY 11802, Tel: 516-733-3000, Telex: 510221-1865; Empl.: 500

GENERAL INSTR., Lamp Div., 4433 N. Ravenswood Ave., Chicago, IL 60640, Tel: 312-784-1020, TWX: 910-221-5445; FSC No.: 71744; Empl.: 390; *Sls. Mgr.:* Jim Flanagan .... 1B•1056

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech.	205-533-2100
AZ	Phoenix, Howe & Howe Sls.	602-264-7971
AR	Fort Smith, Electra Reps.	501-452-4030
CA	Fremont, General Instr. Lamp Div.	415-796-8210
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CA	Santa Clara, Ross Mktg.	408-988-8111
CO	Denver, Moss Mktg.	303-455-7205
CT	Middletown, Gerber Sls.	203-347-3000
FL	Altamonte Springs, "C" Assocs.	305-831-1717
FL	Pompano Beach, "C" Assocs.	305-972-9200
GA	Norcross, Electro-Mech Sls. Engrg. Co.	404-447-6478
IL	Des Plaines, Elctrn. Mktg.	312-298-2330
IN	Indianapolis, M. Gottlieb Assocs.	317-846-5788
IN	Kokomo, M. Gottlieb Assocs.	317-455-0444
IA	Cedar Rapids, Dy-Tronix	319-377-8275
MA	Ludlow, Gerber Sls. Corp.	413-589-9837
MA	Newton Upper Falls, Gerber Sls. Corp.	617-969-2620
MI	Detroit, Rathsburg Assoc.	313-882-1717
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Bridgeton, Dy-Tronix	314-731-5799
MO	Independence, Dy-Tronix	816-373-6600
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NJ	Manasquan, General Instr. Lamp Div.	201-528-5495
NM	Albuquerque, Moss Mktg.	505-292-7505
NY	Buffalo, L. D. Allen	716-837-1955
NY	Commack, Kaelber & Mack	516-499-2924
NY	Fairport, L. D. Allen	716-377-3530
NY	Syracuse, L. D. Allen	315-437-8387
NC	Raleigh, Electro-Mech	919-851-8165
OH	St. Marys, T. Shelby & Co.	419-394-3377
OR	Portland, J. J. Backer Co.	503-297-8744
OR	Salem, J. J. Backer Co.	503-362-0717
TN	Nashville, Electro-Mech. Sls. Engrg. Co.	615-883-0073
TX	Dallas, Electra Reps.	214-387-3594
TX	Houston, Electra Reps.	713-530-2208
UT	Bountiful, Moss Mktg.	801-292-8660
WA	Seattle, J. J. Backer Co.	206-285-1300
EXP	Rio Piedras, Elctrn. Sls. Assocs.	809-769-2911

Local Distributors

AZ	Phoenix, Dalis Radio	602-254-8471
AZ	Tucson, Inland Elctrn. Supp.	602-294-2628
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Buena Park, RPS Elect.	714-521-5230
CA	Gardena, Bell Ind.	213-515-1800
CA	Mountain View, Abacus Elctrn.	408-961-1500
CA	Sun Valley, Richey Elctrn.	213-875-2862
CA	Sunnyvale, Bell Ind.	408-734-8570
CO	Denver, Electronic Parts	303-744-1992
CT	Middletown, Mid-State	203-347-5638
FL	Orlando, Hammond Elctrn.	305-849-6060
GA	Atlanta, E. Sam Jones	404-351-3250
IL	Chicago, Steiner Elec.	312-685-7000
IL	Chicago, Newark Elect.	312-638-4411
IL	Palatine, Ohm Elctrn.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IN	Indianapolis, Genesis (Radisco)	317-637-5571
IA	Cedar Rapids, Deeco	319-365-7551
KY	Louisville, Peerless Elctrn.	502-636-3336
LA	Lafayette, Ralph's Elctrn.	318-234-4507
MD	Rockville, Capitol Radio	301-881-2270
MA	Hingham, Sager Elec.	617-749-6700
MI	Flint, Michigan Elctrn.	313-232-6550
MN	St. Paul, Gopher Elctrn.	612-483-3322
MO	Kansas City, Walters Radio	816-531-7015
MO	St. Louis, Olive Indl.	314-426-4500
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NY	Buffalo, Summitt Dist.	716-884-3450
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OH	Akron, Akron Elect.	216-762-8818
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OK	Tulsa, Oil Capitol Elctrn.	918-622-8520
OR	Portland, United Radio	503-233-5346
SC	Columbia, Dixie Elctrn.	803-779-5332
TN	Memphis, Bluff City	901-345-9500
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Fort Worth, Allied Elctrn.	817-336-5401
TX	Fort Worth, Swieco	817-335-6521
TX	Houston, Harrison Equip.	713-652-4700
UT	Salt Lake City, Standard Supp.	801-486-3371
WA	Seattle, Robert E. Priebe Co.	206-682-8242
WI	Milwaukee, Marsh Elctrn.	414-475-6000

GENERAL INSTRUMENT CORP., Microelectronics Div., 600 W. John St., Hicksville, NY 11802, Tel: 516-733-3107, TWX: 510-221-1866; *Sls. Mgr.:* A. Lindgren; *Dist. Mgr.:* J. Johnson

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CA	Los Angeles, RF Assocs.	213-478-1586
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GA	Griffin, Saber Assocs.	800-327-0853
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NJ	West Orange, EF Tech. Sls.	201-731-7203
NM	Albuquerque, Odyssey One	505-265-6645
NY	Huntington Sta., EF Tech. Sls.	516-549-1818
NC	Clayton, Saber Assocs.	800-327-0853
OH	Lancaster, Cain Forlaw	614-654-4800
PA	Andalusia, Les Associates	215-245-5250
SC	Columbia, Saber Assocs.	800-327-0853
TX	Dallas, Cain & Co.	214-233-6809
VA	McLean, Creative Mktg. Assoc., Ltd.	703-442-9100

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AL	Birmingham, SESCO	205-988-8304
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CA	Long Beach, Saber Entprs.	213-595-5646
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CA	San Diego, Saber Entrps.	619-271-1523
CO	Littleton, Radco	303-794-4279
CT	Cheshire, MECO, Inc.	203-271-0026
FL	St. Petersburg, SESCO	813-576-6991
GA	Altanta, SESCO	404-458-6423
IL	Des Plaines, Marsland Assocs.	312-694-2262
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
LA	Baton Rouge, SESCO	504-928-4951
MA	Reading, MECO, Inc.	617-944-6660
MI	Mt. Clemens, R. J. O'Hara Assocs.	313-791-7140
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-991-1399
NJ	Hillsdale, CB Associates	201-664-6230
NJ	Pennsauken, Scientific Reps	609-662-5222
NM	Albuquerque, Qualtech	505-243-5605
NY	Binghamton, TAE-REP	607-772-6952
NY	Fishkill, TAE-REP	914-896-6966
NY	Rochester, TAE-REP	716-586-8710
NC	Charlotte, SESCO	704-535-4920
OH	Dayton, RIXAN Assocs.	513-278-4216
OK	Tulsa, SESCO	918-622-3868
TX	Austin, SESCO	512-892-2490
TX	Dallas, SESCO	214-231-9364
TX	El Paso, Waltech Inc.	915-592-2415
TX	Houston, SESCO	713-999-3510
VA	Fairfax, Scientific Assocs.	703-385-0600
WA	Seattle, Datacom Assocs.	206-285-2525

Components

CA	Saratoga, TESTCO	408-253-1900
CO	Golden, J. F. Hurlbut Co.	303-279-7796
MI	Farmington, W. R. Hummon & Assoc.	313-474-0661
OH	Dayton, RIXAN Assocs.	513-278-4216
PA	Havertown, Quarracino	215-449-7500
TX	Dallas, Blackburn Assocs.	214-692-8885
TX	Houston, Blackburn Assocs.	713-463-1354
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
VA	Fairfax, Beacon North Inc.	703-591-1300
VA	Forest, Beacon North Inc.	804-239-8486

Local Distributors

CA	Saratoga, TESTCO	408-253-1900
OH	Dayton, RIXAN Assocs.	513-278-4216

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GENERAL SEMICONDUCTOR INDS., INC., 2001 W. 10 Pl., Tempe, AZ 85281, Tel: 602-968-3101, TWX: 910-950-1942; FSC No.: 24444; Empl.: 425; *Sls. Mgr.:* Jim Williams; *Dist. Mgr.:* Howard Israel

GENERAL TRANSISTOR CORP., 216 W. Florence Av., Inglewood, CA 90301, Tel: 213-673-8422, Telex: 653474; FSC No.: 1P738; Empl.: 39; *Sls. Mgr.:* Al Barrios

GENICOM CORP., General Electric Dr., Waynesboro, VA 22980, Tel: 703-949-1000; FSC No.: 01526; Empl.: 2300; *Sls. Mgr.:* W. J. Vanco .... **1B**•1386, 1387

Local Sales Offices & Reps

CA	Los Angeles	213-701-0353
CA	San Francisco	408-925-6648
CT	Meriden	203-238-6800
DC	Washington	301-770-4434
GA	Atlanta	404-256-1966
IL	Chicago	312-577-1100
MA	Boston	617-657-4800

Local Distributors

AL	Huntsville, Arrow Elctrns.	205-882-2730
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Newport Beach, Arrow Elctrns.	714 851-8961
CA	San Diego, Arrow Elctrns	619-565-4800
CA	Santa Ana, Norstan	714-540-4165
CA	Sunnyvale, Arrow	408-745-6600
CO	Thornton, Arrow	303 451-5934
CT	Wallingford, Arrow	203-265-7741
FL	Fort Lauderdale, Arrow	305-776-7790
FL	Palm Bay, Arrow	305-725-1480
GA	Norcross, Schweber	404-449-9170
IL	Schaumburg, Arrow	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IA	Cedar Rapids, Arrow Electrns.	319-395-7230
MD	Baltimore, Arrow	301-247-5200
MD	Towson, Electronic Comp. Sls.	301-296-6282
MA	Woburn, Arrow	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Grand Rapids, Arrow Elctrns.	612-830-1800
MN	Edina, Arrow	612-830-1800
MO	St. Louis, Arrow	314-567-6888
NH	Manchester, Arrow	603-668-6968
NJ	Fairfield, Arrow	201-575-5300
NJ	Moorestown, Arrow	609-235-1900
NM	Albuquerque, Arrow	505-243-4566
NY	Hauppauge, Arrow	516-231-1000
NY	Liverpool, Arrow	315-652-1000
NY	Rochester, Arrow	716-275-0300
NC	Charlotte, Electronics Mktg. Corp.	704-394-6195
NC	Raleigh, Arrow Elctrns.	919 876-3132
NC	Winston-Salem, Arrow	919-725-8711
OH	Centerville, Arrow Electrns.	513-435-5563
OH	Cleveland, Electronics Mktg. Corp.	216-442-3441
OH	Columbus, Electronics Mktg. Corp.	614-299-4161
OH	Dayton, Elctrns Mktg. Corp.	513-278-5745
PA	Monroeville, Arrow Elctrns.	412-856-7000
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Dallas, Arrow	214-386-7500
TX	Stafford, Arrow	713-491-4100
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
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GENISCO TECHNOLOGY CORP., Eldema Div., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-537-4750, TWX: 910-346-6773; FSC No.: 03797; Empl.: 450; *Sls. Mgr.:* W. R. Esser

GENISCO TECHNLG. CORP., Filters Div., 18435 Susana Rd., Rancho Dominguez, CA 90221, Tel: 213-537-4750, TWX: 910-346-6773; FSC No.: 07294; Empl.: 450; *Sls. Mgr.:* B. Hanna

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GENISCO TECHNLG. CORP., Transducers Prods. Div., 650 Easy St., Simi Valley, CA 93065, Tel: 805-581-3985, TWX: 910-346-6773; FSC No.: 13946; Empl.: 450; *Sls. Mgr.:* J. Becker

GENRAD, INC., 300 Baker Ave., Concord, MA 01742, Tel: 617-369-4400

GENSTAR RENTAL ELCTRNS., 2445 Faber Pl., Palo Alto, CA 94303, Tel: 415-856-7600, Telex: 348368

GENTEX, Box 315, Carbondale, PA 18407, Tel: 603-434-0311, Telex: 831-883; FSC No.: 97427; *Sls. Mgr.:* Ture Heline

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CA	Mountain View, Energy Comp.	415-969-0330
FL	Sunrise, Arnold Milrot & Assocs.	305-748-6446
IN	Greenwood, Valentine & Assoc.	317-888-2260
KS	Overland Park, WEB Elctrns.	913-381-2225
MA	Millis, Selmark Assocs.	617-376-2914
MI	Brighton, SAI Mktg. Corp.	313-227-1786
MN	Minneapolis, Furber Sls.	612-881-3620
MO	Florissant, WEB Elctrns.	314-921-5794
NH	Hopkinton, Selmark Assocs.	603-623-5774
NJ	Teaneck, R. T. Reid Assocs.	201-692-0200
NY	Rochester, Ossmann Comp. Sls.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
OR	Portland, SPS Elctrns.	503-285-0214
PA	Philadelphia, Fite Eltech	215-248-3171
TX	Lewisville, Jim Hughes Co.	214-434-2566
TX	Stafford, Jim Hughes Co.	713-343-0673
WA	Seattle, SPS Elctrns.	206-323-4140
WI	Mequon, Stumm Sls.	414-241-8414
WI	Milwaukee, Speaker Electronics	414-878-3727

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CA	Santa Ana, AMCOTEC	714-957-3003
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CT	Guilford, Elctrn. Mktg. Assoc.	203-453-5424
FL	Clearwater, Brennan Assocs.	813-446-5006
GA	Atlanta, Millar Elctrns.	919-787-9564
MA	Marblehead, Elctrn. Mktg. Assoc.	617-536-8206
MI	Southfield, Component Assocs.	313-557-3232
MS	Jackson, Welch & Doby Mktg.	601-932-5534
NH	Salem, Elctrn. Mktg. Assoc.	603-893-5378
NJ	Middlesex, Comtec Cornell Assocs.	201-469-1303
TX	Dallas, S. W. Marketing	214-341-8631
UT	Salt Lake City, Control Agencies	801-328-4305
WA	Seattle, Fleehart & Sullivan	206-522-1533

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GIBSON/EGAN, 2666 East Huntington Dr., Duarte, CA 91010, Tel: 818-358-0191; Empl.: 40

GIC SYSTEMS, 2324 A Ridgepoint Dr., Austin, TX 78754, Tel: 512-926-8840; *Sls. Mgr.:* Ed Barry; *Dist. Mgr.:* Bob Lynch .... **3**•1078-1081

Refer to Gordos Corporation, Bloomfield, New Jersey for Representatives and Authorized Distributor information.

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GLASSMAN HIGH VOLTAGE INC., P.O. Box 551, Salem Indl. Pk., Whitehouse Sta., NJ 08889, Tel: 201-534-9007, TWX: 710-480-2839; Empl.: 45; *Sls. Mgr.:* John R. Belden .... **3**•1578-1581

Local Sales Offices & Reps

AZ	Scottsdale, Power Specialists	602-996-4100
CA	Los Alamitos, Power Specialists	213-594-9418
CA	Los Altos, Jay Stone & Assocs.	415-948-4563
CA	San Diego, Power Specialists	619-560-4061

GLATZER INDUSTRY CORP., 15 River St., New Rochelle, NY 10801, Tel: 914-576-2700; Empl.: 15

GLENAIR, 1211 Air Way, Glendale, CA 91201, Tel: 213-247-6000, Telex: 67-3485, TWX: 910-497-2066; FSC No.: 06324; Empl.: 485; *Sls. Mgr.:* Fred J. Hans

GLENMARC MFG., 330 Melvin Dr., Northbrook, IL 60062, Tel: 312-272-9030, Telex: 28-3499; Empl.: 13; *Sls. Mgr.:* Kevin L. Bagaline, David Greenwood

GLOBAL SPECIALTIES CORP., 70 Fulton Terrace, P.O. Box 1942, New Haven, CT 06509, Tel: 203-624-3103, TWX: 710-465-1227; Empl.: 107

GLOBE BATTERY DIV., See Johnson Controls, Globe Battery Div.

GLOBE PLASTICS, 1342 S. Signal Dr., Pomona, CA 91766, Tel: 714-623-2747; Empl.: 15

GLOBE UNION, See Johnson Controls, Globe Battery Div.

GM NAMEPLATE, INC., 2040 15th Ave. West, Seattle, WA 98119, Tel: 206-284-2200, TWX: 910-444-2053; *Sls. Mgr.:* Ed Westfall

GMR INC., Computer Elctrns., 1048 E. Burgrove St., Carson, CA 90746, Tel: 213-639-4663; *Sls. Mgr.:* Harvey Mushman

GNB BATTERIES INC., Ind'l. Battery Div., 2010 Cabot Blvd. W., Langhorne, PA 19047, Tel: 215-752-0555, TWX: 510-667-2056

GNT AUTOMATIC, 1560 Trapelo Rd., Waltham, MA 02154, Tel: 617-890-3305; Empl.: 14; *Sls. Mgr.:* K. P. Olson

GOLDEN PACIFIC ELCTRNS., INC., 1020 N. Batavia St., Ste. Q, Orange, CA 92667, Tel: 714-538-9752/9753, TWX: 910-593-1620 .... **1B**•1058; **3**•1029, 1582

GOLDWELL COMPS., 1815 W. 205th St. Ste. 201, Torrance, CA 90501, Tel: 213-533-1228, Telex: 182-392; *Sls. Mgr.:* S. Komori

GORDON, CLAUD S., CO., 5710 Kenosha St., Richmond, IL 60071, Tel: 815-678-2211, Telex: 72-2427; Empl.: 260

GORDON, L., PACKAGING, 1050 S. Paca St., Baltimore, MD 21230, Tel: 301-539-6537

GORDON PRODS., 67 Del Mar Dr., Brookfield, CT 06804, Tel: 203-775-4501; Empl.: 20; *Sls. Mgr.:* Leon Najman; *Dist. Mgr.:* Leon Najman

GORDOS
CORPORATION

GORDOS CORP., 250 Glenwood Ave., Bloomfield, NJ 07003, Tel: 201-743-6800, TWX: 710-994-4787; Empl.: 800; *Sls. Mgr.:* Bill McDermott; *Dist. Mgr.:* Bob Lynch .... **1B**•1396-1399, 1401-1403, 1625-1627; **2**•1888, 1889

Local Sales Offices & Reps

AZ	Phoenix, Cleveland Entprs.	602-944-4679
CA	Santa Clara, Maxim Elctrn. Sls.	408-727-0694
CO	Wheatridge, Waugaman Assocs.	303-423-1020
CT	Orange, R. F. Duffy Assocs.	203-795-3678
MA	Braintree, R. F. Duffy Assocs.	617-848-3550
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Pittsford, Noeth-Honsinger Assoc.	716-586-9002
OR	Portland, Micro Sls.	503-297-4726
UT	S. Jordan, Waugaman Assocs.	801-254-0570
WA	Bellevue, Micro Sls.	206-451-0568

Local Distributors

AL	Birmingham, Regal Controls	205-991-6340
AL	Huntsville, RM	205-852-1550
AL	Huntsville, Pioneer	205-837-9300
AZ	Phoenix, Newark	602-957-0085
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Phoenix, Be Switched	602-275-4805
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Time	602-967-2000
AR	Little Rock, Newark	501-225-8130
CA	Buena Park, Control Design	714-521-5040
CA	Chatsworth, IEC	213-998-2200
CA	Foster City, Newark	415-572-8300
CA	Inglewood, Newark	213-671-7066
CA	Los Angeles, Elec. Switches	213-660-1310
CA	Riverside, Elctrn. Supp.	714-683-7300
CA	San Carlos, Control Design	415-592-4808
CA	San Diego, Elctrn. Supp.	619-693-8222
CA	Sunnyvale, Time	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Denver, Integrated Elctrns.	303-534-6121
CO	Denver, Newark	303-757-3351
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Cheshire, Future Elctrns.	203-272-1852
CT	Danbury, Future	203-743-9594
FL	Ft. Lauderdale, Power Comps.	305-565-1614
FL	Ft. Lauderdale, Pioneer	305-771-7520
FL	Ft. Lauderdale, Newark	305-587-2372
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, Pioneer	305-834-9090
GA	Atlanta, Control Design	404-979-3500
GA	Norcross, Newark	404-448-1300
GA	Norcross, Pioneer	404-448-1711
GA	Stone Mountain, Control Design	404-979-3500
HI	Pearl City, Newark	808-456-5933
ID	Boise, Newark	208-342-4311
IL	Addison, L Comp	312-628-1400
IL	Chicago, Newark	312-638-4411
IL	Elk Grove Village, Pioneer	312-437-9680
IL	Genoa, Control Design	815-784-6515
IL	Lombard, RM	312-932-5150
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Indianapolis, Control Design	317-788-4559
IN	Indianapolis, RM	317-247-9701
IN	Indianapolis, Pioneer	317-849-7300
IA	West Des Moines, Ramco	515-225-6933
KS	Wichita, L Comp	316-265-8501
LA	New Orleans, Currier P Roser	504-734-1147
MD	Beltsville, Newark	301-937-5085
MD	Columbia, Time	301-964-3090
MD	Gaithersburg, Pioneer	301-921-0600
MA	Westboro, Future Elctrns.	617-366-2400
MA	Woburn, Newark	617-935-8350

GORDOS
AUTHORIZED DISTRIBUTOR
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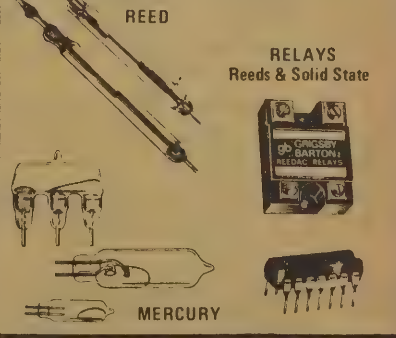
ELECTRIC SWITCHES
INCORPORATED
2478 Fletcher Drive, Los Angeles, Calif. 90039
(213) 660-1310
TOLL FREE WATS
NATIONAL: 800-421-8855
CALIFORNIA: 800-252-4640
TWX 910-321-2971



See complete product line under
SWITCHES ——section 5100
FREE linecard and catalog on request

MA	Woburn, Time	617-935-8080
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Livonia, Pioneer	313-525-1800
MI	Oak Park, Newark	313-967-0600
MN	Minneapolis, Newark	612-331-6350
MN	Minneapolis, Control Design	612-721-1628
MN	Minnetonka, Pioneer	612-935-5444
MO	Kansas City, L Comp	816-221-2400
MO	St. Louis, L Comp	314-291-6200
MO	St. Louis, Control Design	314-426-3150
NE	Omaha, L Comp	402-895-5517
NE	Omaha, Newark	402-392-1221
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Pennsauken, Resco	609-662-4000
NJ	Springfield, Newark	201-376-9500; 212-349-7087
NM	Albuquerque, Bell Inds.	505-292-2700
NM	Albuquerque, Elctrn. Dvcs.	505-884-2950
NY	Buffalo, Summit	716-884-3450
NY	Hauppauge, JACO	516-273-5500
NY	New York, Time	516-273-0100
NY	Rochester, Summit	716-334-8110
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Charlotte, Electronics Mktg. Corp.	704-394-6195
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Pineville, Control Design	704-588-4410
NC	Shelby, Dixie Indl. Supply	704-482-5641
OH	Cleveland, Pioneer	216-587-3600
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4161
OH	Dayton, Pioneer	513-236-9900
OH	Kettering, Elctrns. Mktg. Corp.	513-439-4711
OH	Solon, REH Elctrns.	216-248-1636
OH	Valley View, Newark	216-447-1050
OK	Tulsa, Newark	918-832-7004
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Broomall, Time Elctrns.	215-359-1200
PA	Horsham, Pioneer	215-674-4000
PA	Malvern, Control Design	215-296-0150
PA	Pittsburgh, Pioneer	412-782-2300
PA	Willow Grove, Resco Elctrns.	215-659-4575
SC	Greenville, Hammond	803-233-4121
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Control Design	214-358-1441
TX	Dallas, Pioneer	214-386-7300
TX	Dallas, RM Elctrns.	214-263-8361
TX	Houston, Newark	713-782-4800
TX	Houston, Pioneer	713-988-5555
TX	Richardson, JACO	214-235-9575
UT	Salt Lake City, Bell Inds.	801-972-6969
UT	Salt Lake City, Ballard Supp. Corp.	801-972-2435
VA	Chester, Virginia Control Equip. Co.	804-796-3001
WA	Bellevue, Newark	206-641-9800
WA	Bellevue, IEC	206-455-2727
WA	Bellevue, Bell Inds.	206-747-1515
WI	Milwaukee, Indl. Elctrns.	414-276-1212
WI	New Berlin, RM Elctrns.	414-784-4420
WI	New Berlin, Control Design	414-784-1015
PR	Carolina, Newark	809-762-4490

GORDOS ARKANSAS, INC., 1000 N. Second St., Rogers, AR 72756, Tel: 501-636-5000, TWX: 910-720-7998; *Sls. Mgr.:* Paul Bachman; *Dist. Mgr.:* Bob Lynch .... 1A•1654-1657; 1B•1388-1395, 1400

Local Sales Offices & Reps

AZ	Phoenix, Cleveland Entprs.	602-944-4679
CA	Santa Clara, Maxim Elctrn. Sls.	408-727-0694
CO	Wheatridge, Waugaman Assocs.	303-423-1020
CT	Orange, R. F. Duffy Assocs.	203-795-3678
MA	Braintree, R. F. Duffy Assocs.	617-848-3550
NM	Albuquerque, Cleveland Entprs.	505-256-7893
NY	Pittsford, Noeth-Honsinger Assoc.	716-586-9002
OR	Portland, Micro Sls.	503-297-4726
UT	S. Jordan, Waugaman Assocs.	801-254-0570
WA	Bellevue, Micro Sls.	206-451-0568

Refer to Gordos Corporation, Bloomfield, New Jersey for Authorized Distributor information.

GORE, W. L., & ASSOCS., INC., 1505 N. Fourth St., P.O. Box 1389, Flagstaff, AZ 86002, Tel: 602-526-1290, TWX: 910-972-0969; FSC No.: 60622; *Sls. Mgr.:* Burt Chase (Intl.)

GORE, W. L., & ASSOCS., 555 Paper Mill Rd., Newark, DE 19714, Tel: 302-738-4880, TWX: 510-666-0825; Empl.: 2000; *Sls. Mgr.:* A. B. Chase

GORMAN MACHINE CORP., 7 Burke Dr., Brockton, MA 02401, Tel: 617-588-2900, TWX: 710-345-0679; *Sls. Mgr.:* Kenneth P. Gorman

GORMAN-REDLICH MFG. CO., 6 Curtis St., Athens, OH 45701, Tel: 614-593-3150; Empl.: 4; *Sls. Mgr.:* Jim Gorman

GOULD
Electronics

GOULD INC., Corporate Headquarters, 10 Gould Center, Rolling Meadows, IL 60008; Empl.: 20,650 ....1B•1404-1413; 3•1380, 1384

GOULD-AMI, Sub. Gould Inc., 3800 Homestead Rd., Santa Clara, CA 95051, Tel: 408-554-2150, TWX: 910-338-0018; *Dist. Mgr.:* Judi MacGregor

Local Sales Offices & Reps

CA	Newport Beach, AMI	714-851-5931
CA	Santa Clara, AMI	408-738-4151
FL	Altamonte Springs, AMI	305-830-8889
IL	Elk Grove Village, AMI	312-437-6496
NY	Monsey, AMI	914-352-5333
PA	Ambler, AMI	215-643-0217

GOULD INC., Circuit Protection Div., 374 Merrimac St., Newburyport, MA 01950, Tel: 617-462-6662/3131, Telex: 94-7427, TWX: 710-347-0264; *Sls. Mgr.:* Richard Gray

Local Sales Offices & Reps

AK	Palmer, North Star Agencies	907-745-5436/5446
AZ	Scottsdale, Mahaffey & Assocs.	602-991-9790
CA	Concord, G & R Sales	415-827-1727
CA	Costa Mesa, Dennis Don & Assocs.	213-638-0427
CO	Evergreen, Jim Hammond & Assocs.	303-674-6906
FL	Miami, Glenn Assoc. of Florida	305-592-7335
FL	Orlando, Glenn Assoc. of Florida	305-293-7482
GA	Atlanta, Berry-Elsberry Co.	404-355-9296
HI	Honolulu, Pacific Factors	808-533-7135
ID	Boise, C & J Enterprises	208-375-3116
IL	Addison, McBud, Inc.	312-628-8570
IN	Indianapolis, ESI, Inc.	317-638-4439
IA	Des Moines, Jerry L. Shumway & Assoc.	515-285-0704
KS	Prairie Village, George H. Pearson Co.	913-341-6210
KY	Louisville, Henry Thompson Sls. Co.	502-583-3636
LA	Mandeville, Service Electrical Sls.	504-467-0775
MD	Owings Mills, Specialty Electrical Sls. Co.	301-356-7700, 800-638-6146
MI	Highland, Holley & Upleger	313-887-0064
MN	Minneapolis, LESCO, Inc.	612-542-8242
MS	Brandon, Service Electrical Sls.	601-992-9122
MO	St. Louis, George H. Pearson Co.	314-822-4080
MT	Big Fork, B. L. Peck & Assoc.	406-837-5092
NH	Meredith, Raymon Gerard Assocs.	603-524-6005, 800-343-0574
NJ	Kenilworth, Tri-Tech Assoc.	201-851-0370/0371, 212-567-2610
NY	No. Syracuse, Lachut Electrical Sls.	315-422-2575
NC	Greensboro, Electra-Tek Carolinas	919-272-8254
OH	Cleveland, Electro-Specialities	216-447-3048
OH	Milford, Alexander Equip. Co.	513-248-0901
OK	Oklahoma City, P. & C. Sales Co.	405-745-3431
OR	Portland, Robert A. Amey Co.	503-646-7196
PA	Pittsburgh, Robert W. Colley & Assoc.	412-331-3121
TN	Germantown, Talley & Talley Assocs.	901-755-3130
TX	Houston, Hodges, Kinney & Clark	713-748-8235
TX	Plano, Tubbesing Sls. Corp.	214-985-1079
UT	Salt Lake City, Electrical Systems	801-487-8811
WA	Seattle, Shaffer & Nelson	206-453-5575
WI	Milwaukee, D. S. Berry Co.	414-224-0680
PR	Carolina, Glenn Intl.	809-769-1851

GOULD COMPION, 1101 E. University, Urbana, IL 61081, Tel: 217-384-8500

GOULD INC., Computer Sys. Div., 6901 W. Sunrise Blvd., Ft. Lauderdale, FL 33313, Tel: 305-587-2900, TWX: 510-955-9843; FSC No.: 59-0913135; Empl.: 2376; *Sls. Mgr.:* Howard Kossak; *Dist. Mgr.:* Lionel Agar (Intl.)

GOULD INC., Design & Test Sys. Div., 4600 Old Ironsides Dr., Santa Clara, CA 95050, Tel: 408-988-6800, TWX: 910-338-0509; *Sls. Mgr.:* Dan Cockcroft

GOULD INC., Foil Div., 35129 Curtis Blvd., Eastlake, OH 44094, Tel: 216-953-5000, TWX: 810-427-2506; *Sls. Mgr.:* Tim Quigley

GOULD INC., Imaging & Graphics Div., 1870 Lundy Ave., San Jose, CA 95131, Tel: 408-263-7155, TWX: 910-338-7656; Empl.: 200; *Sls. Mgr.:* Mike Battaglia; *Dist. Mgr.:* Ernie Ohrenstein

GOULD INC., Industrial Controls Div., 901 Baltimore Blvd., Westminster, MD 21157, Tel: 301-876-2214, TWX: 710-862-0846; Empl.: 325; *Sls. Mgr.:* M. Freyermuth ....1B•1404-1413

Local Sales Offices & Reps

AZ	Tempe, Delta Elctrn. Sls.	602-966-9903
CA	Cerritos, El-Com	213-404-2961
CA	Fremont, Wm. Parks Assocs.	415-490-2011
CO	Denver, Electronic Sls.	303-771-6300
CT	Cheshire, Selmark Assocs.	203-573-9088
FL	Melbourne, Raycom	305-259-7988
GA	Atlanta, Electro-Rep. Assocs.	404-320-1134
ID	Boise, Huntley Assocs.	208-343-3753
IL	Chicago, Industrial Reps.	312-647-7755
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
IA	Marion, Design Solutions	319-377-1129
KS	Wichita, Design Solutions	316-529-0114
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Millis, Selmark Assocs.	617-376-2914
MI	Livonia, Elctrn. Salesmasters	800-321-1848
MN	Minneapolis, Giefer Sls.	612-884-2395
MO	Brentwood, Design Solutions	314-961-7170
NH	Hopkinton, Selmark Assocs.	603-623-5774
NJ	Medford, Component Consits.	609-654-5300
NJ	Oakland, Peter C. Gordon Assoc.	201-337-5200
NY	Endicott, Noeth Honsinger Assoc.	607-724-4865
NY	Pittsford, Noeth Honsinger Assoc.	716-586-9002
NC	Charlotte, Electro-Rep Assocs.	704-527-2530
OH	Beachwood, Elctrns. Salesmasters	216-831-9555
OR	Beaverton, Huntley Assocs.	503-649-5388
PA	Pittsburgh, Process Engrg. Co.	412-561-5050
TX	El Paso, Alexander Entprs.	915-591-3142
TX	Seagoville, Delta Comps.	214-287-6333
WA	Everett, Huntley Assocs.	206-353-1833
WI	Milwaukee, Industrial Reps.	414-259-0965

Local Distributors

CA	Cerritos, El-Com	213-404-2961
CA	Hayward, KEA Distr.	415-887-2900
CA	Los Angeles, Master Distrs.	213-452-1229
CO	Englewood, Elctrn. Sls.	303-771-6300
CT	East Haven, JV Elctrns.	203-469-2321
CT	Stamford, Bond Elctrns.	203-348-2663
FL	Altamonte Springs, Control Design	305-788-3220
FL	Ft. Lauderdale, Peerless Radio	305-973-4141
ID	Spirit Lake, A-I Elctrns.	208-623-3111
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Genoa, Control Design	815-784-6515
IN	Fort Wayne, Graham Elctrns.	219-423-3422
KS	Wichita, R.S.C., Inc.	316-267-5213
MA	Newton, Greene-Shaw	617-969-8900
MN	Minneapolis, Control Design	612-721-1628
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Kenilworth, Federated Purchaser	201-272-0505
NJ	Oakland, Gordon/Horne	201-337-5200
NM	Albuquerque, Intl. Elctrns.	505-262-2011
NY	Amherst, Standard Elctrns.	716-691-3801
NY	Buffalo, Summit Distributing	716-884-3450
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Rome, Rome Elctrns.	315-337-5400
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Akron, Akron Elctrns.	216-762-8818
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Wickliffe, Gateway-Megatech	216-944-8565
OK	Oklahoma City, Electro Entprs.	405-427-6591
PA	Philadelphia, Shap Elctrns.	215-969-3300
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TN	Nashville, Electra Distrs.	615-329-3971
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Geophysical Supp.	713-666-4100
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
WA	Seattle, Carlyle Tech. Sls.	206-575-6750

GOULD INC., Meas. Sys. Div., 2230 Statham Blvd., Oxnard, CA 93030, Tel: 805-487-8511, Telex: 65-9223; Empl.: 500

GOULD INC., Medical Prods. Div., 1900 Williams Dr., Oxnard, CA 93030, Tel: 805-983-1300, Telex: 182-204

GOULD INC., Micro Power Prods. Div., 2777 Eagandale Blvd., Eagan, MN 55121, Tel: 612-681-4200, Telex: 297-486; Empl.: 100; *Sls. Mgr.:* H. T. Ross; *Dist. Mgr.:* Mary Weber

GOULD INC., Motion Control Div., 2701 N. Green Bay Rd., Racine, WI 53404, Tel: 414-637-6591, Telex: 201-309

GOULD INC., POWER CONVERSION DIV., See RTE DELTEC CORPORATION

GOULD INC., Programmable Control Div., Box 83, S.V.S., Andover, MA 01810, Tel: 617-475-4700, Telex: 947-402, TWX: 710-347-6610; *Sls. Mgr.:* George Dannecker; *Dist. Mgr.:* Richard Bell

GOULD INC., Recording Systems Div., 3631 Perkins Ave., Cleveland, OH 44114, Tel: 216-361-3315; FSC No.: 96795; Empl.: 550; *Sls. Mgr.:* George Trudeau .... **3**•1380, 1384

Local Sales Offices & Reps

AZ	Mesa, Gould Inc., Recording Sys. Div.	602-833-1602
CA	Cerritos, Gould Inc., Recording Sys. Div.	213-404-1919
CA	Hayward, Gould Inc., Recording Sys. Div.	415-782-0852
CO	Englewood, Gould Inc., Recording Sys. Div.	303-781-4473
FL	Altamonte Springs, Gould Inc., Recording Sys. Div.	305-830-0695
GA	Atlanta, Gould Inc., Recording Sys. Div.	404-441-5556
HI	Honolulu, EMC Corp.	808-836-1138
IL	Elk Grove Village, Gould Inc., Recording Sys. Div.	312-640-4135
IN	Indianapolis, Gould Inc., Recording Sys. Div.	317-842-4484
MD	Greenbelt, Gould Inc., Recording Sys. Div.	301-345-0050
MA	Burlington, Gould Inc., Recording Sys. Div.	617-272-0750
MI	Madison Heights, Gould Inc., Recording Sys. Div.	313-588-4020
MN	Minneapolis, Gould Inc., Recording Sys. Div.	612-544-5253
MO	Florissant, Gould Inc., Recording Sys. Div.	314-921-3444
NJ	Saddle Brook, Gould Inc., Recording Sys. Div.	201-845-0220
NM	Albuquerque, Gould Inc., Recording Sys. Div.	505-292-4063
NY	Albany, Gould Inc., Recording Sys. Div.	518-584-7999
NY	Rochester, Gould Inc., Recording Sys. Div.	716-235-4980
NC	Greensboro, Gould Inc., Recording Sys. Div.	919-275-1978
OH	Centerville, Gould Inc., Recording Sys. Div.	513-433-9586
OH	Cleveland, Gould Inc., Recording Sys. Div.	216-361-3315
PA	Malvern, Gould Inc., Recording Sys. Div.	215-647-2214
PA	Pittsburgh, Gould Inc., Recording Sys. Div.	412-923-2970
TN	Hermitage, Gould Inc., Recording Sys. Div.	615-754-7100
TX	Dallas, Gould Inc., Recording Sys. Div.	214-634-2131
TX	Houston, Gould Inc., Recording Sys. Div.	713-680-1121
VA	Richmond, Gould Inc., Recording Sys. Div.	804-282-5533
WA	Bellevue, Gould Inc., Recording Sys. Div.	206-453-2461

GOULD DATAMETRICS, See Datametrics Inc.

GOWANDA ELCTRNS., 1 Industrial Pl., Gowanda, NY 14070, Tel: 716-532-2234, TWX: 710-529-1211; FSC No.: 24226; Empl.: 200; *Sls. Mgr.:* K. Strohmeyer

GOW-MAC INSTR. CO., P.O. Box 32, Bound Brook, NJ 08805, Tel: 201-560-0600, Telex: 833-174; Empl.: 40; *Sls. Mgr.:* R. J. Mathieu

Local Sales Offices & Reps

CA	Anaheim, Applied Instr. Corp.	714-535-6551
CA	Danville, Western Scientific Assoc.	415-837-4622
MD	Edgewater, Gow-Mac Instr. Co.	301-956-5641
MO	St. Louis, P.J. Cobert Assocs.	314-423-8388
NM	Albuquerque, Hiltech	505-268-1733
NC	Pinehurst, Tri Sci. Co.	919-295-6112
OR	Portland, Extech Ltd.	503-292-9219
TX	Houston, Indl. Sci. Corp.	713-528-1258
UT	Salt Lake City, Instrmn. Sls.	801-277-2044

GRADO LABS., 4614 Seventh Ave., Brooklyn, NY 11220, Tel: 212-435-5340

GRALEX INDS., 155 Marine St., Farmingdale, NY 11735, Tel: 516-694-3600, TWX: 510-224-6406; FSC No.: 11332; Empl.: 25; *Sls. Mgr.:* Moe Wind

GRA-MAR INC., 3165 McCrory Pl., Ste. 265, Orlando, FL 32803, Tel: 305-894-3351, TWX: 810-850-0125; FSC No.: 58-12-31006-40

GRAND TRANSFORMERS, Box 188, Grand Haven, MI 49417, Tel: 616-842-5430; Empl.: 125; *Sls. Mgr.:* G. V. Retzlaff

GRANGER ASSOCS., 3101 Scott Blvd., Santa Clara, CA 95051, Tel: 408-727-3101, Telex: 34-8380; Empl.: 750; *Sls. Mgr.:* Rick Green

GRANITE STATE CIRCUITS, Power Elctrns. Corp., P.O. Box 2208, 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334, TWX: 510-297-4462; *Sls. Mgr.:* Robert S. Karstedt

GRANT HARDWARE CO., Div. of Grant Inds. Inc., 7 Hoover Ave, Haverstraw, NY 10927-1092, Tel: 914-EL8-4400, TWX: 914-358-3541; FSC No.: 83508; Empl.: 490; *Sls. Mgr.:* F. Centrillo

Local Sales Offices & Reps

CA	Canoga Park, Catlin Inds.	213-347-0444
CA	City of Industry, Grant Hardware Co.	213-686-2110
CA	Santa Clara, Nova-Tronix	408-243-9530
CO	Arvada, Challege Sls.	303-427-3149
FL	Ft. Lauderdale, Electro-Comp Assocs.	305-491-4141
IL	Des Plaines, Lincoln, Hodges & Assocs.	312-297-3810
KS	Overland Park, J. Singer Indl. Sls. Corp.	913-381-3684
MA	Lexington, E.F. Del Fino Co.	617-938-1217
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	St. Paul, Repco	612-642-2828
NJ	Fort Lee, Necco	201-461-2789
NJ	Ridgefield, M - D Inds.	201-941-3113
NY	Binghamton, Precision Sls.	607-648-3686
NY	Liverpool, Precision Sls.	315-451-3480
NC	Charlotte, J. Corn Assocs.	704-552-0991
OH	Cincinnati, Tri State Mktg.	513-761-7993
OH	Cleveland, Carter McCormic & Peirce	216-779-5100
OH	Englewood, Carter McCormic & Peirce	513-836-0951
TX	Dallas, Blackburn Assocs.	214-692-8885
WA	Seattle, Norwest Co.	206-282-3707
WI	Waukesha, Lincoln, Hodges & Assoc.	414-542-3087

GRANT TECHNOLOGY SYS. CORP., 11 Summer St., Chelmsford, MA 01824, Tel: 617-256-8881; Empl.: 15; *Sls. Mgr.:* V.P.T. McLeod

GRAPHITE METALLIZING CORP., 1036 Nepperhan Ave., P.O. Box 110, Yonkers, NY 10702, Tel: 914-968-8400, Telex: 13-1571; Empl.: 178; *Sls. Mgr.:* W. W. Walker .... **1B**•1156

GRAPHTEC SERVICES, INC., 1600 N.W. Madrid Way, Boca Raton, FL 33432, Tel: 305-392-3373; Empl.: 12; *Sls. Mgr.:* Ralph D. Pistor

GRASSLIN CONTROLS CORP., Dieter Grasslin Feinwerktechnik, 45 Spear Rd., Ramsey, NJ 07446, Tel: 201-825-9696, Telex: 135038; Empl.: 5

GRAYHILL INC., 569 Hillgrove Ave., La Grange, IL 60525, Tel: 312-354-1040, Telex: 6871375 GHLG UW, TWX: 910-683-1850; FSC No.: 5930; Empl.: 1000; *Sls. Mgr.:* John A. Udisches; *Dist. Mgr.:* Robert J. Ferrel .... **1B**•1414, 1415, 1629-1645, 1772-1779; **2**•1294

Local Sales Offices & Reps

AL	Huntsville, Rep, Inc.	205-881-9270
AZ	Phoenix, Mercury Engrg. Sls.	602-244-0123
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Los Altos, Nickerson-Gray Assoc.	415-941-5777
CA	San Diego, Earle Assocs.	619-278-5441
CO	Denver, Lindberg Co.	303-758-9033
FL	Ft. Lauderdale, Newell-Hynes	305-761-1113
GA	Tucker, Rep, Inc.	404-938-4358
IL	La Grange, Grayhill Inc.	312-354-1040
IN	Ft. Wayne, Menze Sls.	219-747-5616
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Overland Park, PMR Inc.	913-381-0004
KS	Wichita, PMR Inc.	316-684-4141
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MA	Wellesley Hills, Newscott Co.	617-444-1923
MI	Troy, C. B. Jensen & Assoc.	313-643-0506
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Maryland Hgts., PMR Corp.	314-569-1220
NJ	Marlton, Naudain Assoc.	609-983-5300
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Great Neck, Tylinski Assocs.	516-466-9070
NY	Ithaca, B. Dean Inc.	607-257-1111
NC	Charlotte, R. W. Chapman & Co.	704-525-2421
NC	Greensboro, R. W. Chapman	919-282-0740
NC	Raleigh, R. W. Chapman	919-782-2624
OH	Cleveland, A. H. Baier Co. & Assoc.	216-461-6161
OH	Dayton, A. H. Baier Co. & Assoc.	513-276-4128
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TN	Jefferson City, Rep, Inc.	615-475-4105
TX	Arlington, W. Pat Fralia Co.	817-640-9101
TX	Austin, W. Pat Fralia Co.	512-835-7911
TX	Houston, W. Pat Fralia Co.	713-772-1572
UT	Salt Lake City, Lindberg Co.	801-467-1794
WA	Bellevue, Eltech, Inc.	206-643-4330
WI	Milwaukee, Badgerep	414-258-6630

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, Fisher/Brownell	602-967-1464
AZ	Phoenix, Kachina Elctrns.	602-269-6201
AZ	Tempe, Richey/Western Electrns.	602-894-9251
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Alhambra, Fisher/Brownell	213-289-0255
CA	Anaheim, R. V. Weatherford Co.	714-634-9600
CA	Glendale, R. V. Weatherford Co.	213-849-3451
CA	Los Angeles, Electric Switches	213-660-1310
CA	Riverside, Electronic Supp.	714-683-7300
CA	San Diego, Fisher/Brownell	619-560-8545
CA	San Diego, Richey/Western Electrns.	619-271-4511
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Sun Valley, Richey/Western Electrns.	213-875-2862
CA	Sunnyvale, R. V. Weatherford Co.	408-738-8694
CO	Denver, Ragon Elctrns.	303-777-9430
CO	Denver, Newark Elctrns.	303-757-3351
CO	Denver, CSID Inc.	303-292-9594
CT	Bethel, Heilind Elctrns.	203-797-8600
CT	Wallingford, Midan Elctrns.	203-265-2077
FL	Ft. Lauderdale, Powell Elctrns.	305-972-4300
FL	Ft. Lauderdale, Peerless Radio	305-973-4141
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Norcross, A-A Elec.	404-449-8670
HI	Honolulu, Precision Radio	808-537-5291
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IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Palatine, Ohm Elctrn.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Genesis Elctrns.	317-637-5571
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Deeco Inc.	319-365-7551
KS	Wichita, LComp, Inc.	316-265-5100
MD	Baltimore, Resco	301-823-0070
MD	Columbia, Powell Elctrns.	301-621-4070
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Kensington, Marine Air Supp.	301-949-9560
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MN	Minneapolis, Newark Elec.	612-331-6350
MN	Minneapolis, Stark Elctrns.	612-332-1325
MN	St. Paul, Gopher Elctrns.	612-483-3322
MS	Jackson, Ellington Elctrn. Supp.	601-355-0561
MO	Kansas City, LComp, Inc.	816-221-2400
MO	Maryland Hgts., LComp, Inc.	314-291-6200
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NE	Lincoln, Scott Elctrns.	402-466-8221
NH	Hudson, Heilind Elctrns.	603-883-9536
NJ	East Hanover, State Elec.	201-887-2550
NJ	Mt. Laurel, Jerseyswitch, Inc.	609-778-8190
NM	Albuquerque, Walker Elctrn. Supp.	505-247-2288
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Bohemia, Car-Lac Elctrns.	516-567-4200
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Endwell, A.S.I. Elctrns.	607-754-3823
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rome, Rome Elctrns.	315-337-5400
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Dayton, Stotts-Friedman	513-298-5555
OK	Oklahoma City, Electro Entprs.	405-427-6591
OK	Tulsa, Oil Capitol Elctrns.	918-622-8520
OR	Beaverton, Component Resources	503-641-8488
OR	Portland, United Radio	503-233-5346
PA	Erie, REM Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-232-5999
PA	Philadelphia, Herbach & Rademan	215-426-1700
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PA	Philadelphia, Powell Elctrns.	215-365-1900
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PA	Pittsburgh, CAM/RPC	412-782-3770
PA	Reading, George D. Barbey Co.	215-376-7451
RI	Pawtucket, Major Edwards Elctrns.	401-781-8000
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SC	Greenville, Hammond Elctrns.	803-233-4121
TX	Dallas, Harrison Equip. Co.	214-239-2750
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Kent Elctrns.	713-780-7770
TX	Stafford, Harrison Equip.	713-879-2600
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Seattle, R. V. Weatherford Co.	206-575-1340
WI	Milwaukee, Marsh Elctrns.	414-475-6000

GREENLEE TOOL CO., 2330 23rd Ave., Rockford, IL 61108, Tel: 815-399-3903

GREENRAY INDS., INC., 840 W. Church Rd., Mechanicsburg, PA 17055, Tel: 717-766-0223, TWX: 510-650-4939; FSC No.: 16681; Empl.: 65; *Sls. Mgr.:* D. R. Widener

Local Sales Offices & Reps

AZ	Scottsdale, Faser Technical Sls.	602-948-4404
CA	Inglewood, L&M Engrg. So.	213-674-6850
CA	Los Altos Hills, HB Mktg.	415-941-4080
FL	Clearwater, Electrocraft Inc.	813-576-5404
IL	Wauconda, Cudahy Sls.	312-526-2484
MD	Wheaton, Brimberg Sls. Inc.	301-946-2670
MA	Reading, Geder Assoc.	617-944-3105
NY	Huntington, Andrews & Andrews, Inc.	516-692-8686
NY	Skaneateles, Robtron Inc.	315-685-5731
NC	Burlington, P. J. Nahser Co. Inc.	919-226-8053
OH	Columbus, Tom Mulligan & Assoc.	614-457-2242
PA	Glenside, Arby Elctrns.	215-887-2317
TX	Richardson, Southwest Microwave Elect.	214-669-1195

GREGG ELEC., 608 W. Emporia, Ontario, CA 91761, Tel: 714-983-1794; FSC No.: 53014; Empl.: 8

GREIBACH INSTRS. DIV., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35

G. R. ELECTRONICS, 1640 5th St., Suite 224, Santa Monica, CA 90401, Tel: 213-395-4774, Telex: 65-2337 (BT Smedley SNM); *Sls. Mgr.:* Jillian I. Girard; *Dist. Mgr.:* Christopher E. Thomson

GRIES/DYNACAST, Div. Coats & Clark Inc., 162 Beechwood Ave., New Rochelle, NY 10801, Tel: 914-633-8600, TWX: 914-235-2188; Empl.: 600

GRIM CORPORATION, Box 67, Medford, NJ 08055, Tel: 609-267-7950, TWX: 510-683-9392; FSC No.: 21870; Empl.: 125; *Sls. Mgr.:* T. A. McGarrity .... 3•1064

GRM CORP., See Grim Corp.

GROVER PATENT PRODUCTS, 339 W. Arden Ave., Glendale, CA 91203, Tel: 213-245-4400; Empl.: 4

GRUENBERG OVEN CO., INC., P.O. Box 3246, 2121 Reach Rd., Williamsport, PA 17701, Tel: 717-326-1755; Empl.: 75; *Sls. Mgr.:* James Polk

GSE, 23640 Research Dr., Farmington Hills, MI 48024, Tel: 313-476-7875, Telex: 23-0738; Empl.: 105; *Sls. Mgr.:* Harold G. Munn

GSI

GSI CORP., 1917 Greenspring Dr., Timonium, MD 21093, Tel: 301-252-1768; FSC No.: 60990; Empl.: 28; *Sls. Mgr.:* L. B. Morgan .... 2•2102

Local Sales Offices & Reps

MD	Timonium, Roy N. Cook, Jr. & Assocs.	301-252-1161
NC	Raleigh, Barker Assocs.	919-876-0282

GTE AUTOMATIC ELEC., 400 N. Wolf Rd., Northlake, IL 60164, Tel: 312-681-7071, Telex: 72-8477, TWX: 910-226-1975; Empl.: 8,000; *Sls. Mgr.:* J. E. Murphy

GTE CORP., Sylvania Emissive Prods./Process Heat, Portsmouth Ave., Exeter, NH 03833, Tel: 603-772-4331, TWX: 510-294-4471; Empl.: 200000

GTE METAL LAMINATES, 1704 Barnes St., Reidsville, NC 27320, Tel: 918-342-2381; Empl.: 260; *Sls. Mgr.:* J. W. Leone

GTE MICROCIRCUITS, 2000 West 14th St., Tempe, AZ 85281, Tel: 602-968-4431, TWX: 910-951-1383; FSC No.: 16766; Empl.: 432; *Sls. Mgr.:* David Thompson

GTE PRODUCTS GRP. (SYLVANIA), See Sylvania Miniature Lighting

GTE SWITCHING & TELEPHONE PRODUCTS, 400 N. Wolf Rd., Northlake, IL 60164, Tel: 312-681-7100

GTE SYLVANIA, INC., CHEM. & METAL. DIV., See Sylvania Chemicals/Metals

GTE SYLVANIA LIGHTING PRODS., Sylvania Lighting Ctr., 100 Endicott St., Danvers, MA 01923, Tel: 617-777-1900

GTE SYLVANIA, INC., CIRCUIT MOD. OPER., See Sylvania Electronics

GTE SYLVANIA, INC., CONNECTOR PRODS. OPER., See Sylvania Connector Prods. Oper.

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GTE SYLVANIA, INC., ELCTRN. SYS. GRP., See Sylvania Elctrn. Sys. Grp.

GTE SYLVANIA, INC., STANDISH, ME, See Sylvania Control Devices

GTE SYLVANIA, INC., TECH PRODS. DIV., See Sylvania Parts

GTE SYS.-SYLVANIA SYS. GRP., Western Div., P.O. Box 7188, Mountain View, CA 94039, Tel: 415-966-2000, Telex: 415-966-3401, TWX: 910-379-6948; Empl.: 2500; *Sls. Mgr.:* Evan S. Baker; *Dist. Mgr.:* Evan S. Baker

GTE WESGO TECHNICAL CERAMICS & METALS, 477 Harbor Blvd., Belmont, CA 94002, Tel: 415-592-9440; Empl.: 500; *Sls. Mgr.:* W. S. Smith

GTI/CIRCUITS DIV., Box 217, Leesburg, IN 46538, Tel: 219-453-3261, Telex: 023-2653; Empl.: 150; *Sls. Mgr.:* Hugh M. Walker

GTI/ELCTRNS. DIV., P.O. Box 96, Hadley, PA 16130, Tel: 412-253-3161, Telex: 914-545; Empl.: 250; *Sls. Mgr.:* Richard C. Kaufman; *Dist. Mgr.:* Richard C. Kaufman

GUARDIAN CALIFORNIA, 16100 S. Figueroa St., Gardena, CA 90240, Tel: 213-532-3092, TWX: 910-344-7381; Empl.: 48; *Sls. Mgr.:* J. Antrim; *Dist. Mgr.:* K. Ross

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech Sls. Engr. Co.	205-883-9624
AZ	Phoenix, O'Donnell Assocs. SO W	602-274-6072
CA	San Jose, O'Donnell Assocs.	408-263-6500
CA	Torrance, O'Donnell Assocs.	213-539-9564
CO	Denver, Comp. Technlgy.	303-758-5750
FL	Coral Springs, CBC Elctrns.	305-755-1111
GA	Atlanta, Electro-Mech Sls. Engr. Co.	404-447-6478
IL	Chicago, Frank Nitti Sls.	312-243-1100
IN	Fort Wayne, Needler Sls.	219-447-2123
MD	Glen Burnie, Faion Lott & Co.	301-744-4611
MI	Farmington, Miltimore Sls.	313-476-2446
MN	St. Paul, Arkco Sls.	612-777-7454
MO	St. Louis, KKB & Co.	314-647-2400
NH	Salem, Sls. Engrg.	603-893-5521
NJ	Manville, DynoRep	201-685-0135
NY	Rochester, Elcom Sales	716-385-1400
OH	Mentor, K-T/Depco	216-729-3588
PA	Doylestown, T.O.E. Sls.	215-348-5333
TX	Dallas, Ion Assocs.	817-640-8282
WA	Bothell, Temco Northwest	206-488-1254

GUARDIAN ELEC. MFG. CO., 1550 W. Carroll Ave., Chicago, IL 60607, Tel: 312-243-1100, TWX: 910-221-5073 .... **1B**•1417-1431

GUILDLINE INSTRS., 2 Westchester Plaza, Elmsford, NY 10523, Tel: 914-592-9101, Telex: 145-487; Empl.: 85; *Sls. Mgr.:* W. Dietz

GULTON INDS., INC., ELCTRN. COMPS. DIV., See Gulton Inds., Inc., Piezo Products Div.

GULTON INDS., INC., Graphic Instruments Div., Gulton Ind'l. Pk., E. Greenwich, RI 02818, Tel: 401-884-6800, TWX: 710-387-1500; Empl.: 400; *Sls. Mgr.:* Dave Snyder; *Dist. Mgr.:* Ed Cunnie

GULTON INDS., INC., Piezo Prods. Div., Box 4300, Fullerton, CA 92634, Tel: 714-871-2150, TWX: 910-592-1247; Empl.: 120; *Sls. Mgr.:* J. Sloane

GULTON INDS., INC., Servonic Div., 1644 Whittier Ave., Costa Mesa, CA 92627, Tel: 714-642-2400, 800-854-4066, Telex: 183-532, TWX: 910-596-1352; FSC No.: 99564; Empl.: 320; *Sls. Mgr.:* Tom Perrin, Jr.

GUNTHER, W., GMBH, Virnsberger Strasse 51, D 8500 Nurnberg 82, West Germany, Tel: 0911/65521, TWX: 622351 Wigu d; Empl.: 260; *Sls. Mgr.:* Albert Gunther; *Dist. Mgr.:* Bob Lynch

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HACKER INSTRS., Box 657, Fairfield, NJ 07007, Tel: 201-226-8450, Telex: 642769; Empl.: 12

HADCO PRINTED CIRCUITS, Manchester Rd. Rte. 28, Derry, NH 03038, Tel: 603-432-9541, TWX: 710-366-0788; *Sls. Mgr.:* Ronald Boutin

HADES MFG. CORP., 151-A Verdi St., Farmingdale, NY 11735, Tel: 516-249-4244; FSC No.: 51578; Empl.: 18; *Sls. Mgr.:* K. Norris

HADLEY, ROBERT M. CO., INC., 750 West 51st St., Los Angeles, CA 90037, Tel: 213-234-9091

HALLMARK METALS INC., 610 W. Foothill Blvd., Glendora, CA 91740, Tel: 213-335-1263; Empl.: 20; *Sls. Mgr.:* Robert Schoenick

HALMAR ELECTRONICS, INC., 900 N. Hague Ave., Columbus, OH 43204, Tel: 614-276-0131, TWX: 810-482-1654; Empl.: 80

HALLMARK NAMEPLATE, INC./ELECTROPANEL CO., 1855 New Highway, Farmingdale, NY 11735, Tel: 516-454-0700, Telex: 510-222-0884; *Sls. Mgr.:* Florence Finkle

HAMAMATSU PHOTONICS K.K., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref, Japan, Tel: 0534-34-3311, Telex: 4225-185; Empl.: 890; *Sls. Mgr.:* M. Ito

HAMEG, INC., 88-90 Harbor Rd., Port Washington, NY 11050, Tel: 516-883-3837, TWX: 510-223-0889; *Sls. Mgr.:* John F. King

HAMILTON METALCRAFT, 848 N. Fair Oaks Ave., Pasadena, CA 91103, Tel: 818-795-4811; *Sls. Mgr.:* Mel Stahler

HAMILTON STANDARD CONTROLS/STANCOR, See Stancor/Hamilton Standard Controls

HAMILTON STD. CONTROLS, United Technologies, 9100 Airport Dr., P.O. Box 11648, Fort Wayne, IN 46859, Tel: 219-747-6142, TWX: 810-295-0699; Empl.: 3,700; *Sls. Mgr.:* C. Michalski .... **1B•1474**

Local Sales Offices & Reps

CA	Santa Fe Springs	213-946-4807
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IN	Logansport	219-753-7521
NY	New York, Roburn Agencies	212-989-5939
PA	E. Stroudsburg	717-421-1025

HAMILTON STANDARD DIV., United Technologies Corp., Windsor Locks, CT 06096, Tel: 203-623-1621

HAMLIN, Lake & Grove Sts., Lake Mills, WI 53551, Tel: 414-648-2361, TWX: 910-260-3740; Empl.: 1800; *Sls. Mgr.:* Ken Deans .... **1B•**1063, 1433, 1646, 1844

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn Co.	602-257-9015
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Boulder, R-G Entprs.	303-447-9211
CT	North Haven, Coakley, Boyd & Abbett, Inc.	203-239-6217
FL	Casselberry, Southern Elctrn. Mktg.	305-695-3334
FL	Ft. Lauderdale, Southern Electrn. Mktg.	305-475-3686
GA	Jonesboro, Wallace Elctrn. Sls.	404-471-6297
IL	Chicago, Indl. Rep.	312-647-7755
IN	Carmel, Rich Elctrn. Mktg.	317-844-8462
IN	Fort Wayne, Rich Elctrn. Mktg.	219-432-5553
IA	Cedar Rapids, Palatine Sls.	319-365-8071
KS	Mission, Palatine Sls.	913-831-0555
KY	Louisville, Rich Elctrn. Mktg.	502-499-7808
MD	Churchville, Atlantic Technical Sls.	301-879-2236
MA	Needham Heights, Coakley, Boyd & Abbett, Inc.	617-444-5470
MI	Brighton, A.P. Assocs.	313-229-6550
MN	Minneapolis, R-J, Inc.	612-866-3661
MO	Hazelwood, Palatine Sls.	314-839-0800
NH	Plaistow, Coakley, Boyd & Abbett, Inc.	617-444-5470
NJ	Marlton, Naudain Assoc.	609-983-5300
NJ	West Caldwell, Grimm Siegel	201-575-9300
NM	Albuquerque, Shefler-Kahn	505-296-0749
NY	Great Neck, Tylinski Assocs.	516-466-9070
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NY	Wappingers Falls, Bob Dean, Inc.	914-297-6406
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742
OH	Richfield, Bear Mktg.	216-659-3131
OR	Portland, Syscom	503-644-2505
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
TX	Round Rock, Allied Comps.	512-244-1166
WA	Bellevue, Testco, Inc.	206-454-7422
WI	Milwaukee, Indl. Rep.	414-259-0965

Local Distributors

AL	Huntsville, Mock Elctrns.	205-539-2401
AZ	Tempe, Circuit Specialties	602-966-0764
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	San Jose, Cypress Elctrns. Inc.	408-945-8400
CA	Santa Clara, Pyramid Elctrns.	408-727-9018
CA	Torrence, Cypress Elctrns. Inc.	213-533-6005
CA	Van Nuys, Patane Avionics	213-988-4455
CO	Englewood, Ind. Elctrns.	303-694-9444
CT	Bethel, Heilind Elctrns.	203-797-8600
CT	Hartford, Hatry Elctrns.	203-527-1881
CT	New Haven, Hatry Elctrns.	203-787-5921
CT	Stratford, Hatry Elctrns.	203-375-5866
CT	Wallingford, Sager Elect. Supp.	203-265-4600
CT	Waterbury, Hatry Elctrns.	203-755-1181
FL	Lakeland, AA Elec.	813-665-6941
FL	Longwood, Intertec Inc.	305-834-7777
FL	Miami, Elctrn. Equip. Co.	305-871-3500
FL	Orlando, Hammond Elctrn.	305-849-6060
FL	Tampa, Leader Elctrns.	813-870-3315
GA	Norcross, AA Elec.	404-449-8670
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Lombard, RM Illinois	312-932-5150
IL	Palatine, Ohm Elctrns.	312-359-5500
IN	Carmel, Altex Elctrns.	317-848-1323
IN	Ft. Wayne, Graham Elctrns.	219-424-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, RM Elctrns. Co.	317-247-9701
IA	Cedar Rapids, Iowa Radio Supp. Co.	319-393-4510
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Norwood, Gerber Elctrns.	617-769-6000
MI	Wyoming, R-M Elctrn. Co.	616-531-9300
MN	Fridley, Voyager Electronics	612-571-7766
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NH	Hudson, Heilind Elctrns.	603-883-9536
NJ	Fairlawn, Relay Spec.	201-797-3313
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Buffalo, Summit Distr.	716-884-3450
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rome, Rome Elctrns.	315-337-5400
NC	Charlotte, United Elctrn. Supp.	704-372-2650
NC	Gastonia, JMT Elctrns.	704-867-4401
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Greenville, Pair Elctrns.	919-756-2291
NC	Greenville, Hammond Elctrns.	803-232-5357
NC	Shelby, Dixie Indl. Supp.	704-482-5641
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cincinnati, Graham Elctrns.	513-772-1661
OH	Solon, Repco	216-248-8900
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Radar Elec.	503-233-3691
PA	McKeesport, Barno Radio	412-751-5966
RI	Providence, Wm. Dandreta & Co.	401-861-2800
SC	Columbia, Dixie Elctrns.	803-779-5332
TN	Gray, Dixie Elctrns.	615-477-3838
TN	Nashville, Eddie Warner Inc.	615-254-1224
TX	Austin, Harrison Equip. Co.	512-458-3555
TX	Dallas, Harrison Equip. Co.	214-239-2750
TX	Fort Worth, Allied Elctrns.	214-265-9341
TX	Houston, Harrison Equip.	713-879-2771
WA	Kent, Interface Elctrns.	206-872-5800
WA	Seattle, Radar Elec. Co.	206-282-2511
WA	Spokane, Radar Elec. Co.	509-747-3053
WI	Cedarburg, AA Elec.	414-377-7500
WI	Mequon, Taylor Elec.	414-241-4321

HAMMOND MFG. CO., 1690 Walden Ave., Buffalo, NY 14225, Tel: 716-894-5710, Telex: 91-6452; Empl.: 850; *Sls. Mgr.:* Ray Shatzel ... **1A•**2171; **2•**1036, 1037

Local Sales Offices & Reps

AZ	Scottsdale, Mahaffey & Assoc.	602-991-9790
CA	N. Hollywood, Burt Moore & Assocs.	213-877-5955
CA	Redwood City, Hickey Indl. Sls.	415-368-3849
GA	Atlanta, Millar Elctrns.	404-261-6160
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
MD	Silver Spring, Mid Atlantic Sls.	301-593-7749
MA	N. Scituate, W. A. Hendrickson Co.	617-545-0652
MI	Hazel Park, Component Assocs.	313-557-3232
MO	St. Louis, Kathrinus, Kelly & Baumhauer (K.K.B.)	314-647-2400
NY	Bellmore, Selectra Sls.	516-221-7865
NY	Syracuse, Paston-Hunter Co. Inc.	315-437-2992
NC	Raleigh, Millar Elctrns.	919-787-9564
OH	Dayton, Shamrock Elctrn. Sls.	513-258-1227
OR	Portland, Dussault & Assoc. Inc.	503-641-8780
PA	Springfield, George M. Conneen	215-544-5888
TX	Dallas, J. Y. Schoonmaker Co. Inc.	214-349-1650
WA	Seattle, Dussault & Assoc. Inc.	206-527-5454

Local Distributors

AL	Birmingham, Ack Radio	205-322-0588
AL	Montgomery, Handey's Elec. Ctr.	205-262-4885
AL	Muscle Shoals, Jones Elctrns.	205-383-1241
AZ	Phoenix, Tri Tek	602-995-9352
AZ	Phoenix, Electronic Parts Co.	602-277-7281
AZ	Tempe, Circuit Specialists	602-966-2878
AR	Ft. Smith, Carlton Bates	501-646-8201
AR	Little Rock, Carlton Bates	501-562-9100
CA	Burbank, Electronic City	213-842-5275
CA	Burlingame, Logan Elctrns.	415-697-6481
CA	Canoga Park, Sandy's Elec.	213-346-8353
CA	Chatsworth, Poco Sls.	213-700-8727
CA	Costa Mesa, Marvac Elec.	714-540-3280
CA	El Toro, R-Vac Elec.	714-586-1210
CA	Glendale, Eagle Elctrns.	213-245-2338
CA	Hollywood, Yale Radio Elec.	213-465-3186
CA	Hollywood, Pacific Radio	213-462-1392
CA	Irvine, Graymark Intl.	714-540-5480
CA	Los Angeles, I. T. C.	213-388-0621
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Dow Radio	213-681-3416
CA	Redwood City, H.D.B.	415-368-1388
CA	San Diego, Western Radio Elec.	714-239-0361
CA	San Jose, Con. Parts Inc.	408-263-9521
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Rafael, Elctrns. Plus	415-457-0466
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santee, Mouser Elec.	619-449-2300
CO	Denver, Fistell Elctrns.	303-629-1312
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Denver, Con. Parts Inc.	303-458-0978
CT	Danbury, Pilgrim Elec.	203-792-7274
CT	Hartford, Hatry Elec.	203-527-1881
CT	Hartford, Signal Elec. Center	203-233-8551
CT	Middletown, Midstate Elec.	203-347-5638
CT	New London, Aikins Elec. Supp.	203-442-4406
CT	Norwalk, Park Distrbg.	203-853-2011
CT	Norwalk, Cobra	203-853-8228
CT	Stratford, Hatry Elec.	203-375-5866
FL	Dania, Summit Elec.	305-920-6253
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Longwood, Intertec	305-834-7777
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Atlanta, Ack Radio	404-351-6340
GA	Atlanta, Wholesale Dist.	404-447-8431
HI	Honolulu, Elctrn. Equip. Co.	808-533-3884
HI	Honolulu, Honolulu Elec.	808-949-5564
IL	Chicago, Newark Elec.	312-638-4911
IL	Joliet, Mainline Elec.	815-436-3900
IL	Niles, Joseph Elec.	312-459-4030
IL	Northbrook, Classic Comps.	312-272-9650
IL	Wheeling, Hawk Elec.	312-459-4030
IN	Indianapolis, Advent Elec.	317-872-4910
IN	Indianapolis, Mar Elec.	317-875-4510
IN	Lafayette, C.W.Y. Elec.	317-448-1611
KY	Louisville, Peerless Elctrns.	502-637-7677
LA	Harvey, A.F.G. Elec.	504-368-9696
LA	New Orleans, Wm. B. Allen Supp.	504-525-8222
LA	Shreveport, Industrial Elec. Supp.	318-222-9459
MD	Beltsville, Mark Elctrns.	301-595-5040

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MD	Bethesda, Empire Elec.	301-656-3300
MD	College Park, Electronics Plus	301-441-9009
MD	Rockville, M. S. Elec.	301-340-6400
MA	Lynn, Land Elec. Supp.	617-592-2220
MA	Needham, Y.D.I. Elec.	617-449-1005
MA	Woburn, Abbott Elec.	617-935-2040
MA	Woburn, Brownell Electro.	617-935-7820
MI	Farmington Hills, Advent Elec.	313-477-1650
MI	Grand Rapids, S. F. Electrns.	616-459-0216
MI	Lansing, Demco	517-321-1700
MN	Edina, Northern Elec.	612-944-1167
MN	Minneapolis, Acme Elec.	612-338-4754
MO	Kansas City, Electronic Supp.	816-931-0250
MT	Billings, Electronic Supp. Co.	406-252-2197
NH	Dover, American Radio Corp.	603-742-6800
NH	Mason, Radio Kit	603-878-1033
NJ	Fairlawn, Relay Specialties	201-797-3313
NY	Albany, E. E. Taylor Co.	518-438-7811
NY	Buffalo, Summit Dist.	716-884-3450
NY	Buffalo, Goldcrest Elec.	716-885-5878
NY	Buffalo, Genesee Radio	716-873-9661
NY	Commack, Spartan Elec.	516-499-9500
NY	Cortland, Central Elec.	607-756-2523
NY	Deer Park, BVG Elec.	516-586-8668
NY	Glenn Falls, Ray Supp.	518-792-5848
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Johnson City, Goldcrest Elec.	607-797-2389
NY	Johnson City, Unicorn	607-798-0260
NY	Kingston, Greylock Elec.	914-338-5300
NY	Levittown, Edlie Elec.	516-735-3330
NY	Middletown, Greylock Elec.	914-343-7900
NY	N.Y.C., Martin Audio Video	212-541-5900
NY	N.Y.C., Advance Elec.	212-730-7030
NY	Port Washington, Corrector Concepts	516-883-3800
NY	Poughkeepsie, Greylock Elec.	914-452-0550
NY	Rochester, Rochester Radio	716-454-7800
NY	Rochester, Goldcrest Elec.	716-546-8464
NY	Rochester, Masline Elec.	716-546-5373
NY	Rome, Rome Elec.	315-337-5400
NY	Schenectady, Grimmers Elec.	518-374-8480
NY	Schenectady, Goldcrest Elec.	518-377-6424
NY	Syracuse, Goldcrest Elec.	315-471-7115
NY	Syracuse, Saling Elec.	315-422-2336
NY	Troy, Trojan Elec.	518-272-4481
NY	Utica, Central Elec.	315-735-6474
NY	Woodside, Switches Unltd.	212-478-5000
NC	Greensboro, Hammond Elec.	919-275-6391
OH	Cleveland, Roberts Elec.	216-238-1711
OH	Cleveland, Winteradio	216-621-9383
OH	Columbus, Thompson Elec. Supp.	614-228-6191
OH	Dayton, Stott Friedman	513-251-3633
OH	Parma Heights, Phil Reddish Supp.	216-885-1222
OH	Toledo, Warren Radio	419-248-3364
OH	Wintersville, D & R Elec.	614-264-1611
OK	Oklahoma City, Radio Inc.	405-528-2391
OK	Tulsa, Radio Inc.	918-587-9123
OK	Tulsa, Combined Tech.	918-582-8242
OK	Tulsa, Genesis Elec.	918-622-8520
PA	Drexel Hill, Kass Elec.	215-449-2300
PA	Erie, Warren Radio	814-454-5285
PA	Erie, J. V. Duncombe Elec.	814-454-5278
PA	McKean, Advacom	814-476-7774
PA	McKeesport, Barno Radio	412-751-5966
PA	Wayne, Peak Elec.	215-293-9000
RI	Cranston, OEM Supp.	401-781-3904
RI	Newport, J & S Elec. Supp.	401-847-2977
RI	Pawtucket, Major Elec. Supp.	401-725-7400
RI	Providence, Hope Elctrns.	401-521-5600
SC	Greensville, Hammond Elec.	803-242-6880
TN	Memphis, Bluff City Elec.	901-345-9500
TX	Austin, Austin Elec.	512-836-9677
TX	Corpus Christi, Douglas Elec.	512-883-5103
TX	Dallas, Wholesale Elec.	214-824-3001
TX	Dallas, Electrotex	214-234-0433
TX	El Paso, Midland Specialties	915-533-9555
TX	Ft. Worth, Wholesale Elec.	817-336-0461
TX	Ft. Worth, Allied Elec.	817-336-5401
TX	Houston, City Elec. Supp.	713-621-1060
TX	Houston, Ace Elec.	713-688-8114
TX	Houston, Electrotex	713-526-3456
TX	Long View, Vidco	214-757-4911
TX	San Antonio, Electrotex	512-735-9271
TX	San Antonio, Sherman Elec.	512-224-1001
TX	San Antonio, Altex	512-828-0503
UT	Salt Lake City, Standard Elec. Supp.	801-486-3371
UT	Salt Lake City, Western Cont.	801-328-4302
VT	Burlington, Greylock Elec.	802-658-5700
VA	Alexandria, Certified Elec.	703-548-5115
WA	Bellevue, Integrated Elec.	206-455-2727
WA	Bellevue, Nidi Northwest	206-746-7970
WI	Mequon, Lakeview Elec.	414-377-8250
WI	Mequon, Taylor Elec.	414-241-4321
WI	New Berlin, R. M. Wisconsin	414-784-4420

HAMPTON PRODS., 2995 Eastrock Dr., Rockford, IL 61109, Tel: 815-398-2770, TWX: 910-631-3432; *Sls. Mgr.:* Gary Gohlinghorst; *Dist. Mgr.:* Steve Schweitzer

H&T COMPONENTS INC., H&T Components Ltd., 87 Sand Pit Rd., Danbury, CT 06810, Tel: 203-794-1798, Telex: 643011; *Sls. Mgr.:* K. Pulasky; *Dist. Mgr.:* Janet Rapoza .... 2•1318-1328

Local Sales Offices & Reps

AL	Huntsville, D.H.R. Mktg.	205-533-5165
AZ	Phoenix, Adtek Inc.	602-931-9289
CA	Sunnyvale, Schwerin Merrill Inc.	408-735-7900
CO	Littleton, Elctrn. Comp. Sys.	303-797-2772
CT	Milford, Todino Engineering Sales	203-874-6643
FL	Casselberry, Sls. Engrg. Concepts	305-678-1035
GA	Atlanta, D.H.R. Mktg.	404-451-9848
IL	Chicago, Esco Assocs.	312-763-0800
KS	DeSoto, Midtec Assocs.	913-441-6565
MD	Columbia, Delta III Assocs.	301-730-4700
MA	Needham Heights, Todino Engrg. Sls.	617-444-7925
MI	Birmingham, Favco	313-644-0173
MN	Bloomington, D. A. Case Assocs.	612-888-8666
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Haddonfield, Mills Brown Assocs.	609-429-1005
NY	Endicott, Noeth-Honsinger Assocs.	607-754-3214
NY	Hackensack, Meg Elctrns.	201-489-7700
NY	Pittsford, Noeth-Honsinger Assocs.	716-586-9002
NC	Raleigh, McGee Assocs.	919-781-9579
OH	Akron, Augnat Assocs.	216-273-1211
OR	Portland, Barrett Squibb & Assocs.	503-644-2550
TX	Plano, Richmar Elctrns.	214-867-8224
UT	Salt Lake City, Charles Fields & Assocs.	801-277-4859
VA	Richmond, Delta III Assocs.	804-771-9204
WA	Redmond, Barrett Squibb & Assocs.	206-885-6991

Local Distributors

AZ	Phoenix, Dalis Elctrns.	602-275-2626
AZ	Tucson, Inland Elctrn. Supp.	602-294-2628
CA	Mountain View, Bell Inds.	415-960-1440
CA	S. San Francisco, Peters deLaet	415-873-9595
CA	Santa Ana, C. R. Electronics	714-556-2040
CT	Bridgeport, Accurate Elctrns.	203-366-0214
FL	Ft. Lauderdale, Simcona	305-485-4455
GA	Norcross, Whitehead Elctrns.	404-923-6667
IL	Lisle, Components Inc.	312-852-7707
IL	Rosemont, Advent Elctrns.	312-297-6200
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
LA	Lafayette, Ralphs Indl. Elctrn. Supp.	318-234-4507
MD	Baltimore, Pyttronic Inds.	301-792-0780
MA	Hopkinton, Interface Elctrns.	617-435-6858
MA	Lowell, Colonial Wire & Cable	617-459-6400
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MN	North Chatsworth, Northern Automatic	612-481-0022
NJ	Oakland, Gordon/Horne	201-337-5200
NY	Buffalo, Summit Distrs.	800-462-1880
NY	Hauppauge, Broadline Elctrns.	516-231-4100
OH	Cleveland, Roberts Elctrns.	216-238-1711
OH	Columbus, Whitehead Elctrns.	614-224-1186
OH	Dayton, Televok Inc.	513-294-4499
PA	Montgomeryville, Pyttronic Inds.	215-242-6700
TX	Dallas, Computer Components	214-239-0271
TX	Houston, Ralphs Indl. Elctrn. Supp.	713-748-4902
UT	Salt Lake City, Pen-Tec Entprs.	801-972-4817
WA	Redmond, Murphy Elctrns.	206-881-1234

HANDY & HARMAN, 850 Third Ave., New York, NY 10022, Tel: 212-752-3400; Empl.: 800; *Sls. Mgr.:* C. P. Zitzmann

HANDY & HARMAN ELCTRN. MATLS. CORP., 72 Elm St. N., Atteboro, MA 02760, Tel: 617-695-1401; Empl.: 450

HANKSCRAFT MOTORS, Div. of Gerber Prods. Co., P.O. Box 120, Reedsburg, WI 53959, Tel: 608-524-4341; Empl.: 550

HANSCOM, H. F., CO., INC., 225 Chapman St., Providence, RI 02905, Tel: 401-941-1455, Telex: 952107; Empl.: 50; *Sls. Mgr.:* William E. Taplin

HAPCO, Box 1205, Boulder, CO 80302, Tel: 303-447-0441; Empl.: 10; *Sls. Mgr.:* B. Ewing

HARBISON INDL. PRODS., Sub. of Polymer Corp., 7205 Hibbs La., Levittown, PA 19057, Tel: 215-943-9000, TWX: 510-667-0167; Empl.: 50; *Sls. Mgr.:* R. S. Spangler

HARDIGG INDS., INC., North Main St., South Deerfield, MA 01373, Tel: 413-665-2163, Telex: 955431; FSC No.: 11214; *Dist. Mgr.:* Warren H. Bickford

HARDMAN INC., 600 Cortlandt St., Belleville, NJ 07109, Tel: 201-751-3000, TWX: 710-995-4940; Empl.: 95; *Sls. Mgr.:* Carl T. Sanford

HAROWE SERVO CONTROLS, Westtown Rd. at West Chester Pike, W. Chester, PA 19380, Tel: 215-692-2700, Telex: 83-5486, TWX: 510-663-0335; FSC No.: 06989; Empl.: 450; *Sls. Mgr.:* Dennis B. Daisy

HARREL, INC., 16 Fitch St., E. Norwalk, CT 06855, Tel: 203-866-2573; *Sls. Mgr.:* W. Becker .... 3•1131

Local Sales Offices & Reps

CA	Sherman Oaks, Windsor Dynamics	213-989-3631
CA	Walnut Creek, Viking Instr.	415-933-1221
NY	Cazenovia, P. M. Decew, Inc.	315-065-8602
NC	Charlotte, Beck Sls.	704-366-5366
OH	North Olmstead, Odessa Instr. Co.	216-734-6777
PA	Elkins Park, Edwin F. Gregg	215 CA4-0248
TN	Knoxville, Robert Olsen Co.	615-688-4038

HARRIS CIRCUITS MFG., 2706 Colley Ave., Norfolk, VA. 23517, Tel: 804-467-1116; Empl.: 15

HARRIS CORP., Computer Systems Div., 2101 W. Cypress Creek Rd., Ft. Lauderdale, FL 33309, Tel: 305-974-1700, TWX: 510-956-3096; FSC No.: 29436; Empl.: 1000; *Sls. Mgr.:* Jeff Oromaner

HARRIS CORP., Dracon Div., 809 Calle Plano, Camarillo, CA 93010, Tel: 805-987-9511, Telex: 182327; Empl.: 360; *Sls. Mgr.:* Tom Sadowski; *Dist. Mgr.:* Keith Boutillier

HARRIS CORP., PRD Elctrns. Div., 6801 Jericho Tpke., Syosset, NY 11791, Tel: 516-364-0400, TWX: 510-222-4494; FSC No.: 77327; Empl.: 1,850; *Sls. Mgr.:* R. A. Lebowitz

HARRIS MICROWAVE SEMICONDUCTOR, 1530 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-262-2222, TWX: 910-338-2247

HARRIS SEMICONDUCTOR, Box 883, Melbourne, FL 32901, Tel: 305-724-7400, TWX: 510-959-6259; FSC No.: 34371; Empl.: 2300; *Sls. Mgr.:* Dan McCranie; *Dist. Mgr.:* Charles H. Beaty

HARSHAW FILTROL PARTNERSHIP, 1945 E. 97th St., Cleveland, OH 44106, Tel: 216-721-8300; *Sls. Mgr.:* Robert Anfang

HARTLEY PRODS., 620 Island Rd., Ramsey, NJ 07446, Tel: 201-327-4443; *Sls. Mgr.:* R. Schmetterer

HARTMAN SYSTEMS, Figgie Intl., 360 Wolf Hill Rd., Huntington Sta., NY 11746, Tel: 516-427-7500, TWX: 510-226-6982; FSC No.: 92220; Empl.: 310; *Sls. Mgr.:* Robert Griffith

HARTWELL CORP., 900 S. Richfield Rd., Placentia, CA 92670, Tel: 714-993-4200, Telex: 683-485, TWX: 910-596-1294; FSC No.: 83014; Empl.: 425

HARWIL, 1548 17th St., Santa Monica, CA 90404, Tel: 213-829-2310; Empl.: 7

HASCO COMPS., INC., 214-22 Waters Edge Dr., Bayside, NY 11360, Tel: 212-428-5155, TWX: 710-582-5750; Empl.: 6; *Sls. Mgr.:* Tab Hauser .... 1B•1436-1442, 1647

HAYDON SWITCH & INSTR., 1500 Meriden Rd., P.O. Box 3329, Waterbury, CT 06705, Tel: 203-756-7441, Telex: 643852 - HSIINTLWBY; FSC No.: 02005; Empl.: 291; *Sls. Mgr.:* Scott Moulton

HAZELTINE CORP., 500 Commack Rd., Commack, NY 11725, Tel: 516-462-5100, Telex: 64-0525, TWX: 510-226-0239; Empl.: 2,500

H-A-Z LABORATORIES, Brass Castle Rd., P.O. Box 67-M, Washington, NJ 07882, Tel: 201-689-0110; *Sls. Mgr.:* Henry Zajac

HBS EQUIPMENT DIV., 3000 Supply Ave., Los Angeles, CA 90040, Tel: 213-726-3033, TWX: 910-580-3179; Empl.: 40; *Sls. Mgr.:* K. Lowery

HDR POWER SYS., INC., 600 Oakland Park Ave., Columbus, OH 43214, Tel: 614-262-6832, Telex: 246524; Empl.: 41; *Sls. Mgr.:* Harlan W. Bates

HDS INC., 12310 Pinecrest Rd., Reston, VA 22091, Tel: 703-620-6200, Telex: 64585; Empl.: 54

HEADWAY RESCH., INC., 3713 Forest La., Garland, TX 75042, Tel: 214-272-5431, Telex: 73-0257; Empl.: 50; *Sls. Mgr.:* Mina Kelly

Local Sales Offices & Reps

CA	Santa Clara, California Tech. Svcs.	408-496-1156/57
CA	Tarzana, California Tech. Svcs.	213-343-3131
NY	New Rochelle, East Coast Sls. Co.	914-636-4325

HEATH CO., Benton Harbor, MI 49022, Tel: 616-982-3886, Telex: 72-9421

HEAT SYSTEMS-ULTRASONICS, INC., 1938 New Highway, Farmingdale, NY 11735, Tel: 516-694-9555, Telex: 14-3101; *Sls. Mgr.:* Lyle E. Cady

HECON CORP., 31 Park Rd., Tinton Falls, NJ 07724, Tel: 201-542-9200, Telex: 13-2457; Empl.: 200; *Sls. Mgr.:* P. Shine; *Dist. Mgr.:* R. Drum

HEI, INC., 1495 Steiger Lake La., Victoria, MN 55386, Tel: 612-443-2500, TWX: 910-578-3961; Empl.: 175; *Sls. Mgr.:* R. D. Young .... 1B•1219

Local Sales Offices & Reps

AL	Huntsville, REP, Inc.	205-881-9270
AZ	Phoenix, Toward Engrg.	602-955-3193
AR	Little Rock, Quad State	501-680-9588
CA	Los Angeles, MASCO	714-525-0866
CA	Mountain View, Leddy Assocs.	415-969-6313
CO	Aurora, Ausco Sls.	303-750-3846
FL	Coral Springs, CBC Elctrns.	305-755-1111
FL	Longwood, CBC Elctrns.	305-831-5380
GA	Tucker, REP, Inc.	404-938-4358
IL	Schaumburg, Micro-Tex	312-885-1131
KS	De Soto, Midtec Assocs.	913-441-6565
MI	Novi, Miltimore Sls.	313-349-0260
NH	Salem, Sls. Engrg.	603-893-5521
NJ	Pitman, Colrud Corp.	609-589-5866
NY	Massapequa, Coughlin Assoc.	516-799-7743
NY	Rochester, D. L. Eiss Assocs.	716-328-3000
NC	Raleigh, REP, Inc.	919-851-3007
OH	Rocky River, Norm Case Assocs.	216-333-0400
TN	Jefferson City, REP, Inc.	615-475-9012
TX	Dallas, Quad State Mktg.	214-680-9588
WA	Bellevue, Comtec	206-453-1188

HEINEMANN ELEC. CO., Brunswick Pike, Alt. Rte. 1, P.O. Box 6800, Lawrenceville, NJ 08648-0800, Tel: 609-882-4800, Telex: 843431; FSC No.: 74193; Empl.: 625; *Sls. Mgr.:* R. E. Delaney .... 1B•1266, 1267

Local Sales Offices & Reps

AL	Birmingham, Austin Brown Assocs. Inc.	205-822-6198
AZ	Phoenix, O'Donnell Assocs. SW	602-944-9542
CA	Chatsworth, Porter Co.	818-700-0808
CA	San Diego, Porter Co.	619-275-0641
CA	San Jose, O'Donnell Assocs. No.	408-263-6500
CO	Englewood, Computech Mktg.	303-773-3981
FL	Boca Raton, Conley & Assoc.	305-395-6108
FL	Oviedo, Conley & Assocs.	305-365-3283
FL	Tampa, Conley & Assocs.	813-885-7658
GA	Atlanta, Austin Brown Assocs. Inc.	404-457-6381
IL	Chicago, D. Dolin Sls.	312-286-6200
IN	Ft. Wayne, O.H. Bromberg & Assocs.	219-456-6010
KY	Louisville, O.H. Bromberg & Assocs.	502-245-8916
MD	Pikesville, Imagitron Sls. Co.	301-521-2020
MA	Framingham, Sullivan Tech. Sls.	617-620-0195
MI	Southfield, L. H. Dickelman Co.	313-353-8210
MN	Minneapolis, Furber/Smith Assoc.	612-881-3620
MO	Creve Coeur, Hill & Co.	314-432-1136
NJ	Ridgewood, Ballou, Inc.	201-444-6990
NY	Rochester, Canavan-Scanlon	716-424-1830
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Charlotte, J. Rudisill Assocs.	704-377-6901
OH	Cincinnati, O.H. Bromberg & Assocs.	513-771-9333
OH	Cleveland, Brown Elect. Prod.	216-331-2072
OH	Dayton, KW Elctrn. Sls.	513-890-2150
PA	Allison Park, KW Electrn. Sls.	412-487-4300
PA	Washington Crossing, DVS Co.	215-493-4642
TN	Brentwood, Austin Brown Assocs. Inc.	615-373-2068
TX	Dallas, Glidden Electro Equip.	214-341-0610
TX	Houston, Glidden Electro Equip.	713-681-1415
WA	Mercer Island, Andersen Assocs.	206-232-0484
WI	Elm Grove, Key Entpr.	414-784-3390

Local Distributors

AL	Montgomery, Southern Controls	205-277-5030
CA	Burlingame, Campbell & George	415-697-2965
CA	Chatsworth, POCO Sls.	818-700-8727
CA	San Jose, Cazco Sls.	408-263-6503
CO	Denver, CSID Inc.	303-292-9594
CT	Hartford, L. E. Whelan Co.	203-246-5694
CT	New Haven, Green Shaw Co.	203-397-0710
FL	Oviedo, Dixie Sls.	305-365-5211
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Nedco Elctrns.	312-286-5565
IL	Northbrook, Classic Comps. Supp.	312-272-9650
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Edwardville, C. Tennant & Sons	913-441-1801
MD	Baltimore, Automation Indl. Control	301-747-0044
MA	Boston, Apparatus Svc.	617-787-1300
MA	Framingham, Cavalier Comps.	617-875-2000
MA	Newton, Green Shaw Co.	617-969-8900
MI	Southfield, Michigan Lectrols Corp.	313-353-1350
MN	Minneapolis, Northland Elec. Supp.	612-341-6100
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Trenton, Automation Controls & Equip.	609-882-6330
NJ	West Caldwell, L. E. Whelan Co.	201-575-5880
NY	Binghamton, Pioneer/Harvey Elctrns.	607-748-8211
NY	Syracuse, Baldwin Hall	315-463-9251
NY	Whitestone, Power Electro Supp. Co.	212-767-1447
NC	Charlotte, Joyce Sls. Co.	704-377-1555
OH	Cincinnati, Cartessa Corp.	513-385-7700
OH	Dayton, Duellman Elec.	513-461-5010
OH	Solon, REPCO Elctrns.	216-248-8900
OH	Valley View, Newark Elctrns.	216-447-8860
OR	Portland, Platt Elec. Supp.	503-228-6121
OR	Tualatin, North Coast Elec. Co.	503-684-2570
PA	Washington Crossing, Riverside Comps.	215-493-4642
PA	West Chester, West Chester Elec. & Electrn.	215-696-7500
TN	Chattanooga, Techni-Tronics	615-875-5449
TX	Dallas, Geeco Sls. Co.	214-341-2626
VA	Charlottesville, Va. Radio Supp. Co. Inc.	804-296-4184
WI	Milwaukee, Hunt Co.	414-383-1781

HEINEMANN ELECTRIC CO., P.O. Box 6800, Lawrenceville, NJ 08648-0800, Tel: 609-882-4800

HEITZ, KARL, INC., P.O. Box 427, Woodside, NY 11377, Tel: 212-565-0004; Empl.: 15

HELICAL PRODS. CO., INC., Box 1069, Santa Maria, CA 93456, Tel: 805-928-3851, TWX: 910-351-5856; FSC No.: 13201; Empl.: 41

HELIONETICS, INC., DECC Div., 17312 Eastman St., Irvine, CA 92714, Tel: 714-546-4731, 800-421-7915, TWX: 910-595-2829; *Sls. Mgr.:* R. S. Tullock

HELLESENS BATTERY ENGRG., INC., A/S Hellesens, 1636 Hyde Park Ave., Hyde Park, MA 02136, Tel: 617-361-7555, Telex: 940536 BOSTELEX; FSC No.: 60289; *Sls. Mgr.:* James Epstein

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HENES PRODS., 4301 E. Madison St., Phoenix, AZ 85034, Tel: 602-275-4126; Empl.: 25

HENSCHEL, 14 Cedar St., Amesbury, MA 01913, Tel: 617-388-1103, Telex: 94-7444; FSC No.: 28199; Empl.: 180

HERAEUS-VOLKERT INC., 222-34 96th Ave., Queens Village, NY 11429, Tel: 212-464-8400, Telex: 142338; Empl.: 250; *Sls. Mgr.:* Len Lattanzi

HERBERT PRODS. INC., 180 Linden Ave., Westbury, NY 11590-0384, Tel: 516-334-6500, TWX: 510-222-5963; Empl.: 98; *Sls. Mgr.:* L. C. Peshkin

HERMETIC SEAL, 4232 Temple City Blvd., Rosemead, CA 91770, Tel: 818-283-0411, TWX: 910-587-3352; FSC No.: 04820; Empl.: 220

HERMETIC SWITCH, Box 1325, Hwy. 92, Chickasha, OK 73018, Tel: 405-224-4046, Telex: 796125 Hermetic CKSA; Empl.: 150; *Sls. Mgr.:* E. R. Andrus .... 1B•1648

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MN	Minneapolis, Peterson Sls. & Assocs.	612-944-0030
NY	Oceanside, Current Inds.	516-678-3895
OR	Beaverton, LD Elctrns.	503-649-8556
PA	Furlong, Avenir	215-348-8290
TX	Austin, R. F. Kimball Co.	800-442-4506
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	(Boise, ID #) 208-343-2741

HERTNER DIV., 12690 Elmwood Ave., Cleveland, OH 44111, Tel: 216-252-4242, Telex: 98-5552; Empl.: 125; *Sls. Mgr.:* S. Steven

HERTZ FILTER, 3 Aerial Way, Syosset, NY 11791, Tel: 516-822-4770; Empl.: 22 .... **1A•1598**

HEURIKON CORP., 3001 Latham Dr., Madison, WI 53713, Tel: 608-271-8700; Empl.: 55; *Sls. Mgr.:* C. M. Priebe .... **3•1082-1084**

Local Sales Offices & Reps

CA	N. Hollywood, Qualtech	213-765-1419
CA	Orange, Qualtech	714-639-9820
CA	Palo Alto, Qualtech	415-494-9060
CA	San Diego, Mesa Engrg.	619-278-8021
CO	Denver, PAR Assocs.	303-371-4140
GA	Atlanta, Magaro & Assocs.	404-451-8862
KS	Prairie Village, Panatek	913-362-3349
MD	Rockville, Spectro Assocs.	301-279-2010
MA	Waltham, Daner-Hayes	617-894-7290
MN	Minneapolis, Micro Resources	612-830-1454
NY	Brewster, Daner-Hayes	800-225-8760
OH	Cincinnati, Applied Data Management	513-579-8108
TX	Houston, Acudata	713-488-8195
TX	Plano, Acudata	214-424-3567
UT	Centerville, PAR Assocs.	801-292-8145

HEWLETT-PACKARD CO., P.O. Box 301, 815 Southwest 14th St., Loveland, CO 80537, Tel: 303-667-5000

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HEWLETT-PACKARD CO., 1820 Embarcadero Rd., Palo Alto, CA 94303, Tel: Call Local Sls. Off.; Empl.: 68,000 .... **3•1585-1588**

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AZ	Phoenix	602-273-8000
AZ	Tucson	602-889-4631
CA	Fresno	209-221-6821
CA	Fullerton	714-870-1000
CA	Lawndale	213-970-7500
CA	North Hollywood	213-877-1282
CA	Palo Alto	415-857-8000
CA	Sacramento	916-929-7222
CA	San Diego	714-279-3200
CA	Santa Ana	714-641-0977
CA	Santa Clara	408-988-7000
CO	Englewood	303-771-3455
CT	Wallingford	203-265-7801
FL	Ft. Lauderdale	305-973-2600
FL	Orlando	305-859-2900
GA	Atlanta	404-955-1500
HI	Honolulu	808-526-1555
IL	Bloomington	309-663-0383
IL	Downers Grove	312-960-5760
IL	Rolling Meadows	312-255-9800
IN	Indianapolis	317-842-1000
IA	Iowa City	319-351-1020
LA	Kenner	504-463-6201
MD	Hanover	301-796-7700
MD	Rockville	301-948-6370
MA	Lexington	617-861-8960
MI	Farmington Hills	313-476-6400
MN	St. Paul	612-644-1100
MO	Kansas City	816-763-8000
MO	St. Louis	314-878-0200
NV	Las Vegas	702-736-6610
NJ	Eatontown	201-542-1384
NJ	Paramus	201-265-5000
NJ	Piscataway	201-981-1199
NM	Albuquerque	505-292-1330
NM	Las Cruces	505-526-2484
NY	Albany	518-458-1550
NY	Clarence	716-759-8621
NY	Fairport	716-223-9950
NY	Poughkeepsie	914-462-7683
NY	Syracuse	315-455-2486
NY	Woodbury	516-921-0300
NC	Greensboro	919-852-1800
OH	Cleveland	216-243-7300
OH	Columbus	614-436-1041
OH	Dayton	513-859-8202
OK	Oklahoma City	405-721-0200
OR	Wilsonville	503-682-8000
PA	King of Prussia	215-265-7000
PA	Pittsburgh	412-782-0400
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TX	Houston	713-776-6400
TX	Richardson	214-231-6101
TX	San Antonio	512-434-8241
UT	Salt Lake City	801-974-1700
VA	Richmond	804-285-3431
WA	Bellevue	206-643-4000
WA	Spokane	509-922-7000
WI	Brookfield	414-784-8800
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HEXACON ELEC., 161 W. Clay Ave., Roselle Park, NJ 07204, Tel: 201-245-6200, Telex: 13-8812; Empl.: 150 .... **2•1928**

Local Sales Offices & Reps

AL	Huntsville, BJR Mfrs. Reps.	205-881-3569
AZ	Tucson, Ross IV Associates	602-299-1425
CA	Newport Beach, Ross IV Asso.	714-650-5542
CA	Sunnyvale, J. F. Peil Co.	408-730-5869
CO	Littleton, Production Equip. Sls.	303-795-5022
CT	E. Woodstock, H & M Assocs.	203-928-9442
FL	Merritt Island, J. A. Kennedy Co.	305-452-9821
IL	Elk Grove Village, Bradley Reps.	312-228-8450
IN	Indianapolis, Harvey Guenther	317-251-8143
KS	Kansas City, L. E. Bruns	913-287-5242
MD	Phoenix, B&W Mktg.	301-592-8907
MN	Fridley, Teskey & Assocs.	612-571-0876
NJ	Jersey City, Dunn & Bryan	201-963-4478
NY	New Hartford, V. Clair	315-735-8122
OH	Solon, KDF Co.	216-248-8010
OR	Gladstone, Northcoast Mfrs. Agency II	503-657-9427
PA	West Chester, B&W Mktg.	215-692-7155
TX	Dallas, P. J. Scanlon	214-231-4661
WA	Seattle, Northcoast Mfrs. Agency	206-284-5024
EXP	NY, New York, W. D. Blood & Co.	212-344-0210

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Intl	Australia, Kilkenny, Werner Elctrn. Inds.	268-2766
Intl	Austria, Braunau/Inn, Albert Berner	07722-2211
Intl	Belgium, Bruxelles, N.V. Beluma S.A.	02-427-42-15
Intl	Denmark, Herlev, Harttung Fasteners A/S	02-84-11-00
Intl	England, Wimborne, Heyco Mfg.	0202-87-14-11
Intl	Finland, Tampere, United Shoe Mach.	28-180
Intl	France, Paris, M.F.O.M.	205-67-39
Intl	Germany, Giessen, Heyman Mfg.	0641-76250
Intl	Hong Kong, North Point, S & T Entprs.	5-784-0921
Intl	Israel, Tel Aviv, Helet Trading Ltd.	216-157
Intl	Italy, Milan, Elektrozubehor	02-74-90-541
Intl	Japan, Tokyo, Hakuto Co. Ltd.	03-341-2611
Intl	Mexico, Mexico City, Retenes y Refacciones Ind.	5-754-0503
Intl	Netherlands, Diemen, Onkenhout & Onkenhout B.V.	020-90-40-40
Intl	Norway, Oslo, United Shoe Mach.	02-21-86-50
Intl	Singapore, 0923, S & T Entprs.	747-9235
Intl	South Africa, Durban, Three-D Agencies	39-23-51
Intl	South Africa, Johannesburg, Three-D Agencies	825-5065
Intl	South America - Colombia - Cordoba, Ira Export	40-4648
Intl	Sweden, Orebro, United Shoe Mach.	019-12-42-30
Intl	Switzerland, Hunzenschwil, Agro AG	064-472-61
Intl	Taiwan, Taipei, Shigma Inc.	771-3403
Can	Toronto, Cords Canada	416-787-1114

HGA ELCTRNS., 519 S. Fifth Ave., Mt. Vernon, NY 10550, Tel: 914-664-5393; Empl.: 2

HH CONTROLS CO., INC., 16 Frost St., Arlington, MA 02174, Tel: 617-646-2626; Empl.: 13

HICKOK ELEC. INSTR., 10514 DuPont Ave., Cleveland, OH 44108, Tel: 216-541-8060, TWX: 810-421-8286; Empl.: 450; *Dist. Mgr.:* T. Hayden

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Local Sales Offices & Reps

AL	Huntsville, L & D Inc.	205-837-1469
AZ	Phoenix, Westrep	602-997-8899
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Littleton, Omega	303-798-7040
FL	Clearwater, Hallmark Elctrns.	305-530-4543
FL	Melbourne, Beacon	305-724-8010
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Fort Wayne, Given Corp.	219-432-5585
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Overland Park, Advanced Tech. Sls.	913-642-6675
MD	Pikesville, Imagitron Sls. Co.	301-521-2020
MA	Bloomfield, Astrorep New England	203-967-4848
MI	Ann Arbor, Elliott Sls. Co.	313-662-4087
MN	St. Paul, Repco	612-642-2828
MO	St. Louis, Advanced Tech. Sls.	314-227-4448
NE	Lincoln, Lorenz Sls.	402-475-4660
NJ	Perth Amboy, Astrorep	201-826-8050
NY	Babylon, Astrorep	516-422-2500
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Ronkonkoma, Hallmark Elctrns.	516-737-0600
NC	Greensboro, L & D Inc.	919-292-3201
OH	Cleveland, Comps.	216-243-9200
OH	Miamisburg, Comps.	513-866-0661
OK	Tulsa, Bonser-Philhower Sls.	918-496-3236
OR	Wilsonville, RTS	503-638-5670
PA	Pittsburgh, Comps.	412-824-1600
TX	Richardson, Bonser - Philhower Sls.	214-234-8438
WA	Vashon, RTS	206-285-1363
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

AL	Huntsville, Hallmark Elctrns.	205-837-8700
AZ	Phoenix, Hallmark Elctrns.	602-243-6601
AR	Little Rock, Electro Entprs.	501-664-9207
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Chatsworth, IEC/Jaco	213-998-2200
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	San Diego, Hallmark Elctrns.	714-268-1201
CA	San Diego, Arrow Elctrns.	714-565-4800
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Ana, Norstan Elctrns.	714-540-4165
CA	Sunnyvale, Hallmark Elctrns.	408-773-9990
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Torrance, Cypress Elctrns.	213-533-6005
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Englewood, Hallmark Elctrns.	303-790-1662
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Hallmark Elctrns.	305-530-4543
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Hallmark Elctrns.	305-971-9280
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FL	Palm Bay, Arrow Elctrns.	305-725-1480

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GA	Norcross, Arrow Elctrns.	404-449-8252
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IL	Northbrook, Classic Comps.	312-272-9650
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
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MD	Baltimore, Arrow Elctrns.	301-247-5200
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MN	St. Paul, Ragon Elctrns.	612-642-2828
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NJ	Fairfield, Hallmark Elctrns.	201-575-4415
NJ	Moorestown, Arrow Elctrns.	609-235-1900
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NM	Albuquerque, Bell Inds.	505-292-2700
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NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Jaco Elctrns.	516-273-5500
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NY	Rochester, Arrow Elctrns.	716-275-0300
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NC	Winston-Salem, Arrow Elctrns.	919-725-8711
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OH	Solon, Hallmark Elctrns.	216-349-4632
OH	Wosterville, Hallmark Elctrns.	614-891-4555
OK	Oklahoma City, Electro Entprs.	405-478-1752
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TX	Austin, Hallmark Elctrns.	512-837-2814
TX	Dallas, Arrow Elctrns.	214-386-7500
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WI	New Berlin, Classic Comps.	414-786-5300
WI	Oak Creek, Arrow Elctrns.	414-764-6600
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HIGH VOLTAGE ENGRG. CORP., S. Bedford St., Burlington, MA 01803, Tel: 617-272-1313, TWX: 710-332-0245; Empl.: 750

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IL	Steamwood, Al Holte & Assocs.	312-837-4066
KS	Shawnee Mission, Florence & Meyer, Inc.	913-722-5210
MA	Topsfield, RFC Assocs.	617-887-8545
MN	Minneapolis, Wendell E. Lee & Assocs.	612-831-5056
NY	Great Neck, Cooper & Simon & Co., Inc.	516-487-1142
NY	Rochester, BKT Assocs., Inc.	716-586-5814
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
PA	W. Conshohocken, Eastern Comps. Sls. Corp.	215-825-8610
TX	Plano, B & R Elctrn Sls. Corp.	214-985-0028

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IL	Des Plaines, Edmar Elctrn. Co.	312-298-8580
IL	Elmhurst, Schuten Elctrns.	312-941-9033
IL	Melrose Park, Belford Elctrns.	312-965-2400
NJ	Clifton, J-Mar Elctrns.	201-772-6400
NY	Plainview, A.C.I. Elctrns.	516-293-6630
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PA	York, E.C.I., Inc.	717-843-8971
WA	Kent, Shannon Ltd.	206-763-0545

HILTRONICS CORP., 111 S. Liberty Dr., Stony Pt., NY 10980, Tel: 914-942-1222

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CA	Pasadena, RDX Corp.	213-681-3451
CA	San Diego, RDX Corp.	619-278-6863
CA	Sunnyvale, RDX Corp.	408-734-4500
CO	Denver, E. C. Rudy Co.	303-433-1066
CT	Meriden, Abbott Allison Co.	203-481-0405
FL	Ft. Lauderdale, Powercom Engrg. Corp.	305-463-6059
HI	Honolulu, Aloha Assocs.	808-879-5296
IL	Hawthorne Woods, Ryan & Assocs.	312-438-2905
IN	Ossian, Science Sales	219-622-7383
KS	St. Louis, Fitzgerald Sales Co.	314-862-1660
MN	Edina, Ainslie Co.	612-920-2996
NJ	East Orange, Friedman Assocs.	201-694-6200
NM	Albuquerque, Hewitt & Assocs.	505-229-7746
NY	Cazenovia, Peter De Cew Agency	315-655-8602
PA	Downingtown, Kenn Ebert-Hipotronics	215-269-5898
TX	Richardson, Hipotronics-Dusty Arnold	214-644-7607
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400

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TX	Paris, Packard Assocs.	214-785-4544
EXP	MN, Minneapolis, C. Tennant, Sons & Co. of New York	612-475-7321

Local Distributors

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TX	Paris, Electro Hardware Co.	214-785-4544

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FL	Madeira Beach, MacKay, Smith & Assocs.	813-393-7144
FL	Orlando, MacKay, Smith & Assocs.	305-277-1513
FL	St. Petersburg, MacKay, Smith & Assocs.	813-393-7144
GA	Atlanta, MacKay, Smith & Assocs.	404-449-7444
KS	Shawnee Mission, Florence & Meyer	913-722-5210
MO	St. Louis, Florence & Meyer	314-965-5117
NC	Cary, MacKay, Smith & Assocs.	919-467-5400
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
NC	Raleigh, MacKay, Smith & Assocs.	919-851-5000
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TX	Irving, AID Elctrns.	214-259-4761

HITACHI AMERICA, 1800 Bering Dr., San Jose, CA 95112, Tel: 408-292-6404, Telex: 17-1581, TWX: 910-338-2103; *Sls. Mgr.:* Jack Ordway; *Dist. Mgr.:* Michael Barthman

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CO	Broomfield, Connors Inc.	303-466-9628
GA	Doraville, Hitachi Denshi Amer. Ltd.	404-451-9453
GA	Smyrna, BC Elctrns.	404-436-5169
IL	Itasca, L-Tec	312-775-2900
IL	Melrose Park, Hitachi Denshi Amer. Ltd.	312-344-4020
IN	Indianapolis, Loren Green Assocs.	317-293-9827
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MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
MN	Eden Prairie, Electronics Instr. Conslts.	612-937-9701
NY	Auburn, ADN Enterprises	315-255-2701
OH	Westlake, KRW Sls.	216-871-7521
TX	Dallas, Hitachi Denshi Amer. Ltd.	214-233-7623
TX	Dallas, SW Mktg. Assocs.	214-341-8631
WA	Tumwater, Weeks & Assocs.	206-943-1079

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CA	Canoga Park, RAG Entprs.	213-998-6500
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CA	Palo Alto, Metermaster	415-968-0313
CA	Sacramento, Zackit Corp.	916-446-3131
CA	San Diego, Instrument Engrs.	619-278-8037
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CO	Boulder, Instr. Repair Labs	303-449-2721
CO	Denver, CW Elctrns. Sls.	303-832-1111
CT	Norwalk, Park Distrs.	203-853-2011
CT	West Hartford, Signal Elctrn. Center	203-233-8551
FL	Ft. Lauderdale, Southeastern	305-563-4131
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FL	Tampa, Hammond Elctrns.	813-253-0104
GA	Decatur, EME II	404-325-0165
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IL	S. Holland, Union Elctrns.	312-333-4100
IA	Davenport, Waren Radio Co.	319-322-5301
KS	Wichita, Radio Supp.	316-267-5213
LA	Metairie, Pelican Elctrn. Supp.	504-888-4720
LA	Shreveport, Whls. Elctrn. Supp.	318-222-2063
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MA	N. Billerica, AST/Servo System	617-667-8541
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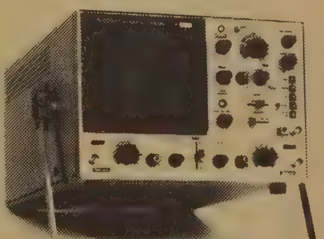

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NJ	Pinebrook, Parts Masters Inc.	201-227-7797
NM	Santa Fe, A-1 Comms. Supp.	505-982-4488
NY	Great Neck, Instr. Mart	516-487-7430
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NY	Rochester, R. Baker Elctrns.	716-586-9164
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NC	Greenville, Pair Elctrns.	919-756-2291
OK	Oklahoma City, Whls. Elctrns. Supp.	405-528-2391
OK	Tulsa, Whls. Elctrn. Supp.	918-587-5516
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PA	Philadelphia, Sunshine Sci. Inst.	215-673-5600
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TX	Austin, Whls. Elctrn. Supp.	512-478-9568
TX	Austin, Electrotex	512-476-7644
TX	Beaumont, Electrotex	713-838-6421
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TX	Ft. Worth, Whls. Elctrns. Supp.	718-429-3956
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CA	Woodland Hills, Glenn M. Stevenson Co.	213-348-5506
CT	South Windsor, Maher Assocs.	203-644-2481
FL	Orlando, Alcott Prods. Co.	305-295-5457
IL	Wood Dale, Power Prods.	312-595-1142
MA	Lynn, Maher Assocs.	617-581-3244
MI	Sheridan, MacDougall and Assocs.	517-291-3334
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
NJ	River Edge, Maher Assocs.	201-261-2225
OH	Seven Hills, Nenaoal Entprs.	216-524-4293
OR	Lake Oswego, Baxter Air Engrg.	503-635-3915
TN	Chattanooga, Wade Prods. Co.	615-266-2262
TX	Fort Worth, Terrell J. Small Co.	817-332-6352
WA	Bellevue, Baxter Air Engrg.	206-641-6118

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AL	Huntsville, MacKay, Smith & Assoc.	205-539-8000
CA	Los Angeles, RF Assocs.	213-478-1586
CA	Palo Alto, RF Assocs.	415-494-3331
CT	Ridgefield, Manning & Assoc. Inc.	203-438-5027
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FL	Ft. Lauderdale, MacKay, Smith & Assocs.	305-467-3888
FL	Orlando, MacKay, Smith & Assocs.	305-277-1513
FL	St. Petersburg, MacKay, Smith & Assocs.	813-393-7144
GA	Atlanta, MacKay, Smith & Assocs.	404-449-7444
HI	Honolulu, Aloha Assocs.	808-941-1574
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MD	Elkton, Electro-Mek Sls.	301-398-8148
MT	Billings, Calvert Controls	406-252-0064
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NJ	Woodbury, Electro-Mek Sls.	609-423-5611
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NC	Raleigh, MacKay, Smith & Assocs.	919-851-5000
OH	Dayton, Mohawk Intronics	513-434-8873
OR	Eugene, Calvert Controls	503-683-2018
OR	Portland, Calvert Controls	503-222-6473
PA	Harrisburg, Electro-Mek Sls.	717-589-7222
PA	Pittsburgh, Greye Glass Assocs.	412-366-6664
UT	Salt Lake City, Calvert Controls	801-531-8129
VA	Charlottesville, Marktron	804-973-5874
WA	Seattle, Calvert Controls	206-447-9375
WA	Spokane, Calvert Controls	509-244-3601
WA	Tri-Cities, Calvert Controls	509-545-4506

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NM	Alburquerque, Fred Board & Assoc.	505-293-1399
NY	Binghamton, Empire Technical Assoc.	607-772-0651
NC	Henderson, B.T.F., Inc.	919-438-7570
NC	Raleigh, B.T.F. Inc.	919-782-3493
OH	Dayton, Del Steffen & Assoc.	513-293-3145
OR	Portland, Barrett-Squibb	503-644-2550
TX	Dallas, Erickson Sls.	214-739-5833
UT	Salt Lake City, Electrodyne	801-486-3801
WA	Redmond, Barrett- Squibb	206-885-6991
WI	Milwaukee, Momak Sls.	414-962-9576
EXP	SC, Inman, Holmberg Elctrns.	803-472-2821
PR	Hato Rey, Karden Corp.	809-765-7355

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AZ	Mesa, Bergquist Co.	602-986-4271
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Tempe, Bell Inds., Elctrn.	602-966-7800
CA	Belmont, Lodan, Inc.	415-592-4600
CA	Cerritos, El-Com Sls.	714-739-5656
CA	Fountain Valley, Component Center	714-979-0433
CA	Irvine, Product Supply	714-641-8736
CA	Riverside, Electronic Supply	714-683-7300
CA	Sacramento, Integrated Elctrns.	916-424-5297
CA	San Diego, El-Com Sls.	619-578-0900
CA	San Francisco, Peters-De Laet	415-873-9595
CA	San Jose, Cypress Elctrns.	408-945-8400
CO	Denver, CSID Elctrns.	303-893-9594
CT	Yalesville, Schaal Assoc.	203-269-3779
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Longwood, Intertec Comps.	305-834-7777
FL	Orlando, Deanco	305-671-5100
GA	Atlanta, K.S.M.	404-458-2013
GA	Cumming, Pan American	800-554-9796
GA	Marietta, Deanco	404-429-0126
IL	Addison, K.S.M.	312-953-9473
IL	Arlington Hgts., Lodan Elctrns.	312-398-5311
IL	Lisle, Comps., Inc.	312-852-7707
IN	Indianapolis, RM Indiana	800-792-3445
IA	Cedar Rapids, Bergquist Co.	319-366-8733
MD	Baltimore, Whitney Distr.	301-944-8080
MD	Baltimore, Resco-Baltimore	301-823-0070
MD	Beltsville, Resco/Washington	301-937-9100
MD	Gaithersburg, Deanco	301-948-5444
MA	Burlington, Deanco	617-272-1506
MA	Burlington, Schaal Assocs.	617-272-7940
MA	Natick, Tec-Con	617-655-9333
MI	Grand Rapids, S&F Elec.	616-459-0216
MN	Minneapolis, Cassidy Elctrns.	612-835-7746
MN	Minneapolis, Bergquist Co.	612-835-2322
MO	Kansas City, Finnigan Elctrns.	816-421-4277
NJ	Fairfield, Deanco	201-575-7960
NJ	Whippany, Tonar Inds.	201-884-1400
NY	Hauppauge, Schaal Assocs.	516-234-4600
NY	Ithaca, Deanco	607-257-4444
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Rome, Rome Elctrns.	315-476-2033
NC	Raleigh, Century	919-872-2203
NC	Raleigh, Deanco	919-851-2065
OH	Dayton, Televox, Inc.	513-294-4499
OR	Lake Oswego, Bell Inds.	503-241-4115
OR	Lake Oswego, Rose Elctrn. Distr. Co.	503-635-8823
PA	Montgomeryville, Pytronic Ind., Inc.	215-643-2850
PA	Norristown, Century Elctrn. Comps.	215-631-5400
TN	Memphis, Nealco Dist.	901-353-1241
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Ft. Worth, Texas Connector	817-246-0109
UT	Salt Lake City, Diplomat	800-453-5503
VA	Virginia Beach, Deanco	804-460-3558
WA	Bellevue, Bell Inds.	206-747-1515
WA	Redmond, Murphy Elctrns.	206-881-1234

HOLT INC., 8 Chrysler Ave., Irvine, CA 92714, Tel: 714-859-8800, Telex: 753307; Empl.: 102; *Sls. Mgr.:* Mark Ellsberry

HOLT LLOYD CORP., LPS Chem. Prods., 4647 Hugh Howell Rd., Tucker, GA 30084, Tel: 404-934-7800, TWX: 810-766-4920; *Sls. Mgr.:* Les Gable

HOLUB INDUSTRIES, 1701 W. Bethany Rd., Sycamore, IL 60178, Tel: 815-895-6501, Telex: 25-7359; Empl.: 90; *Sls. Mgr.:* R. J. Morrison

HONEYWELL INC., Aerospace & Defense Grp., Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-5186, TWX: 910-576-2692; Empl.: 15,000

HONEYWELL INC., Commercial Div., MN 27-7246, Honeywell Plaza, Minneapolis, MN 55408, Tel: 612-870-5346

HONEYWELL INFO. SYS., 200 Smith St., MS 440, Waltham, MA 02154, Tel: 617-895-6000

HONEYWELL MICRO SWITCH DIV., See Micro Switch, a Honeywell Division

Honeywell

HONEYWELL OPTOELECTRONICS, 830 E. Arapaho Dr., Richardson, TX 75080, Tel: 214-234-4271, Telex: 73-0890; Empl.: 300; *Sls. Mgr.:* Joe Tucker; *Dist. Mgr.:* Joe Tucker ....**1B**•1112, 1113, 1220-1230

Local Sales Offices & Reps

AL	Huntsville, RM Alabama	205-852-1550
AZ	Phoenix, Cetec Elctrns.	602-272-7951
CA	Anaheim, Honeywell Optoelectronics	714-956-4410
CA	Cupertino, Western Micro	408-725-1660
CA	Glendale, Orion Sales, Inc.	213-240-3151
CA	Inglewood, Force Elctrns.	213-776-1324
CA	Irving, Cetec Elctrns.	714-250-4141
CA	San Diego, Force Elctrns.	619-569-9661
CA	San Diego, Cetec Elctrns.	619-278-5020
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	Santa Clara, Force Elctrns.	408-739-1324
CA	Santa Clara, I⅜¢2 Inc.	408-988-3400
CA	South Gate, Cetec Elctrns.	213-773-6521
CO	Denver, Integrated Elctrns.	303-534-6121
CO	Englewood, Delta Sls. Assocs.	303-741-0646
CO	Englewood, Honeywell Optoelctrns.	303-779-6541
CT	Glastonbury, Honeywell Optoelctrns.	203-659-4011
CT	Stanford, Bond	203-348-2663
DE	Huntington Valey, Knowles Assocs.	215-947-5641
FL	Coral Springs, E.P.M.	305-752-0054
FL	Ft. Lauderdale, Hammond	305-973-7103
FL	Orlando, Hammond	305-849-6060
GA	Atlanta, E.M.A. Inc.	404-448-1215
IL	Bensenville, Honeywell Optoelctrns.	312-860-3984
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Elk Grove Village, Oasis Sales	312-640-1850
IL	Lombard, RM Illinois	312-932-5150
IL	Rosemont, Advent	312-297-6200
IN	Indianapolis, Advent	317-872-4910
IN	Indianapolis, Elctrn. Sls. and Engrg.	317-849-4260
IN	Indianapolis, Advent	317-247-9701
IA	Cedar Rapids, Dy-Tronix, Inc.	319-377-8275
IA	Cedar Rapids, Advent	319-363-0221
KS	Wichita, LCOMP, Inc.	316-265-8501
KS	Wichita, LComp	316-265-8501
MD	Baltimore, Whitney	301-944-8080
MD	Baltimore, Whitney	301-944-8080
MD	Glen Burnie, Stinson Assocs.	301-760-8878
MA	Burlington, Lionex	617-272-9400
MA	Newton, Gerber Sls.	617-969-2620
MA	Newton Lower Falls, Honeywell Optoelctrns.	617-923-7675
MA	W. Newton, A. W. Mayer	617-965-1111
MI	Grand Rapids, RM Michigan	616-531-9300
MI	Novi, Action Comps.	313-349-3940
MN	Bloomington, Com-Tek Sls.	612-888-7011
MN	Minneapolis, Industrial Comp.	612-831-2666
MO	Bridgeton, Dy-Tronix, Inc.	314-731-5799
MO	Independence, Dy-Tronix, Inc.	816-373-6600
MO	Kansas City, LComp	816-221-2400
MO	Maryland Heights, LComp	314-291-6200
NH	Hudson, C&H Elctrns.	603-882-1133
NJ	Bellmawr, Mid Atlantic	609-931-5303
NJ	Fairfield, Lionex Corp.	201-227-7960
NJ	Fairfield, Lionex	201-227-7960
NM	Albuquerque, B.F.A. Corp.	505-292-1212
NM	Albuquerque, Elctrn. Devices	505-884-2950
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Endwell, Noeth Honsinger Assocs.	607-754-3214
NY	Hauppauge, Lionex	516-273-1660
NY	Ilion, Noeth Honsinger Assocs.	315-894-9943
NY	Pittsford, Noeth Honsinger Assocs.	716-586-9002
NY	Port Chester, Zeus Comps.	914-937-7400
NY	Rochester, Honeywell Optoelctrns.	716-424-2700
NC	Greensboro, Hammond	919-275-6391
NC	Raleigh, E.M.A. Inc.	919-847-8800
OH	Akron, B.J. David Corp.	216-645-0517
OH	Cincinnati, Schuster Elec.	513-489-1400
OH	Columbus, Hughes-Peters	614-294-5351
OH	Twinsburg, Schuster Elec.	216-425-8134
OR	Portland, Jas. J. Backer Co.	503-297-8744
PA	Feasterville, Knowles Assocs.	215-322-7100
PA	Horsham, Lionex	215-443-5150
SC	Greenville, E.M.A. Inc.	803-233-4637
SC	Greenville, Hammond	803-233-4121
TX	Austin, Harrison Equip. Co. Inc.	512-458-3555
TX	Dallas, Harrison Equip. Co. Inc.	214-239-2750
TX	Houston, Harrison Equip. Co. Inc.	713-879-2727
TX	Houston, Force Elctrns.	713-772-8483
TX	Irving, Force Elctrns.	214-438-5700
TX	Richardson, Honeywell Optoelctrns.	214-234-4271
UT	Salt Lake City, Integrated Elctrns.	801-298-1869
VA	Charlottesville, Stinson Assocs.	804-973-2678
VA	Cloverdale, Stinson Assocs.	703-992-5459
VA	Rustin, Stinson Assocs.	703-471-0723
WA	Kent, Shannon Ltd.	206-763-0540
WA	Seattle, Jas. J. Backer Co.	206-285-1300
WI	Brookfield, Oasis Sales	414-782-6660
WI	Mequon, Taylor Elec. Co.	414-241-4321

HONEYWELL, Process Control Div., 1100 Virginia Dr., Ft. Washington, PA 19034, Tel: 800-321-5111, Ext. 596, TWX: 510-661-0328; Empl.: 2500

Local Sales Offices & Reps

AL	Birmingham	205-945-3500
AZ	Phoenix	602-861-4402
AR	Little Rock	501-664-0070
CA	Los Angeles	213-726-6000
CA	San Francisco	415-957-2500
CO	Englewood	303-779-6200
CT	Hartford	203-549-3800
FL	Orlando	305-894-3131
GA	Atlanta	404-982-2000
IL	Lansing	312-474-9300
IL	Park Ridge	312-296-0710
IN	Indianapolis	317-243-0831
IA	Davenport	319-359-3441
KS	Wichita	316-522-3431
KY	Louisville	502-459-5970
LA	Baton Rouge	504-924-8601
ME	Portland	207-775-3501
MD	Baltimore	301-667-4020
MA	Newton	617-969-0250
MI	Farmington Hills	313-478-1600
MI	Grand Rapids	616-247-4811
MN	Minneapolis	612-830-3500
MS	Jackson	601-957-1025
MO	St. Louis	314-576-2500
NE	Omaha	402-331-3200
NJ	Westfield	201-233-9200
NM	Albuquerque	505-884-1070
NY	Albany	518-456-7000
NY	Syracuse	315-451-4000
NC	Charlotte	704-364-4770
OH	Cleveland	216-459-6000
OK	Oklahoma City	405-848-2811
OR	Portland	503-245-0721
PA	Philadelphia	215-666-8200
SC	Columbia	803-779-3280
TN	Memphis	901-345-6222
TX	Houston	713-780-6500
UT	Salt Lake City	801-487-0681
VA	Richmond	804-285-8211
WA	Seattle	206-233-2000
WV	Charleston	304-766-8000
WI	Milwaukee	414-784-6260

HONEYWELL, Test Instrs. Div., P.O. Box 5227, Denver, CO 80217, Tel: 303-773-4700, Telex: 45793 DVR; Empl.: 850; *Sls. Mgr.:* Frank Doherty

HOPKINS ENGRG., 12900 Foothill Blvd., San Fernando, CA 91342, Tel: 213-361-8691, TWX: 910-496-1531; FSC No.: 02777; Empl.: 100; *Sls. Mgr.:* Gary M. Smith; *Dist. Mgr.:* Clyde M. Salisbury

HOPT, KARL, CO., 118 First Ave., Atlantic Highlands, NJ 07716, Tel: 201-291-0633, Telex: 132496; Empl.: 400; *Sls. Mgr.:* G.C. Ellis

HOTPACK CORP., Heinicke Instrs., 10940 Dutton Rd., Philadelphia, PA 19154, Tel: 215-824-1700, 800-523-3608, TWX: 710-670-1694; FSC No.: 66; Empl.: 100; *Sls. Mgr.:* Ed Hammer

Hotpack is a manufacturer and is sold direct. To contact the salesman in your area call 800-523-3608 or 215-824-1700.

HOTTINGER BALDWIN MEASUREMENTS, 139 Newberry St., Framingham, MA 01701, Tel: 617-875-8282, Telex: 94-8499; Empl.: 179; *Sls. Mgr.:* Robert Haggerson

HOUSE OF METAL ENCLOSURES, Box 225, Hermann, MO 65041, Tel: 314-486-3111; Empl.: 55; *Sls. Mgr.:* Richard L. Kastel

HOUSTON INSTRUMENT, Div. Bausch & Lomb, P.O. Box 15720, Austin, TX 78761, Tel: 512-835-0900, TWX: 910-874-2022; Empl.: 450; *Dist. Mgr.:* Rod Schaffner

HOWARD INDS., Box 287, Milford, IL 60953, Tel: 815-889-4105, TWX: 910-642-2950; FSC No.: 815-889-4105; Empl.: 500; *Sls. Mgr.:* Ralph Young; *Dist. Mgr.:* Al Mancuso

HOWELL INSTRS., 3479 W. Vickery Blvd., Ft. Worth, TX 76107, Tel: 817-336-7411, Telex: 75-8233; FSC No.: 98869; Empl.: 180; *Sls. Mgr.:* Bruce Pike

HTL ELECTRO KINETICS, 402 E. Gutierrez St., Santa Barbara, CA 93101, Tel: 805-963-2055, TWX: 910-334-1177; Empl.: 180; *Sls. Mgr.:* Robert E. Lynch

HUDSON TOOL & DIE CO., INC., 18 Malvern St., Newark, NJ 07105, Tel: 201-589-1800, TWX: 710-995-4445; FSC No.: 02875; Empl.: 300; *Sls. Mgr.:* William Miller

HUGHES AIRCRAFT CO., 6155 El Camino Real, Carlsbad, CA 92008, Tel: 619-438-9191, TWX: 910-322-1393; Empl.: 1000

HUGHES AIRCRAFT CO, Aerospace Grps./Support Sys., P.O. Box 90515, Los Angeles, CA 90009, Tel: 213-670-1515, Telex: 67222, TWX: 213-871-5210; *Sls. Mgr.:* W. L. Pemberton

HUGHES AIRCRAFT CO., Connecting Devices Div., 17150 Von Karman Ave., Irvine, CA 92714, Tel: 714-660-5701, TWX: 910-595-2523; FSC No.: 53669; Empl.: 700; *Sls. Mgr.:* Phil Larson

HUGHES AIRCRAFT CO., Electron Dynamics Div., 3100 W. Lomita Blvd., P.O. Box 2999, Torrance, CA 90509, Tel: 213-517-6000, Telex: 67-7064, TWX: 910-347-7321; Empl.: 2,748; *Sls. Mgr.:* Robert L. Woods

Local Sales Offices & Reps

AZ	Phoenix, Odyssey 1	602-246-8846
CA	Anaheim, Blair Assocs.	714-635-1350
CA	San Jose, MCH Assocs.	408-246-7330
CO	Littleton, FG Mktg.	303-795-9176
FL	Orlando, E. G. Holmes & Assocs.	305-894-8901
GA	Chamblee, E. G. Holmes & Assocs.	404-451-6161
IL	Mt. Prospect, Cain-Forlaw Co.	312-253-3578
MD	Columbia, M. Lader Co.	202-296-2497
MO	Kansas City, EIR Co.	816-452-7030
MO	Leasburg, EIR Co.	314-895-4100
NH	Nashua, JPR Electronic Sls.	603-889-8285
NM	Albuquerque, Odyssey 1	505-265-6645
NY	Fayetteville, R.D. Sherman	315-637-9861
NY	New Rochelle, Ascor Elctrns.	914-235-8838
OH	Lancaster, Cain-Forlaw	614-654-4800
PA	Lafayette Hill, M. Lader Co.	215-825-3177
WA	Bellevue, Arva-Hudson, Inc.	206-455-0773

HUGHES AIRCRAFT CO., Indl. Prods. Div. FACT Sys., 6155 El Camino Real, Carlsbad, CA 92008, Tel: 619-438-9191, Telex: 672222, TWX: 910-322-1393; *Sls. Mgr.:* R. L. Giusti

HUGHES AIRCRAFT CO., Microelctrn. Sys. Div., 2601 Campus Dr., Irvine, CA 92715, Tel: 714-752-3800, TWX: 910-595-2435; *Sls. Mgr.:* J. L. Waters

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HUGHES SOLID STATE PRODUCTS, 500 Superior Ave., Dept. E8, Newport Bch., CA 92663, Tel: 714-759-2411, TWX: 910-596-1374 ....**1A**•1362-1365

Local Sales Offices & Reps

AL	Huntsville, L & D Inc.	205-837-1469
AZ	Phoenix, Toward Engrg. Assocs.	602-955-3193

CA	Mountain View, Weseloh/Swanson	415-961-0565
CA	San Diego, Wes-K Assocs.	619-295-3501
CA	Van Nuys, Wes-K Assocs.	213-989-3070
CT	Ansonia, R. H. Sturdy Co.	203-734-2186
CT	Rocky Hill, R. H. Sturdy Co.	203-563-8455
FL	Clearwater, Delmac Sls.	813-447-5192
FL	Orlando, Delmac Sls.	305-898-4688
FL	Tamarac, Delmac Sls.	305-726-1330
GA	Atlanta, L & D Inc.	404-455-3483
IL	Elk Grove Village, Carlson Elctrn. Sls.	312-956-8240
IN	Indianapolis, J & W Sales	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
KS	Shawnee Mission, Technical Sls. Assocs.	913-888-3330
MD	Glen Burnie, Faion Lott & Co.	301-744-4611
MA	Salisbury, R. H. Sturdy Co.	617-465-1505
MA	Wellesley Hills, R. H. Sturdy Co.	617-235-2330
MI	Livonia, Luebbe Sls.	313-477-3131
MN	Minneapolis, Deming (Bill) & Assocs.	612-888-5000
MO	Ferguson, Technical Sls. Assocs.	314-725-5361
NY	Endwell, Tri-Tech Elctrns.	607-754-1094
NY	Fairport, Tri-Tech Elctrns.	716-223-5720
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Poughkeepsie, Tri-Tech Elctrns.	914-473-3880
NC	Greensboro, L & D Inc.	919-292-3201
NC	Raleigh, L & D Inc.	919-876-5301
OH	Cincinnati, Luebbe Sls.	513-891-5770
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls.	513-294-0426
PA	Bala Cynwyd, Electro-Comp Sls.	215-667-9360
PA	Pittsburgh, Luebbe Sls.	412-931-0414
TX	Dallas, Southern States Mktg.	214-248-8600
TX	Houston, Southern States Mktg.	713-988-0991
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

HUGHEY & PHILLIPS, INC., 3050 N. California St., Burbank, CA 91504, Tel: 818-849-1104, TWX: 910-498-2252; FSC No.: 94295; Empl.: 38; *Sls. Mgr.:* C.L. Phillis; *Dist. Mgr.:* C.L. Phillis

HUGIN INDS. INC., 745 Distel Dr., Los Altos, CA 94022, Tel: 415-961-2950, Telex: 348 399; Empl.: 4; *Sls. Mgr.:* Peter Hugin

Local Sales Offices & Reps

IL	Chicago, Patton Sls.	312-325-2170
NJ	Tenafly, D&D Engrg.	201-568-5032
NY	Rochester, Irondequoit Inds.	716-544-6257
NC	Fayetteville, Zim-Tek	919-485-2222
OH	Dover, AJ Assocs.	216-343-2224

HULL CORP., Davisville Rd., Hatboro, PA 19040, Tel: 215-672-7800, TWX: 510-665-6822; Empl.: 200; *Sls. Mgr.:* Ken Haywood

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HUMISEAL DIV., 26-60 Bklyn. - Queens Expwy., Woodside, NY 11377, Tel: 212-932-0800, TWX: 710-582-2141; FSC No.: 99109; Empl.: 150 .... 2•1083

Local Sales Offices & Reps

AL	Huntsville, BJR Mfg. Reps.	205-881-3569
AZ	Phoenix, Coker & Assocs.	602-277-7148
CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CA	Mountain View, Target Elctrns.	415-961-1170
CO	Arvada, Arrowhead Sls.	303-423-5556
CT	Bridgeport, Betronic Assocs.	203-374-6404
FL	Casselberry, Barrett Assocs.	305-699-0311
IL	Hillside, Miltex Sales Corp.	312-449-0420
KS	Kansas City, L. E. Bruns Co.	913-287-5242
MD	Baltimore, Advanced Tech. Sls.	301-583-8252
MA	Waltham, Betronic Assocs.	617-894-8400
MI	Birmingham, W. R. Cline	313-642-2526
MN	Bloomington, Smiley-Scott Assoc.	612-888-5551
NJ	Florham Park, H. Thaw Sls.	201-992-2711
NY	Rochester, Gislason Sls.	716-454-4741
NC	Charlotte, Reynolds Cowardin Assocs.	704-596-6898
OH	Cleveland, Marlow Assocs.	216-991-6500
PA	Pittsburgh, Marlow Assocs.	412-367-8886
TX	Dallas, R. D. Spooner Co.	214-357-6636
VA	Richmond, Reynolds Cowardin Assocs.	804-266-3457
WA	Kirkland, R. R. Chase & Assocs.	206-823-6500

Local Distributors

CA	Alhambra, ULTEX	213-283-7694
CA	Mountain View, Target Elctrns.	415-961-1170
TX	Dallas, R. D. Spooner Co.	214-357-6636
WA	Kirkland, R. R. Chase & Assocs.	206-823-6500
WI	Milwaukee, Ellsworth Sys.	414-352-1230
Intl	England, Surrey, Woking, Concoat Ltd.	(04862) 6944/14
Intl	France, Paris, Spetelec	686-56-65, 25801
Intl	Japan, Tokyo, Bokusui Brown	572-8851, J22491
Can	Scarborough, Ont., Paisley Prods.	416-755-2216

HUMPHREY, INC., 9212 Balboa Ave., San Diego, CA 92123, Tel: 619-565-6631, TWX: 910-335-2001; Empl.: 220

Local Sales Offices & Reps

CA	Los Angeles, L.L. Stoakes Inc.	213-640-2178
CA	Palo Alto, Harris Assocs.	415-328-3370
CA	San Diego, L.L. Stoakes Inc.	714-452-1600
FL	Orlando, Gra-Mar, Inc.	305-894-3351
IN	Carmel, Carter, McCormic & Peirce	317-844-4175
KS	Wichita, Humphrey, Inc.	316-685-7563
MA	Cochituate, High Tech Sls. Inc.	617-653-3838
MI	Farmington, Carter, McCormick & Peirce	313-477-7700
NY	Plainview, Eastern Metro Assocs.	516-931-1414
OH	Cleveland, Carter, McCormick & Peirce	216-779-5100
OH	Englewood, Carter, McCormick & Peirce	513-836-0951
PA	Philadelphia, Humphrey, Inc., Eastern Div.	215-632-6040
PA	Pittsburgh, Carter, McCormick & Peirce	412-824-3760
TX	Dallas, W.N. Rider Co.	214-357-2246
TX	El Paso, Nokomis of El Paso	915-778-2801
TX	Houston, Humphrey, Inc.	713-774-2004
WA	Nine Mile Falls, H. R. Davis Tech. Sls.	509-466-1532

HUNTER STANLEY ELEC., 208 Russell St., Nashville, TN 37213, Tel: 615-254-6532; FSC No.: 21675; Empl.: 10; *Sls. Mgr.:* W. D. Stanley

HUNTER TOOLS, 6721 Baymeadow Dr., Glen Burnie, MD 21061, Tel: 301-760-2200; Empl.: 450

HUNTINGTON ELECTRIC INC., P.O. Box 366, Dept. EEM 80-81, Huntington, IN 46750, Tel: 219-356-0778; *Sls. Mgr.:* Robert Smith

HUNTRON INSTRS., INC., 15123 Highway 99, Lynnwood, WA 98036, Tel: 206-743-3171, 800-426-9265, Telex: 152951 Hunt Inst, TWX: Lywd; FSC No.: 57705; *Sls. Mgr.:* Jim Crosson; *Dist. Mgr.:* Jim Crosson

HURST MFG. CORP., Box 326, Princeton, IN 47670, Tel: 812-385-2564; Empl.: 200; *Sls. Mgr.:* W. W. Taylor

Local Sales Offices & Reps

AZ	Phoenix, Sierra Ind. Eng.	602-272-0084
CA	Los Angeles, Sierra Ind'l. Engrg. Co.	213-624-3123
CA	San Jose, Sierra Ind'l. Engr. Co.	408-274-7041
CO	Denver, Comp. Sls.	303-759-1666
FL	St. Petersburg, Tech-Rep Assoc.	813-577-2779
IL	Chicago, Jerry Golten Co.	312-792-1991
IN	Indianapolis, Pacer Sls. & Engrg. Co.	317-849-1481
MD	Glen Arm, Hodgins Assoc.	301-592-7047
MA	Lexington, Hathaway Elctrns.	617-861-7010
MI	Grand Rapids, R. Van Riper Sls.	616-452-0464
MN	Minneapolis, Giefer Sls. Co.	612-884-2395
MO	Ferguson, Kinrick Co.	314-521-4877
NJ	Little Falls, D. Carbone	201-256-9191
NM	Phoenix, Sierra Ind. Eng.	602-272-0084
NY	Rochester, W.H. Zimmerman Co.	716-586-4450
NY	Syracuse, W.H. Zimmerman Co.	315-474-4889
NC	Garner, Candor Co.	919-876-4999
OH	Chagrin Falls, Kilroy Sls. Co.	216-247-8997
SC	Myrtle Beach, Candor Co.	803-448-8361
TX	Houston, C.R. Colvin Assoc.	713-961-1262
TX	Richardson, Campion Sales Co.	214-238-8145
UT	Salt Lake City, Comp. Sls.	801-466-8623
WA	Seattle, Rep-West	206-283-8351
WI	Milwaukee, Badgerep Inc.	414-258-6630
EXP	NY, Freeport, Minthorne Int'l.	516-546-4700

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HYBRICON CORP., 410 Great Rd., Littleton, MA 01460, Tel: 617-486-3174, TWX: 710-347-0654; Empl.: 62; *Sls. Mgr.:* Richard W. Palmer

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AZ	Phoenix, Cristee-Meade Co.	602-267-7197
AR	Little Rock, Beacon Elctrns.	501-224-5449
CA	Inglewood, Basic Sys. Corp.	213-673-4300
CA	San Diego, Basic Sys. Corp.	619-268-8000
CA	Santa Clara, Basic Sys. Corp.	408-727-1800
CO	Lakewood, Cristee-Meade Co.	303-232-0287
FL	Ft. Lauderdale, Beacon Elctrns.	305-491-1054
GA	Atlanta, Beacon Elctrns.	404-256-9640
KS	Wichita, DLE Elctrns.	316-744-2126
MD	Churchville, Atlantic Tech. Sls.	301-879-2236
NH	Salem, OEM Mktg. & Sls.	603-893-0009
NY	Jericho, J-Square Mktg.	516-935-3200
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Cincinnati, Applied Data Mgmt.	513-579-8108
OR	Beaverton, Elctrns. Tech. Sls. Assoc.	503-641-5780
PA	Huntingdon Valley, Lynbar Grp. Inc.	215-947-3554
TX	Dallas, Jim D. Gray & Assocs.	214-341-7190
WA	Kirkland, Elctrns. Tech. Sls. Assoc.	206-827-8086

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CA	Mountain View, Leddy Assocs.	415-969-6313
CA	Santa Ana, Calif. Elctrn. Mktg.	714-835-2701
CT	Collinsville, Dynamic Sls. of New Eng.	203-693-6567
FL	Clearwater, Cherith Sls.	813-797-3004
GA	Atlanta, Magaro & Assocs.	404-451-8862
IL	Palatine, T-Squared Assocs.	312-991-2144
IN	Ft. Wayne, Scott Elctrns.	219-484-7865
IN	Indianapolis, Scott Elctrns.	317-897-9976
KS	Kansas City, BC Elctrns.	913-342-1211
KS	Wichita, BC Elctrns.	316-942-9840
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MD	Lutherville, Walker-Houck Assocs.	301-296-6021
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MI	Brighton, Michigan Marketing & Sales	313-229-6218
MN	Minnetonka, S.A.I. Mktg. Corp.	612-935-0777
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NY	Rochester, Murcan Sls. Corp.	716-586-4450
NY	Syracuse, Murcan Sls. Corp.	315-437-0734
NC	Greensboro, Magaro & Assocs.	919-294-4783
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns.	216-473-5050
OH	Kettering, Scott Elctrns.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
PA	Norristown, Rivco January	215-631-1414
PA	Pittsburgh, Scott Elctrns.	412-963-6116
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TX	Houston, Dyna Mktg.	713-460-0314
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VA	Moneta, Walker-Houck Assocs.	703-297-4496
WI	Racine, T-Squared Assocs.	414-633-9456

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CA	Mountain View, Leddy Assocs.	415-969-6313
CA	N. Hollywood, Jewett Co.	213-789-8103
CO	Commerce City, Williams Assocs.	303-289-5647

CT	Bethany, Reps. Corp.	203-393-0024
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MN	St. Paul, Murnco, Inc.	612-484-8200
NJ	Wayne, G.T. Assocs.	201-694-6040
NM	Albuquerque, Williams Assocs.	505-255-0622
NY	Fayetteville, R. D. Sherman	315-637-9861
NC	Greensboro, JHU Assoc.	919-852-9097
OH	Centerville, Dolfuss-Root & Co.	513-433-6776
OK	Tulsa, Cunningham Comps.	918-492-0390
PA	Paoli, Tyler Griffin Co.	215-647-1550
TN	Talbot, JHU Assoc.	615-581-4141
TX	Dallas, Cunningham Comps.	214-233-4303
UT	Salt Lake City, Williams Assocs.	801-532-7701
WA	Bellevue, A.I.E. Inc.	206-455-4697

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CA	Del Mar, Chapman & Chapman	619-453-0771
CA	Los Angeles, Astralonics	213-991-3602
CA	Los Gatos, Pro Assocs.	408-358-3861
CA	Tarzana, Power Comps. Sls.	213-881-9111
CO	Englewood, Dynatech, Inc.	303-773-2830
FL	Melbourne, Reynolds & Assocs.	305-259-7000
IL	Des Plaines, Electron Mktg. Corp.	312-298-2330
IL	Elk Grove Village, Micro Sls.	312-956-1000
MD	Glen Burnie, New Era Sls.	301-768-6666
MD	Towson, DGR	301-583-1360
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MA	Tyngsboro, Comptech, Inc.	617-649-3030
MN	Minneapolis, Comps. Grp.	612-374-1250
MN	Roseville, Components Grp.	612-636-5060
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NM	Albuquerque, Power Entprs.	505-298-1918
NM	Albuquerque, Reptronix	505-881-8001
NY	Cazenovia, Naylor Elctrns.	315-655-8174
NY	Rochester, L-Mar Assocs., Inc.	716-323-1000
NY	Wantagh, Tri-Tek	516-221-7600
NC	Kernersville, Naylor Assocs.	919-996-4641
OH	Bricksville, W.R.R. Assocs.	216-526-2023
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TX	Dallas, Sundance Sls.	214-699-0451
TX	El Paso, Power Entprs.	915-533-9902
TX	Grapevine, Elctrns. Mktg. Assoc.	817-481-7502
TX	Houston, Electronics Mktg.	713-498-8120
WA	Bellevue, Olson, Ferre & Assocs.	206-454-2110
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AZ	Scottsdale, Fred Board Assocs.	602-994-9388
CA	North Hollywood, ILC Data Device Corp.	818-982-6454
CO	Englewood, WesTenn Sls.	303-798-0945
CT	Canton Center, Dynamic Sls. of New Eng.	203-693-6567
FL	Clearwater Beach, Perrott Assocs.	813-443-5214
FL	Orlando, Perrott Assocs.	305-298-7748
FL	Sunrise, Perrott Assocs.	305-792-2211
GA	Norcross, Montgomery Mktg. Inc.	404-447-6124
IL	Des Plaines, Elctrn. Mktg.	312-298-2330
IN	Fort Wayne, Giesting & Assocs.	219-486-1912
IN	Indianapolis, Giesting & Assocs.	317-271-5183
KS	Lenexa, Dytec/South	913-888-0215
MA	Burlington, Dynamic Sls. of New Eng.	617-272-5676
MI	Coloma, Giesting & Assocs.	616-468-4200
MI	Novi, Giesting & Assocs.	313-348-3811
MN	Minneapolis, Comprehensive Techn.	612-888-7011
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NJ	Haddonfield, G.L. Williams Assocs.	609-428-6060
NM	Albuquerque, Vermillion Co.	505-883-3668
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	E. Rochester, Tri Tech Elcttrns.	716-385-6500
NY	Endwell, Tri Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri Tech Elctrns.	315-446-2881
NY	Fishkill, Tri Tech Elctrns.	914-897-5611
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OH	Cincinnati, Giesting & Assocs.	513-521-8800
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OK	Tulsa, Bonser-Philhower Sls.	918-496-3236
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PA	Pittsburgh, Giesting & Assocs.	412-963-0727
TX	Austin, Bonser-Philhower Sls.	512-346-9186
TX	Houston, Bonser-Philhower Sls.	713-531-4144
TX	Richardson, Bonser-Philhower Sls.	214-234-8438
UT	Salt Lake City, Trembly Assocs.	801-486-5292
VT	Burlington, Dynamic Sls. of New Eng.	802-863-6665
WA	Bellevue, Venture Elctrns.	206-454-4594
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CA	El Cajon, KCE Corp.	619-588-1198
CA	Palo Alto, Mollard Mktg.	415-961-0456
CA	Woodland Hills, Illinois Capacitor, Inc.	800-323-3652
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CT	Bristol, Technology Prods. Grp.	617-731-0858
FL	N. Miami Beach, Ben Goldner	305-932-2782
IN	Indianapolis, Fred Dorsey Assoc.	317-842-0060
KY	Louisville, Fred Dorsey Assoc.	502-426-3540
MA	Brookline, Technology Prods. Grp.	617-731-0858
MI	Warren, Dem Elctrns. Sls.	313-575-9444
MN	Golden Valley, Highland Elctrn. Sls. Co.	612-545-4028
MS	Jackson, Welch & Doby, Inc.	601-932-5534
MO	Blue Springs, Kathrinus-Kelly & Co.	816-229-0001
MO	St. Louis, Kathrinus-Kelly	314-647-2400
NJ	Wayne, Richman Sls. Co.	201-694-1115
NY	Commack, Richman Sls. Co.	516-543-5532
NY	De Ruyter, Net Sales, Inc.	315-662-7996
NY	Fairport, Net Sls.	716-467-4538
NY	Troy, Net Sales, Inc.	518-274-4758
NY	Webster, Net Sales, Inc.	716-671-0022
NC	Raleigh, J & B Sls.	919-878-8600
OR	Tigard, Elctrn. Comp. Sls.	503-245-2342
PA	Narberth, J. Bresson Assocs.	215-664-6460
TN	Tullahoma, J & B Sls., Inc.	615-455-7487
TX	Houston, Barry Sls., Inc.	713-784-5860
TX	Richardson, Barry Sls., Inc.	214-234-0255
UT	Salt Lake City, Elcom	801-532-7940
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WI	Milwaukee, Erdman Sls. Co.	414-281-1330

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MA	Wakefield, Lorcor	617-246-1903
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NJ	Roselle, Lectron Ind.	201-245-5859
NY	Buffalo, Genesee Radio & Parts Co.	716-873-9661
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NY	Troy, Trojan Elctrn. Supp.	518-274-4481
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OH	Dayton, Semtex Ind. Corp.	513-435-6600
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MO	St. Louis, Harris-Hanson	314-432-3611
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NY	Great Neck, Trionics Assocs.	516-466-2300
NC	Greensboro, Beacon Elctrns.	919-275-9997
OH	Dayton, Electrical Systems Co.	513-434-9822
OR	Lake Oswego, Huntley Assocs.	503-636-7558
TN	Oak Ridge, Beacon Elctrns.	615-482-2409
TX	Dallas, Kruvand Assocs.	214-691-4592
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CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	Essex, Winslow Elec.	203-767-8229
FL	Coral Springs, Heller Assoc.	305-752-7520
IL	Oakbrook Terrace, Fromm	312-627-9595
MA	Newton, Gerber Sls.	617-969-2620
NJ	Haddonfield, Mesa Tech.	609-429-9531
NY	Great Neck, Trionic Assoc.	516-466-2300
NY	Rochester, H. C. Johnson Agcy.	716-586-0777
NY	Williamsville, H. C. Johnson Agcy.	716-632-7880
PA	Exton, Kiley Elec.	215-363-8550
PA	Glenshaw, H. C. Johnson Agcy.	412-961-0414
TX	Dallas, Mark Kruvano Assoc.	214-691-4592
VA	Falls Church, Beacon North	703-534-7200
WA	Everett, Huntley Assoc.	206-353-1833
EXP	Ottawa, ON, Graham Dewar & Assoc.	613-235-0970

IMC MAGNETICS CORP., New Hampshire Div., Rte. 16B, Rochester, NH 03867, Tel: 603-332-5300, TWX: 510-297-4466; *Sls. Mgr.:* Robert Kintner; *Dist. Mgr.:* William L. Beaulieu

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cerritos, El Com Inc.	213-404-2961
CA	Los Altos, Recht Assocs.	415-964-6321
CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	Middletown, Gerber Sls. Corp.	203-347-3000
FL	Coral Springs, Heller Assocs.	305-752-7520
GA	Atlanta, Beacon Elctrns.	404-256-3640
IL	Chicago, D. Dolin Sls. Co.	312-286-6200
MA	Newton Upper Falls, Gerber Sls. Corp.	617-969-2620
MO	Grandview, Harris-Hanson	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
NJ	Haddonfield, Mesa Tech. Assoc.	609-429-9531
NY	Fairport, Net Sales Co.	716-467-4538
NY	Great Neck, Trionics Assocs.	516-466-2300
NC	Greensboro, Beacon Elctrns.	919-275-9997
OH	Dayton, Electrical Systems Co.	513-434-9822
OR	Lake Oswego, Huntley Assocs.	503-636-7558
TN	Oak Ridge, Beacon Elctrns.	615-482-2409
TX	Dallas, Kruvand Assocs.	214-691-4592
VA	Falls Church, Beacon North	703-534-7200
WA	Everett, Huntley Assocs.	206-353-1833

Local Distributors

AL	Huntsville, C.D.I.	205-883-7501
AZ	Phoenix, Sterling Elctrns.	602-268-2121
AZ	Tempe, Bell Industries	602-966-7800
AZ	Tucson, Southwest Sales	602-325-4087
AR	Little Rock, Comp. Distr., Inc.	501-227-6278
CA	Cerritos, El-Com	213-404-2961
CA	Garden Grove, Bell Industries	714-220-0681
CA	Gardena, Bell Industries	213-515-1800
CA	Inglewood, Newark Elctrns.	213-671-7387
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, El-Com	619-578-0900
CA	Santa Clara, El-Com, Santa Clara Div.	408-496-0880
CA	Sunnyvale, Bell Industries	408-734-8570
CA	Thousand Oaks, Bell Industries	805-499-6821
CO	Denver, Newark Denver Elctrns.	303-757-3351
CO	Ravada, Denver Wintronics	303-431-7161
CO	Wheatridge, Bell Inds.	303-424-1985
CT	East Haven, J. V. Elctrns.	203-469-2321
CT	Wallingford, Sterling Electronics	203-265-9535
CT	Wallingford, Sager Elctrl. Supp. Co.	203-265-4600
FL	Ft. Lauderdale, C.D.I.	305-971-4950
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Norcross, C.D.I.	404-441-3320
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Industries	312-982-9210
IL	Northbrook, Classic Comps.	312-272-9650
IN	Carmel, Altex Elctrns. Inc.	317-848-1323
KS	Wichita, RSC Elctrns.	316-267-5213
LA	Metairie, Sterling Electronics	504-887-7610
MD	Savage, Pyttronic Industries	301-792-0780
MA	Burlington, Lionex Corporation	617-272-9400
MA	Hingham, Sager Elctrl. Supp. Co.	617-749-6700
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Somerville, Electro Sales	617-666-0500
MA	Waltham, Sterling Elctrns.	617-894-6200
MI	Adrian, Wedemeyer Elctrn. Supp. Co.	517-263-2925
MI	Ann Arbor, Wedemeyer Elctrn. Supp. Co.	313-665-8611
MI	Lansing, Wedemeyer Elctrn. Supp. Co.	517-484-9009
MN	Minneapolis, Aéro-Space Computer Supplies Inc.	612-884-4725
MO	St. Louis, Olive Elctrns. Inc.	314-426-4500
NJ	Bellmawr, Mid-Atlantic Interstate Industrial Park	609-931-5303
NJ	Fairfield, Lionex Corp.	201-227-7960
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NM	Albuquerque, Sterling Elctrns.	505-884-1900
NM	Albuquerque, Bell Industries	505-292-2700
NY	Buffalo, Summit	716-884-3450
NY	Endwell, A.S.I. Elctrns.	607-754-3823
NY	Hauppauge, Lionex Corp.	516-273-1660
NY	Mt. Vernon, Q.A.R. Indl. Sls.	914-699-2224
NY	Plainview, Progress Elctrns.	516-433-1700
NY	Rochester, Summit	716-334-8110
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, C.D.I.	919-834-9465
OH	Columbus, Wedemeyer Elctrn. Supp. Co.	614-436-9600
OH	Dayton, Bell Industries Micro-Mil Div.	513-434-8231
OH	Dayton, Esco Elctrns.	513-226-1133
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Youngstown, Newark Elctrns.	216-793-6134
OK	Tulsa, Sterling Elctrns.	918-663-2410
OR	Lake Oswego, Bell Industries	503-241-4115
PA	Braddock, Leff Elctrns.	412-351-5000
PA	Horsham, Lionex Corp.	215-443-5150
PA	McKean, Advacom Inc.	814-476-7774
PA	Montgomeryville, Pyttronic Industries	215-643-2850
PA	Reading, Barbey Elctrns.	215-376-6116
RI	Providence, Wm. Dandreta & Co.	401-861-2800
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Nashville, Electra Distrbg. Co.	615-329-3971
TX	Austin, Sterling Elctrns.	512-863-1341
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Dallas, Heilind Elctrns.	214-351-2050
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Houston, Sterling Elctrns.	713-623-6600
UT	Salt Lake City, Standard Supp.	801-486-3371
UT	Salt Lake City, Bell Industries	801-972-6969
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Bell Industries	206-747-1515
WI	New Berlin, Classic Comps.	414-786-5300
WI	Waukesha, Bell Industries	414-547-8879

IMC MAGNETICS CORP., Thermal Prods. Grp., 100 Jericho Quad., Ste. 221, Jericho, NY 11753, Tel: 516-938-0800, TWX: 510-221-2126

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cerritos, El Com Inc.	213-404-2961
CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	Middletown, Gerber Sls. Corp.	203-347-3000
FL	Coral Springs, Heller Assocs.	305-752-7520
GA	Atlanta, Beacon Elctrns.	404-256-3640
IL	Chicago, D. Dolin Sls. Co.	312-286-6200
MA	Newton Upper Falls, Gerber Sls. Corp.	617-969-2620
MO	Grandview, Harris-Hanson	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
NJ	Haddonfield, Mesa Tech Assoc.	609-429-9531
NY	Fairport, Net Sales Co.	716-467-4538
NY	Great Neck, Trionics Assocs.	516-466-2300
NC	Greensboro, Beacon Elctrns.	919-275-9997
OH	Dayton, Electrical Systems Co.	513-434-9822
OR	Lake Oswego, Huntley Assocs.	503-636-7558
TN	Oak Ridge, Beacon Elctrns.	615-482-2409
TX	Dallas, Kruvand	214-691-4592
VA	Falls Church, Beacon North	703-534-7200
WA	Everett, Huntley Assocs.	206-353-1833

IMC MAGNETICS CORP., Western Div., 12627 Hiddencreek Way, Cerritos, CA 90701, Tel: 213-926-0927, TWX: 910-583-1355; FSC No.: 99743; *Sls. Mgr.:* Joe Gute

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Cerritos, El Com Inc.	213-404-2961
CA	Los Altos, Recht Assocs.	415-964-6321
CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	Middletown, Gerber Sls. Corp.	203-347-3000
FL	Coral Springs, Heller Assocs.	305-752-7520
GA	Atlanta, Beacon Elctrns.	404-256-3640
IL	Chicago, D. Dolin Sls. Co.	312-286-6200
MA	Newton Upper Falls, Gerber Sls. Corp.	617-969-2620
MO	Grandview, Harris-Hanson	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
NJ	Haddonfield, Mesa Tech. Assoc.	609-429-9531
NY	Fairport, Net Sales Co.	716-467-4538
NY	Great Neck, Trionics Assocs.	516-466-2300
NC	Greensboro, Beacon Elctrns.	919-275-9997
OH	Dayton, Electrical Systems Co.	513-434-9822
OR	Lake Oswego, Huntley Assocs.	503-636-7558
TN	Oak Ridge, Beacon Elctrns.	615-482-2409
TX	Dallas, Kruvand Assocs.	214-691-4592
VA	Falls Church, Beacon North	703-534-7200
WA	Everett, Huntley Assocs.	206-353-1833

IMEC CORP., 2434 Southport Way, National City, CA 92050, Tel: 619-474-8991

IMPANDEX, INC., 203 Brookdale St., Maywood, NJ 07607, Tel: 201-845-4664, Telex: 134 656; Empl.: 11; *Sls. Mgr.*: Stanley I. Goldberg; *Dist. Mgr.*: Rober F. Carlson

I.M.S. EQUIPMENT, INC., P.O. Box 16909, Irvine, CA 92713, Tel: 714-559-6901, Telex: 678317; *Sls. Mgr.*: W. Charles Davison

IMTRONICS INDS., 11930 31st Ct., Clearwater, FL 33520, Tel: 813-577-9010, Telex: 566027 IMTRON CWTR UD; Empl.: 10; *Sls. Mgr.*: Steven B. Cohen

INCOM, INC., 205 Chapin St., P.O. Drawer G, Southbridge, MA 01550, Tel: 617-765-9151, TWX: 710-347-1604; *Sls. Mgr.*: David MacGrath

INCONIX CORP., 10 Tech Circle, Natick, MA 01760, Tel: 617-655-1170, TWX: 710-386-1997; Empl.: 60; *Sls. Mgr.*: Al Vitale

INDEPENDENT CABLE, INC., 43 Broad St., Hudson, MA 01749, Tel: 617-562-9913

INDIANA GENERAL/DIV. EMM CORP., Magnet Prods., 405 Elm St., Valparaiso, IN 46383, Tel: 219-462-3131, Telex: 25-8489, TWX: 910-690-4891; Empl.: 1200; *Sls. Mgr.*: Royce D. Wright

INDUCTIVE PRODS. INC., 11733 Markon Dr., Garden Grove, CA 92641, Tel: 714-891-2572; Empl.: 10; *Sls. Mgr.*: Cary Rosen

Industrial Computer Designs

INDUSTRIAL COMPUTER DESIGNS, INC., 31121 Via Colinas 1005, Westlake Village, CA 91362, Tel: 818-889-3179; *Sls. Mgr.*: David J. Knight 3•1110, 1111

Local Distributors

CA	Chatsworth, Priority One Elctrns.	818-709-5111
CA	Irvine, Priority One Elctrns.	714-660-1411; 800-423-5922 (outside CA)

INDUSTRIAL CONDENSER CORP., See Industrial Midwec Capacitors

INDUSTRIAL CONTROL CO., 3100 Pineda Ave., Rockledge, FL 32955, Tel: 305-259-7105; Empl.: 15; *Sls. Mgr.*: I. Nobilio 3•1932

INDUSTRIAL DEVICES, INC., Edgewater, NJ 07020, Tel: 201-224-4700, Telex: 12-7459; FSC No.: 91802; Empl.: 200; *Sls. Mgr.*: Michael Diceglie 1B•1020, 1064-1083

Local Sales Offices & Reps

AL	Huntsville, E.M.A., Inc.	205-837-7363
AZ	Phoenix, Bill Earl Assoc.	602-994-3813
CA	Los Angeles, Universal Comps.	213-641-4255
CA	Mountain View, Westech Sls.	415-961-1422
CO	Aurora, Sage Sls.	303-750-3501
FL	Casselberry, Southern Elctrn. Mktg.	305-695-3334
FL	Clearwater, Southern Elctrn. Mktg.	813-441-3902
FL	Ft. Lauderdale, Southern Elctrn. Mktg.	305-475-3686
GA	Atlanta, E.M.A., Inc.	404-448-1215
IL	Chicago, K. D. Engle	312-539-1820
IN	Indianapolis, Elctrn. Mktg. Consits.	317-253-1668
MD	Towson, Ernie Stefkovic Assocs.	301-321-6008
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MI	Oak Pk., W. Spenser	313-967-0808
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
NJ	Cherry Hill, Ernie Stefkovic Assocs.	609-667-4066
NJ	Manville, Dyno Rep	201-685-0135
NY	New York, Drake America Corp.	212-758-5400
NY	Rochester, Apex Assocs.	716-254-6050
NC	Raleigh, E.M.A., Inc.	919-847-8800
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	800-362-2265
OR	Portland, Earl & Brown	503-245-2283
PA	Pittsburgh, Marlow Assocs.	412-367-8886
SC	Greenville, E.M.A., Inc.	803-233-4637
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, Earl & Brown	206-284-1121

Local Distributors

AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2885
CA	Gardena, Calif. Switch & Signal	213-770-2330
CA	Los Angeles, Elec. Switches	213-664-1141
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Empire Elctrn. Distr.	213-681-2711
CA	S. San Francisco, Steven Engrg.	415-588-9200
CA	San Diego, Sigma Elctrns.	714-565-2000
CA	San Diego, Shanks & Wright	619-239-0176
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Cypress Elctrns.	408-727-7080
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Santa Monica, Master Distrs.	213-452-1229
CA	Santa Rosa, Steven Engrg.	707-578-0666
CO	Arvada, Denver Wintronics	303-431-7161
CT	Norwalk, Park Distrs.	800-243-5006
CT	Wallingford, Sager Electrical Supp.	203-265-4600
FL	Longwood, Inter Tec	800-432-1654
FL	Miami, Electro Standard Lab (ESL)	305-633-6973
FL	Tampa, Leader Elctrns.	813-870-3315
GA	Atlanta, Wholesale Indl. Elec.	800-282-1857
HI	Honolulu, Precision Radio	808-537-5291
IL	Bridgeview, Midco Comps.	312-599-7777
IL	Villa Park, Melvin Elctrns.	312-279-5015
IL	Wood Dale, Electro-Kinetics	312-595-6700
IN	East Chicago, ACRO Elctrns.	312-375-1269
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elctrs.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Bergquist Co.	319-366-8733
IA	Cedar Rapids, Iowa Radio Supp.	319-393-4510
KY	Bowling Green, Crescent Elctrns.	502-842-2444
LA	Lafayette, Ralph's	318-234-4507
LA	New Orleans, Wm. B. Allen Supp. Co.	800-462-9520
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	N. Wilbraham, Indl. Comps.	413-596-3854
MA	Norwood, Gerber Elctrns.	617-329-2400
MA	Worcester, RM Elctrns.	617-756-8311
MI	Flint, Shand Elctrns.	313-743-8940
MN	Minneapolis, Bergquist Co.	612-835-2322
MN	Minneapolis, Elctrn. Center	612-371-5200
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Olive Indl. Elect.	816-842-8556
MO	St. Louis, Van Sickle Radio-Elec.	314-621-5000
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NE	Lincoln, Scott Elctrn. Supp.	402-466-8221
NE	Omaha, Scott Elctrn. Supp.	402-734-6750
NV	Las Vegas, Kiesub Elctrns.	702-733-3888
NJ	Fair Lawn, Relay Spec.	201-797-3313
NJ	Hanover, State Elctrns. Parts	201-887-2550
NJ	Springfield, Route Elctrns.	201-379-7710
NY	Albany, E. E. Taylor Co.	518-438-7811
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Hauppauge, Broadline Elctrns.	516-231-4100
NY	Hempstead, Elctrn. Equip.	800-645-1605
NY	Mt. Vernon, Q.A.R. Indl. Elctrn. Sls.	914-699-2224
NY	New York, Drake America Corp.	212-758-5400
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Raleigh, Southeastern Radio Supp.	919-828-2311
OH	Cincinatti, Hughes-Peters	513-351-2000
OH	Cincinnati, United Radio	513-761-4030
OH	Cleveland, REPCO Inc.	216-248-8900
OH	Columbus, Hughes Peters	614-294-5351
OH	Dayton, Stotts-Friedman Co.	513-298-5555
OH	Toledo, Warren Radio	419-248-3364
OK	Oklahoma City, Trice Whls. Elctrns.	405-524-4411
OK	Tulsa, Oil Capitol Elctrns.	918-622-8520
OR	Portland, United Radio Supp.	503-233-7151
PA	Erie, Rem/Mace Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
SC	Columbia, Dixie Radio Supp.	803-779-5332
TN	Knoxville, Roden Elctrl. Supp.	615-546-8755
TN	Memphis, Bluff City Elctrns.	901-345-9500
TN	Nashville, Randolph & Rice	615-255-5601
TX	Fort Worth, Swieco	817-335-6521
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
TX	San Antonio, Sherman Elctrns. Supp.	512-224-1004
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Arlington, Arlington Elctrn. Whlsrs.	703-524-6256
VA	Glenn Allen, Hermitage Distrs.	804-798-3830
WA	Seattle, United Radio Supp.	206-284-0200
WI	Milwaukee, Marsh Elctrns.	414-475-6000

IEE THE DISPLAY MAKERS
INDUSTRIAL ELECTRONIC ENGINEERS

INDUSTRIAL ELCTRN. ENGRS., INC., 7740 Lemona Ave., Van Nuys, CA 91405, Tel: 818-787-0311, TWX: 910-495-1707; Empl.: 400; *Sls. Mgr.*: C. Doria, J. Hart, I. Minarik; *Dist. Mgr.*: J. Hart 1B•1084, 1085, 1781

Local Sales Offices & Reps

AL	Huntsville, TMA Technology Mktg. Assoc.	205-883-7893
AZ	Phoenix, Gramer & Co.	602-995-9455; 602-942-1415
CA	Brea, Masco Elctrns., Inc.	714-529-0866
CA	Campbell, LCO Tech. Sls.	408-378-9900
CA	Los Angeles, Masco Elctrns. Inc.	714-529-0866
CA	Vista, Masco Elctrns., Inc.	619-758-5562
CO	Denver, Lindberg Co.	303-758-9033,34,35,36
CT	North Haven, Kitchen & Kutchin, Inc.	203-239-0212
FL	Melbourne, TMA Technlg. Mktg. Assoc.	305-676-3776
FL	Orlando, TMA Technlg. Mktg. Assoc.	305-857-3760
FL	Pompano Beach, TMA Technlg. Mktg. Assoc.	305-942-0774
GA	Atlanta, TMA Technlg. Mktg. Assoc.	404-257-0374
ID	Boise, Huntley Assocs.	208-343-7588
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Carmel, TMC Techng. Mktg. Corp.	317-844-8462
IN	Ft. Wayne, TMC Techng. Mktg. Corp.	219-432-5553
IA	Cedar Rapids, PMR Penzner/Mankus Reps., Inc.	319-362-9177
KS	Overland Park, PMR Penzner/Mankus Reps., Inc.	913-381-0004
KS	Wichita, PMR Penzner/Mankus Reps., Inc.	316-684-4141
KY	Louisville, TMC Technlg. Mktg. Corp.	502-499-7808
MD	Hunt Valley, Marktron, Inc.	301-628-1111
MD	Rockville, Marktron, Inc.	301-251-8990

IEE
INDUSTRIAL ELECTRONIC ENGINEERS, INC.
LAMPS • LED's • LCD's

Franchised Stocking Distributor

LOGICOMP ELECTRONICS, INC.

895 MAMARONECK AVENUE
MAMARONECK, NEW YORK 10543
PHONE: (914) 698-9332

TOLL FREE (Outside N.Y.)
800/431-2625

MA	Burlington, Kitchen & Kutchin, Inc.	617-229-2660
MI	Southfield, L. H. Dickelman Co.	313-353-8210
NY	Fairport, Reagan/Compar Albany, Inc.	716-271-2230
NY	New Hartford, Reagan/Compar Albany, Inc.	315-732-3775
OH	Cleveland, Geotronix, Inc.	216-526-2535
OH	Trotwood, Geotronix, Inc.	513-854-5939
OR	Beaverton, Huntley Assocs.	503-649-5388
PA	Norristown, RJI	215-631-1414
SC	Greenville, DHR Mktg., Inc.	803-235-3594
TX	Dallas, MGR Electronics, Inc.	214-238-5246; 713-759-0187;817-338-1493
UT	Salt Lake City, Lindberg Co.	801-467-1794,95
VA	Charlottesville, Marktron, Inc.	804-973-5874
WA	Everett, Huntley Assocs.	206-353-1833
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

AL	Huntsville, C.D.I.	205-883-7501
AZ	Phoenix, Tri-Tek, Inc.	602-995-9352
AZ	Tempe, Circuit Specialists Co.	602-966-0764
AR	Little Rock, C.D.I.	501-227-6278
CA	Cerritos, El-Com, Inc.	213-404-2961
CA	Gardena, California Switch & Signal Co.	213-538-9830
CA	Industry, Ital Elctrn. Sls. Inc.	818-968-8515; 714-990-0922
CA	Lakeside, Mouser Elctrn. Corp.	619-449-2229
CA	San Diego, Richey/Western Elctrns.	619-565-4444
CA	San Diego, El-Com, Inc.	619-578-0900
CA	San Jose, Richey/Western Elctrns.	408-946-6611
CA	Santa Clara, Waltronic Sls.	408-727-1200
CA	Sun Valley, Richey/Western Elctrns.	818-768-3800
CO	Denver, Integrated Elctrns.	303-292-6121
CT	East Haven, U.V. Elctrns.	203-469-2321
FL	Alamonte Springs, Pioneer/Orlando	305-834-9090; 800-432-6094
FL	Ft. Lauderdale, C.D.I.	305-971-4950
FL	Miami, Elctrn. Equip. Co. Inc.	305-871-3500
GA	Norcross, C.D.I.	404-441-3320
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Inds.	312-982-9210
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elmhurst, Semiconductor Specialists, Inc.	312-279-1005
IL	Northbrook, Classic Comps.	312-272-9650
IN	Carmel, Altex Elctrns., Inc.	317-848-1323; 800-692-6039
KS	Wichita, R.S.C.	316-267-5213
MD	Beltsville, Treeko Sls.	301-937-8260
MD	Gaithersburg, Pioneer/Washington	301-948-0710
MA	Billerica, A. W. Mayer Co., Inc.	617-667-6900
MA	Danvers, Criterion Elctrns.	617-777-4725
MA	Needham, Cronin Elctrns., Inc.	617-449-5000
MI	Grand Rapids, S-F Elctrn. Supp. Inc.	616-459-0216
MI	Southfield, Michigan Lectrols Corp.	313-353-1350
MN	Minneapolis, Stark Elctrns.	612-332-1325
MO	Kansas City, Semiconductor Specialists, Inc.	816-452-3900
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NM	Albuquerque, Beatron Elctrns.	505-344-2381
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Farmingdale, S.A.I.	516-293-2710
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rochester, Modutex Corp.	716-424-1620
NC	Greensboro, Hammond Elec.	919-275-6391
NC	Raleigh, So. Eastern. Elctrns.	919-828-2311
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cleveland, Alpha Distr. Corp.	216-526-3716
OH	Dayton, The Stotts-Friedman Co.	513-298-5555
OK	Oklahoma City, Electro Entrs., Inc.	405-427-6591
PA	Philadelphia, Philadelphia Elctrns. Inc.	215-568-7400
PA	Philadelphia, Herbach & Rademan, Inc.	215-426-1700
SC	Taylors, Cantrell Wholesalers	803-268-1194
TX	Austin, The Altair Co.	512-837-4490
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, Solid State Elctrns.	713-772-8483
TX	Houston, The Altair Co.	713-462-3029
TX	Irving, Solid State Elctrns.	214-438-5700
TX	Richardson, The Altair Co.	214-231-5166
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, The Altair Co.	214-231-5166
TX	Stafford, Southwest Elctrns.	713-491-4900
WA	Kent, Shannon Ltd.	206-763-0545
WI	Mequon, Taylor Elec. Co.	414-241-4321
WI	Milwaukee, Marsh Elctrns.	414-475-6000

INDUSTRIAL ELCTRN. HARDWARE CORP., 109 Prince St., New York, NY 10012, Tel: 212-677-1881, TWX: 710-581-4338; FSC No.: 97913; Empl.: 430; *Sls. Mgr.:* Louis Roberts; *Dist. Mgr.:* Louis Roberts ....**2•**1329

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Phoenix, Knight Co.	602-582-8506
CA	Los Angeles, Knight Co	213-670-2833
CA	San Diego, Knight Co.	619-693-1806
CA	Sunnyvale, M2 Mktg. Grp.	408-733-1361
CT	Wethersfield, Underwood Sls. Corp.	203-563-3046
FL	St. Petersburg, Tech. Rep. Assoc.	813-577-2779
GA	Atlanta, Beacon Elctrns.	404-256-9640
KS	Wichita, Thunderbird Tech. Sls.	316-684-3941
MD	Ellicot City, Techn. Sls.	301-461-2400
MA	Lowell, Underwood Sls.	617-256-8191
MN	St. Paul, Countryman	612-645-9151
MO	St. Louis, Thunderbird Tech. Sls.	314-567-6488
NJ	Fort Lee, FJK Assocs. Inc.	201-592-1002
NJ	Haddonfield, Mills-Brown Assoc	609-429-1005
NY	Buffalo, Franklin Sls.	716-248-8251
NY	Pittsford, Franklin Sls.	716-248-8251
NY	Ronkonkoma, PMR	516-467-8200
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Beachwood, Elctrn. Salesmasters Inc.	216-831-9555
OR	Beaverton, Barrett-Squibb	503-642-1661
RI	Warwick, Monette Eng. & Assoc.	401-885-2205
TX	Dallas, Pro-Mark	214-644-0497
VA	Portsmouth, F.B.D. Sls.	804-484-3162
WA	Redmond, Barrett-Squibb	206-885-6991

INDUSTRIAL FABRICATING CO., 820 Woodend Ave., Stratford, CT 06497, Tel: 203-375-5853; Empl.: 30; *Sls. Mgr.:* Ray Peterson

INDUSTRIAL MIDWEC CAPACITORS, 4902 Tollview Dr., Rolling Meadows, IL 60008, Tel: 312-577-0120, TWX: 910-687-3375; Empl.: 800; *Sls. Mgr.:* Andy Kaluski

Powertron

INDUSTRIAL TEST EQUIP., 21 Yennicock Ave., Port Washington, NY 11050, Tel: 516-883-1700; FSC No.: 99074; *Sls. Mgr.:* Robert Loiacono ....**3•**1886-1888

INERTIAL MOTORS, 280 N. Broad St., Doylestown, PA 18901, Tel: 215-345-1010, Telex: 83-1633; Empl.: 49; *Sls. Mgr.:* Lori Clarkin

INFICON LEYBOLD-HERAEUS, INC., 6500 Fly Rd, E. Syracuse, NY 13057, Tel: 315-437-0377, TWX: 710-541-0594; Empl.: 150; *Sls. Mgr.:* D. A. Di Renzo

InfoCap

INFOCAP, INC., 31119 Via Colinas 502, Westlake Village, CA 91362, Tel: 818-991-1410; *Sls. Mgr.:* David Knight ....**3•**1085

INFODEX, INC., 395 W. Main St., Waterbury, CT 06702, Tel: 203-757-9291, Telex: 178702 IFDX; FSC No.: 09087; Empl.: 42; *Sls. Mgr.:* E. H. Ulm ....**1B•**1086, 1087

Local Sales Offices & Reps

CA	Pasadena, A-F Sales Engrg.	818-681-5631
MA	Boston, Nortech Engrg. Sls.	617-359-6063
MA	Concord, Nortech Engrg. Sls.	617-259-0032

INFO-LITE CORP., See Dio-Rey and Crosspoint

INFORMATION CONTROL, Dept. EM7 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 55; *Sls. Mgr.:* Carol J. Smith

INFORMATION CONTROL CORP., Abacus Div. Dept. EM7, 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 50

INFORMATION CONTROL CORP., Light Pen Div., Dept. EM7, 9610 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-8520, TWX: 910-328-7234; Empl.: 50

INFORMATION TERMINALS, See Verbatim Corp.

iti THE SWITCHING COMPANY

INFORMATION TRANSFER INDL., Box 357, Holcomb, NY 14469, Tel: 716-657-7074; FSC No.: 55137; Empl.: 40; *Sls. Mgr.:* J. E. Wiseman ....**3•**1162, 1163, 1246

Local Sales Offices & Reps

AZ	Scottsdale, Luscombe Engrg.	602-949-9333
CA	Campbell, Luscombe Engrg.	408-370-2020
CA	Pasadena, Luscombe Engrg.	213-684-2000
CA	San Diego, Luscombe Engrg.	714-295-4300
CT	Hamden, Polytek Assocs.	203-288-5246
IL	Schaumburg, Kenneth W. Meyers Co.	312-882-4808
IN	Indianapolis, Kenneth W. Meyers Co.	317-243-6681
IA	Cedar Rapids, Kenneth W. Meyers Co.	319-363-8987
MD	Greenbelt, Riffe Assocs.	301-474-8600
MA	Ashland, Polytek Assocs.	617-881-4741
MN	Minneapolis, Kenneth W. Meyers Co.	612-920-7080
NJ	Oxford, Malin Assocs.	201-689-7398
NY	Albany, R. F. Lamb Co.	518-869-3355
NY	Buffalo, R. F. Lamb Co.	716-874-4900
NY	Rochester, R. F. Lamb Co.	716-323-1250
NY	Syracuse, R. F. Lamb Co.	315-454-2469
OR	Portland, Tasco	503-245-8168
PA	Melrose Park, Robert Meyers Assocs.	215-224-1663
TX	Houston, Sci. Sls. Co.	713-460-9170
TX	Richardson, Sci. Sls. Co.	214-231-6541
WA	Bellevue, Tasco	206-453-1414
WI	Brookfield, Kenneth W. Meyers Co.	414-784-3790

INFOSPHERE, INC., 4730 S.W. Macadam Ave., Portland, OR 97201, Tel: 503-226-3515, Telex: 360312; *Sls. Mgr.:* Wm. David Sharon; *Dist. Mgr.:* Wm. David Sharon

Local Sales Offices & Reps

AZ	Scottsdale, A.S.R.	602-949-8293
CA	Sacramento, Manco	916-985-0370
CA	Santa Clara, Manco	408-496-6611
NM	Albuquerque, A.S.R.	505-243-8454
OH	Cleveland, Dolfuss-Root and Co.	216-238-0300
OH	Columbus, Dolfuss-Root and Co.	513-433-6776
OR	Portland, Cascade Data Mktg.	503-641-9266
PA	Pittsburgh, Dolfuss-Root and Co.	412-221-4420
TX	Houston, Abcor, Inc.	713-486-9251
WA	Seattle, Cascade Data Mktg.	206-747-6190

INFRARED INDS., INC., P.O. Box 14200, Orlando, FL 32857, Tel: 305-282-7700, Telex: 568908; Empl.: 80; *Sls. Mgr.:* Thomas Chisholm

INJECTORALL ELCTRNS., 98-100 Glen St., Glen Cove, NY 11542, Tel: 516-671-6010 ....**2•**1091

Local Sales Offices & Reps

AL	Birmingham, John F. Russell Co.	205-822-2196
CA	Burlingame, Carelli-Ema	415-342-4514
CA	Long Beach, Ross Sls.	213-424-9818
FL	Miami Beach, Everett Wollman Sls.	305-932-1790
MA	Northboro, W. B. Pray Co.	617-393-3434
MI	Livonia, Harvey Sales Co.	313-476-1974
NY	Brooklyn, Moet Maltz & Co.	212-252-1139
OH	Jamestown, Landro-Edwards Sls.	513-675-2059
PA	Library, Landro & Edwards Sls. Co.	412-854-5727
WA	Edmonds, McLaughlin Mktg. Inc.	206-743-1161

Local Distributors

AL	Huntsville, Mock	205-539-2401
AZ	Tucson, Electronic City	
CA	Los Angeles, ITC	213-388-0621
CA	San Jose, Quement	408-998-5900
CA	San Rafael, Elctrns. Plus	415-457-0466
CA	Sunnyvale, Halted Specialties	408-732-1573
FL	Pensacola, Pensacola Elctrns.	904-478-3771
GA	Atlanta, Delta	404-458-4690
IL	Chicago, Tron	
IN	East Chicago, Acro	219-397-8681
KY	Louisville, P.I. Burkes	
MA	Needham, Y.D.I.	617-449-1005
MI	Bay City, KDC	517-892-1594
MI	Port Huron, Main	313-985-5103
NJ	Vineland, Laraco	609-691-2900
NY	Elmsford, Ancar	914-592-7100
NY	Levittown, Edlies Elctrns.	516-735-3330
NY	New York City, Taft	212-575-5194
NY	Richmond Hill, Anchor	212-846-2420
OR	Beaverton, Norvac	503-644-1025
PA	Norristown, Philadelphia Elctrns.	215-275-5550
TX	Dallas, Nanney	

TX	Fort Worth, Sweico	817-335-6521
WA	Seattle, Elctrn. Supermart	206-575-1093
WA	Seattle, Radar	206-282-2511

INLAND MOTOR DIV. KOLLMORGEN, INDL. DRIVES GRP., See Kollmorgen Corp.

INLAND MOTOR, SPECIALTY PRODS. DIV., Kollmorgen Corp., 4020 E. Inland Rd., Sierra Vista, AZ 85635, Tel: 602-459-1150, Telex: 62858, TWX: 910-973-9869; *Sls. Mgr.:* Ken Irvin

INLAND MOTOR SPECIALTY PRODS. DIV., Kollmorgen Corp., 501 First St., Radford, VA 24141, Tel: 703-639-9045, TWX: 710-875-3740; FSC No.: 11384; Empl.: 450

Local Sales Offices & Reps

Specialty/Instrument/Industrial Drive Group

AL	Huntsville, Technology Mktg. Assoc.	205-883-7893
AZ	Phoenix, Thor Engrg. Mfg.	602-437-1463
AZ	Sierra Vista, Inland Motor - SPD	602-459-1150
CA	Alhambra, Thorson Co.	213-281-2280
CA	Goleta, Thorson Co.	805-964-8751
CA	Mountain View, Thorson Co.	415-964-9300
CA	San Diego, Thorson Co.	619-292-8525
CA	Signal Hill, Thorson Co.	213-595-0361
CO	Englewood, Thorson Co.	303-779-0666
CT	Wolcott, Vanguard Elctrns.	203-879-9310
FL	Melbourne, Technology Mktg. Assoc.	305-676-3776
FL	Orlando, Technology Mktg. Assoc.	305-857-3760
FL	Pompano Beach, Technology Mktg. Assoc.	305-942-0774
FL	Winter Park, Magna Engrg. Sls.	305-671-8716
GA	Atlanta, Technology Mktg. Assoc.	404-257-0374
IL	Collinsville, Magna Engrg. Sls.	618-345-5583
IL	Elk Grove, Carlson Elctrn. Sls.	312-956-8240
IN	Indianapolis, Carlson Elctrn. Sls.	317-842-3740
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
KS	Wichita, Magna Engrg. Sls.	316-744-0851
MD	Baltimore, Rep-Tron	301-621-1313
MA	Needham Heights, Vanguard Elctrns.	617-449-5578
MI	Detroit, R. P. Urban Assoc.	313-535-2355
MI	Grand Rapids, R. P. Urban Assoc.	616-245-0511
MN	St. Paul, J. J. Exon co.	612-636-5533
NJ	Wayne, S. Howard Lagerveld & Assoc.	201-790-1714
NY	E. Rochester, A & D Devices	716-385-2778
OH	Chagrin Falls, Jerry Kilroy Corp.	216-543-3370
OR	Beaverton, Thorson Co.	503-644-5900
PA	Media, Homer Smith Co.	215-543-2434
TX	Dallas, Magna Engrg. Sls.	214-349-6171
UT	West Valley City, Thorson Co	801-973-7969
WA	Bellevue, Thorson Co.	206-455-9180
WI	Milwaukee, Carlson Elctrn. Sls.	414-476-2790

INMAC, 2465 Augustine Dr., Santa Clara, CA 95051, Tel: 408-727-1970, TWX: 910-338-2091; Empl.: 500

INMARK CORP., 147 West Cedar St., Norwalk, CT 06854, Tel: 203-866-8474, Telex: 99-6419; *Sls. Mgr.:* Lars Giers

INMOS CORP., P.O. Box 16000, Colorado Springs, CO 80935, Tel: 303-630-4000 Ext. 4454, TWX: 910-920-4904; Empl.: 1500; *Sls. Mgr.:* Peter Fowler; *Dist. Mgr.:* Jim O'Sullivan

INNOTRONICS, Brooks Rd., Lincoln, MA 01773, Tel: 617-678-8720; *Sls. Mgr.:* Julio DeCastro; *Dist. Mgr.:* Stephen Scheuer

INNOVATEK MICROSYSTEMS, INC., Smithfield Rd., Millerton, NY 12546, Tel: 914-373-9003, Telex: 750120; Empl.: 8; *Sls. Mgr.:* Paul F. Fitts

INNOVATIVE ELECTRONICS, INC., 4714 N.W. 165th St., Miami, FL 33014, Tel: 305-624-1644, Telex: 80-7121; Empl.: 28; *Sls. Mgr.:* Diane Ruggiero; *Dist. Mgr.:* Diane Ruggiero

INRECO, See Ransco Industries

INRESCO/INSTR. RESISTOR, 2106 Bridge Ave., Pt. Pleasant, NJ 08742, Tel: 201-892-5881; Empl.: 16; *Sls. Mgr.:* G. L. Martin

INSERVCO, INC., Box 106, La Grange, OH 44050

INSTRON CORP., 100 Royall St., Canton, MA 02021, Tel: 617-828-2500, Telex: 924434; Empl.: 1000; *Sls. Mgr.:* S. J. Vinciguerra; *Dist. Mgr.:* Lawrence Frost

INSTRULAB, P.O. B. 98, Dayton, OH 45404, Tel: 513-223-2241; Empl.: 22; *Sls. Mgr.:* Philip C. Alderton

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	303-289-5647
CA	Los Angeles, Crown Elctrns.	213-877-3550
CA	San Francisco, Paul Rosen Co.	415-526-8286
CO	Denver, Williams Assoc.	303-289-5647
GA	Atlanta, E. G. Holmes & Assoc.	404-451-6161
IL	Chicago, Data Elctrn.	312-283-0300
IN	Indianapolis, Data Elctrns.	317-359-5368
KS	Overland Park, Ramsey Assocs.	913-649-6996
MD	Baltimore, Easter Instr.	301-384-8500
MA	Boston, Addelco Corp.	617-444-4754
MI	Detroit, E.Q.S. Sys.	313-961-3042
MN	Minneapolis, Loren Green Assoc.	612-571-6666
MO	St. Louis, Ramsey Assoc.	314-878-5042
NJ	Cresskill, Eastern Inst. of N Y	201-567-9505
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Syracuse, DB Assocs.	315-446-0220
NC	Raleigh, E. G. Holmes	919-469-8850
OH	Chesterland, E. Q. S. Sys.	216-729-2222
OH	Dayton, E.Q.S. Systems	513-294-2476
PA	Philadelphia, Sci. Devices	215-825-9515
TX	Lewisville, Milstek Inc.	214-436-1597
UT	Salt Lake City, Williams Assocs.	801-485-6511
WA	Seattle, Hood Engrg.	206-453-9375

INSTRU-LEC, 520 Homestead Ave., Mt. Vernon, NY 10550, Tel: 914-668-3754; FSC No.: 13782; Empl.: 10

INSTRUMENTATION & CONTROL SYS., 520 Interstate Rd, Addison, IL 60101, Tel: 312-543-6200, TWX: 910-991-5945; Empl.: 50; *Sls. Mgr.:* Andrew Hart;Ken Horning

INSTRUMENTATION MEASUREMENTS LAB., Div. of Lockheed Electronics Co. Inc., 1501 Rt. 22, Plainfield, NJ 07061, Tel: 201-757-3730; *Sls. Mgr.:* P. Murray Grinnell

INSTRUMENTATION PRODS., 3M Co., 300 S. Lewis Rd., Camarillo, CA 93010, Tel: 805-482-1911, TWX: 910-336-1676; Empl.: 500

INSTRUMENT ENCLOSURES, 9767 Glenoaks Blvd., Sun Valley, CA 91352, Tel: 213-768-4622, Telex: 66-2442; FSC No.: 62012; Empl.: 20; *Sls. Mgr.:* William B. Taylor

INSTRUMENT RESEARCH CO., Box 40207, Santa Barbara, CA 93103, Tel: 805-962-8336; Empl.: 6

INSTRUMENT RESISTOR CO., See INRESCO/INRESCO/Instr. Resistor

INSTRUMENTS, INC., 7263 Engineer Rd., San Diego, CA 92111, Tel: 619-571-1111, Telex: 695073, TWX: 910-335-1607; FSC No.: 34563; Empl.: 28; *Sls. Mgr.:* Ken Kalbfell

INSTRUMENTS AND CONTROLS DIV., Technology Inc., P.O. Box 3036, Overlook Branch, Dayton, OH 45431, Tel: 513-426-2405, TWX: 810-450-2620; FSC No.: 23978; Empl.: 100

ifi INSTRUMENTS FOR INDUSTRY

INSTRUMENTS FOR INDUSTRY, INC., 151 Toledo St., Farmingdale, NY 11735, Tel: 516-694-1414, TWX: 510-222-0876; Empl.: 25; *Sls. Mgr.:* Ron Richards ....3•1011

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CA	Los Altos, DJM Elctrns.	415-966-1680
CA	Valencia, DJM Elctrns.	213-367-9482
CO	Lakewood, Westek Data Prods.	303-989-1900
FL	Clearwater, Beacon Elctrns.	813-796-2378
GA	Atlanta, Beacon Elctrns.	404-256-9640
MD	Laurel, CSDS, Inc.	301-490-3800
MN	Minneapolis, Deerland Distrs.	612-331-6433
MO	Kansas City, EIR Co.	816-452-7030
MO	Leasburg, EIR Co.	314-895-4100
NJ	N. Plainfield, Brady Co.	201-753-7988
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	Guilderland, Electro Modular Sys.	518-456-2665
NC	Greensboro, Beacon Elctrns.	919-275-9997
OH	Bedford Hgts., Bill Teplitz Assocs.	216-439-3265
OH	Dayton, Bill Teplitz Assocs.	513-277-6531
TN	Johnson City, Beacon Elctrns.	615-282-2421
UT	Salt Lake City, Westek Data Prods.	801-582-1200
WI	Milwaukee, Deerland Distrs.	414-784-1414

INSTRUMENT SPECIALTIES CO., P.O. Box A, Delaware Water Gap, PA 18327, Tel: 717-424-8510, TWX: 510-671-4526; Empl.: 350; *Sls. Mgr.:* James P. May ....2•1908, 1909

Local Sales Offices & Reps

AZ	Phoenix, O'Donnell Assocs.	602-274-6072
CA	San Diego, O'Donnell Assocs.	619-578-1645
CA	Sunnyvale, O'Donnell Assocs.	408-745-7043
CA	Torrance, O'Donnell Assocs.	213-328-9710
SC	Greenville, B & B Sls.	803-297-1200
TX	Dallas, J. M. Spell	214-620-0040
WA	Bothell, Temco Northwest	206-488-1254

INTECH, Instruments Div., 282 Brokaw Rd., Santa Clara, CA 95050, Tel: 408-727-0500, TWX: 910-338-0254; Empl.: 120; *Sls. Mgr.:* Howard Randall; *Dist. Mgr.:* Howard Randall

INTECH, Microcircuits Div., 2270 Martin Ave., Santa Clara, CA 95050, Tel: 408-988-4930, TWX: 910-338-2213; FSC No.: 33967; Empl.: 150; *Sls. Mgr.:* D. Arnold

INTEGRA, INC., 2368 Walsh Ave., Santa Clara, CA 95051, Tel: 408-727-9601, TWX: 910-338-0585; FSC No.: 51162

INTEGRAL DATA SYS., INC., Rte. 13 S, Milford, NH 03055, Tel: 603-673-9100, Telex: 95-3032; *Dist. Mgr.:* M. Dude

INTEGRATED CIRCUIT ENGRG. CORP. (ICE), 15022 N. 75th St., Scottsdale, AZ 85260, Tel: 602-998-9780, Telex: 165-755; Empl.: 45; *Sls. Mgr.:* Daniel J. Shelton

INTEGRATED CIRCUITS, INC., 10301 Willows Road, Redmond, WA 98052, Tel: 206-882-3100, TWX: 910-443-2302; FSC No.: 50821; Empl.: 160; *Sls. Mgr.:* B. W. Brugman ....1A•1660; 3•1593-1597

Local Sales Offices & Reps

CA	El Toro, Martronix	714-855-6397
CA	Mountain View, Weseloh-Swanson Sls.	415-961-0565
CO	Parker, Tech. Mktg. Assoc.	303-841-3435
FL	Melbourne, EMS Inc.	305-724-1027
IL	Schaumburg, Gassner & Clark Co.	312-882-8608
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MD	Owings Mills, Neal Deoul Assocs.	301-363-4311
MA	Wakefield, Howard C. Jappe Co.	617-245-9359
MN	Minneapolis, Electromark	612-881-3306
MO	St. Louis, Beams Co.	314-569-1060
NJ	Flanders, K & R Engrg. Sls.	201-584-5235
OH	Cleveland, Arthur H. Baier Co.	216-461-6161
PA	Newtown, Yax Assocs.	215-860-2540
TX	Irving, Kite Elctrn. Sls.	214-438-9336

INTEGRATED COMPUTER SYSTEMS, 6305 Arizona Pl., P.O. Box 45405, Los Angeles, CA 90045, Tel: 213-417-8888, Telex: 4995168 ICS LA; Empl.: 80; *Sls. Mgr.:* Ruth Dordick

INTEGRATED DEVICE TECHNLG., INC., 3236 Scott Blvd., Santa Clara, CA 95051, Tel: 408-727-6116, TWX: 910-338-2070; FSC No.: 61772; Empl.: 240; *Sls. Mgr.:* Lanny Flessas

INTEGRATED MICROWAVE, 11526 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-457-0277, TWX: 910-335-2037; FSC No.: 60656; *Sls. Mgr.:* Art Brand

INTEL MEMORY SYSTEMS, 1302 N. Mathilda, Sunnyvale, CA 94086, Tel: 408-734-8102, TWX: 910-339-9361; FSC No.: 34649; Empl.: 600; *Sls. Mgr.:* G. Andersen, Mktg. Mgr.

INTERACTIVE Computer Products, Inc.

INTERACTIVE COMPUTER PRODUCTS, INC., 23591 El Toro Rd., Ste. 180, El Toro, CA 92630, Tel: 714-770-5332, Telex: 469459; *Sls. Mgr.:* Jim Bearden

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
CA	Sunnyvale, Industrial Modules	408-737-7727
CA	Van Nuys, Momjian & Associates	213-764-4891
CO	Aurora, Garrett Sls. Co.	303-695-3720
GA	Stone Mountain, 20th Century Mktg.	404-292-7088
MA	Waltham, Benchmark Associates	617-899-3390
NY	Staten Island, Budd-Tronics Sales	212-494-7894
TN	Knoxville, 20th Century Mktg.	615-690-1618
UT	Salt Lake City, Garrett Sls. Co.	801-350-7406

INTERACTIVE MICRO SYS., INC., 644 Davisville Rd., Willow Grove, PA 19090

INTERCONICS, BMC Industries, Inc., 610 Bremer Tower, St. Paul, MN 55101, Tel: 612-228-6512, Telex: 297022; *Sls. Mgr.:* Lee Jamison

INTERCONNECT DEVICES, INC., 5101 Richland Ave., Kansas City, KS 66106, Tel: 913-342-5544, Telex: 437-262; *Sls. Mgr.:* Edward J. Schifman

Local Sales Offices & Reps

AZ	Phoenix, Piper Sls. Co.	602-949-0048
CA	Los Angeles, M.A. Stolaroff Co.	213-295-7781
CA	Santa Clara, Electro Venture	408-727-1553
CO	Denver, Piper Sls. Co.	303-443-5337
CT	Canton, Bell Controls	203-693-8926
FL	Orlando/Ft. Lauderdale, Equipment Sales	305-339-2972
GA	Atlanta, Equipment Sales	404-992-7180
MN	Minneapolis, Mil-Com Marketing	612-944-8030
NH	Nashua, Bell Controls	603-882-6984
NY	New York, Sprung-Nussbaum	201-569-5666
TX	Dallas, R. F. Kimball	214-231-3447

INTERCONNECTION TECHNOLOGY, INC., 5542 Buckingham Drive, Huntington Beach, CA 92649, Tel: 714-891-5305, TWX: 910-596-1879; *Sls. Mgr.:* Ken Rhines **2**•1890

Local Sales Offices & Reps

AZ	Scottsdale, Semi-sys. Arizona, Inc.	602-991-1151
CA	El Segundo, Varigon Assocs.	213-322-1120
CA	El Toro, Varigon Assocs.	714-855-0233
CA	San Diego, Varigon Assocs.	619-576-0100
CA	Santa Clara, DC Elctrns.	408-980-1199
IL	Park Ridge, Probe Elctrns.	312-696-2828
MD	Pasadena, Macrotech Assocs.	301-437-5588
NM	Albuquerque, Syntech	505-266-7951
OH	Mansfield, Ralph Meckling Assocs.	419-756-4433
WA	Edmonds, Cunningham Sales; Inc.	206-771-4848

INTERDESIGN, INC., 1500 Green Hills Rd., Scotts Valley, CA 95066, Tel: 408-438-2900, TWX: 910-339-9374; Empl.: 230

Local Sales Offices & Reps

IL	Schaumburg, Interdesign	312-397-1990
MA	Burlington, Interdesign	617-229-5811

INTERDYNE CO., 157 Topaz St., Milpitas, CA 95035, Tel: 408-943-9133; FSC No.: 31598; Empl.: 30

INTERELECTRONICS CORP., Interelectronics Park, 550 U.S. Rte. 303, Congers, NY 10920, Tel: 914-EL8-8000; Empl.: 82; *Sls. Mgr.:* M. H. Pintell; *Dist. Mgr.:* G. Sherwood **3**•1598

INTERFACE, 7401 Butherus Dr., Scottsdale, AZ 85260, Tel: 602-948-5555, Telex: 668-394; FSC No.: 32311

INTERFACE ENGRG., 386 Lindelof Ave., Stoughton, MA 02072, Tel: 617-344-7383, Telex: 940-848; FSC No.: 14352; Empl.: 25; *Sls. Mgr.:* Thomas Scanlon **3**•1164, 1165

Local Sales Offices & Reps

NY	Great Neck, Industron Assoc.	516-487-2620
VA	Arlington, Gans & Pugh	703-527-3262

INTERFACE TECH. DYNATECH, 150 East Arrow Hill Way,, San Dimas, CA 91773, Tel: 714-592-2971

INTERGALACTIC CORP., Box 7025, Salt Lake City, UT 84107, Tel: 801-262-0094

INTERLOK
ONE OF THE **PURDY** GROUP OF COMPANIES

INTERLOK, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-348-5625, TWX: 910-374-2353; FSC No.: 55951; Empl.: 30; *Sls. Mgr.:* Ray Vorce **2**•1038, 1039, 1334-1337, 1761

Local Sales Offices & Reps

AZ	Tempe, Foley, Tallent & Lee	602-894-2345
AR	Little Rock, J. Y. Schoonmaker	501-375-2168
CA	Anaheim, Impact Elctrns., Inc.	714-553-1351
CA	Burlingame, W. J. Purdy	415-347-7701
CO	Denver, W. J. Purdy	303-777-1411
CT	Hartford, Sturgeon	203-249-7800
IL	Elmhurst, Hill-Gray Assoc.	312-832-4101
IN	Indianapolis, Sukup & Cox	317-253-5501
IA	Marion, MSB Assocs.	319-377-6261
KS	Shawnee Mission, MSB Assocs.	913-432-2131
MD	Lisbon, S. K. MacDonald	301-442-1590
MA	Needham Hgts., P. R. Sturgeon	617-444-6603
MI	Ferndale, Hilltronics	313-398-5556
MO	Hazelwood, MSB Assocs.	314-895-4700
NJ	Englewood, Harold Gray	201-894-0894
NM	Albuquerque, W. J. Purdy	505-266-7959
NY	Syracuse, Paston-Hunter	315-437-2843
OH	Beachwood, Elctrn. Salesmasters	216-831-9555
OK	Tulsa, J. Y. Schoonmaker	918-444-0373
OR	Beaverton, William J. Purdy	503-641-9373
PA	Philadelphia, S. K. MacDonald	215-545-1205
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J. Y. Schoonmaker	713-738-2427
WA	Redmond, William J. Purdy	206-882-3144

Local Distributors

AZ	Tempe, Anjon Entprs.	602-894-1332
AZ	Tempe, Waltronic Sls.	602-967-1020
CA	Chatsworth, Panel Parts Co.	213-998-5991
CA	Santa Clara, Dynametron	408-727-6531
CA	Santa Clara, Waltronic Sls.	408-727-1200
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Wallingford, Sager Electrical Supp. Co.	203-265-4600
IL	Villa Park, Melvin Elctrns.	312-279-5010
MA	Hingham, Sager Electrical Supp. Co.	617-749-6700
MA	Lynn, Land Elctrn. Supp. Co.	617-592-2220
MA	Waltham, Vantage Elctrns. Corp.	617-894-8690
NJ	Cranford, Garden State Elctrns., Inc.	201-272-6400
NY	Buffalo, Summit Distrs.	716-884-3450
OK	Tulsa, Radio, Inc.	918-587-9123
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TX	Houston, Lenert Co.	713-225-1465
VA	Richmond, Instrument Tech. Rep.	804-275-1431

INTER-MARKET, 1946 Lehigh Ave., Glenview, IL 60025, Tel: 312-729-5330, TWX: 910-651-1997; FSC No.: 34165; Empl.: 10; *Sls. Mgr.:* Phil Gardanier **1B**•1088, 1649

Local Sales Offices & Reps

MA	Braintree, Nova Assoc.	617-848-9330
MN	St. Paul, Kenco Tronics	612-645-7717
PA	Rydal, Espy Sls.	215-576-0780
TX	Irving, Kite Elctrn. Sls.	214-438-9336
WA	Redmond, Elctrn. Mktg.	206-882-0962

Local Distributors

CA	Chatsworth, Mil-Comm Distr.	213-998-3111
CO	Denver, Integrated Elctrns.	303-292-6121
ID	Spirit Lake, A-1 Electronics	800-635-1545
IL	Chicago, Newark Elctrns.	312-638-4411
MI	Grand Rapids, S-F Electronics	616-459-0216
MN	St. Paul, K.D.I. Inc.	612-645-5090
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Fairlawn, Relay Specialties	201-797-3313
OH	Dayton, Stotts-Friedman	513-298-5555
PA	Willow Grove, Resco Electric	215-659-4575
TX	Austin, Galtronics	512-837-7470
WI	Mequon, Lake-View Elctrn.	414-377-8250
WI	Oshkosh, Electronic Inds.	414-235-8930
Can	Montreal, Que., Braydon Electro	514-332-5650

INTERMATIC, Intermatic Plaza, Spring Grove, IL 60081, Tel: 815-675-2321, Telex: 25-265; Empl.: 1000

INTERNATIONAL COMPS. CORP., 105 Maxess Rd., Melville, NY 11747, Tel: 516-293-1500, TWX: 510-224-6409; Empl.: 100; *Sls. Mgr.:* Irwin Okin **1A**•1074, 1876, 2096; **2**•1338; **3**•1030

Local Sales Offices & Reps

AL	Huntsville, EMA	205-533-6640
AZ	Tempe, Electronic Dev. & Sls.	602-829-9699
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Redwood City, Hickey Inds.	
CT	Bethel, GM Branch	203-744-1426
CT	Vernon, G-M Assoc.	203-646-4443
FL	Casselberry, HAI	305-752-7520
FL	Coral Springs, HAI	305-752-7550
GA	Atlanta, EMA	404-329-0530
IL	Arlington Heights, MJ Petersen & Assoc.	312-577-8200
IN	Fort Wayne, Jim Finnegan & Co.	219-747-7650
IA	Cedar Rapids, IOWA Tech. Sls.	319-377-5795
MD	Baltimore, Espy Sls. Co.	301-444-6982
MA	Framingham, G-M Assoc.	617-872-4871
MA	Stroughton, GM Assocs.	617-344-0116
MN	Minneapolis, PSI	612-944-8545
NH	Exeter, GM Branch	603-778-7472
NJ	East Brunswick, Winch Sls. Assocs.	201-828-4615
NY	Jericho, Metro Tech. Sls.	516-935-3330
NY	Syracuse, Nycom	315-437-8343
NC	Pineville, EMA	704-541-2628
NC	Winston-Salem, EMA	919-784-7304
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
PA	Camp Hill, ESPY Branch	717-763-9577
PA	Rydal, Espy Sls. Co.	215-576-0780
TN	Donnelson, EMA	615-883-1414
TN	Jonesboro, EMA Branch	615-753-8861
TX	Austin, Mech-tron Mktg.	512-835-0980
TX	Dallas, Mech-tron Mktg.	214-343-3786
TX	Houston, Mech-tron Mktg.	713-462-1432
WA	Edmonds, McLaughlin Mktg. Inc.	206-743-1161

Local Distributors

AZ	Phoenix, ACC	602-269-5655
CA	Canoga Park, Myco Vickers	213-340-2025
CA	Redwood City, Hi-Cor	415-365-5087
CO	Denver, Integrated Elect.	303-623-8713
CT	Danbury, Pilgrim Elect.	203-792-7274
CT	East Haven, JV Elctrns.	203-469-2321
CT	Wallingford, Midstate Elctrns. Co.	203-265-9900
FL	Ft. Lauderdale, National Resistor Co.	305-772-4500
MD	Baltimore, Lorac Elctrns. Co.	301-247-1682
MN	Eden Prarie, Cassidy Elec. Co.	612-944-0100
MN	Minneapolis, Cassidy Elctrns.	612-835-7746
PA	Philadelphia, Mur'Tronics	215-632-4330
PA	Philadelphia, Jan Indl. Elec.	215-WA 2-1321
TX	Ft. Worth, C & W Supp. Co.	817-831-0395

INTERNATIONAL CRYSTAL MFG., 10 N. Lee, P.O. Box 26330, Oklahoma City, OK 73126, Tel: 405-236-3741, Telex: 747-147, TWX: 910-831-3177; Empl.: 165; *Sls. Mgr.:* Paul E. Denwalt **1A**•1367

INTERNATIONAL DATA SCIENCES, 7 Wellington Rd., Lincoln, RI 02865, Tel: 401-333-6200, TWX: 710-384-1911; Empl.: 125

INTERNATIONAL DEVICES INC., 3200 Pendleton, Santa Ana, CA 92704, Tel: 714-557-9394, 800-854-7651, Telex: 681387; FSC No.: 53763; *Sls. Mgr.:* Alan J. Vanek; *Dist. Mgr.:* Alan J. Vanek

INTERNATIONAL DIODE, 229 Cleveland Ave., Harrison, NJ 07029, Tel: 201-482-6518; Empl.: 9; *Sls. Mgr.:* Lee Toong

INTERNATIONAL ELECTRO MAGNETICS, INC., 350 N. Eric Dr., Palatine, IL 60067, Tel: 312-358-4622; Empl.: 30; *Sls. Mgr.:* T. Pretto **3**•1031

Local Sales Offices & Reps

NY	New York, United Research Labs.	212-751-4660

INTL. ELCTRN. RESCH., 135 W. Magnolia Blvd., Burbank, CA 91502, Tel: 213-849-2481, TWX: 910-498-2206; FSC No.: 98978; Empl.: 116; *Sls. Mgr.:* J.S. Smith

INTERNATIONAL HIGH VOLTAGE ELCTRNS., INC., 98 Mill Plain Rd., Danbury, CT 06810, Tel: 203-792-7820; *Sls. Mgr.:* A. Pellegrino **3**•1599-1601

Local Sales Offices & Reps

CT	Waterbury, HLM Assocs.	203-753-9894
NJ	Parsippany, HLM Assocs.	201-263-1535
NY	Northport, HLM Assocs.	516-757-1606

INTERNATIONAL INSTRUMENTATION, 31131-602 Via Colinas, Westlake Vlg., CA 91362, Tel: 213-991-9614; *Sls. Mgr.:* C. D. Morrison; *Dist. Mgr.:* D. Casey

INTERNATIONAL INSTRUMENTS, 88 Marsh Hill Rd., Orange, CT 06477, Tel: 203-795-4711, TWX: 710-465-2897; Empl.: 150; *Dist. Mgr.:* J. Connolly

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
AZ	Tempe, Gassner & Clark	602-968-9037
CA	Burlingame, Engrg. Rep.	415-348-5042
CA	Los Angeles, Barnard & Assocs.	213-515-2978
CA	San Diego, Engrg. Rep.	714-565-2131
CO	Denver, Nelson	303-573-1516
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Chicago, Memeco Sls. & Svc.	312-774-0919
KS	Shawnee Mission, Tech. Sls. Assoc.	913-888-3330
MD	Perry Hall, Electra-Tech	301-256-2723
MA	Hingham, Northeast Reps.	617-749-8700
MN	Eden Prairie, Yukon Sls. Assocs.	612-941-8155
MO	Ferguson, Tech. Sls. Assocs.	314-725-5361
NJ	Berkley Heights, NBS Assocs.	201-464-8500
NY	Rochester, H.C. Johnson Agencies	716-586-0777
NY	Williamsville, H.C. Johnson Agencies	716-632-7880

NC	Charlotte, D.G.W.	704-334-7090
NC	Winston Salem, D.G.W.	919-768-7166
OH	Westlake, Advanced Tech. Assocs.	216-835-5050
OK	Tulsa, Telstar Instr.	918-628-1011
OR	Portland, Garland Affolter Engrg.	503-223-7349
PA	Glenshaw, H.C. Johnson Agencies	412-487-1246
PA	Paoli, Stitzer Assocs.	215-644-5500
TX	Houston, Wilson-Markham Assoc.	713-445-5780
VA	Dumfries, Electra-Tech	703-670-6962
WA	Kirkland, Garland Affolter Engrg.	206-822-2275

INTERNATIONAL LASER SYS., 3404 N. Orange Blossom Trail, Orlando, FL 32804, Tel: 305-295-4010, TWX: 810-850-0195; Empl.: 408; *Sls. Mgr.:* W. C. Hudson

INTERNATIONAL MFG. SVCS., 50 Schoolhouse La., Portsmouth, RI 02871, Tel: 401-683-9700; Empl.: 25; *Sls. Mgr.:* Jay Benson

INTERNATIONAL MICROELECTRONIC PRODS., 2830 North First Street, San Jose, CA 95134, Tel: 408-262-9100, Telex: 499-1041, TWX: 910-338-2274; *Sls. Mgr.:* Robert Kromer

INTERNATIONAL MICROSYSTEMS, 11554 C Ave., Auburn, CA 95603, Tel: 916-885-7262, TWX: 910-367-3706; Empl.: 12; *Sls. Mgr.:* Gail Jones

INTERNATIONAL MICROTRONICS CORP., 4016 E. Tennessee St., Tucson, AZ 85714, Tel: 602-748-7900, TWX: 910-952-1170; Empl.: 25; *Sls. Mgr.:* Otto Fest; *Dist. Mgr.:* Janice Dougall

INTERNATIONAL POWER MACHINES, 11534 Pagemill Rd., Dallas, TX 75243, Tel: 214-343-6076; *Sls. Mgr.:* Jack Conn

INTERNATIONAL RECTIFIER CORP., Semiconductor Div., 233 Kansas St., El Segundo, CA 90245, Tel: 213-772-2000, Telex: 472-0403, TWX: 910-348-6291; Empl.: 1200; *Sls. Mgr.:* W. Lewis; *Dist. Mgr.:* D. Coppinger

Local Sales Offices & Reps

IL	Palatine	312-991-5520
MN	Edina	612-831-6400
NJ	Pallisades Park	201-943-4554
OH	Independence	216-447-9717
VA	Charlottesville	804-973-1316
WI	Elm Grove	414-784-2480

INTERNATIONAL RESOURCE SVCS., 7343 N.W. 79th Terr., Miami, FL 33166, Tel: 305-884-2924, Telex: 522261 MIA DEPT 262; Empl.: 5; *Sls. Mgr.:* Richard L. Winn

INTERNATIONAL SENSOR SYSTEMS, INC., Aurora Industrial Pk., Box 345, Aurora, NE 68818, Tel: 402-694-6111; Empl.: 45 **1A•1661**

Local Sales Offices & Reps

AZ	Tempe, Spectrum Assoc. SW	602-966-1788
CA	Claremont, Gandalf Elctrns.	714-626-5481
CA	Palo Alto, Tri-Rep	415-965-1822
CT	Branford, LJM Assocs.	203-488-4244
FL	Plantation, Electro-Mechanical Standards	305-587-7146
IL	Chicago, Esco Assocs.	312-763-0800
MA	Westboro, RJC Assocs.	617-366-0399
MN	Minneapolis, R-J Inc.	612-866-3661
NY	Syracuse, Labtronics	315-455-7314
NY	Wantagh, Bytec Reps.	516-781-7400
OR	Beaverton, Ravencraft	503-646-9261
PA	Southampton, Campbell Assocs.	215-322-6630
TX	El Paso, Nokomis Consumer Prods.	915-778-2801
TX	Euless, Andy Byles Intl.	817-267-4099
VA	Fairfax, Schibley Assoc.	703-591-3008

INTERNATIONAL TRANSDUCER, 93 Castillian Dr., Goleta, CA 93117, Tel: 805-685-1441, Telex: 658 495; FSC No.: ID 532; Empl.: 75; *Sls. Mgr.:* Glen E. Liddiard

INTERNATIONAL WIRE PRODUCTS CO., 500 W. Main St., Wyckoff, NJ 07481, Tel: 201-891-5800, Telex: 642580; Empl.: 700; *Sls. Mgr.:* C. D. Abbott

INTEROPTICS
ONE OF THE PURDY GROUP OF COMPANIES

INTEROPTICS, Purdy Group, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-7727 **1B•**1114, 1115

INTERSIL, 10710 N. Tantau Ave., Cupertino, CA 95014, Tel: 408-996-5000, TWX: 910-338-0583; FSC No.: 32293; Empl.: 4102; *Dist. Mgr.:* Bruce Mattern

INTERSTATE ELECTRONICS CORP., Box 3117, 1001 E. Ball Rd., Anaheim, CA 92803, Tel: 714-635-7210, Telex: 655443, TWX: 910-591-1197; FSC No.: 6625, 5985; Empl.: 1500; *Sls. Mgr.:* Darryl Watanabe; *Dist. Mgr.:* R. Sorenson

INTERSWITCH

INTERSWITCH, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-8217, TWX: 910-374-2353; Empl.: 30; *Sls. Mgr.:* Ray G. Vorce **1B•1650**

Local Sales Offices & Reps

AZ	Tempe, Foley, Tallent & Lee	602-894-2345
AR	Little Rock, J. Y. Schoonmaker	501-375-2168
CA	Burlingame, W. J. Purdy	415-347-7701
CA	Costa Mesa, Berman-Gravely Co.	714-549-2122
CO	Denver, W. J. Purdy	303-777-1411
CT	Hartford, Sturgeon	203-249-7800
IL	Elmhurst, Hill-Gray	312-832-4101
IN	Indianapolis, Sukup & Cox	317-253-5501
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs.	913-432-2131
MD	Baltimore, S. K. MacDonald	301-254-3380
MA	Needham Hgts., P. Sturgeon	617-444-6603
MI	Ferndale, Hilltronics	313-398-5556
MO	Hazelwood, M-S-B Assocs.	314-895-4700
NJ	Englewood, H. Gray	201-894-0894
NM	Albuquerque, W. J. Purdy	505-266-7959
NY	Syracuse, Paston-Hunter	315-437-2843
OH	Beachwood, Elctrn. Salesmasters	216-831-9555
OK	Tulsa, J. Y. Schoonmaker	918-583-0912
OR	Beaverton, William J. Purdy	503-641-9373
PA	Philadelphia, S. K. MacDonald	215-545-1205
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J. Y. Schoonmaker	713-738-2427
UT	Salt Lake City, William J. Purdy	801-486-8557
WA	Redmond, William J. Purdy	206-882-3144

Local Distributors

AZ	Tempe, Waltronic Sls.	602-967-1020
AZ	Tempe, Anjon Entprs.	602-894-1332
CA	Chatsworth, Panel Parts Co.	213-998-5991
CA	N. Hollywood, Merit Comp. Supp.	213-842-8162
CA	Santa Clara, Waltronic Sls.	408-727-1200
CO	Denver, Ragon	303-744-3601
FL	Ft. Lauderdale, Peerless Radio Corp.	305-973-4141
IL	Addison, L Comp-Chicago	312-628-1400
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
MA	Lynn, Land Elctrn. Supp. Co.	617-592-2220
MN	Minneapolis, Bergquist	612-835-2322
NJ	Englewood, Tech. Elctrn./Powell	201-894-0800
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Rochester, Summit Distrs.	716-334-8110
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cincinnati, Hughes-Peters, Inc.	513-351-2000
OH	Columbus, Hughes-Peters, Inc.	614-294-5351
PA	Willow Grove, Resco Elctrns.	215-659-4575
TX	Houston, Harrison Equip. Co.	713-879-2600
WI	Mequon, Taylor Elec. Co.	414-241-4321

The Inter-Technical Group Inc.
WIMA Division

INTER-TECHNICAL GRP., Box 23, Irvington, NY 10533, Tel: 914-591-8822, TWX: 710-564-0802; Empl.: 13; *Sls. Mgr.:* T. A. Galgano **1A•**1075-1079

Local Sales Offices & Reps

AL	Huntsville, J. R. Assocs.	205-830-2130
AZ	Scottsdale, Semper Fi Sls. Inc.	602-991-4606
CO	Lakewood, Palmer Assocs.	303-233-9423
CT	Colchester, Normell Assocs.	203-537-5555/3758
FL	Altamonte Springs, "C" Assocs.	305-831-1717
GA	Dunwoody, J. R. Assocs.	404-399-1831
IL	Westchester, W. G. Brouilette & Assocs.	312-345-6500
MA	Newton, Normell Assocs.	617-969-5478
MN	Minneapolis, Intl. Sls.	612-831-8423
NJ	Colonia, H. B. Heft Assocs.	201-381-5193
NY	Lynbrook, H. B. Heft Assocs.	516-LY 9-3351
NY	Rochester, BKT Assocs.	716-586-5814
NC	Kennersville, Naylor Assocs.	919-996-4162
OR	Portland, Harry Levinson Co.	503-245-1902
PA	King of Prussia, R. D. Freedman Assocs.	215-279-5767
PA	W. Conshohocken, Eastern Comps. Sls. Corp.	215-825-8610
TX	Carrollton, Paulsen Elctrn. Sls.	214-386-4785
UT	Salt Lake City, Alpine Entprs.	801-278-6920
VA	Manassas, Eastern Comps. Sls.	800-223-3850
WA	Seattle, H. Levinson Co.	206-323-5100

INTEX MICRO SYSTEMS CORP., 725 S. Adams Rd., Suite L-8, Birmingham, MI 48011, Tel: 313-540-7601, Telex: 230254 WUPUBTLX; *Sls. Mgr.:* R. Thielman

INTRA-COMPUTER, 101 W. 31st St., New York, NY 10001, Tel: 212-947-5533, Telex: 64-5067; Empl.: 9; *Sls. Mgr.:* Art Yaglian

intronics

INTRONICS, INC., 57 Chapel St., Newton, MA 02158, Tel: 617-964-4000, Telex: 200095, TWX: 710-335-6835; Empl.: 130; *Sls. Mgr.:* J. Swartz **3•**1602, 1603

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Mfrs. Agts.	205-830-4030
AZ	Tempe, Delta Elctrns.	602-966-9903
CA	Los Altos Hills, HB Marketing	415-941-4080
CA	Temple City, HMC Inc.	213-285-0485
CO	Denver, Anderson Assoc.	303-295-3342
CT	Guilford, Elctrn. Mktg. Assoc.	203-543-5424
FL	Melbourne, Reynolds & Assoc.	305-259-7000
GA	Atlanta, Elctrn. Mfrs. Agts.	404-329-0530
IL	Palatine, Kingston Comps.	312-359-7990
IN	Fort Wayne, Domino Unlimited	219-747-5621
IA	Cedar Rapids, Technical Electronics	319-362-4116
KS	De Soto, Midtec Assoc.	913-441-6565
MD	Severna Park, DelMarva Engr.	301-647-8007
MI	Southfield, Infinity Inc.	313-557-7230
MN	Minneapolis, Dan'l Engr.	612-854-7550
MO	Florissant, Midtec Assoc.	314-837-5200
NH	Salem, Elctrn. Mktg. Assoc.	603-893-5378
NJ	Vincentown, Eastern Sci. Mktg.	609-268-0250
NY	Canandaigua, Bensman/Upstate	716-396-2498
NY	Jericho, J-Square Mktg.	516-935-3200
NC	Pineville, Elctrn. Mfrs. Agts.	919-781-4139
OH	Dayton, Del Steffen & Assoc.	513-293-3145
PA	Chalfont, Eastern Sci. Mktg.	215-822-6503
TN	Jonesboro, Elctrn. Mfrs. Agts.	615-753-5844
TX	Richardson, Scientific Sls.	214-231-6541
WA	Seattle, Data Com. Assoc.	206-285-2525

ION PHYSICS CO., Div. High Voltage Engrg. Corp., P.O. Box 416, So. Bedford St., Burlington, MA 01803, Tel: 617-272-2800, Telex: 951733

IPAC GRP., 3047 Indl. Blvd., Bethel Pk., PA 15102, Tel: 412-831-9200, TWX: 510-697-3935; Empl.: 50; *Sls. Mgr.:* D. T. Cusack

IQ SYSTEMS, Applied Circuit Tech., 2931 La Jolla St., Anaheim, CA 92806, Tel: 714-630-6834; *Sls. Mgr.:* Jim Stedt

IR SCIENTIFIC, Box 110, Carlisle, MA 01741, Tel: 617-369-7118; Empl.: 10; *Sls. Mgr.:* S. J. Sommer

ISC MAGNETICS DIV., See Aeroflex Labs., Inc., Magnetic Prods. Div.

ISKRA ELECTRONICS, INC., 8 Greenfield Rd., Syosset, NY 11791, Tel: 516-364-2616 ....**1A**•1080, 1081, 1877, 2039, 2097; **1B**•1443

ISL PRODUCTS INTL. LTD., 235 P Robbins Lane, Syosset, NY 11791-6093, Tel: 516-822-9601, TWX: 510-221-2109; Empl.: 25,000; *Sls. Mgr.:* Ken Kawaller .... **1A**•1082, 1083, 2098

Local Sales Offices & Reps

IL	Lake Bluff, R & R Marketing	312-295-6660
IN	Noblesville, Newton & Assoc.	317-845-8157
MD	Pikesville, Muncy Sls.	301-484-6376
MA	Topsfield, RFC Assocs.	617-887-8545
TX	Dallas, Dick Bellew Sls.	214-373-4590
VA	Charlottesville, Electronic Sources	804-953-6315

ISOCHEM PRODS. CO., A Sub. of Rohm and Haas Adv. Matls. Co., 99 Cook St., Lincoln, RI 02865, Tel: 401-723-2100; Empl.: 26; *Sls. Mgr.:* Arthur M. Goldfarb

ISOLATION PRODUCTS, INC., 1245 Birchwood Dr., Sunnyvale, CA 94086, Tel: 408-734-4068; *Sls. Mgr.:* Joseph D. Bianco

ISOREG CORP., 410 Great Rd., P.O. Box 486, Littleton, MA 01460, Tel: 617-486-9483, TWX: 710-347-6974 ISOREG LTTN; Empl.: 65; *Sls. Mgr.:* Paul Foss; *Dist. Mgr.:* Paul Foss

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ISOTEMP RESEARCH, INC, Box 3389, Charlottesville, VA 22901, Tel: 804-295-3101; FSC No.: 031785; Empl.: 30 ....**1A**•1368, 1369

Local Sales Offices & Reps

AZ	Scottsdale, Faser Technical Sls.	602-948-4404
CA	Costa Mesa, EBA Microwave	714-857-6079
CA	Fremont, Wm. Parks & Assocs.	415-490-2011
CA	San Diego, Qualtronics	619-560-8955
CO	Denver, W. H. Howard Assoc.	303-353-7281
IL	Woodridge, Trend-Tronics	312-985-0626
IN	Fort Wayne, Given Corp.	219-432-5585
MD	Columbia, M. Lader Co.	301-730-1550
MD	Conowingo, M. Leader Co.	301-272-3449
NY	Melville, Carnes Assoc.	516-694-1600
PA	Lafayette Hill, M. Lader Co.	215-825-3177

ISOTRONICS, Industrial Park, New Bedford, MA 02745, Tel: 617-998-2000, TWX: 710-344-1961; *Sls. Mgr.:* Mike LoFrumento

ITEK MEASUREMENT SYS., Div. Litton Inds., 27 Christina St., Newton, MA 02161, Tel: 617-969-7300, TWX: 710-335-6783; Empl.: 100 .... **1B**•1845

Local Sales Offices & Reps

CA	Los Angeles, Measurement Sys. Div.	213-641-0476
FL	Orlando, K. S. Chaney	305-293-5656
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MN	Minneapolis, Marsland Assocs.	612-545-4481
NJ	Metuchen, Measurement Sys. Div.	201-548-1500
NM	Las Cruces, BFA Corp.	505-524-9693

Local Distributors

FL	Orlando, Kenneth S. Chaney	305-423-9465
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
MN	Minneapolis, Marsland Assocs.	612-545-4481
NM	Las Cruces, BFA Corp.	505-524-9693
Intl	England, Tadley, Hampshire, Hightech Comps., Ltd.	07356-3922
Intl	France, Paris, Sedeme	580.72.000
Intl	Germany, Munich, Weltronic GmbH	089-49 20 66
Intl	Holland, Rotterdam, Anru	010-137395
Intl	India, Bombay, Echbee Corp.	253489
Intl	Israel, Tel-Aviv, Airtronic Engrg. Ltd.	45 48 71
Intl	Italy, La Spezia, Motordiesel Elec. Instr. & Comp.	36.232
Intl	Japan, Tokyo, Nippon Engrg. Sys.	494-4045
Intl	Norway, Oslo, Ole A. Nordby A/S	02 55 07 50
Intl	Sweden, Bromma, Magnetic AB	08-2904-60

ITHACO, INC., Meas. & Control Instrs. Div., 735 W. Clinton St., P.O. Box 6437, Ithaca, NY 14851-6437, Tel: 607-272-7640, TWX: 510-255-9307; Empl.: 120; *Sls. Mgr.:* Allen Roth

ITOH ELECTRONICS, INC., 5301 Beethoven St., Los Angeles, CA 90066, Tel: 212-682-0420, Telex: 12-5059; Empl.: 100; *Sls. Mgr.:* F.I. Makstein, VP Mktg.

ITT CANNON, 10550 Talbert Avenue, P.O. Box 8040, Fountain Valley, CA 92708, Tel: 714-964-7400, Telex: 65-5358, TWX: 910-596-2620; FSC No.: 71468; Empl.: 2500; *Sls. Mgr.:* Bruce Simpson; *Dist. Mgr.:* Frank Cosentino ....**2**•1339-1354

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens & Co.	205-833-0445
AZ	Phoenix, ITT Cannon	602-275-4792
CA	Campbell (San Jose), ITT Cannon	408-559-1777
CA	Fountain Valley, ITT Cannon	714-964-7400
CA	San Diego, ITT Cannon	619-560-0917
CA	Santa Ana, ITT Cannon	714-557-4700
CO	Denver, ITT Cannon	303-778-1855
CO	Littleton, ITT Cannon	303-973-8766
CT	Danbury, ITT Cannon	203-748-5801
CT	Enfield, ITT Cannon	203-749-7246
FL	Deerfield Beach, Brandel-Stephens & Co.	305-427-8558
FL	Orlando, Brandel-Stephens & Co.	305-425-3202
GA	Atlanta, Brandel-Stephens & Co.	404-261-7579
IL	Des Plaines, ITT Cannon	312-297-3150
IN	Fort Wayne, ITT Cannon	219-484-6447
IA	Swisher, ITT Cannon	319-369-9107
KS	Haysville, ITT Cannon	316-529-0127
MD	Baltimore, ITT Cannon	301-254-3707
MD	Baltimore, ITT Cannon	301-882-4760
MA	Wakefield, ITT Cannon	617-246-2510
MI	Sterling Heights, ITT Cannon	313-643-4620
MN	Minneapolis, ITT Cannon	612-854-1973
MO	Bridgeton, ITT Cannon	314-739-6040
NM	Albuquerque, ITT Cannon	505-293-0457
NY	Buffalo, L-Mar Assoc.	716-675-1277
NY	East Syracuse, L-Mar Assoc.	315-437-7779
NY	Henniker, ITT Cannon	603-428-3883
NY	Holbrook, ITT Cannon	215-646-2801
NY	Ithaca, L-Mar Assoc.	607-257-5712
NY	Poughkeepsie, ITT Cannon	914-473-3314
NY	Rochester, L-Mar Assoc.	716-323-1000
NC	Greensboro, Brandel-Stephens & Co.	919-274-6952
OH	Kettering, ITT Cannon	513-434-8181
OH	Uniontown, ITT Cannon	216-494-6749
PA	Blue Bell, ITT Cannon	215-646-2801
PA	Trevose, P.S.A., Inc.	215-245-0513
TX	Dallas, ITT Cannon	214-661-0302
TX	Houston, ITT Cannon	713-777-1177
WA	Bellevue, ITT Cannon	206-454-3903
WI	Waukesha, ITT Cannon	414-544-1018

Local Distributors

AZ	Tempe, Time Elctrns.	602-967-2000
CA	San Diego, Richey/Western	619-271-4511
CA	Sun Valley, Richey Elctrns.	213-875-2862
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Denver, Arrow Elctrns.	303-758-4585
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
GA	Atlanta, Electro Air	404-351-3545
IL	Bensenville, Hall-Mark Elctrns.	312-860-3814
IN	South Bend, Genesis Elctrns.	219-287-2911
MA	Woburn, Time Elctrns.	617-935-8080
MO	St. Louis, Time Elctrns.	314-391-6444
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Hauppauge, Time Elctrn. Sls.	516-273-0100
NY	Plainview, A.S.I./Progress	516-433-1700
PA	Broomall, Time Elctrns.	215-359-1200
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Warminster, Henwarr	215-675-4104
TX	Dallas, Hall-Mark	214-343-5000
TX	Stafford, Harrison Equip.	713-879-2600
WA	Bellevue, Almac Elctrns.	206-643-9992

ITT CANNON ELECTRIC, 666 East Dyer Rd., Santa Ana, CA 92702, Tel: 714-557-4700

ITT COMPS. ELECTROMECHANICAL GRP., 3201 So. Standard St., Santa Ana, CA 92705, Tel: 714-751-3900, Telex: 681-389, TWX: 910-595-1744; FSC No.: 61725; Empl.: 35; *Sls. Mgr.:* J Biggs; *Dist. Mgr.:* C. McElroy .... **1B**•1444- 1450, 1489

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens & Co.	205-883-0445
AZ	Scottsdale, Semi-Systems	602-991-1151
CA	Anaheim, Spectrum	714-630-6977
CA	Mountain View, Caltron Comps.	415-964-3244
CA	San Diego, C.K. Assocs.	619-279-0420
CO	Denver, I W Strong & Assoc	303-292-6900
CT	Guilford, Data Mark	203-453-0575
FL	Deerfield Beach, Brandel-Stephens & Co.	305-427-8558
FL	Orlando, Brandel-Stephens & Co.	305-425-3202
GA	Atlanta, Brandel-Stephens & Co.	404-261-7579
IL	Rolling Meadows, Sieger Assoc.	312-991-6161
IN	Fort Wayne, M/S Sls.	219-484-1904
KS	Leawood, Thunderbird Tech. Sls.	913-642-7220
MD	Millersville, Trimark	301-987-9103
MA	Southboro, KSA of New England	617-485-9432
MI	Brighton, SAI Mktg.	313-227-1786
MN	Minneapolis, SAI Mktg.	612-935-0777
MO	Maryland Heights, Thunderbird Tech. Sls.	314-567-6488
NM	Albuquerque, Syn Tech	505-266-7951
NY	Manhasset, Wincor Elctrns.	516-627-9474
NY	Rochester, D. L. Eiss Assoc.	716-328-3000
NC	Greensboro, Brandel-Stephens & Co.	919-274-6952
OH	Beachwood, Thompson & Assoc.	216-831-6277
OH	Dayton, Thompson & Assoc.	513-435-7733
OR	Portland, Jas. J. Backer Co.	503-297-8477
PA	Prospect Park, Elf Sls.	215-534-3340
TX	Austin, Norcom	512-451-2757
TX	Dallas, Norcom	214-386-488
UT	Salt Lake City, I W Strong	810-942-699
VA	Lynchburg, Trimark	804-528-0681
WA	Seattle, Jas. J. Backer Co.	206-285-130

Local Distributors

AL	Huntsville, RM Elctrns.	205-852-155
AZ	Phoenix, Kachina Elctrn. Distr.	602-269-620
AZ	Tempe, Richey Western Elctrns.	602-894-925
AZ	Tempe, TIME Elctrns.	602-967-200
CA	Anaheim, TIME Elctrns.	714-937-091
CA	Chatsworth, Integrated Elctrns.	213-998-220

CA	Irvine, Integrated Elctrns.	714-660-1055
CA	Los Angeles, Master Distrs.	213-452-1229
CA	Los Angeles, Richey Western Elctrns.	213-820-3777
CA	San Diego, Richey Western Elctrns.	619-271-4511
CA	Santa Clara, Richey Western Elctrns.	408-727-7411
CA	Santa Monica, Distr. Specialists	213-393-9666
CA	Sun Valley, Q.C. Comps.	213-768-6111
CA	Sunnyvale, TIME Elctrns.	408-734-9888
CA	Torrance, TIME Elctrns.	213-320-0880
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Englewood, TIME Elctrns.	303-850-7701
CT	East Haven, J.V. Elctrns.	203-469-2321
CT	New Haven, Greene Shaw Co.	203-397-0710
CT	Norwalk, Pioneer Elctrns.	203-853-1515
CT	Stamford, Bond Elctrns.	203-348-2663
FL	Davie, ARCO Distrs.	305-772-4500
FL	Fort Lauderdale, NRC	305-772-4500
FL	Ft. Lauderdale, TIME Elctrns.	305-974-4800
GA	Atlanta, Prehler Elctrns.	404-447-5540
IL	Chicago, NEP Elctrns.	312-625-8400
IN	Indianapolis, RM Elctrns.	317-247-9701
IA	Cedar Rapids, DEECO	319-365-7551
MD	Baltimore, Resco	301-823-0070
MD	Beltsville, TREEKO Sales	301-792-0112
MD	Beltsville, RESCO-Washington	301-937-9100
MD	Columbia, TIME Elctrns.	301-964-3090
MA	Lexington, Pioneer Elctrns.	617-861-9200
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Wilmington, R.C. Components	617-273-1860
MA	Woburn, TIME Elctrns.	617-935-8080
MI	Farmington Hills, Prehler Elctrns.	313-473-7200
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Livonia, Reptron Elctrns.	313-525-2700
MN	Eden Prairie, Cassidy Elctrns.	612-944-0100
MN	Minneapolis, Industrial Comps.	612-831-2666
MO	St. Louis, TIME Elctrns.	314-391-6444
NV	Las Vegas, Kiesub Elctrns.	702-733-3888
NJ	Pine Brook, Pioneer Elctrns.	201-227-1262
NJ	Rahway, RSR	201-381-8777
NJ	Whippany, Tonar Inds.	201-884-1400
NM	Albuquerque, Betatron Elctrns.	505-344-2381
NM	Albuquerque, International Elctrns.	505-345-8127
NY	Fairport, Pioneer Elctrns.	716-381-7070
NY	Hauppauge, TIME Elctrns.	516-273-0100
NY	Hauppauge, JACO	516-273-5500
NY	Vestal, Pioneer Elctrns.	607-748-8211
NY	Woodbury, Pioneer Elctrns.	516-921-8700
OH	Columbus, Reptron	614-436-6675
OH	Middleburg Hts., Prehler Elctrns.	216-243-5510
OR	Wilsonville, Zepher Elctrns.	503-582-2929
PA	Broomall, TIME Elctrns.	215-359-1200
PA	Essington, Tri-Com	215-521-3080
PA	Horsham, RM Elctrns.	215-674-1181
TX	Addison, Quality Comps.	214-387-4949
TX	Austin, Quality Comps.	512-835-0220
TX	Dallas, RM Elctrns.	214-263-8361
TX	El Paso, International Elctrns.	915-598-3406
TX	El Paso, ERA Elctrns.	915-592-4126
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Seattle, Richey Western Elctrns.	206-575-1910
WA	Seattle, Zepher Elctrns.	206-241-1980
WI	New Berlin, RM Elctrns.	414-784-4420
WI	New Berlin, NEP Elctrns.	414-785-9100

ITT COMPS. PASSIVE GRP., 3201 S. Standard St., Santa Ana, CA 92705, Tel: 714-751-3900, Telex: 68-1389, TWX: 910-595-1744; FSC No.: 61725; Empl.: 35; *Sls. Mgr.:* Jim Biggs; *Dist. Mgr.:* C. McElroy ....**1A**•1084-1089, 1371

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens & Co.	205-833-0445
AZ	Scottsdale, Semi-Systems Arizona	602-991-1151
CA	Anaheim, Spectrum Assocs.	714-630-6977
CA	Mountain View, Caltron Comp. Corp.	415-964-3244
CA	San Diego, C. K. Assocs.	619-279-0420
CO	Denver, T. W. Strong & Assoc.	303-292-6900
CT	Guilford, Data Mark	203-453-0575
FL	Deerfield Beach, Brandel-Stephens & Co.	305-427-8558
GA	Atlanta, Brandel-Stephens & Co.	404-261-7579
IL	Rolling Meadows, Sieger Assoc.	312-991-6161
IL	Waukegan, Sieger Assoc.	312-991-6161
IN	Fort Wayne, M/S Sls. & Assoc.	219-483-4520
KS	Leawood, Thunderbird Tech. Sls.	913-642-7220
MD	Millerville, Tri-Mark	301-987-9103
MA	Southboro, KSA of New England	617-485-9432
MI	Brighton, SAI Mktg.	313-227-1786
MN	Minneapolis, SAT Mktg.	612-935-0777
MO	Maryland Hts., Thunderbird Tech. Sls.	314-567-6488
NM	Albuquerque, Syntech	505-266-7951
NY	Manhasset, Win-Cor Elctrn. Sls.	516-627-9474
NY	Rochester, D. L. Eiss Assoc.	716-328-3000
NY	Syracuse, D. L. Eiss Assoc.	315-457-0492
NC	Greensboro, Brandel-Stephens & Co.	919-274-6952
OH	Beachwood, Thompson Assoc.	216-831-6277
OH	Dayton, Thompson Assoc.	513-435-7733
OR	Portland, Jas J. Backer Co.	503-297-3777
OR	Salem, Jas J. Backer Co.	503-362-0717
PA	Prospect Park, Elf Sls.	215-534-3340
TX	Austin, Norcom	512-451-2757
TX	Dallas, Norcom	214-386-4888
UT	Salt Lake City, I. W. Strong	810-942-6998
VA	Lynchburg, Tri-Mark	804-528-0681
VA	Lynchburg, Tri-Mark	804-528-0681
WA	Seattle, Jas J. Backer Co.	206-285-1300

Local Distributors

AL	Huntsville, RM Elctrns.	205-852-1550
AZ	Phoenix, Kachina Elctrn. Distrs.	602-269-6201
AZ	Tempe, Richey Western Elctrns.	602-894-9251
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Shelley Elctrns.	619-453-7133
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Irvine, Integrated Elctrns.	714-660-1055
CA	Los Angeles, Richey Western Elctrns.	213-820-3777
CA	San Diego, Richey Western Elctrns.	619-271-4511
CA	San Diego, Shelly Elctrns.	619-453-7133
CA	San Jose, Shelley Elctrns.	408-942-9111
CA	San Jose, Integrated	408-263-1100
CA	Santa Ana, Nesco	714-541-6181
CA	Santa Clara, Richey Western Elctrns.	408-727-7411
CA	Sun Valley, G. C. Comps.	213-768-6111
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Sunnyvale, Capsco Sls.	408-734-3020
CA	Torrance, Time Elctrns.	213-320-0880
CA	Van Nuys, Nesco	213-781-0505
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Englewood, Time Elctrns.	303-850-7701
CT	East Haven, J.V. Elctrns.	203-469-2321
CT	New Haven, Greene Shaw Co.	203-397-0710
CT	Norwalk, Pioneer Elctrns.	203-853-1515
CT	Stamford, Bond Elctrns.	203-348-2663
FL	Dania, Arco Distrs.	305-462-3370
FL	Fort Lauderdale, Time Elctrns.	305-974-4800
FL	Fort Lauderdale, NRC	305-772-4500
GA	Atlanta, Prehler Elctrns.	404-447-5540
IL	Chicago, NEP Elctrns.	312-625-8400
IL	Elmhurst, Semiconductor Specialists	312-279-1000
IN	Indianapolis, RM Elctrns.	317-247-9701
IA	Cedar Rapids, DEECO	319-365-7551
MD	Baltimore, Resco-Baltimore	301-823-0700
MD	Beltsville, Treeko Sls.	301-792-0112
MD	Beltsville, Resco, Washington	301-937-9100
MD	Columbia, Time Elctrns.	301-964-3090
MA	Burlington, TLC	617-273-0140
MA	Lexington, Pioneer Elctrns.	617-861-9200
MA	Needham, Impact Elctrns.	617-444-3977
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Wilmington, R.C. Comps.	617-273-1860
MA	Woburn, Time Elctrns.	617-935-8080
MI	Farmington Hills, Prehler elctrns.	313-473-7200
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Livonia, Reptron Elctrns.	313-525-2700
MN	Eden Prairie, Cassidy Elctrns.	612-944-0100
MN	Edina, Cassidy Elctrns.	612-835-7747
MN	Minneapolis, Industrial Comps.	612-831-2666
MO	St. Louis, Olive Elctrns.	314-426-4500
MO	St. Louis, Time Elctrns.	314-391-6444
NV	Las Vegas, Klesub Elctrns.	702-733-3888
NJ	Pinebrook, Pioneer Elctrns.	201-227-1262
NJ	Rahway, RSR Elctrns.	201-381-8777
NJ	Whippany, TONAR Inds.	201-884-1400
NM	Albuquerque, Betatron Elctrns.	505-344-2381
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NY	Central Islip, Semicap Elctrns.	516-582-4400
NY	Fairport, Pioneer Elctrns.	716-381-7070
NY	Hauppauge, Time Elctrns.	
NY	Hauppauge, Jaco	516-273-5500
NY	Vestal, Pioneer Elctrns.	607-748-8211
NY	Woodbury, Pioneer Elctrns.	516-921-8700
OH	Columbus, Reptron	614-436-6675
OH	Middleburg Hieghts, Prehler Elctrns.	216-243-5510
OK	Tulsa, The Altair Co.	918-252-5781
OR	Wilsonville, Zepher Elctrns.	503-582-2929
PA	Broomall, Time Elctrns.	215-359-1200
PA	Essington, Tri-Com	215-521-3080
PA	Horsham, RM Elctrns.	215-674-1181
TX	Addison, Quality Comps.	214-387-4949
TX	Austin, Quality Comps.	512-835-0220
TX	Dallas, RM Elctrns.	214-263-8361
TX	Dallas, Captronics	214-340-3592
TX	El Paso, International Elctrns.	915-598-3406
TX	El Paso, ERA Elctrns.	915-592-4126
TX	Ft. Worth, TTI, Inc.	817-831-0441
TX	Houston, The Altair Co.	713-462-3029
TX	Richardson, The Altair Co.	214-231-5166
WA	Bellevue, Integrated	206-455-2727
WA	Seattle, Richey Western Elctrns.	206-575-1910
WA	Seattle, Zepher Elctrns.	206-241-1980
WI	Maguon, Taylor Elec. Co.	414-241-4321
WI	New Berlin, NEP Elctrns.	414-785-9100
WI	New Berlin, RM Elctrns.	414-784-4420

ITT ELECTRON TUBE, Box 100, Easton, PA 18042, Tel: 215-252-7331, Telex: 847494; FSC No.: 20948; Empl.: 550

ITT ELECTRO-OPTICAL PRODS., 7635 Plantation Rd., Roanoke, VA 24019, Tel: 703-563-0371, Telex: 829458; Empl.: 850; *Sls. Mgr.:* R. Moore; *Dist. Mgr.:* P. Williams

ITT GENERAL CONTROLS DIV., Intl. Telephone & Telegraph Corp., 801 Allen Ave., Glendale, CA 91201, Tel: 213-842-6131, Telex: 673147, TWX: 910-498-2225; Empl.: 1545; *Sls. Mgr.:* Phillip Vaughn

Local Distributors

AL	Birmingham, Control Specialists	205-991-7274
AZ	Phoenix, Wisco Equip. Co.	602-243-4361
CO	Englewood, Davis & Davis	303-935-4694
CT	Portland, Flocon, Inc.	203-342-4840
FL	Orlando, Diller-Brown Assocs.	305-851-7830
GA	Atlanta, Automatic Controls Co.	404-266-0130
HI	Honolulu, ARVAK Inc., Machinery Prods. Div.	808-845-9386
MN	Minneapolis, Tech Sls. Co.	612-823-8238
MO	Kansas City, Economy Power & Instr.	816-523-1010
MO	St. Louis, C. M. Tilley Co.	314-878-3353
NE	Omaha, Newton Valve Svc. Div.	402-339-2443
NY	Buffalo, KOM-Lamb	716-874-3530
NC	Charlotte, Genl. Control Equip. Co.	704-588-0484
OH	Cincinnati, M. L. Johnson Co.	513-874-8445
TN	Kingsport, Tenn. Instrmn. Co.	615-247-1148
TX	Corpus Christi, ITT Snyder co.	512-884-3822
TX	Odessa, ITT Snyder Co.	915-332-9408
UT	Salt Lake City, Peterson Co.	801-972-3328
WA	Kirkland, Unit Process Co.	206-827-0433

ITT GILFILLAN, 7821 Orion Ave., Van Nuys, CA 91409, Tel: 818-988-2600, Telex: 651421, TWX: 910-495-1787; FSC No.: 24930; Empl.: 1600; *Sls. Mgr.:* Ted Sprink

ITT-HIGBIE MFG., Wagner Rd., Rochester, MI 48063, Tel: 313-651-5300, TWX: 810-232-1592; Empl.: 1500; *Sls. Mgr.:* C. J. Clemens

ITT JENNINGS, Div. ITT Corp., 970 McLaughlin Ave., San Jose, CA 95122, Tel: 408-292-4025, Telex: 34-6311, TWX: 910-338-0159; FSC No.: 73905; Empl.: 370; *Sls. Mgr.:* E. V. Valehrach ....**1A**•1090-1092; **1B**•1452-1454, 1651; **3**•1247

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
AZ	Phoenix, Crown Systems	602-274-3180
CA	Granada Hills, C & W Comps.	213-368-4032
CA	Santa Clara, Silicon Valley Sls.	408-371-8814
CO	Denver, Lindberg Co.	303-758-9033
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
MD	Silver Spring, Marktron	301-460-6100
MD	Timonium, Marktron	301-252-7111
MA	Haverhill, L. K. Harman, Inc.	617-373-1313
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NJ	Englewood, Cooper Assocs.	201-871-4985
NM	Albuquerque, Lindberg Co.	505-881-1006
NC	Greensboro, Brandel-Stephens	919-274-6952
OH	Westlake, Harry W. Applegate Co.	216-331-2960
PA	Huntingdon Valley, Omega Elctrns.	215-947-4135
PA	Pittsburgh, Covert & Newman & Co.	412-531-2022
TX	Houston, Barry Sales	713-784-5860
TX	Richardson, Barry Sales	214-234-0255
UT	Salt Lake City, Lindberg Co.	801-969-2400
VA	Charlottesville, Marktron	804-973-5874
WI	Milwaukee, Berndt Assocs.	414-545-8400

ITT POMONA ELECTRONICS, 1500 E. 9th St., P.O. Box 2767, Pomona, CA 91766, Tel: 714-623-3463, TWX: 910-581-3822; FSC No.: 05276; Empl.: 150; *Sls. Mgr.:* Carl Wm. Musarra; *Dist. Mgr.:* Carl Wm. Musarra ....**2**•1355- 1470

Local Sales Offices & Reps

AL	Madison, South Eastern Assocs.	205-772-9616
AZ	Phoenix, More Sls.	602-274-4558; 602-265-9201

CA	Burlingame, Carelli/EMA	415-342-4514
CA	Culver City, DeAngelo, Rothman & Co.	213-827-2202
CA	Pasadena, Paul Nurches Co.	818-681-8957; 818-796-5844
CA	Santa Clara, Engrg. Assocs. Corp.	408-988-5001
CO	Denver, A-E-S Inc.	303-777-8733
FL	Hialeah, L. Haas Co.	305-822-2300
IL	Northbrook, W. M. Linz	312-498-9600
IN	Indianapolis, Blind Elctrn. Sls. Co.	317-291-0860; 317-293-6205
IA	West Des Moines, Nevco	515-225-9866
MA	Sharon, A Appell Assoc.	617-784-3439
MI	Kentwood, C. Geer	616-534-9449; 616-243-2746
MN	Minneapolis, Hei-lite Sls.	612-861-6051
MO	Kansas City, Nevco	816-421-1751
MO	St. Louis, Nevco	314-843-7406
NJ	Belleville, D. F. Tobias & Co.	201-751-8680
OH	Dayton, Lessis Assocs.	513-294-1551
OH	Mentor, P. Lohse	216-255-1992
OR	Beaverton, Eclipse Mktg. Grp.	503-642-1661
OR	Portland, Eclipse Mktg. Grp.	503-644-2550
PA	Philadelphia, David S. Linz	215-379-0734
SC	Greenville, H. C. Norman	803-244-6254
TX	Dallas, Techno Assocs.	214-357-9212
WA	Redmond, Eclipse Mktg. Grp.	206-885-6991

ITT POWERSYSTEMS DIV., Box 688, Galion, OH 44833, Tel: 419-468-8100, Telex: 24-1401, TWX: 810-248-2907; Empl.: 800; *Dist. Mgr.:* W. E. Fox

ITT ITT Schadow inc

ITT SCHADOW, 8081 Wallace Rd., Eden Prairie, MN 55344, Tel: 612-934-4400, Telex: 29-0556, TWX: 910-576-2469; Empl.: 175; *Sls. Mgr.:* Darrell Wilk; *Dist. Mgr.:* Darrell Wilk .... **1B**•1652-1654

Local Sales Offices & Reps

AL	Huntsville, Brandel-Stephens	205-883-0445
CA	Los Angeles, Ed Landa	213-879-0770
CA	Mountain View, Caltron Comps.	415-964-3244
CA	San Diego, Ed Landa	619-729-7267
CO	Boulder, Component Prod. Sls.	303-442-1100
CT	Farmington, R. Perron & Co.	203-673-4825
CT	Trumbull, R. Perron & Co.	203-268-9631
FL	Deerfield Beach, Brandel-Stephens	305-427-8558
FL	Orlando, Brandel-Stephens	305-425-3202
GA	Atlanta, Brandel-Stephens	404-261-7579
IL	Chicago, IRI	312-647-7755
KS	Wichita, PMR	316-684-4141
MA	Newton, R. Perron & Co.	617-969-8100
MI	Lathrup Village, R. C. Nordstrom Co.	313-559-7373
MN	Edina, Monroe Hanna	612-925-5700
MO	Maryland Heights, PMR	314-569-1220
NH	Bedford, Ray Perron & Co.	603-472-3030
NH	Dover, Ray Perron & Co.	603-742-2321
NM	Albuquerque, Thorson Desert States	505-265-5655
NY	Rochester, Ossmann Comps.	716-424-4460
NY	Syracuse, Ossmann Comps.	315-455-6611
NC	Greensboro, Brandel-Stephens	919-274-6952
OH	Columbus, K. W. Elctrns.	614-888-0483
OH	Dayton, K. W. Elctrns.	513-890-2150
PA	Philadelphia, P.S.A., Inc.	215-245-0513
RI	Mt. Penn, P.S.A., Inc.	215-245-0513
TX	Arlington, W. Pat Fralia Co.	817-640-9101
TX	Houston, W. Pat Fralia Co.	713-772-1572
UT	Salt Lake City, Comp. Prods.	801-262-0000
WA	Seattle, Jas. J. Backer Co.	206-285-1300

Local Distributors

AL	Huntsville, Hallmark	205-837-8700
CA	Los Angeles, Richey Western	213-820-3777
CA	Mountain View, Time Elctrns. Nor/Cal	415-961-1170
CO	Denver, Integrated Elctrns.	303-534-6121
FL	Miami, Hallmark	305-971-9280
FL	Orlando, Hallmark	305-855-4020
IL	Chicago, Hallmark	312-437-8800
KS	Kansas City, Hallmark	913-888-4747
KS	Wichita, Radio Supp.	316-267-5216
MD	Baltimore, Hallmark	301-796-9300
MD	Beltsville, Treeko Sls.	301-937-8260
MA	Boston, Sager Elec.	617-749-6700
MA	Waltham, Impact Sls. Co.	617-964-7740
MI	Kentwood, R.M. Elctrns.	616-531-9300
MN	Bloomington, Hallmark	612-884-9056
MN	Minneapolis, Berquist Co.	612-835-2322
MO	St. Louis, Hallmark	314-291-5350
NY	Lynbrook, Peerless Radio	516-593-2121
NC	Raleigh, Hallmark	919-832-4465
OH	Cincinnati, Schuster Elec.	513-984-1600
OH	Columbus, Hallmark	614-846-1882
OH	Medina, Schuster Elec.	216-722-5531
OK	Tulsa, Hallmark	918-835-8458
PA	Philadelphia, Phila. Elctrns.	215-568-7400
PA	Philadelphia, Hallmark	215-355-7300
TX	Austin, Hallmark	512-837-2814
TX	Dallas, Hall-Mark	214-234-7300
TX	Houston, Hall-Mark	713-781-6100
TX	Stafford, SW Elctrns.	713-494-6021
WA	Seattle, Zepher Elctrn. Sls.	206-575-0922
WI	Milwaukee, Hallmark	414-476-1270

ITT SEMICONDUCTORS, 500 Broadway, Lawrence, MA 01841, Tel: 617-688-1881, Telex: 947413, TWX: 710-342-1357; *Sls. Mgr.:* Ed Burgess; *Dist. Mgr.:* John Flannery

ITT SEMICONDUCTORS, Intl. Telephone & Telegraph, 470 Broadway, Lawrence, MA 01841, Tel: 617-688-1881, Telex: 947413, TWX: 710-342-1357; Empl.: 1600; *Sls. Mgr.:* Del Brand; *Dist. Mgr.:* Del Brand

ITT SURPRENANT DIVISION, 172 Sterling St., Clinton, MA 01510, Tel: 617-365-6331

ITT TELECOMMUNICATIONS, Apparatus Dept., Fulton Dr., Corinth, MS 38834, Tel: 601-287-3771, TWX: 510-984-0211; Empl.: 2000; *Sls. Mgr.:* Charles Yancey

ITT THERMOTECH, Div. IT & T, 1203 S. 5th St., Hopkins, MN 55343, Tel: 612-933-9400, Telex: 29-0414; Empl.: 605

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assoc.	602-955-3193
AR	Little Rock, Schmidt & Assocs.	501-225-5613
CA	Glendale, Secana	818-240-7570
CA	Oakland, Richard B. Peters Co. (Brush Holder Prods.)	415-835-5135
CO	Denver, Manufacturers Mktg.	303-425-9569
CT	Newington, Interep (Brush Holder Prods.)	203-666-4233
FL	Orlando, Don Wegner (Brush Holder Prods.)	305-894-6206
FL	St. Petersburg, Florida Div.	813-347-2191
IL	Arlington Hgts., Diethert-Angel	312-593-7600
IL	Bannockburn, Heth (Brush Holder Prods.)	312-295-8440
IL	Buffalo Grove, B. Reynolds	312-775-2425
IN	Ft. Wayne, R. McCampbell	219-672-3012
IN	Indianapolis, R & D Sls.	317-842-4768
IA	Cedar Rapids, Seltec Sls.	319-393-1114
IA	Des Moines, I. L. Davidson Co. (Brush Holder Prods.)	515-265-0288
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MI	Farmington, L. George	313-474-1505
MN	Minneapolis, W. J. Houlihan	612-544-3023
MO	Maryland Heights, Leander & Co.	314-569-3338
NJ	Union, Plastech	201-687-4810
NY	Penfield, Upstate Comp. Sls.	716-381-6070
OH	Cleveland, W. J. Williams	216-831-6220
PA	Erie, F. W. "Fritz" Schubert (Brush Holder Prods.)	814-899-3740
PA	Wayne, Midlantic Plastic Sls.	215-964-0510
SC	Fort Mill, Eagle Sls.	803-548-2222
TN	Memphis, D. Barry Temple (Brush Holder Prods.)	901-386-3651
TX	Houston, Texstar Sls., Inc.	713-367-0465
VA	Salem, George Headford (Brush Holder Prods.)	703-989-8127
WI	Milwaukee, Indl. Sls. Tech.	414-462-5024

ITW, Cortron Div., 400 W. Grand, Elmhurst, IL 60126, Tel: 312-279-9110

ITW SWITCHES, Tool Works Co., 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; *Sls. Mgr.:* A. Steiner; *Dist. Mgr.:* A. Steiner .... **1B**•1656-1667

Local Sales Offices & Reps

AL	Huntsville, Electro Mech	205-533-2100
AZ	Tempe, Spectrum Assoc. Southwest	602-966-1788
AR	Fort Smith, Electra Reps	501-452-4030
CA	Anaheim, Spectrum Assoc.	714-630-6977
CA	San Jose, McKnight	408-942-0880
CO	Denver, High Plains Mktg.	303-751-7150
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Altamonte Springs, Semtronics	305-831-8233
GA	Atlanta, Electro Mech.	404-447-6478
IL	Elk Grove Village, Parcom	312-228-6360
IA	Cedar Rapids, Comstrand	319-377-1575
KS	Kansas City, BC Elctrns.	913-342-1211
MD	Baltimore, MicroComp	301-247-0400
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Grand Rapids, Urban & Assoc.	616-245-0511
MN	Minneapolis, Comstrand	612-788-9234
MO	Bridgeton, BC Elctrns.	314-291-1101
NJ	Livingston, Varrelman Gorman	201-992-2505
NY	Syracuse, Fountain, Young & Co.	315-437-7733
NC	Raleigh, Electro Mech	919-851-8165
OH	Dayton, Rockford Controls	513-898-5452
OH	Euclid, Rockford Controls	216-731-5250
OR	Beaverton, Barrett Squibb & Assoc.	503-642-1661
PA	Ardmore, Precision Mktg.	215-649-6301
TN	Nashville, Electro Mech	615-885-0073
TX	Dallas, Electra Reps.	214-387-3594
TX	Houston, Electra Reps.	713-530-2208
WA	Redmond, Barrett Squibb & Assoc.	206-885-6991

IVEK CORP., 43 School St., N. Springfield, VT 05150, Tel: 802-886-8278; Empl.: 4; *Sls. Mgr.:* Gene Williams

IVERON PACIFIC, 1152 Morena Blvd., San Diego, CA 92110-3899, Tel: 619-275-1500; Empl.: 16; *Sls. Mgr.:* Lee Kerl

IVO INDS., INC., P.O. Box 603, 201 Industrial Way W., Eatontown, NJ 07724, Tel: 201-542-5151, Telex: 132-414; Empl.: 20; *Sls. Mgr.:* Nat Garratano

IWATSU ®

IWATSU INSTRUMENTS, INC., 430 Commerce Blvd., Carlstadt, NJ 07072, Tel: 201-935-5220, TWX: 710-989-0255 .... **3**•1366-1368

Local Sales Offices & Reps

CA	Garden Grove, Advanced Digital Grp.	213-598-9645
CA	Sunnyvale, Koosen Tech. Sls. Corp.	408-249-5858
CT	Old Saybrook, MJT Assocs.	203-388-5890
FL	Sarasota, Ram-Z Assocs.	813-921-5561
IL	Rolling Meadows, Commodore 1	312-394-5441
MN	Minneapolis, Kodo Assocs.	612-881-1255
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NH	Nashua, MJT Assocs.	603-889-5373
NJ	Parsippancy, HLM Assocs.	201-263-1536
NJ	Pennsauken, Sci-Rep Corp.	609-662-5222
NY	Northport, HLM Assocs.	516-757-1606
NY	Rochester, Harmony Labs.	716-458-3376
OH	North Ridgeville, TMS	216-327-3527
OK	Tulsa, Spectra Sls. Corp.	918-663-7188
TX	Houston, Spectra Sls. Corp.	713-747-2798
VA	Fairfax, Sci-Rep Corp.	703-385-0600

Local Distributors

CA	Canoga Park, Rag Elctrns.	213-998-6500
CA	Freemont, Rep Inc.	415-651-4131
CA	Van Nuys, Testek Corp.	213-786-6890
CO	Boulder, Instr. Repair Labs	303-449-2721
CT	Monroe, Connecticut Calibration	203-261-9518
FL	South Daytona, Kapital Instr. Sls.	904-257-4334
IL	Downers Grove, Ames Supply Co.	800-942-1596
MA	Billerica, Hayes Instr. Svc.	617-663-4800
MO	St. Louis, Indl. Svc. Lab. Corp.	314-535-5760
NJ	North Caldwell, Hosica	201-256-7724
NJ	Ocean, Rag Elctrns.	201-544-0666
NJ	Wyckoff, Ames Supply Co.	201-891-9560
NY	Frankfort, Kapital Instr. Sls.	315-894-4245
NY	Great Neck, Instrument Mart	516-487-7430
NC	Pineville, Elctrn. Measuring Instr. Svc.	704-588-4624
OK	Oklahoma City, Houston De Pue Labs.	404-235-5469
TX	Austin, Tinkertronics	512-926-4420
TX	Dallas, Hutton Co.	214-484-0580
VA	Fairfax, Scientific Trading	703-385-0600
WA	Seattle, Vanguard Elctrn. Tool	206-284-6186
WI	Madison, Schrenk Sls.	603-255-7400

IXYS CORP., 3685 Enochs, Santa Clara, CA 95051, Tel: 408-733-4045; *Sls. Mgr.:* Samuel Kory Jr. .... **1A**•1663; **1B**•1231; **3**•1605

JACO MFG. CO., 468 Geiger St., Berea, OH 44017, Tel: 216-234-4000

JAIDINGER MFG., 1921 W. Hubbard St., Chicago, IL 60622, Tel: 312-421-1090; Empl.: 35; *Sls. Mgr.:* John S. Jaidinger

JAMB INDS., Box 281, Rockaway Valley Rd., Boonton, NJ 07005, Tel: 201-263-9295; Empl.: 3

JAMESBURY, 640 Lincoln St., Worcester, MA 01605, Tel: 617-852-0200, Telex: 92-0448, TWX: 710-240-1268; Empl.: 1000; *Sls. Mgr.:* C. A. Richardson

JAMES ELECTRONICS, 4050 N. Rockwell, Chicago, IL 60618, Tel: 312-463-6500, TWX: 910-221-5034; *Sls. Mgr.:* J. R. Ther; *Dist. Mgr.:* J. R. Ther

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AN ESOP CORP.

JANCO CORP., Box 3038-Glenoaks Sta., Burbank, CA 91504, Tel: 818-846-1800, TWX: 910-498-2701; FSC No.: 91812; Empl.: 205; *Sls. Mgr.:* Sam Kay, Jr. ....1B•1668, 1669

Local Sales Offices & Reps

AZ	Tempe, Piper Sls.	602-949-0048
AR	Dallas, M. Kruvand	214-691-4592
CA	Cupertino, Codella	408-257-2561
CA	San Diego, Qualtronics	619-560-8955
CO	Longmont, Piper Sls.	303-651-2378
FL	Orlando, MacKay, Smith & Assocs.	305-277-1513
GA	Atlanta, MacKay, Smith & Assocs.	404-449-7444
IL	Addison, Engineered Sls.	312-832-8425
IN	Ft. Wayne, Aktron Corp.	219-747-3650
KS	Wichita, T-Bird Tech. Sls. & Svc.	316-684-3941
MD	Silver Spring, H.R. Sieber	301-589-9110
MA	Newton, Cornwall, Caron, Fahey	617-332-2042
MN	Minneapolis, Electro-Serv	612-338-3475
MO	Maryland Heights, T-Bird Sls. & Svc.	314-567-6488
NJ	Cherry Hill, Quality Comps.	609-428-6266
NY	Albertson, C.F. Ward	516-742-5561
NC	Charlotte, MacKay, Smith & Assocs.	704-372-1188
OH	Columbus, Tom Mulligan Company	614-457-2242
TX	Dallas, Mark Kruvand	214-691-4592
WA	Seattle, Norwest	206-827-9562

Local Distributors

CA	Burbank, Merit Comp. Supp.	818-842-8162
CA	Westlake Village, Tech-Cable Prods.	818-991-4697

J & S TOOL, 70 Okner Pkwy., Livingston, NJ 07039, Tel: 201-533-0700, Telex: 139229; Empl.: 50; *Sls. Mgr.:* K.F. Swenson

JAN HARDWARE MFG. CO., 47-27 36th St., Long Island City, NY 11101, Tel: 212-361-0800; FSC No.: 99813; Empl.: 60; *Sls. Mgr.:* Irwin E. Wasserman ....2•1756, 1762-1779

Local Sales Offices & Reps

AZ	Phoenix, Steve Fisher Assocs.	602-247-7865
CA	Menlo Park, Long Assocs.	415-327-1300
CA	San Diego, Robert Scott Co.	619-420-6446
CA	Thousand Oaks, S.A.R.G.E.	213-991-6706
FL	Seminole, Custom Assembly	813-397-8302
IL	Schaumburg, Croydon Elect.	312-980-6766
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MA	Brookline, Harman Assocs.	617-232-6687
MA	Lee, Harman Assocs. Inc.	413-243-1158
MN	Golden Valley, A.I.M.	612-542-8437
MO	Crestwood, Nevco	314-843-7406
MO	Kansas City, Nevco	816-421-1751
NJ	Englewood, H. Gray Assoc.	201-894-0894
NJ	Marlton, Naudain Assocs.	609-983-5808
OH	Dayton, F. L. Ohmer & Assocs.	513-434-1454
TX	Richardson, AGM Sls.	214-644-1475

JAPANESE PRODS. CORP., 31368 Via Colinas, Suite 103-104, West Lake Village, CA 91362, Tel: 818-991-6111, Telex: 13-1581; Empl.: 8; *Sls. Mgr.:* Don Cassalia ....1B•1158

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Englewood, Integrated Motion Sys. Inc.	303-762-1817
FL	Casselberry, Hilco, Inc.	305-695-6208
GA	Dunwoody, Hilco, Inc.	404-393-1771
IL	Rolling Meadows, Sumer Inc.	312-991-8500
MD	Columbia, Versatrol	301-730-5577
MA	Salem, Forbes Engrg	617-744-1693
MI	Brighton, A.P. Assoc.	313-229-6550
MN	Minnetonka, Gibb Electric Sls.	612-935-4600
NY	Syosset, Motion Control Sls	516-921-5656
NC	Charlotte, Hilco, Inc.	704-568-3938
PA	Exton, Kiley Elec.	215-363-8550
PA	Pittsburgh, Exonic Sys.	412-784-8400
SC	Mt. Pleasant, Hilco, Inc.	803-883-9633
TX	Dallas, Automated Motion Control	214-340-4192
WA	Redmond, Halbar Assocs.	206-882-0990
WA	Vancouver, Halbar Assocs.	206-696-0170
WI	Brookfield, Sumer, Inc.	414-784-6641

Local Distributors

CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Santa Monica, Trojan Inds.	213-829-1735
NY	New York, B&B Motor & Control	212-966-5777
TX	Fort Worth, Allied Elctrns.	817-336-5401

JARO COMPONENTS, INC., 5549 Powerline Rd., Ft. Lauderdale, FL 33309-2883, TWX: 305-771-7000, Telex: 522-334; Empl.: 30; *Sls. Mgr.:* Robert C. Flipse; *Dist. Mgr.:* Floyd Burwell

JAY CONTROL CO., 21 Sequin Dr., Glastonbury, CT 06033, Tel: 203-633-5294; Empl.: 40; *Sls. Mgr.:* Mike Colomonico

JAYCOR, P.O. Box 85154, San Diego, CA 92138, Tel: 619-453-6580, TWX: 910-322-1064; Empl.: 300; *Sls. Mgr.:* Steven Lutjens

JAY-EL PRODS., Sub. Ducommun Inc., 1859 W. 169th St., Gardena, CA 90247, Tel: 213-321-3260, TWX: 910-346-7633; FSC No.: 08719; Empl.: 270

JB ELCTRN. TRANSFORMERS, 2300 W. Armitage Ave., Chicago, IL 60647, Tel: 312-342-0080, TWX: 910-221-1283; FSC No.: 11700; Empl.: 150; *Sls. Mgr.:* F. J. Bussa

JBM ELECTRONICS, INC., 531 Front St., Manchester, NH 03102, Tel: 603-623-0222, Telex: 953134, TWX: 710-220-8978; *Sls. Mgr.:* David Crowley ....1A•1529-1536

J-B-T INSTRS., Box 1818, New Haven, CT 06508, Tel: 203-776-1111; Empl.: 25; *Sls. Mgr.:* Virginia Devitt ....3•1332

Local Sales Offices & Reps

MN	Minneapolis, Hei-Lite Sls.	612-861-6051
TX	Dallas, Forner Sls.	214-241-2166

Local Distributors

AL	Montgomery, Southern Controls	800-633-8796
CA	Glendale, Western Elctrns.	213-246-4861
CA	Los Angeles, Metermaster	213-685-4340
CA	San Francisco, Pacific Elctrns.	415-543-3104
CA	Wilmington, Wilmington Instrs.	213-834-1133
CO	Denver, E.I.L. Instrs.	303-534-4160
CT	New Haven, Hatry Elctrns.	203-787-5921
FL	Miami, Florida Precision	305-324-1731
GA	Augusta, Speciality Distributing	404-873-2521
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Elk Grove Village, Metermaster	312-593-8650
LA	Lafayette, Ralph's Elctrns.	318-234-4507
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Hingham, Sager Elec.	617-749-6700
MN	Minneapolis, Instrument Controls	612-871-2514
MS	Jackson, Ellington Elctrn. Supp.	601-355-0561
NJ	Belleville, Miscorp	201-751-8680
NJ	North Caldwell, Hosica Labs	201-256-7724
NY	Long Island City, Metermod	212-726-4850
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Maspeth, Harry Alter	212-366-0123
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Bluffton, Bluffton Prods.	419-358-7891
OH	Cleveland, Weschler Elec.	216-238-2550
OK	Oklahoma City, Trice Wholesale	405-524-4411
PA	Reading, Barbey Elctrns.	215-376-7451
RI	Providence, William Dandreta	401-861-2800
TN	Nashville, Electra Distributing	615-329-3971
TX	Ft. Worth, Swieco	817-335-6521
TX	Garland, Metermaster	214-271-5671
TX	Houston, Harrison Equip.	713-879-2600
TX	Houston, Quality Instrs.	713-524-0528
WA	Seattle, Eicher-Richards	206-523-7888
WV	St. Albans, Preiser Scientific	304-727-2902

J-B-T SWITCHES, CUTLER-HAMMER PRODS., EATON CORP., Box 1904, New Haven, CT 06509, Tel: 203-772-2220; FSC No.: 55459; Empl.: 160; *Sls. Mgr.:* C. A. Peffer

Refer to Eaton Corp./Cutler-Hammer Prods., Aerospace/Commercial Controls Div. for distributor information.

JDK CONTROLS, INC., 2630 Lavery Ct., Suite F, Newbury Park, CA 91320-1593, Tel: 805-499-7779; *Sls. Mgr.:* Reece Kendall ....1A•2040

JEFFERS ELCTRNS., Grand Plaza, 945 Grand Ave., Nogales, AZ 85621, Tel: 602-287-5851, TWX: 910-973-9794; FSC No.: 59474; Empl.: 400; *Sls. Mgr.:* Ken Shobert; *Dist. Mgr.:* Steve Morris

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, O'Donnell Assoc.	602-944-9542
CA	Santa Clara, I Squared	408-988-3400
CO	Boulder, R.G. Entprs.	303-447-9211
CT	Middletown, Gerber Sls.	203-347-3000
FL	Tampa, APM Assoc.	813-886-2457
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Arlington Hgts., C.L. Greenslade Sls.	312-253-9620
IN	Ft. Wayne, J.F. Kilfoil	219-436-7233
KS	Overland Park, Advanced Techn. Sls.	913-642-6675
LA	Kenner, Cartwright & Bean	504-666-0020
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Lathrup Village, R. C. Nordstrom	313-559-7373
MN	Edina, Grayden & Flemmer	612-941-1120
NM	Albuquerque, Power Entprs.	505-298-1918
NY	E. Fishkill, Tri-Tech Elctrns.	914-897-5611
NY	E. Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Great Neck, MOS Assoc.	516-487-3966
NC	Raleigh, Cartwright & Bean	919-781-6560
OH	Cincinnati, J.F. Kilfoil Co.	513-791-6150
OR	Beaverton, Barrett & Squibb	503-642-1661
PA	Ardmore, Wm. K. Metz	215-896-7300
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Lewisville, Jim Hughes	214-221-1536
PR	Puerto Rico, Hato Rey, M. Anderson Co.	809-751-2026
WA	Redmond, Barrett & Squibb	206-885-6991

JEFFERSON ELEC., Litton Inds., 840 25th Ave., Bellwood, IL 60104, Tel: 312-626-7700, Telex: 72-8402; Empl.: 1200; *Sls. Mgr.:* Nick Shah; *Dist. Mgr.:* C. Travis

Local Sales Offices & Reps

AK	Anchorage, Alaska Elect. Agents	907-563-8699
AZ	Phoenix, Ross-Bloom & Assoc.	602-955-5024
AR	Little Rock, Southland Sls	501-753-4013
CA	Mountain View, TSR	415-961-5655
CA	Pasadena, A-F Sls. Eng'r.	213-681-5631
CO	Denver, E-O Sls.	303-778-1900
FL	Tampa, SRT Mktg.	813-884-4805
HI	Honolulu, Atlas Elec. Co.	808-524-5866
IL	Wood Dale, Power Prods. Co.	312-595-1142
IN	Indianapolis, Clyde Warble & Assoc.	317-632-1465
KY	Louisville, Bryan, Haley & Hackman	502-491-9984
LA	New Orleans, Corrigan Mktg.	504-626-5231
MA	Framingham, Gerald Rosen Co.	617-879-5505
MA	Stoughton, North Coast Sls.	617-344-1007

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Division of CUTLER-HAMMER
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CALIFORNIA: 800-252-4640
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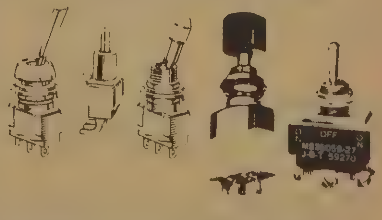
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SWITCHES -- SECTION 5100
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MI	Detroit, Electrical Materials	313-541-1650
MI	Grand Rapids, Electrical Materials	313-942-0128
MN	Minneapolis, Boerger & Assoc.	612-560-3435
MS	Jackson, Welch & Doby	601-932-5534
MO	Kansas City, Forristal-Young	816-358-6771
MO	St. Louis, Schaeffer Sls.	314-647-1000
NE	Omaha, Boyle & Williamson	402-553-1666
NJ	Edison, Bizzarro Elect. Sls.	201-757-7010
NY	New Hartford, F. W. Laver & Son	315-724-2304
NC	Charlotte, W. H. Lassister Sls.	704-523-2736
NC	Raleigh, DHR Mktg.	919-876-5450
OH	Cincinnati, Bryan, Haley & Hackman	513-561-0500
OH	Cleveland, Marlow Assoc.	216-991-6500
PA	Philadelphia, Electrical Sls. Assn.	609-456-7110
PA	Pittsburgh, Robert Colley Assoc.	412-331-3121
TX	Dallas, SW Mktg.	214-341-8631
UT	Sandy, Pete Farley Agcy.	801-278-4082
WA	Seattle, Bangs Assoc.	206-262-0262
WI	Butler, J. F. Nolan & Assoc.	414-781-1140

JENSEN

JENSEN TOOLS, INC., Axia, Inc., 7815 S. 46th St., Phoenix, AZ 85040, Tel: 602-968-6241, TWX: 910-950-0115; Empl.: 100; *Sls. Mgr.:* Tom Fenzel .... **2•1931**

JEROME INDUSTRIES CORPORATION

JEROME INDUSTRIES CORP., Power Supply Div., B 730 Division St., Elizabeth, NJ 07201, Tel: 201-353-5700, Telex: 132001-JEROME, ELIZ; Empl.: 150; *Sls. Mgr.:* Anthony Di Girolamo .... **3•1606, 1607**

Local Sales Offices & Reps

MN	St. Paul, Countrymen Assocs.	612-645-9151

JEROME INDUSTRIES CORP., Transformer Div., 730 Division St., Elizabeth, NJ 07201, Tel: 201-353-5700, Telex: 132001-JEROME, ELIZ; *Sls. Mgr.:* Anthony Di Girolamo .... **1A•2177**

JERSEY SPECIALTY CO., See JSC Wire & Cable

Distributor

JERSEYSWITCH, INC., 129A Gaither Dr., Mt. Laurel, NJ 08054, Tel: 609-778-8190 .... **1B•1742**

JETTRON PRODS., P.O. Box 337, E. Hanover, NJ 07936, Tel: 201-887-0571; FSC No.: 04435; Empl.: 30; *Sls. Mgr.:* J. M. Schill .... **2•1471**

Local Sales Offices & Reps

CA	El Cajon, A-Tronics	619-444-1501
CA	Woodland Hills, A-Tronics	818-703-7212
NY	New York, Eltron Export Co.	212-944-7635

Local Distributors

Intl	England, Slough, Berks, LPPI	44-753-77788
Intl	France, Le Chesnay, LPPI	33 3 955 2104
Intl	Italy, Cinisello Balsamo (Milano), LPPI	2-6127821
Intl	Netherland, Krimpen a.d. Yssel, LPPI	31-1807-1 8555
Intl	Sweden, Stockholm, LPPI	46-8-132030
Intl	Switzerland, Zurich, Litton Precision Prods. Intl. Inc. (LPPI)	1 312 35 44

JEWELL ELECTRICAL INSTRS., Grenier Field, Manchester, NH 03108, Tel: 603-669-6400, Telex: 943435; Empl.: 400; *Sls. Mgr.:* W. P. Bolia .... **3•1333**

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier	205-536-1506
AZ	Phoenix, The Knight Co.	602-582-8506
AR	Little Rock, J. Y. Schoonmaker	501-375-2168
CA	Fremont, William Parks Assocs.	415-490-2011
CA	Los Angeles, Knight Co.	213-670-2833
CA	San Diego, Knight Co.	619-571-7903
CT	Middletown, Gerber Sls.	203-347-3000
FL	Orlando, Currie, Peak & Frazier	305-855-0843
GA	Duluth, Currie, Peak & Frazier	404-476-3107
GA	Norcross, Currie, Peak & Frazier Inc.	404-449-7662
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
IA	Cedar Rapids, Gassner & Clark Co.	319-393-5763
MA	Ludlow, Gerber Sls.	413-589-9837
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Troy, C. B. Jensen	313-643-0506
MN	Edina, M. Foster Co.	612-941-9790
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NM	Albuquerque, C. T. Carlberg	505-888-3883
NY	Buffalo, Rudell-Merrifield Assocs.	716-634-4300
NY	Melville, Comtronics Assocs.	516-249-0505
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
NC	Raleigh, Currie, Peak & Frazier Inc.	919-787-0808
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
OK	Oklahoma City, J. Y. Schoonmaker	405-685-4477
OR	Portland, Frank Jackson	503-292-2638
TX	Austin, J. V. Schoonmaker Co., Inc.	512-480-9257
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J. Y. Schoonmaker	713-738-2427
WA	Redmond, F. Jackson	206-881-7277
WI	Milwaukee, Berndt Assocs.	414-545-8400

Local Distributors

AL	Birmingham, Brownell Electro Inc.	205-322-3374
AL	Mobile, Brownell Electro Inc.	205-479-8581
AZ	Phoenix, Metermaster Inc.	602-243-4111
CA	Lamirada, Stevens Instr. Co.	714-994-5111
CA	Los Angeles, Metermaster, Inc.	213-685-4340
CA	Los Angeles, E.I.L. Instrs., Inc.	213-685-7020
CA	Palo Alto, Metermaster Inc.	415-968-0313
CA	San Diego, Metermaster, Inc.	619-560-4844
CA	Santa Clara, Dynametron Inc.	408-727-6531
CA	Santa Clara, E.I.L. Instrs. Inc.	408-727-0396
CA	Santa Clara, Fisher-Brownell	408-988-6041
CO	Denver, Metermaster Instr. Inc.	303-722-5766
CO	Denver, E.I.L. Instrs., Inc.	303-534-4160
CT	Middletown, E.I.L. Instrs. Inc.	203-346-6646
FL	Miami, Brownell Electro Inc.	305-591-3215
FL	Orlando, Brownell Electro Inc.	305-843-6770
FL	Palm Bay, E.I.L. Instrs., Inc.	305-725-8300
GA	Atlanta, Brownell Electro Inc.	404-762-5181
IL	Bridgeview, E.I.L. Instrs. Inc.	312-430-2292
IL	Elk Grove Village, Metermaster Inc.	312-593-8650
IL	Oak Park, Pacific Indicator Co.	312-383-0220
IN	Evansville, Electro-Lab Svcs., Inc.	812-423-5211
IN	Indianapolis, E.I.L. Instrs., Inc.	317-545-1373
KY	Louisville, E.I.L. Instrs., Inc.	502-454-3420
LA	Kenner, Breard-Gardner	504-466-3401
MD	Baltimore, Sunshine Sci. Instr., Inc.	301-661-5900
MD	Gaithersburg, Pioneer/Instrmn.	301-921-0660
MD	Sparks, E.I.L. Instrs., Inc.	301-771-4800
MA	Burlington, E.I.L. Instrs., Inc.	617-272-9450
MA	Waltham, Calibron Corp.	617-894-6440
MA	Woburn, Brownell Electro Inc.	617-935-7820
MN	Minneapolis, Process Measurement Co.	612-544-4035
NJ	Pennsauken, E.I.L. Instrs., Inc.	609-488-0474
NC	Charlotte, Trott Electronics, Inc.	704-376-2237
NC	Raleigh, Brownell Electro Inc.	919-876-6524
OH	Dayton, E.I.L. Instrs., Inc.	513-435-2134
OH	Dayton, Pioneer Std. Elctrn.	513-236-9900
OK	Tulsa, Combined Technlg. Co.	918-665-3002
PA	Pittsburgh, E.I.L. Instrs., Inc.	412-731-5230
PA	Pittsburgh, CAM/RPC Instrmn.	412-782-3770
TN	Knoxville, Brownell Electro Inc.	615-966-3441
TN	Nashville, Brownell Electro Inc.	615-889-8230
TX	Dallas, E.I.L. Instrs., Inc.	214-931-1236
TX	Dallas, Ultra Instr. Lab, Inc.	214-357-0297
TX	El Paso, McNicol Elctrns.	915-566-2936
TX	Houston, Quality Instr. Lab	713-524-0528
TX	Houston, E.I.L. Instrs., Inc.	713-271-3100
WA	Richland, Branom Instr. Co.	509-943-6664
WA	Seattle, E.I.L. Instrs., Inc.	206-762-0880
WV	Alexandria, E.I.L. Instrs., Inc.	703-354-4330
WV	Virginia Beach, E.I.L. Instrs., Inc.	804-499-3746

JFD ELCTRNS., See Murata Erie No. Amer., Inc.

JFW INDS., INC., 2719 E. Troy Ave., Indianapolis, IN 46203, Tel: 317-783-9875; Empl.: 30; *Sls. Mgr.:* Joetta Walker; *Dist. Mgr.:* Joetta Walker .... **1A•1705-1707**

Local Distributors

CA	Sunnyvale, Electronic Resources	408-745-1420

JKL COMPS., 13343 Paxton St., Pacoima, CA 91331, Tel: 818-896-0019, Telex: 910-496-1504; FSC No.: 55335; Empl.: 14; *Sls. Mgr.:* Bob Brandt

JMJ TECHNICAL PRODS., P.O. Box 26, Kendall Park, NJ 08824, Tel: 201-589-4257; Empl.: 8; *Sls. Mgr.:* John Stefiuk .... **2•1780**

JMK

JMK, INC., 15 Caldwell Dr., Amherst, NH 03060, Tel: 603-886-4100, Telex: 955329 TLY SRVC; Empl.: 200; *Sls. Mgr.:* J. Kennedy .... **1A•1600**

Local Sales Offices & Reps

AL	Huntsville, JWL Assoc.	205-881-0413
CA	Santa Clara, Cummings & Assoc.	408-247-8656
CA	Woodland Hills, Cummings & Assoc.	213-340-6035
CO	Denver, Arkco Sls.	303-758-1151
IL	Downers Grove, Momak Sls.	312-963-6400
IN	Indianapolis, Gorny Sls.	317-271-7504
MA	Framingham, STS	617-620-0195
MI	Novi, Lektronics	313-349-3304
MN	St. Paul, Arkco Sls.	612-777-7454
NJ	Ridgewood, Ballou Assoc.	201-444-6990
NY	Rochester, Elcom Sls.	716-385-1400
NY	Syracuse, Elcom Sls.	315-685-8245
NC	Charlotte, JWL Assoc.	704-523-3001
OH	New Lebanon, J. N. Bailey	513-226-0512
OK	Tulsa, Barry Sls.	918-749-7775
OR	Portland, Cummings & Assoc.	503-761-4411
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
WA	Edmonds, Cummings & Assoc.	206-775-1421
WI	Muskego, Momak Sls.	414-363-7744

Local Distributors

CA	Woodland Hills, C & A Elctrns.	213-340-6022
IL	Chicago, Voyager Elctrns.	312-773-4900
MN	St. Paul, Voyager Elctrns.	612-571-7766
NH	Hudson, C & H Electronics	603-882-1133

JM TRANSFORMER CO., INC., 112 Florida St., Farmingdale, NY 11735, Tel: 516-293-0475; Empl.: 13; *Sls. Mgr.:* J. Millman .... **1A•2178-2181**

JOBMASTER CORP., 9008 Liberty Rd., Randallstown, MD 21133, Tel: 301-655-1400; Empl.: 12; *Sls. Mgr.:* Robert H. Goldman .... **2•1792**

JOHANSON DIELECTRICS

JOHANSON DIELECTRICS, 2220 Screenland Dr., Burbank, CA 91505, Tel: 213-848-4465, TWX: 910-498-2735; Empl.: 154 .... **1A•1094**

Local Sales Offices & Reps

AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Anaheim, Westrep	213-404-3381
CA	Mountain View, Straube Assocs.	415-969-6060
FL	Orlando, Delmac Sls.	305-898-4688
IL	Park Ridge, Metcom Assocs.	312-696-1490
IN	South Bend, C-S Electronic Sls	219-291-6258
MA	Wethersfield, Compac Sls.	203-563-4784
MN	Minneapolis, Bill Deming & Assocs.	612-888-5000
NC	Greensboro, L & D Inc.	919-292-3201
PA	Trevose, PSA	215-245-0513
TX	Arlington, W. Pat Fralia Co.	817-640-9101
WA	Seattle, Northmar Inc.	206-524-5170

Local Distributors

CA	Los Alamitos, SEMI DICE	213-594-4631
CA	Santa Clara, SEMI DICE	408-980-9777
NJ	Fairfield, CHPS Inc.	201-882-0997

JOHANSON MFG. CORP., 400 Rockaway Valley Rd., Boonton, NJ 07005, Tel: 201-334-2676, TWX: 710-987-8367; FSC No.: 91293; Empl.: 200 .... **1A•1095**

Local Sales Offices & Reps

AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Anaheim, Westrep	213-404-3881
CA	Mountain View, Straube Assocs.	415-969-6060
CO	Westminster, Straube Assoc., Mt. States	303-426-0890
FL	Orlando, Perrott Assocs.	305-298-7748
IL	Northfield, Johanson Mfg.	312-446-4021
IN	South Bend, Schillinger Assocs.	219-282-4570
IA	Cedar Rapids, ARD Sales Co.	319-393-6392
MA	Seekonk, J. Murphy Assocs.	617-761-7153
MN	Bloomington, Bill Deming & Assoc.	612-888-5000

NJ	Boonton, Johanson Mfg. Corp.	201-334-2676
NY	Mount Vernon, Friedman-Smith Elctrn. Sls.	914-664-4866
NY	Pittsford, NHA, Inc.	716-586-9002
NC	Winston-Salem, Murcota Corp.	919-722-9445
OH	Cleveland, Baehr, Greenleaf & Assoc.	216-221-9030
PA	Trevose, P.S.A.	215-245-0513
TX	Arlington, W. Pat Fralia Co.	817-640-9101
WA	Seattle, Northmar	206-524-5170

Local Distributors

AZ	Tempe, Shelley Elctrns.	602-894-2058
AZ	Tempe, Bell Inds.	602-267-7774
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Integrated Electronics	213-998-2200
CA	Gardena, Bell Inds.	213-515-1800
CA	Irvine, Integrated Electronics	714-660-1055
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, Shelley Elctrns.	408-942-9111
CA	San Jose, Integrated Electronics	408-263-1100
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Diplomat/Westland	408-734-1900
CA	Van Nuys, CW Swift & Assocs.	213-989-1133
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Wheatridge, Bell Inds.	303-424-1985
FL	Orlando, Pelcor Co.	305-299-1541
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns.	312-638-4411
MD	Baltimore, Radio Elec. Svc.	301-823-0070
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MA	Medford, Blake Assocs.	617-391-7890
MA	Woburn, Diplomat Elctrns.	617-935-6611
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Mt. Vernon, ASAP Elctrns.	914-699-2727
NY	Syracuse, Newark Elctrns.	315-437-6611
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TX	Ft. Worth, PATCO Supplies	817-429-8596
TX	Richardson, Jaco Elctrns.	214-235-9575
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Bell Inds.	206-747-1515
WA	Bellevue, Integrated Electronics	206-455-2727

JOHNSON, E. F., CO., 299 Johnson Ave., Waseca, MN 56093, Tel: 507-835-6222, Telex: 290470, TWX: 910-565-2161; Empl.: 1400; *Sls. Mgr.:* G. Mena

JOHNSON CONTROLS, Globe Battery Div., 5757 N. Green Bay Ave., Milwaukee, WI 53201, Tel: 414-228-1200, TWX: 910-262-3084; Empl.: 20,000

JOLO INDS., 13921 Nautilus Dr., Garden Grove, CA 92643, Tel: 714-554-6840, TWX: 910-595-1138; Empl.: 20; *Sls. Mgr.:* J.S. Giampiccolo, Jr.

JONARD INDS. CORP., 134 Marbledale Rd., Tuckahoe, NY 10707, Tel: 914-793-0700, Telex: 996570, TWX: 710-562-0107; Empl.: 65; *Sls. Mgr.:* R. Fersen

JONATHAN MFG., 1101 So. Acacia Ave., Fullerton, CA 92631, Tel: 714-526-4651, Telex: 910 592-1241; Empl.: 265

JONES, HIRAM, ELCTRNS. INC., See Hiram Jones Elctrns. Inc.

JORDAN ELEC., 2380 Camino Vida Roble, Carlsbad, CA 92008, Tel: 619-438-6876; FSC No.: 5905; Empl.: 75; *Sls. Mgr.:* B. M. Barton

JORI RESOURCES, 2128 Knoll Dr., Ventura, CA 93003, Tel: 805-642-2266; Empl.: 4

JOSLYN ELCTRN. SYS., 6868 Cortona Dr., Goleta, CA 93017, Tel: 805-968-3551, TWX: 910-334-3464; FSC No.: 23663; Empl.: 210; *Sls. Mgr.:* A. deSouza

JRW INDS., INC., 2312 N Second St., Harrisburg, PA 17110, Tel: 717-236-1418; Empl.: 4; *Sls. Mgr.:* James Thorbahn

JSC WIRE & CABLE, Box 248, Burgess Pl., Wayne, NJ 07470, Tel: 201-694-6200; Empl.: 40; *Sls. Mgr.:* R. D. Foster; *Dist. Mgr.:* J. Freeman .... **2•**2103

Local Sales Offices & Reps

CA	Van Nuys, Art Szerlip Sls. Co.	213-782-1765
CO	Denver, Mountain Reps.	303-623-0972
DE	Newark, F. S. Carmine Co.	302-731-0697
FL	Crystal River, Foster Sls.	904-795-7831
IL	Chicago, Lassers & Co.	312-539-0170
IA	Burlington, J. S. Ridge Entprs.	319-754-8745
KY	Louisville, Mid Central Sls. Co.	502-239-5614
MA	Lynn, Keene Sls. Co.	617-595-2300
MI	Livonia, Harvey Sls.	313-476-1974
NJ	Teaneck, Fisher Elctrn. Assocs.	201-837-1200
NY	Rochester, Warren Kaufman	716-266-2728
NC	Charlotte, D. Austin Co.	704-334-0174
OH	Columbus, Benchmark	614-861-2070
OR	Portland, R. M. Minthorne	503-246-4556
TX	Dallas, Crockett Sls. Co.	214-748-8209
WI	Minneapolis, John E. M. Anderson	612-823-6459
EXP	NY, New York, Roburn Agencies	212-989-5939

JUDCO MFG. INC., P.O. Box 487-E84, 24030 Frampton Ave., Harbor City, CA 90710, Tel: 213-534-0959 .... **1B•**1671

Judd Wire
DIVISION OF HIGH VOLTAGE ENGINEERING

JUDD WIRE, High Voltage Engrg., 57 Turnpike Rd., Turners Falls, MA 01376, Tel: 413-863-4357, TWX: 510-290-2147; FSC No.: 3357; Empl.: 148; *Sls. Mgr.:* Jack Allen .... **1B•**1011; **2•**2104, 2105

Local Sales Offices & Reps

AL	Huntsville, Hughes Assocs.	205-533-9108
CA	Los Altos, Ewing Foley	415-941-4525
CO	Denver, Duffy Assocs.	303-595-4244
FL	Orlando, Donato & Assocs.	305-352-0727
GA	Norcross, Hughes Assocs.	404-449-1177
IL	Chicago, Rozner Sls. Co.	312-283-0022
MA	Marlborough, O.K. Engrg.	617-481-6400
MI	Southfield, C. H. Schmidt Co.	313-353-6000
MN	Brooklyn Center, Willman Assoc.	612-566-5010
MS	Corinth, Hughes Assocs.	601-287-2915
NJ	Haddonfield, Mesa Tech. Assocs.	609-429-9531
NY	Attica, B. H. Tollefson Assoc.	716-591-1219
NY	Auburn, B. H. Tollefson Assoc.	315-253-4109
NY	Rochester, B. H. Tollefson Assoc.	716-271-4141
NC	Research Triangle Park, Naylor Assocs.	919-836-0478
OH	Worthington, Simcox Assocs.	614-885-8995
OR	Portland, Jas. J. Backer Co.	503-297-8744
SC	Greenville, Naylor Assocs.	803-297-9969
TN	Morristown, Hughes Assocs.	615-587-2433
TX	Dallas, Stevens Sls. Co.	214-350-2476
UT	Salt Lake City, Electrodyne	801-486-3801
WA	Seattle, Jas. J. Backer Co.	206-285-1300

Local Distributors

AL	Madison, Sea Wire & Cable	205-772-9616
AZ	Tempe, Pacer Elctrns.	602-267-0299
CA	Anaheim, Innovative Sys.	714-632-8800
CA	Concord, Control Master	415-939-3600
CA	Harbor City, Falmat	213-530-3333
CA	Mountain View, Sonic Wire	415-965-4646
CA	Torrance, Blake Wire & Cable	213-515-0561
CA	Valencia, Wirenetics Co.	805-257-2400
CT	East Hartford, E. J. Stephens Co.	203-568-1927
CT	Manchester, I.M.S.	203-649-4415
FL	Ft. Lauderdale, Simcona Elctrn.	305-485-4455
FL	Ft. Lauderdale, Pacer Elctrns.	305-462-0902
GA	Clarkston, Lance Engrg.	404-292-4404
MD	Hanover, Vertex Elctrns.	301-796-5000
MA	Burlington, QPL Elctrn. Dist.	617-229-2424
MA	Woburn, Pacer Elctrns.	617-935-8330
MN	Bloomington, K. L. Tannehill	612-881-6700
NH	Amherst, North Country Wire & Cable	603-889-0063
NH	Manchester, Yankee Elctrn.	603-625-9746
NJ	Dover, Electro Spec.	201-361-5079
NJ	Fairfield, Olympic Wire & Cable	201-227-7996
NY	Fairport, Pacer Elctrns.	716-377-0462
NY	Farmingdale, Welco Elctrns.	516-293-0050
NY	Farmingdale, Vertex Elctrns.	516-293-9880
NY	Rochester, Simcona Elctrn.	716-328-3230
NY	Ronkonkoma, Zenith Wire	516-585-1444
OH	Dayton, Astro Inds.	513-429-5900
PA	Harleysville, Omega Wire & Cable	215-256-6577
PA	Montgomeryville, Pyttronic ind.	215-242-6700
TX	Garland, Interstate Wire	214-271-0541
WA	Seattle, Anixter	206-251-5287
WI	New Berlin, Indl. Elec. Wire & Cable	414-782-2323

JUDD WIRE, High Voltage Engrg., 870 Los Vallecitos Blvd., San Marcos, CA 92069, Tel: 619-744-7720, TWX: 910-322-1149; FSC No.: 3357 .... **1B•**1011; **2•**2104, 2105

Refer to Judd Wire, Turners Falls, MA for sales office and distributor information.

JRL JULIE RESEARCH

JULIE RESCH. LABS., 211 West 61st St., New York, NY 10023, Tel: 212-245-2727, TWX: 710-581-5138; Empl.: 45; *Sls. Mgr.:* Pamela Spencer .... **1A•**1878; **3•**1248-1252

Local Sales Offices & Reps

	Instruments	
CO	Boulder, Instr. Repair Labs	303-449-2721
	Resistors	
CA	Northridge, Craig Assocs.	213-993-4060

JUNCTION DEVICES, INC., 2488-A Townsgate Rd., Westlake Village, CA 91361-2594, Tel: 213-889-4030, 805-497-4421, TWX: 910-336-1293; FSC No.: 60858; Empl.: 70; *Sls. Mgr.:* N. Pena

Local Sales Offices & Reps

CA	Burbank, MCA Repco	213-843-4096
CA	Cupertino, Allis Assoc.	408-252-2883
CA	Dana Point, MCA Repco	714-661-1300
CA	Westlake Village, MCA Repco	213-889-5553
FL	Palm Bay, Spartech Assoc.	305-727-8045
GA	Smyrna, Spartech Assoc.	404-432-3644
MA	Lowell, Matrix Sls.	617-458-2096
MO	Kansas City, E I R Company	816-452-7030
MO	Leasburg, E I R Company	314-245-6860
NY	Hartsdale, Spectrum Sls.	914-472-8600
TX	Richardson, Southwest Microwave Elctrns.	214-669-1195
VA	Fairfax, Schibley Assocs.	703-591-3008
EXP	NJ, Wayne, Expo Intl. Co.	201-956-7037

JUPITER SYSTEMS, 1100 Marina Village Parkway, Alameda, CA 94501, Tel: 415-523-9000; *Sls. Mgr.:* Richard MacElhiney

KAHGAN Electronics Corp.

KAHGAN ELCTRNS. CORP., 556 Peninsula Blvd., Hempstead, NY 11550, Tel: 516-538-2300, TWX: 510-222-4347; Empl.: 39 .... **1A•**1119

Local Sales Offices & Reps

AL	Huntsville, BCI, Inc.	205-539-4411
AZ	Phoenix, Sanford Sls. Assocs.	602-957-3570
CA	Anaheim, Micrometals	714-630-7420
CA	Huntington Beach, Corcoran Assoc.	714-841-4759
CA	Los Angeles, Corcoran Assoc.	213-823-4589
CA	Santa Clara, Maxim Elctrn. Sls.	408-946-6001
CO	Aurora, High Tech Assocs.	303-695-1990
CO	Denver, Walter Engrg. Assocs.	303-777-5585
FL	Casselberry, Southern Elctrn. Mktg. (A/K/A Semi)	305-695-3334
FL	Ft. Lauderdale, Southern Elctrn. Mktg. (A/K/A Semi)	305-475-3686
GA	Chamblee, BCI, Inc.	404-455-0405
IL	Palatine, Technology Sls.	312-991-6600
KS	Overland Park, J. F. Guernsey Co.	913-381-2225
MA	Lexington, Del-Con Sls.	617-938-1929
MN	Minneapolis, Smiley-Scott Assoc.	612-888-5551
NM	Albuquerque, Nelco Electronix	505-293-1399
NC	Raleigh, BCI, Inc.	919-781-9426
PA	King of Prussia, Emerald Elctrns.	215-265-1360
TX	Dallas, Marcom	214-351-4532
TX	Houston, Marcom	713-271-5635
VA	Reston, Tytronics Tech. Sls.	703-471-0440
WA	Vancouver, Ray Over Sls.	206-695-6179
WI	Wauseka, Techn. Sls.	414-787-5015

KAHLE ENGRG., Div. Joule Machinery Grp., 3344 Hudson Ave., P.O. Box 877, Union City, NJ 07087, Tel: 201-867-6500, Telex: 42-7757, TWX: 710-992-8835; Empl.: 50; *Sls. Mgr.:* Carl A. Napor

KAISER ELCTRNS., Kaiser Aerospace & Elctrns., 2701 Orchard Pkwy., San Jose, CA 95134, Tel: 408-946-3000, TWX: 910-338-0196

KAISER ELECTROPRECISION, Kaiser Aerospace & Elctrns., 1700 S. Redhill Ave., Irvine, CA 92714, Tel: 714-540-6810, Telex: 678467; FSC No.: 86831; *Sls. Mgr.:* Archie M. Cardwell

KSI Kaiser Systems, Inc.

KAISER SYSTEMS, INC., 33 Cherry Hill Drive, Danvers, MA 01923, Tel: 617-777-5102 .... **3•**1608-1610

KALART VICTOR CORP., Hultenius St., Plainville, CT 06062, Tel: 203-747-1663; *Sls. Mgr.:* J. J. Costag

KALGLO ELCTRNS. CO., INC., 6584 Ruch Rd., E. Allen Twp., Bethlehem, PA 18017, Tel: 215-837-0700; *Sls. Mgr.:* Joe H. Ungerer

K&A

KALMUS & ASSOCS., INC., 2424 S. 25th Ave., Box 525, Broadview, IL 60153, Tel: 312-343-7004, TWX: 910-226-0713; Empl.: 290; *Sls. Mgr.:* D.R. Capparelli, Sr., V.P. Sls. & Mktg. .... **2•**1093

Local Sales Offices & Reps

AL	Huntsville, Alpha Mktg.	205-533-0766
CA	Pasadena, Black & White, Inc.	818-792-2133
CA	San Diego, Varigon Assocs.	619-576-0100
CA	Sunnyvale, M2 Mktg. Grp.	408-746-3630
CO	Boulder, Comp. Product Sls.	303-530-2800
FL	Plantation, Gallagher & Assocs.	305-473-2101
GA	Tucker, Alpha Mktg.	404-491-9430
IL	Arlington Heights, M. J. Petersen & Assocs.	312-577-8200
IL	Chicago, W. F. Hamilton Co.	312-867-5030
IN	Ft. Wayne, F. J. Campisano Co.	219-747-2633
IN	Indianapolis, F. J. Campisano Co.	317-253-7651
MA	Braintree, Nova Assocs.	617-848-9330
MI	Jackson, Jim Jordan Assocs.	517-750-2677
MN	Minneapolis, Northstar Components	612-553-1888
MS	Meridian, Alpha Mktg.	601-483-9306
MO	Independence, Engrg. Svcs. Co.	816-254-3600
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	Mountainside, Henry G. Richter Co.	201-233-4615
NY	Fayetteville, Henry G. Richter Co.	315-637-6713
NY	Rochester, Henry G. Richter Co.	716-436-0300
NC	Charlotte, T. C. Sales, Inc.	704-364-8996
OH	Cincinnati, F. J. Campisano Co.	513-574-7111
OH	Cleveland, F. J. Campisano Co.	216-749-5550
PA	Corapolis, F. J. Campisano Co.	412-264-5151
TN	Austin, C. R. Colvin Assocs.	512-474-8698
TN	Houston, C. R. Colvin Assocs.	713-961-1262
TN	Oak Ridge, Alpha Marketing	615-482-4681
TX	Richardson, McCoy Assocs. Co.	214-238-1017
UT	Salt Lake City, Comp. Product Sls.	801-262-0000

K&L MICROWAVE, INC., 408 Coles Circle, Salisbury, MD 21801, Tel: 301-749-2424, TWX: 710-864-9683; FSC No.: 50140; Empl.: 320; *Sls. Mgr.:* Charles J. Schaub

K & L QUARTZTEK, K & L Microwave, 20 S. 48th Ave., Phoenix, AZ 85043, Tel: 602-272-7944, TWX: 910-951-1305; FSC No.: 59492; *Sls. Mgr.:* Mark H. Story

K & M ELCTRNS., 123 Interstate Dr., W. Springfield, MA 01089, Tel: 413-781-1350, TWX: 710-350-6463; Empl.: 500; *Sls. Mgr.:* Allan Mallanik .... **1A•**1883

Local Distributors

MA	West Springfield, Moldcon	413-736-0371

KANTZ ELCTRN. IND., 1804 Wall Church Rd., Wall Township, NJ 07719, Tel: 201-974-0090; Empl.: 12; *Sls. Mgr.:* L. Herold

KAPPA NETWORKS INC

KAPPA NETWORKS, 165 Roosevelt Ave., Carteret, NJ 07008, Tel: 201-541-1600, Telex: 139408 KAPPA CRET; Empl.: 125; *Sls. Mgr.:* M. Pearl .**1A•**1538-1553

Local Sales Offices & Reps

CA	Alhambra, M. W. Riedel & Co.	213-283-7694
CA	Alhambra, Kappa Networks	213-283-2048
CA	Santa Clara, Emerging Technology Sls.	408-727-1771
CO	Englewood, White Sales Co.	303-694-9555
CT	Cheshire, Selmark Assocs.	203-573-9088
IA	Grandview, R.R. Burton & Assocs.	816-762-5285
MA	Millis, Selmark Assocs.	617-376-2914
MN	Osseo, Gaffney Sls. Co.	612-425-5484
MO	Grandview, R.R. Burton & Assocs.	816-765-5385
NH	Hopkinton, Selmark Associates	603-746-3299
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NC	Raleigh, Leigh Sls.	919-872-1484
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TX	Dallas, Technlg. Sls.	214-380-0200
TX	Houston, Technlg. Sls.	713-266-2473
EXP	Carteret NJ, Kappa Networks	800-223-0603

Local Distributors

CA	Alhambra, Delay Line Distrs. Co.	213-283-2058

KAPPA SCIENTIFIC CORP., Box 30585, Santa Barbara, CA 93105, Tel: 805-687-9648; Empl.: 4

KARKAR ELECTRONICS, INC., 245 Eleventh St., San Francisco, CA 94103, Tel: 415-552-1247, TWX: 910-372-7754; FSC No.: 017857; *Sls. Mgr.:* A. Slikkerveer

Local Sales Offices & Reps

NJ	Ocean Township, Karkar Elctrns., Inc.	201-493-3303
TX	Richardson, Karkar Elctrns., Inc.	214-680-9854

KARL HOPT CO, See Hopt, Karl, Co.

KATES SCI. INSTRS., 142 Adam St., Newton, MA 02158, Tel: 614-527-2711; Empl.: 28; *Sls. Mgr.:* D. Kates

KAUFMAN DATA COMMS., INC., Orange Nassau Elctrns. Co., 145 E. Dana St., Mountain View, CA 94041, Tel: 415-962-8811, TWX: 910-379-5021

KAVLICO CORPORATION

KAVLICO CORP., 20869 Plummer St., Chatsworth, CA 91311-5096, Tel: 818-882-2400, FAX 818-998-2050, Telex: 65-1481; Empl.: 250; *Sls. Mgr.:* Vic Cetta; *Dist. Mgr.:* Rudi Kettler .... **1B•**1846

Local Sales Offices & Reps

CO	Lakewood, Loritz Controls	303-232-7803
FL	Winter Park, James T. Conklin, P.E.	305-629-1739
MN	Minneapolis, Industra Co.	612-835-5535
NM	Albuquerque, Indl. Prods. Corp. (IPC)	505-256-3561
NY	Thompson Ridge, Neville & Vespo Corp.	914-457-9209
PA	King of Prussia, FLW of PA	215-337-4343
SC	Greenville, E. C. Capell & Assocs.	803-297-6550
TX	Ft. Worth, UTM Engineering	817-429-2456
TX	Houston, Collinsystems Pro-Quip	713-464-9428

KAYE INSTRUMENTS, 15 De Angelo Dr., Bedford, MA 01730, Tel: 617-275-0300, Telex: 6817183, TWX: 710-326-1598; Empl.: 170 .... **3•**1166

Local Sales Offices & Reps

AL	Birmingham, Hile Controls of Alabama	205-879-2990
AL	Mobile, Hile Controls of Alabama	205-476-7258
AZ	Phoenix, Southwest Controls Inc.	602-267-1171
AZ	Tucson, Southwest Controls Inc.	602-299-8981
AR	El Dorado, Kemp Engineering Co. Inc.	501-862-5869
CA	Costa Mesa, FLW, Inc.	714-751-7512
CA	Hayward, FLW, Inc.	415-487-2222
CA	San Diego, FLW, Inc.	619-277-0993
CA	Van Nuys, FLW, Inc.	213-989-5236
CO	Lakewood, Tech. Mktg. Mfg.	303-232-1516
CT	North Haven, Pat Jenks Assoc.	203-239-6201
FL	Tampa, Lewis & Assocs.	813-988-2104
GA	Marietta, Hile Controls of Georgia	404-424-8372
IL	Chicago, Comtel Midwest	312-539-4838
IN	Indianapolis, Comtel Midwest	317-253-1681
IA	Cedar Rapids, Comtel Midwest	319-377-9434
KS	Shawnee Mission, Comtel Midwest	913-722-1030
LA	Baton Rouge, Rise Inc.	504-776-4645
ME	Brewer, Leen Co.	207-989-7363
ME	Portland, Leen Co.	207-774-6266
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Woburn, Pat Jenks Assoc.	617-938-0488
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MI	Southfield, Comtel Midwest	313-358-2510
MN	Wayzata, Comtel Midwest	612-476-1551
MO	St. Louis, Comtel Midwest	314-991-5363
NJ	Emerson, Instrumentation Prods.	201-265-6330
NJ	Metuchen, FLW, Inc.	201-548-4343
NM	Albuquerque, Tech. Mktg. Mfg.	505-298-6893
NY	Syracuse, Labtronics	315-455-7314
NC	Matthews, W. K. Hile Co.	704-847-9125
OH	Cleveland, Fox & Dole	216-476-2625
OH	Englewood, Carter, McCormic & Peirce	513-836-0951
OK	Tulsa, Kemp Engrg. Co.	918-663-4501
PA	King of Prussia, FLW, Inc.	215-337-4343
PA	Murrysville, Data Acquisition Sys.	412-327-8979
TN	Knoxville, Hile Controls of TN	615-584-0208
TN	Memphis, Hile Controls of TN	901-372-0451
TX	Lubbock, Summit Controls	806-792-2072
TX	Plano, Summit Controls	214-867-6056
TX	Sugar Land, Pan/Tech Engrg. Corp.	713-240-1220
UT	Salt Lake City, Tech. Mktg. Mfg.	801-487-7676
WA	Issaquah, DCI/Alpha	206-392-7521
WA	Vancouver, DCI/Alpha	206-693-7447
WI	New Berlin, Comtel Midwest	414-544-6042

KAY ELEMETRICS CORP., 12 Maple Ave., Pine Brook, NJ 07058-9797, Tel: 201-227-2000, TWX: 710-734-4347; FSC No.: 80138; Empl.: 70; *Sls. Mgr.:* Stephen P. Crump .... **1A•**1708

KAY-TOWNES ANTENNA, P.O. Box 593, Rome, GA 30161, Tel: 404-291-9871, TWX: 810-764-4809; Empl.: 85; *Sls. Mgr.:* Charles S. Ford; *Dist. Mgr.:* James A. Sheffiled

KB ELCTRNS., 73 Wortman Ave., Brooklyn, NY 11207, Tel: 212-257-3300, TWX: 710 584 2308; Empl.: 125; *Sls. Mgr.:* A Bueller

KBI, A Div. of Cabot Corp., PO Box 1462, Reading, PA 19603, Tel: 215-371-3600, Telex: 902251, TWX: 510-651-0106; Empl.: 600; *Sls. Mgr.:* Robert J. Longenecker

KCK AMERICA INC., 1245 Forest Ave., Ste. 10, Des Plaines, IL 60018, Tel: 312-297-5435, Telex: 726481; *Sls. Mgr.:* Carl Bronder; *Dist. Mgr.:* Carl Bronder

KD COMPONENTS, INC., 3016 S. Orange Ave., Santa Ana, CA 92707, Tel: 714-545-7108, TWX: 910-595-2678; Empl.: 25

KDI ELECTRONICS, INC., 60 S. Jefferson Rd., Whippany, NJ 07981, Tel: 201-887-8100, TWX: 710-986-8220; Empl.: 250; *Sls. Mgr.:* William M. Dodge; *Dist. Mgr.:* William M. Dodge .... **1A•**1879

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assocs.	602-955-3193
CA	Los Angeles, Elsco	714-891-4621
CA	Mountain View, Gene Woempner Co., Inc.	415-578-1581
CA	Mountain View, J.I. Tech. Sls.	415-969-5552
CA	Mountain View, Gene Woempner	415-578-1581
CO	Denver, High Plains Mktg.	303-751-7150
FL	PalmBay, Spartech Assocs., Inc.	305-727-8045
GA	Smyrna, Spartech Assocs., Inc.	404-432-3644
IL	Northfield, Imex Ltd.	312-446-8934
IL	Park Ridge, Probe Elctrns.	312-698-2044
MD	Owings Mills, Neal Deoul Assocs.	301-363-4311
MA	Ashland, John O'Donnell	617-881-1380
MA	N. Andover, Torrey Assocs.	617-687-0099
MN	New Brighton, TWC Sls.	612-636-1770
MO	Grandview, Harris - Hanson	816-763-6200
MO	St. Louis, Harris - Hanson	314-432-3611
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Bridgeport, Lightstone Corp.	315-699-5747
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NY	Huntington, CDB Entrps., Inc.	516-692-5200
NY	Syracuse, T-Squared Elctrns.	315-463-8592
OH	Dayton, Frederick L. Ohmer & Assoc.	513-434-1454
PA	Doylestown, Lou Adezio	215-249-9729
TX	Dallas, Texas Avionics	214-386-3566
TX	Garland, Carey, McMahill & Zerbe Co., Inc.	214-681-1414
TX	Sherman, Repmasters	214-247-6236
WA	Vancouver, Ray Over Sls.	206-695-4697

Local Distributors

CA	Chatsworth, MIL-COMM Distrs.	213-998-3111
CA	Mountain View, Target Elctrns.	415-961-1170
FL	Tampa, Impala Elctrns.	813-885-4747
NJ	Englewood, Tech. Elctrn. Distrs.	201-894-0800
NY	Farmingdale, Command Elctrns.	516-293-1212
TX	Houston, Lenert Co.	713-225-1465

KEC ELECTRONICS, INC.

KEC ELCTRNS., INC., 20817 Western Ave., Torrance, CA 90501, Tel: 213-320-3902, TWX: 910-349-6962; Empl.: 8; *Sls. Mgr.:* Frank Chase .... **3**•1613-1616

Local Sales Offices & Reps

AZ	Tempe, Quatra	602-894-2802
CA	Cupertino, Costar	408-446-9339
CA	Los Alamitos, Power Specialists	213-594-9418
CO	Fort Collins, Vic Myers Assoc.	303-223-8907
FL	Cocoa Beach, Teqspec	305-748-9292
FL	Hobe Sound, Teqspec	305-746-4987
FL	Palm Harbor, Teqspec	813-785-2276
GA	Atlanta, Teqspec	404-455-7222
IL	Elk Grove Village, Loren Green Assoc.	312-593-0282
IN	Indianapolis, Loren Green Assoc.	317-293-9827
MA	Danvers, C. H. Burnham Assocs.	617-774-0111
MI	Jenison, R. C. Nordstrom & Co.	616-457-5762
MI	Southfield, R. C. Nordstrom & Co.	313-559-7373
MN	Minnetonka, Chris-Tek	612-934-1334
NH	Durham, C. H. Burnham Assocs.	603-868-2282
NJ	Springlake, Neville & Vespo	201-974-1520
NM	Albuquerque, Vic Myers Assocs. Inc.	505-884-6878
NY	Binghamton, TAE-Rep.	607-772-6952
NY	Rochester, TAE-Rep.	716-586-8710
NY	Thompson Ridge, Neville & Vespo	914-457-9209
NC	Winston Salem, Teqspec	919-723-8102
OH	Chesterland, KT/DEPCO	216-729-3588
PA	Erdenheim, Omni Sls.	215-233-4600
PA	Pittsburg, KT/Depco	412-487-8777
RI	Johnston, C. H. Burnham Assocs.	401-231-7475
TN	Morristown, Teqspec	615-587-0980
VA	Fairfax, Nine Assocs.	703-273-1803
WA	Bellevue, Elctrn. Mktg. Grp.	206-746-5915

KEENE LAMINATES, Keene Corp., 199 Amaral St., E. Providence, RI 02914, Tel: 800-556-7683, Telex: 927524

KEDMAN CO., Box 25667, Salt Lake City, UT 84125, Tel: 801-973-9112, TWX: 910-925-4116; Empl.: 100

KEENE RAY PROOF, Keene Corp., 50 Keeler Ave., Norwalk, CT 06878, Tel: 203-838-4555, Telex: 96-5812; *Sls. Mgr.:* Robert C. Barbour; *Dist. Mgr.:* Ken Makowski

KEITHLEY INSTRS., 28775 Aurora Rd., Cleveland, OH 44139, Tel: 216-248-0400, Telex: 98-5469; Empl.: 461; *Sls. Mgr.:* Ron Ruiz; *Dist. Mgr.:* T. A. Hayden

KEL-AM, 308 E. 5th, P.O. Box 313, Eldon, MO 65026, Tel: 314-392-7174, Telex: 42-301; FSC No.: 57856; Empl.: 67; *Sls. Mgr.:* Bob Riemer; *Dist. Mgr.:* Bob Riemer .... **2**•1472-1483

Local Sales Offices & Reps

AZ	Scottsdale, BH&B Sls.	602-994-4455
CA	Placentia, Local Sls.	714-993-1800
CA	Santa Clara, Acclaim	408-745-7416
CO	Parker, Mikro Sls.	303-841-4131
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Sarasota, Phoenix Comps.	813-371-1163
GA	Atlanta, Electro Sls.	404-394-1122
IL	Arlington Heights, Diethert/Angel	312-593-7600
IN	Fort Wayne, Temple Engrg.	219-743-0362
IA	Davenport, Electro Tech.	319-386-1134
MD	Baltimore, Faion Lott, Inc.	301-744-4611
MA	Lexington, Kitchen & Kutchin	617-862-8230
MI	Ypsilanti, Tamco, Inc.	313-572-1950
MN	Minneapolis, Electro-Tech	612-927-5878
MO	N. Kansas City, Weisler & Assocs.	314-394-4543
MO	St. Louis, Weisler & Assocs.	
NJ	Clark, R. E. Breuer Co.	201-388-5045
NM	Albuquerque, Nelco Elctrns.	505-293-1399
NY	Port Washington, R. E. Breuer Co.	516-883-7810
NY	Rochester, Tech. Comps.	716-342-2406
OR	Portland, SPS Engrg.	503-297-6919
PA	Downingtown, MCCoy, Inc.	215-363-0350
PA	McKean, ECCO Sls.	814-476-1376
SC	Greer, Sunbelt Sls.	803-877-9088
TN	Chattonooga, Electro Sls.	615-267-4260
TX	Grapevine, Elctrn. Mktg. Assoc.	817-481-7502
TX	Houston, Elctrn. Mktg. Assoc.	713-498-8120
WA	Redmond, SPS Elctrns.	206-392-5264

Local Distributors

AZ	Tempe, Anjon	602-894-1332
CA	Belmont, LO-DAN Elctrns.	415-592-4600
CA	Corona, Konex Corp.	714-371-1200
CA	Glendale, Remco	714-558-3202
CA	Mountain View, Cornett Elctrns.	415-969-5420
CA	San Diego, Mann	619-578-1550
CA	San Fernando, REMCO	213-365-1176
CA	Santa Ana, Mann S.W.	714-558-3202
CA	Santa Clara, Mann Elctrns.	408-988-6061
CO	Denver, CSID Intergrated Elctrns.	303-893-9594
CT	Stratford, Utronics	203-378-4201
FL	Ft. Lauderdale, Intertec Comps.	305-975-8644
FL	Largo, Lo Dan Elctrns.	813-586-2851
FL	Longwood, Intertec Comps.	305-834-7777
IL	Arlington Hgts., Lo Dan Elctrns.	312-398-5311
IL	Hoffman Estates, Intercomp	312-843-2040
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Shawnee, Besco Elctrns.	913-268-7633
KS	Wichita, Radio, Inc.	316-264-2798
MA	Lowell, Bay State Wire & Cable	617-454-2444
MA	Woburn, Elctrn. Packaging Comps.	617-935-0400
MI	Farmington Hills, Ambur Elctrns.	313-477-8670
MI	Southfield, LSI Mktg.	313-356-7002
MN	Farmington, Tel-Tek, Inc.	612-460-6299
MN	Minneapolis, Wilde, Inc.	612-941-4825
MO	Independence, H.F. Signalling	816-833-4448
NE	Lincoln, Scott Elctrns.	402-466-8221
NE	North Platte, Scott Elctrns.	308-532-9260
NE	Omaha, Scott Elctrns.	402-734-6750
NH	Hampstead, Astrum Elctrns.	603-329-5656
NJ	Roselle, Lectron Inds.	201-245-5858
NM	Albuquerque, Elctrn. Devices	505-293-1935
NY	Port Washington, Connector Concepts	516-883-3800
OK	Oklahoma City, Radio, Inc.	405-789-0741
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Beaverton, Zepher Elctrns.	503-643-1980
PA	McKean, Advacom	814-476-7774
PA	Montgomeryville, Pyttronics	215-643-2850
TX	Addison, Connec/Tek	214-239-7552
WA	Redmond, Mann N.W.	206-881-0440
WA	Seattle, Zepher Elctrns.	206-241-1980

KELTEC FLORIDA, P.O. Box 2917, Ft. Walton Bch., FL 32549, Tel: 904-651-1210, TWX: 510-730-7654; FSC No.: 09062; Empl.: 400 .... **3**•1617-1619

Local Sales Offices & Reps

AZ	Phoenix, J. Smith Assoc.	602-267-0981
CA	Los Angeles, Cain Technology	213-476-2251
CA	Orange, Cain Technology	714-997-7311
CA	Sunnyvale, Loeswick's	408-745-6751
CO	Colorado Springs, J. Smith Assoc.	303-597-5343
IN	Ossian, Science Sls.	219-622-7383
IA	Cedar Rapids, Palatine Sls.	319-365-8071
KS	Goddard, Palatine Engrg. & Sls.	316-788-5521
KS	Mission, Palatine Sls.	913-831-0555
MD	Ellicott City, VPI	301-461-2525
MA	Needham Hgts., O'Sullivan & Murphy	617-449-4141/4142/4144
MO	Hazelwood, Palatine Sls.	314-893-0800
NJ	Danville, Metro-MICS	201-625-5959
NJ	Westfield, Metro MICS	201-233-6116
NM	Albuquerque, J. Smith Assoc.	505-265-3406
NY	Melville, Metro MICS	516-433-3333
NY	N. Tonawanda, Labtronics	315-454-9314
NY	New York, Landseas Corp.	212-265-8323
NY	Syracuse, Labtronics	315-455-7314
OH	Brunswick, Science Sls.	216-273-4429
PA	Montgomerysville, VPI	215-474-3200
TX	Richardson, Lear Assocs.	214-231-5388
TX	Spring, Lear Assocs.	713-370-7449

KELTLON CORP., Viking Modules Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 75; *Sls. Mgr.:* T. Chadurjian

KELTRON CORP., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 270; *Sls. Mgr.:* E. Chown; *Dist. Mgr.:* E. Chown

KELTRON CORP., Walden Div., 225 Crescent St., Waltham, MA 02154, Tel: 617-894-8700, Telex: 948197; Empl.: 225; *Sls. Mgr.:* T. Chadurjian

KELVIN, 5919 Noble Ave., Van Nuys, CA 91411, Tel: 818-782-6662, Telex: 65-1417; FSC No.: 19587; Empl.: 250; *Sls. Mgr.:* R. A. Featherston .... **1A**•1880-1882

Local Sales Offices & Reps

AL	Huntsville, Macro Mktg.	205-883-9630
AZ	Scottsdale, D.H. Entprs.	602-990-0452
CA	Mountain View, G. C. Woempner Co.	415-964-5454
CA	Van Nuys, Wes-K Assoc.	213-989-3070
CO	Boulder, R-G Entprs.	303-447-9211
CT	Milford, Todino Engrg. Sls.	203-874-6643
FL	Ft. Lauderdale, Electro-Comp.	305-491-4141
IL	Deerfield, Walt Krueger	312-945-3720
MD	Reisterstown, Massey Assocs.	301-833-2039
MA	Needham Hgts., Todino Engrg.	617-444-7925
MI	Birmingham, Forand Sls.	313-644-0087
MN	Minneapolis, Parker Shoap	612-755-6904
NJ	Medford, Jack McCoy Inc.	609-953-0770
NY	Fayetteville, Foster & Wager	315-637-5427
NY	Great Neck, Trionic	516-466-2300
NY	Webster, Foster & Wager	716-265-2072
OH	New Lebanon, J. N. Bailey & Assoc.	513-687-1325
OR	Beaverton, General Elctrns.	503-641-5288
TX	Austin, C. R. Colvin Assoc.	512-474-8698
TX	Dallas, Stasco	214-239-4517
TX	Houston, C. R. Colvin Assoc.	713-961-1262
WA	Seattle, General Elctrns.	206-241-7990

KEMET®

KEMET, UNION CARBIDE CORPORATION, ELCTRNS. DIV., Components Dept., Box 5928, Greenville, SC 29606, Tel: 803-963-6348, Telex: 57-0496, TWX: 810-287-2536; FSC No.: 31433; *Sls. Mgr.:* C. E. Volpe; *Dist. Mgr.:* J. A. Bruorton .... **1A**•1096-1118

Local Sales Offices & Reps

AL	Huntsville, Union Carbide	205-830-1090
AZ	Tempe, Union Carbide	602-831-2151
CA	Marina del Rey, Union Carbide	213-821-8824
CA	Mountain View, Union Carbide	415-969-9390
CA	San Diego, Union Carbide	619-560-0768
CO	Englewood, Union Carbide	303-773-0494
FL	Ft. Lauderdale, Union Carbide	305-731-2187
FL	Orlando, Union Carbide	305-855-8886
FL	Pompano Beach, Union Carbide	305-785-1990
FL	Tampa, Union Carbide	813-872-1861
IL	Schaumburg, Union Carbide	312-843-1030
IN	Carmel, Union Carbide	317-844-7756
IA	Ceder Rapids, Seltec Sls.	319-393-1114
MD	Columbia, Union Carbide	301-992-5600
MA	Woburn, Union Carbide	617-938-5400
MI	Livonia, Union Carbide	313-591-0555
MN	Edina, Union Carbide	612-929-4642
NY	Liverpool, Union Carbide	315-451-0720

KEITHLEY

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OK	Tulsa, Union Carbide	918-664-8592
PA	Exton, Union Carbide	215-363-8310
SC	Greenville, Union Carbide	803-242-5789
TX	Austin, Union Carbide	512-458-3181
TX	Irving, Union Carbide	214-556-0009
WA	Kirkland, Union Carbide	206-828-4853
PR	Santurce, ISLA CARIBE Electro Sls.	809-722-5140

Local Distributors

AL	Huntsville, Schweber Elctrns.	205-882-2200
AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AL	Huntsville, Hall-Mark Elctrns. Corp.	205-837-8700
AZ	Phoenix, Hall-Mark Elctrns. Corp.	602-243-6601
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Fisher-Brownell	602-967-1464
AZ	Tempe, Hamilton/Avnet Elctrns.	602-231-5100
CA	Alhambra, Fisher-Brownell	714-739-2201
CA	Canoga Park, Schweber Elctrns.	213-999-4702
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Costa Mesa, Hamilton/Avnet Elctrns.	714-641-1850
CA	Culver City, Hamilton Electro Sls. (Corp. Off.)	213-558-2662
CA	Irvine, Schweber Elctrns.	714-556-3880
CA	Sacramento, Hamilton/Avnet Elctrns.	916-920-3150
CA	Sacramento, Schweber Elctrns.	916-929-9732
CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Diego, Hall-Mark Elctrns. Corp.	619-268-1201
CA	San Diego, Hamilton/Avnet Elctrns.	619-571-7510
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Santa Clara, Schweber Elctrns.	408-748-4700
CA	Sunnyvale, Hall-Mark Elctrns. Corp.	408-773-9990
CA	Sunnyvale, Hamilton/Avnet Elctrns.	408-743-3355
CA	Sunnyvale, Bell Inds. (Corp. Off.)	408-734-8570
CA	Woodland Hills, Avnet Elctrns.	213-884-3333
CO	Englewood, Hall-Mark Elctrns. Corp.	303-694-1662
CO	Englewood, Hamilton/Avnet Elctrns.	303-740-1000
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Danbury, Schweber Elctrns.	203-792-3500
CT	Danbury, Hamilton/Avnet Elctrns.	203-797-2800
CT	Norwalk, Pioneer/Harvey Elctrns.	203-853-1515
FL	Altamonte Springs, Schweber Elctrns.	305-331-7555
FL	Ft. Lauderdale, Hall-Mark Elctrns. Corp.	305-971-9280
FL	Ft. Lauderdale, Hamilton/Avnet Elctrns.	305-971-2900
FL	Hollywood, Schweber Elctrns.	305-927-0511
FL	Orlando, Hall-Mark Elctrns. Corp.	305-855-4020
FL	St. Petersburg, Hamilton/Avnet Elctrns.	813-576-3930
GA	Norcross, Hall-Mark Elctrns. Corp.	404-447-8000
GA	Norcross, Schweber Elctrns.	404-449-9170
GA	Norcross, Hamilton/Avnet Elctrns.	404-447-7500
IL	Bensenville, Hamilton/Avnet Elctrns.	312-678-6310
IL	Bensenville, Hall-Mark Elctrns. Corp.	312-860-3800
IL	Elk Grove, Pioneer/Chicago Elctrns.	312-437-9680
IL	Elk Grove Village, Schweber Elctrns.	312-364-3750
IN	Carmel, Hamilton/Avnet Elctrns.	317-844-9333
IN	Indianapolis, Pioneer/Indianapolis	317-849-7300
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Schweber Elctrns.	319-373-1417
KS	Lenexa, Hall-Mark Elctrns. Corp.	913-888-4747
KS	Overland Park, Hamilton/Avnet Elctrns.	913-888-8900
KS	Overland Pk., Schweber Elctrns.	913-492-2921
MD	Baltimore, Hall-Mark Elctrns. Corp.	301-796-9300
MD	Columbia, Hamilton/Avnet Elctrns.	301-995-3500
MD	Gaithersburg, Schweber Elctrns.	301-840-5900
MA	Bedford, Schweber Elctrns.	617-275-5100
MA	Burlington, J. V. Elctrns. of Boston	617-273-4300
MA	Framingham, Cavalier Comps.	617-875-2000
MA	Lexington, Pioneer/Harvey Elctrns.	617-861-9200
MA	Woburn, Hamilton/Avnet Elctrns.	617-935-9700
MI	Grand Rapids, Hamilton/Avnet Elctrns.	616-243-8805
MI	Livonia, Pioneer/Michigan Elctrns.	313-525-1800
MI	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
MI	Livonia, Schweber Elctrns.	313-525-8100
MN	Bloomington, Hall-Mark Elctrns. Corp.	612-884-9056
MN	Eden Prairie, Schweber Elctrns.	612-941-5280
MN	Minneapolis, Merit Elctrns. Corp.	612-546-5383
MN	Minnetonka, Pioneer/Twin Cities Elctrns.	612-935-5444
MN	Minnetonka, Hamilton/Avnet Elctrns.	612-932-0600
MO	Earth City, Schweber Elctrns.	314-739-0526
MO	Earth City, Hamilton/Avnet Elctrns.	314-344-1200
MO	Maryland Hgts., Hall-Mark Elctrns. Corp.	314-291-5350
NJ	Cherry Hill, Hall-Mark Elctrns. Corp.	609-424-7300 (NJ), 215-355-7300 (PA)
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-424-0100
NJ	Fairfield, Hall-Mark Elctrns. Corp.	201-575-4415
NJ	Fairfield, Schweber Elctrns.	201-227-7880
NJ	Fairfield, Hamilton/Avnet Elctrns.	201-575-3390
NJ	Pine Brook, Pioneer/Harvey Elctrns.	201-227-1262
NM	Albuquerque, Alliance Elctrns.	505-292-3360
NM	Albuquerque, Bell Inds.	505-292-2700
NM	Albuquerque, Hamilton/Avnet Elctrns.	505-765-1500
NY	Buffalo, Summit Distrs.	716-884-3450
NY	E. Syracuse, Hamilton/Avnet Elctrns.	315-437-2642
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Melville, Hamilton/Avnet Elctrns.	516-454-6010
NY	Rochester, Summit Distrs.	716-334-8110
NY	Rochester, Schweber Elctrns.	716-424-2222
NY	Rochester, Hamilton/Avnet Elctrns.	716-475-9130
NY	Westbury, Schweber Elctrns. (Corp. Off.)	516-334-7474
NY	Woodbury, Pioneer/Harvey Elctrns.	516-921-8920
NC	Raleigh, Schweber Elctrns.	919-876-0000
NC	Raleigh, Hall-Mark Elctrns. Corp.	919-832-4465
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OK	Tulsa, Schweber Elctrns.	918-622-8000
OK	Tulsa, Hall-Mark Elctrns. Corp.	918-835-8458
OR	Lake Oswego, Bell Inds.	503-241-4115
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PA	Horsham, Schweber Elctrns.	215-441-0600
PA	Pittsburgh, Schweber Elctrns.	412-782-1600
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TX	Austin, Pioneer/Austin	512-835-4000
TX	Austin, Schweber Elctrns.	512-458-8253
TX	Austin, Hall-Mark Elctrns. Corp.	512-837-2814
TX	Austin, Hamilton/Avnet Elctrns.	512-837-8911
TX	Dallas, Pioneer/Dallas Elctrns.	214-386-7300
TX	Dallas, Schweber Elctrns.	214-661-5010
TX	Dallas, Hall-Mark Elctrns. Corp. (Corp. Off.)	214-343-5000
TX	Houston, Pioneer/Houston Elctrns.	713-988-5555
TX	Houston, Hamilton/Avnet Elctrns.	713-780-1771
TX	Houston, Schweber Elctrns.	713-784-3600
TX	Houston, Hall-Mark Elctrns. Corp.	713-781-6100
TX	Irving, Hamilton/Avnet Elctrns.	214-659-4111
TX	Richardson, Fisher-Brownell	214-235-3177
TX	Richardson, Jaco Elctrns.	214-235-9575
UT	Salt Lake City, Bell Inds.	801-972-6969
UT	Salt Lake City, Hamilton/Avnet Elctrns.	801-972-2800
WA	Bellevue, Bell Inds.	206-747-1515
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Bellevue, Hamilton/Avnet Elctrns.	206-453-5845
WI	Brookfield, Schweber Elctrns.	414-784-9020
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WI	Oak Creek, Hall-Mark Elctrns. Corp.	414-761-3000

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KENCO INDUSTRIES, INC., Elctrn. Chemicals Div., P.O. Box 88500, Atlanta, GA 30338, Tel: 404-475-6100; Empl.: 25; *Sls. Mgr.:* J. Rothenbach

KENSOL WIRE MARKING, Kensol Olsenmark Inc., 40 Melville Park Road, Melville, NY 11747, Tel: 516-694-7773, Telex: 510-224-6418; *Sls. Mgr.:* Tony Fiorey

KEN-TRON MFG., INC., 1204 Industrial Dr., Owensboro, KY 42301, Tel: 502-684-0431, Telex: 20-4305; Empl.: 100; *Sls. Mgr.:* J. Douglas

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Local Sales Offices & Reps

AL	Huntsville, J. L. Highsmith Co.	205-536-6666
AZ	Tempe, J. F. Hurlbut Co.	602-968-5962
CA	Los Angeles, Windsor Dynamics	213-990-4173
CA	San Diego, Windsor Dynamics	714-452-1891
CA	San Francisco, N-S Assocs.	415-854-4870
CO	Denver, J. F. Hurlbut Co.	303-279-7796
CT	Farmington, R. Perron Co.	203-673-4825
FL	Boca Raton, J. L. Highsmith Co.	305-368-9194
FL	Orlando, J. L. Highsmith Co.	305-422-5794
GA	Tucker, J. L. Highsmith Co.	404-493-1055
IL	Chicago, Century Elctrns.	312-777-9700
IN	Noblesville, Century Elctrns.	317-849-2026
IA	Cedar Rapids, Century Elctrns.	319-362-4410
KS	Shawnee, ATECH	913-268-9644
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Needham, R. Perron Co.	617-449-6162
MI	Detroit, Carter McCormic & Peirce	313-477-7700
MN	Minneapolis, E.C. Elctrn. Sls.	612-831-0229
MO	St. Louis, ATECH	314-576-2884
NH	Dover, R. Perron & Co.	603-742-2321
NJ	Cresskill, Eastern Instrmn.	201-567-9505
NM	Albuquerque, Techn. Mktg. Assoc.	505-345-8921
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NY	Syracuse, NACO Elctrns. Corp.	315-699-2651
NY	Utica, NACO Elctrns. Corp.	315-732-1801
NC	Charlotte, J. L. Highsmith Co.	704-333-7743
OH	Cleveland, Carter McCormic & Peirce	216-779-5100
OH	Dayton, Carter McCormic & Peirce	513-836-0951
OR	Portland, H. Levinson	503-245-1902
PA	Bensalem, Eastern Instrmn.	215-927-7778
PA	Pittsburgh, Carter McCormic & Peirce	412-372-4415
TX	Austin, Airep Elctrns.	512-327-0778
TX	Dallas, Airep Elctrns.	214-349-4360
TX	Houston, Airep Elctrns.	713-944-2055
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
VA	Richmond, J. L. Highsmith Co.	804-745-5555
WA	Seattle, H. Levinson Co.	206-382-1300
WI	Milwaukee, Century Elctrns. Sls.	414-645-3680

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AK	Morrilton, Tri-State	501-354-1849
AZ	Phoenix, Metermaster	602-243-4111
AZ	Phoenix, Bob Anderson Co.	602-266-2070
AR	Little Rock, Drives and Elec.	501-568-8800
CA	Burbank, Coast Wholesale Elec.	213-843-4111
CA	Dublin, Standard Meter Lab	415-828-4837
CA	Fresno, Allied Elec. Motor Ser.	209-486-4222
CA	Irvine, Metercraft	714-979-1420
CA	Los Angeles, Metermaster	213-685-4340
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Oakland, Western Electro-Mechanical	415-452-1936
CA	Palo Alto, Metermaster	415-968-0313
CA	San Diego, Metermaster	619-560-4841
CA	Santa Clara, E.I.L. Instrs.	408-727-0396
CA	Santa Monica, Master Distr.	213-452-1229
CO	Aurora, Esco Svcs.	303-360-8008
CO	Denver, E.I.L. Instrs.	303-534-4160
CT	Middletown, E.I.L. Instrs.	203-346-6646
FL	Cantonment, C.B. Metcalf	904-968-5500
FL	Clearwater, Esco Svc.	813-461-6454
FL	Ft. Lauderdale, Elctrn. Devices & Controls	305-974-2500
FL	Ft. Lauderdale, McDonald	305-563-6165
FL	Ft. Lauderdale, Power & Pumps	305-566-3261
FL	Jacksonville, Power & Pumps	904-356-5881
FL	Orlando, Power & Pumps	305-843-7400
FL	Palm Bay, E.I.L. Instrs.	305-725-8300
FL	Tampa, Power & Pumps	813-621-8071
GA	Norcross, Metermaster	404-446-0166
GA	Norcross, AA Elec.	404-449-8670
HI	Honolulu, Process Valve	808-848-0337
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Decatur, Englewood Elec.	217-875-7300
IL	Downers Grove, Neuco	312-960-3800
IL	Peoria, Tecco Inc.	309-692-2312
IL	Woodale, Electro-Kinetics	312-595-6700
IN	Columbus, Kirby Risk Supp.	812-372-8431
IN	Evansville, Hutch & Sons	812-425-7201
IN	Indianapolis, Bryat Controls	317-784-0261
IN	Indianapolis, E.I.L. Instrs.	317-545-1373
KY	Edgewood, AC/DC	606-341-0330
KY	Louisville, E.I.L.	502-454-3432
LA	New Orleans, Indl. Instr. Works	504-733-8355
MD	Baltimore, B. R. Smith	301-945-1000
MD	Gaithersburg, Pioneer	301-921-0660
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Burlington, E.I.L. Instrs.	617-272-9450
MA	W. Springfield, Control Engrg.	413-781-1330
MI	Cadillac, Ackerman Elctrl. Supp.	616-775-9734
MI	Clio, Control Dvcs.	313-686-2410
MI	Grand Rapids, Ackerman Elctrl. Supp.	616-459-8327
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MI	Southfield, ESCO Svc.	313-354-3818

MN	Bloomington, NWR	612-854-7329
MN	Hibbing, NWR	218-262-5228
MN	Minneapolis, Dot Elctrns.	612-861-3343
MO	St. Louis, Indl. Svc. Labs	314-535-5760
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NJ	Paterson, Feldman Bros.	201-742-7329
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NY	Rochester, E.I.L. Instrs.	716-424-5750
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NC	Charlotte, Carolina Elec. Supp. Co.	704-333-7526
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NC	Gastonia, J.M.T. Elctrn.	704-867-4401
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OH	Cleveland, Metermaster	216-651-4100
OH	Cleveland, Pioneer Std.	216-587-3600
OH	Dayton, Pioneer	513-236-9900
OH	Dayton, E.I.L. Instrs.	513-435-2134
OH	Tipp City, Tech. Comp. Sls.	513-667-1216
OK	Tulsa, Tri-State	918-836-0286
OR	Portland, Westcon	503-283-0132
PA	Exton, Valey Assocs.	215-363-2650
PA	Havertown, Quarracino	215-449-7500
PA	Media, W. Reeves Assocs.	215-566-6709
PA	Pittsburgh, E.I.L. Instrs.	412-731-5230
PA	Pittsburgh, CAM RPC	412-782-3770
SC	Columbia, Control Specialists	803-254-8087
TX	Dallas, Solid State	214-438-5700
TX	Dallas, E.I.L. Instrs.	214-931-1236
TX	Fort Worth, Allied Electrns.	817-336-5401
TX	Ft. Worth, Swieco Inc.	817-335-6512
TX	Garland, Metermaster	214-271-5671
TX	Houston, Quality Inst. Labs	713-524-0528
TX	Houston, E.I.L. Instrs.	713-271-3100
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UT	Salt Lake City, Stuart	801-466-8603
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VA	Virginia Beach, E.I.L. Instrs.	804-499-3746
WA	Seattle, E.I.L. Instrs.	206-762-0880
WA	Seattle, C. B. Parsons	206-762-7373
WI	Fond du Lac, Englewood Elctrl.	414-922-4240
WI	Green Bay, Englewood Elctrl.	414-432-2000
WI	Oconomowoc, Atlas Instrs.	414-367-8759
WI	Schoefield, Englewood Elctrl.	715-359-0454

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CA	Anaheim	714-871-0280
NJ	Newark	201-589-0246

KEUFFEL & ESSER/KRATOS, 20 Whippany Rd., Morristown, NJ 07960, Tel: 201-285-5181, Telex: 136425; Empl.: 1800

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KEYAN INDS., INC., P.O. Box 1228, Middleboro, MA 02346, Tel: 617-947-7719; Empl.: 11; *Sls. Mgr.:* Tris Klingenberg; *Dist. Mgr.:* Herb Holt

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CA	Sierra Madre, McCornack & Assocs.	213-355-0466

CO	Littleton, Omega Ltd.	303-798-7040
CT	Wethersfield, L.J. Labant	203-529-0048
GA	Marietta, J.J. Arnold	404-427-1062
IL	West Dundee, W. S. Heffron	312-426-6472
IN	Fort Wayne, R.O. Whitesell & Assoc.	219-432-5591
IN	Indianapolis, R.O. Whitesell & Assoc.	317-359-9283
IN	Kokomo, R.O. Whitesell & Assoc.	317-457-9127
KS	Shawnee, Benson Engrg.	913-642-4442
KY	Louisville, R.O. Whitesell & Assoc.	502-426-7696
MI	Grand Rapids, J.L. Montogomery Co.	616-774-9308
MI	Southfield, J.L. Montgomery Assoc.	313-358-2616
MN	Minneapolis, Stoss Assocs.	612-925-2757
NY	Fayetteville, S.F. Foster Co.	315-637-5427
NY	Webster, S.F. Foster Co.	716-265-2072
NC	Greensboro, DHR Mktg.	919-273-2671
NC	Raleigh, DHR Mktg.	919-876-5450
OH	Cincinnati, R.O. Whitesell & Assoc.	513-521-2290
OH	Cleveland, R.O. Whitesell & Assoc.	216-447-9020
OH	Columbus, R.O. Whitesell & Assoc.	614-888-9396
OH	Dayton, R.O. Whitesell & Assoc.	513-298-9546
PA	Pittsburgh, R.O. Whitesell & Assoc.	412-963-6161
PA	Plymouth Meeting, J. E. Shea	215-825-2046
SC	Greenville, DHR Mktg.	803-235-3594
TN	Greenville, R.O. Whitesell & Assocs.	615-639-6154
TX	Dallas, Benson Engrg.	214-352-7541
TX	Houston, Benson Engrg.	713-861-1551
WA	Seattle, Northmar Inc.	206-524-5170
WI	New Berlin, T. L. Labant	414-425-7157
EXP	NY, Freeport, Minthorne Int'l.	516-546-4700

Local Distributors

AZ	Scottsdale, Allied Elctrns.	602-990-9549
CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Inglewood, Newark Elctrns.	213-671-7066
CA	Santa Clara, Allied Elctrns.	408-727-1690
CO	Wheatridge, Allied Elctrns.	303-425-7144
FL	Ft. Lauderdale, Allied Elctrns.	305-486-0500
GA	Atlanta, Allied Elctrns.	404-237-3366
IL	Elgin, Allied Elctrns.	312-697-8200
MA	Wilmington, Allied Elctrns.	617-942-0150
MI	Westland, Allied Elctrns.	313-595-6565
MN	Minneapolis, Allied Elctrns.	612-559-9545
MO	Maryland Hgts., Newark Elctrns.	314-739-0133
MO	St. Louis, Allied Elctrns.	314-878-1229
NJ	Springfield, Newark Elctrns.	212-349-7087
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Cary, Allied Elctrns.	919-467-0720
OH	Willoughby, Allied Elctrns.	216-951-0908
OK	Tulsa, Allied Elctrns.	918-663-7630
PA	Bala Cynwyd, Allied Elctrns.	215-667-6940
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Allied Elctrns.	713-445-7123
VA	Alexandria, Allied Elctrns.	703-836-5002
WA	Seattle, Allied Elctrns.	206-767-5772
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WI	Milwaukee, Allied Elctrns.	414-463-2662

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CA	N. Hollywood, Bassett Sls. Corp. (South)	213-877-7129; 714-539-4000
CO	Denver, William J. Purdy Co.	303-777-1411
FL	Lighthouse Point, Jack Krutek Assocs.	305-941-6544
GA	Atlanta, DHR Marketing	404-451-9848
IL	Wilmette, Joel Wasserman Assoc.	312-256-3566
IN	Carmel, Brainard-Wilson Mktg. Inc.	317-844-2800
MA	Needham Heights, The Newscott Co. Inc.	617-444-1923
MN	Minneapolis, Donald Luger & Assoc.	612-553-1122
MO	St. Louis, KKB & Co.	314-647-2400; 816-229-0001
NJ	South Orange, Sonny Simberkoff Assoc.	201-763-7900
NM	Albuquerque, William J. Purdy Co.	505-266-7959
NC	Raleigh, DHR Marketing	919-876-5450; 919-273-2671
OH	Beachwood, Elctrn. Salesmasters	216-831-9555; 800-321-1848
OR	Beaverton, William J. Purdy Co.	503-641-9373
UT	Salt Lake City, William J. Purdy Co.	801-486-8557
WA	Redmond, William J. Purdy Co.	206-882-3144

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AZ	Tempe, Cantec Sls., Inc.	601-829-0191
CA	Cupertino, Patterson Control Sys.	408-973-1050
CA	Long Beach, Measurement Assocs.	213-433-0977
CO	Englewood, F. G. Mktg. Co.	303-795-9176
CT	Mt. Carmel, Scientific Devices - CONN	203-248-9361
FL	Cocoa Beach, Teqspec, Inc.	305-783-3444
FL	Hobe Sound, Teqspec, Inc.	305-746-4987
FL	Palm Harbor, Teqspec, Inc.	813-785-2276
GA	Atlanta, Kemp Instrs.	404-452-8050
IL	LaGrange, PVA Co.	312-579-9300
KS	De Soto, Midtec Assocs., Inc.	913-441-6565
MA	Waltham, Scientific Devices N.E.	617-890-2252
MN	Minneapolis, HEI-LITE Sls.	612-861-6051
NJ	Englewood Cliffs, Scientific Devices - East	201-871-3916
NC	Winston-Salem, Radco Co.	919-722-9671
OR	Beaverton, Eicher Richards Co.	503-641-3300
PA	Blairsville, Measurement Instrs. East, Inc.	412-459-8090
PA	Oreland, Technical Instr. Sls.	215-836-2222
TX	Dallas, True Tech. Co.	214-691-7870
VA	McLean, WWB Assocs.	703-893-6516
WA	Seattle, Eicher Richards Co.	206-523-7888
WI	Glendale, Stapelman Corp.	414-352-5777

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TN	Memphis, Memphis Group	901-362-8600
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TX	Dallas, Mark Hutton	214-484-0580
TX	Hurst, McGarrah & Assocs.	817-268-3557
EXP	NJ, Rahway, REA Intl.	201-382-7100

WALTER KIDDE, Div. of Kidde, Inc., P.O. Box 1147, Wake Forest, NC 27587, Tel: 919-556-6811, Telex: 802569 WALTKIDDE; Empl.: 250; *Sls. Mgr.:* Frank Lindsey

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Local Sales Offices & Reps

AL	Huntsville, Morard & Co.(MOCO)	205-881-5968
AZ	Phoenix, Cherry Assoc.(Scopes Only)	602-242-1922
AZ	Scottsdale, Power Specialist	602-996-4100
CA	Carson, Amasco South	213-516-8561
CA	Sunnyvale, Amasco North	408-733-8690
CO	Aurora, R & R Instrmn.	303-340-8728
FL	Melbourne, EMS, Inc.	305-724-1027
HI	Honolulu, EMC Corp.	808-836-1138
IL	Elmhurst, Sector Engrg. Sls.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
KS	Olathe, Rush & West Assoc. (Power Supp.)	913-764-2700
KS	Overland Park, Ramsey Assocs. (Scopes Only)	913-649-6996
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MD	Wheaton, Brimberg Sls. (Power Supp.)	301-946-2670
MA	Bedford, Eastronix	617-275-5775
MI	Warren, Dietrich & Assocs.	313-751-4990
MN	Minneapolis, Sector Engrg. Sls.	612-888-6920
MO	Ballwin, Rush & West Assoc. (Power Supp.)	314-394-7271
MO	Maryland Hgts., Ramsey Assocs. (Scopes Only)	314-878-5042
NJ	Englewood Cliffs, Sci. Devices East	201-871-3916
NM	Albuquerque, Cleveland Entprs.	505-265-7893
NY	Syracuse, Martindale - Paul	315-432-1141
OH	Cleveland, Dietrich & Assocs.	216-781-1855
OH	Dayton, Dietrich & Assocs.	513-223-6042
OR	Portland, Westcon	503-283-0132
PA	Pittsburgh, Dietrich & Assocs.	412-892-2992

PA	Springhouse, Sci. Devices East	215-643-3335
TX	Houston, Sci. Devices S.W.	713-864-1711
TX	Richardson, Sci. Devices S.W.	214-231-8106
VT	Shelburne, Eastronix	802-985-3743
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280
PR	San Juan, David S. Ternent	809-762-2688

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Local Sales Offices & Reps

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CA	Campbell, Kottmeier Assocs.	408-866-5153
CT	Yalesville, Kanan Assocs.	203-265-2404
FL	St. Petersburg, David A. King	813-381-1893
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Cedar Rapids, H. R. Brown Sls. Co.	319-366-0635
KS	Olathe, M. E. Bettis Co.	913-649-7142
KS	Wichita, M. E. Bettis Co.	316-265-8250
MD	Columbia, Tyler Griffin Co.	301-995-1215
MA	Reading, Kanan Assocs.	617-944-8484
MN	St. Paul, De Beck	612-835-4649
NJ	Colts Neck, Trionic Assoc.	201-431-0415
NM	Albuquerque, Data Handling	505-884-0284
NY	Cazenovia, S. T. Woolard Co.	315-655-8145
NY	Great Neck, Trionic Assoc.	516-466-2300
NY	Rochester, Lamb	716-323-1250
NC	Charlotte, DGW, Inc.	704-334-7090
NC	Winston-Salem, DGW, Inc.	919-768-7166
OH	Cleveland, Components, Inc.	216-243-9200
OH	Miamisburgh, Components, Inc.	513-866-0661
OK	Tulsa, Norcom, Inc.	918-832-7747
OR	Tigard, Components West	503-684-1671
PA	Paoli, Tyler Griffin	215-647-1550
TX	Austin, Norcom, Inc.	512-451-2757
TX	Dallas, Norcom, Inc.	214-386-4888
TX	Houston, Norcom, Inc.	713-778-0392
WA	Renton, Components West	206-271-5252

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KINEMETRICS, INC., 222 Vista Ave., Pasadena, CA 91107, Tel: 818-795-2220, Telex: 67-5402; Empl.: 110; *Sls. Mgr.:* Steve Pauly

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CA	Santa Rosa, Kinemetrics/TrueTime	707-528-1230
OK	Tulsa, Kinemetrics/Monitron	918-836-6831

KINEMETRICS TRUETIME INSTR. CO., 3243 Santa Rose Ave, Santa Rosa, CA 95401, Tel: 707-528-1230, Telex: 176687 (TRUETIME SORO); Empl.: 30; *Sls. Mgr.:* Victor Kunkel

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KINGSLEY MACHINE CO., 850 Cahuenga Blvd., Hollywood, CA 90038, Tel: 213-469-7243, Telex: 910-3214581; *Sls. Mgr.:* John M. Butler

KING-WAY ASSOC., 16400 Ventura Blvd., Encino, CA 91316, Tel: 213-788-4124

KING WIRE & CABLE CORP., 179-45 110 Ave., Jamaica, NY 11433, Tel: 212-657-4422, 800-221-0144, Telex: 96-8858; FSC No.: 06145; *Sls. Mgr.:* Ira M. Lash; *Dist. Mgr.:* Ira M. Lash

KIPP & ZONEN, 390 Central Ave., Bohemia, NY 11716, Tel: 516-589-2885, Telex: 0960250; Empl.: 25; *Sls. Mgr.:* Wm. Novack; *Dist. Mgr.:* Wm. Novack

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KLC CORP., 2234 East Colorado, Pasadena, CA 91107, Tel: 818-796-0525; Empl.: 6; *Sls. Mgr.:* Chris Connelly

KLC/KARL LAMBRECHT CORP., 4204 N. Lincoln Ave., Chicago, IL 60618, Tel: 312-472-5442, Telex: 759819

KLM ELECTRONICS, 16890 Church St., P.O. Box 816, Morgan Hill, CA 95037, Tel: 408-779-7363, TWX: 910-590-4468; Empl.: 250; *Sls. Mgr.:* Chuck McKinney

KLOCKNER MOELLER, 4 Strathmore Rd., Natick, MA 01760, Tel: 617-655-1910, Telex: 94-8434; Empl.: 250; *Sls. Mgr.:* George Tamer

Local Sales Offices & Reps

CA	Cerritos	213-926-2355
CA	Concord	415-676-5353
GA	Marietta	404-952-0258
IL	Elk Grove	312-593-0980
NJ	Fairfield	201-227-3140
NY	New York	212-697-1184
OK	Tulsa	918-627-0676
TX	Stafford	713-491-2687

KMC SYSTEMS INC., 140 Greenwood Ave. (Bldg. 3), Midland Pk., NJ 07432, Tel: 201-447-0007, Telex: 642-374; Empl.: 120; *Sls. Mgr.:* E. Verder

Local Sales Offices & Reps

NJ	Mt. Laurel, Control Equip.	215-676-1460
UT	Bountiful, Lectrol, Inc.	801-292-7674

KNOL ENTERPRISES, 3468 Sacramento Dr., San Luis Obispo, CA 93401, Tel: 805-544-4881; Empl.: 6; *Sls. Mgr.:* Dave Bone

KNOWLES ELCTRNS., INC., 3100 N. Mannheim Rd., Franklin Park, IL 60131, Tel: 312-455-3600, Telex: 72-8397; *Sls. Mgr.:* Reginald G. Garratt, VP-Mktg.

KOA

KOA SPEER ELCTRNS., Bolivar Dr., P.O. Box 547, Bradford, PA 16701, Tel: 814-362-5536, Telex: 91-4404, TWX: 510-695-5921; Empl.: 50; *Sls. Mgr.:* L. G. Holzwarth; *Dist. Mgr.:* L. Rice ....1A•1885-1888

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AZ	Phoenix, O'Donnell Assocs.	602-944-9542
CA	Anaheim, Westrep	213-404-3881
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, I2 Inc.	408-988-3400
CO	Boulder, R. G. Entprs.	303-447-9211
CT	Middletown, Gerber Sls.	203-347-3000
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Longwood, APM Assocs.	305-869-6831
FL	Tampa, APM Assocs.	813-886-2457
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Arlington Hgts., C. L. Greenslade Sls.	312-253-9620
IN	Fort Wayne, John F. Kilfoil	219-436-7233
KS	Overland Park, Advanced Techn. Sls.	913-642-6675
LA	Kenner, Cartwright & Bean	504-466-0020
MA	Ludlow, Gerber Sls.	413-589-9837
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Troy, C. B. Jensen & Assocs.	313-643-0506
MN	Edina, Grayden & Flemmer	612-941-1120
MS	Jackson, Cartwright & Bean	601-981-1170
MO	Ellisville, Advanced Techn. Sls.	314-227-4448
NM	Albuquerque, Power Entprs.	505-298-1918
NY	East Rochester, Tri-Tech Elctrns.	716-385-6500
NY	Endwell, Tri-Tech Elctrns.	607-754-1094
NY	Fayetteville, Tri-Tech Elctrns.	315-446-2881
NY	Fishkill, Tri-Tech Elctrns.	914-897-5611
NY	Great Neck, MOS Assocs.	516-487-3966
NC	Charlotte, Cartwright & Bean	704-377-5673
NC	Raleigh, Cartwright & Bean	919-781-6560
OH	Cincinnati, John F. Kilfoil	513-791-6150
OR	Beaverton, Barrett-Squibb & Assoc.	503-642-1661
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TN	Knoxville, Cartwright & Bean	615-693-7450
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Lewisville, Jim Hughes	214-221-1536
TX	Stafford, Jim Hughes	713-343-0673
WA	Redmond, Barrett-Squibb & Assoc.	206-885-6991
PR	Hato Rey, M. Anderson	809-751-2026

Local Distributors

AZ	Phoenix, Sterling Elctrns.	602-258-4531
AZ	Phoenix, Kachina	602-269-6201
AZ	Tucson, Kachina	602-792-2223
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Chatsworth, IEC/JACO	213-998-2200
CA	Fountain Valley, Comps. Ctr.	714-979-0433
CA	Irvine, KELEX	714-957-3247
CA	Irvine, Ryno Elctrns.	714-557-5021
CA	San Diego, Ryno Elctrns.	619-292-6022
CA	San Jose, Eric Elctrns.	408-262-1111
CA	Santa Clara, Components Ctr.	408-988-3751
CA	Sun Valley, QC Comps.	213-768-6111
CO	Boulder, R. G. Entprs.	303-447-9211
CO	Denver, Integrated Elctrns.	303-534-6121
CT	Stratford, Utronics	203-378-4201
CT	Wallingford, Midstate Elctrns.	203-265-9900
FL	Orlando, TTI	305-859-1000
FL	W. Palm Beach, Nurmi Elctrn. Supp.	305-684-0320
GA	Roswell, Quality Comps.	404-993-8146
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3220
IL	Northbrook, Classic Comp. Supp.	312-272-9650
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
LA	Baton Rouge, Indl. Elctrn. Supp.	504-926-0513
LA	Shreveport, Indl. Elctrn. Supp.	318-222-9459
MD	Baltimore, Radio Elec. Svc. Co.	301-823-0070
MD	Beltsville, Radio Elec. Svc.	301-937-9100
MA	Billerica, Baldwin Comp. Ctr.	617-667-6710
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Waltham, Sterling Elctrns.	617-894-6200
MI	Ann Arbor, Wedemeyer	313-665-8611
MI	Farmington Hills, Prehler Elctrns.	313-476-7084
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Livonia, Reptron	313-525-2700
MN	St. Paul, Ragon Elctrns.	612-642-2828
NE	Lincoln, Scott Elctrns.	402-466-8221
NJ	Clifton, J Mar Elctrns.	201-772-6400
NJ	Mountainside, Enox Resistor Co.	201-654-7600
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NY	Amherst, Standard Elctrns.	716-691-3801
NY	Bohemia, Justin Elctrns.	516-589-4000
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, SAI	516-293-2710
NY	Hauppauge, Prime Comps.	516-582-6258
NY	Hauppauge, Fairmont Elctrn. Sls.	516-231-3313
NY	Hauppauge, Jaco	516-273-5500
NY	Huntington Station, Sherburn Elctrns.	516-421-1940
NY	Rochester, Summit Distrs.	716-334-8110
NY	Ronkonkoma, Baldwin Comp. Ctr.	516-588-5700
NC	Raleigh, Resco Raleigh	919-781-5700
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Cleveland, Repco	216-248-8900
OH	Cleveland, Roberts Elect. Corp.	216-238-1711
OH	Columbus, Reptron/Ohio	614-436-6675
OH	Dayton, Stotts-Friedman Elctrns.	513-298-5555
OH	Solon, Hart Elctrns.	216-248-8855
OK	Tulsa, Altair Co.	918-252-5781
PA	Braddock, Leff Elctrns.	412-271-2800
PA	Drexel Hill, Kass Elctrns. Dist.	215-449-2300
PA	Erie, Rem Elctrns.	814-453-5626
PA	Harrisburg, Cumberland Elctrns.	717-233-5883
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
RI	Providence, Wm. Dandreta Co.	401-861-2800
SC	Columbia, Dixie Radio Supp.	803-779-5332
TN	Kingsport, Radio Elctrn. Supp.	615-247-8111
TN	Memphis, Bluff City Elctrns.	901-345-9500
TN	Nashville, Bluff City Elctrns.	615-242-8000
TX	Ft. Worth, T.T.I. Inc.	817-429-1440
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
WA	Kent, Shannon Ltd.	206-763-0545
WA	Redmond, Murphy Elctrns.	206-881-1234
WI	Hartland, G W Elctrns.	414-367-6003
WI	New Berlin, RM-Wisconsin	414-784-4420

KODE, 2752 Walnut Ave., Tustin, CA 92680, Tel: 714-730-6901, TWX: 910-595-2680; FSC No.: 62767; Empl.: 65; *Sls. Mgr.:* Richard E. Miller

KOGYOSHA, 179 Riveredge Rd., Tenafly, NJ 07670, Tel: 201-569-8769; Empl.: 3; *Sls. Mgr.:* Mark Nakanishi; *Dist. Mgr.:* Mark Nakanishi

KOLE IND., 3553 N.W. 50th St., Miami, FL 33102-0152, Tel: 305-633-2556, 800-327-6085; Empl.: 45; *Sls. Mgr.:* B. J. Neelands

KOLIN INDS., Box 357, Pondfield Rd. W., Bronxville, NY 10708, Tel: 914-961-5065, Telex: 137453; Empl.: 40; *Sls. Mgr.*: J. Kolinsky

KOLLMORGEN CORP., Industrial Drives Div., 201 Rock Rd., Radford, VA 24141, Tel: 703-639-2495, TWX: 710-875-3743; FSC No.: 11384; Empl.: 250; *Sls. Mgr.*: Sandor L. Tako

KOLLSMAN INSTR., 220 Daniel Webster Hwy., Merrimack, NH 03054, Tel: 603-889-2500, Telex: 94-3537, TWX: 710-366-6883; Empl.: 2200

KONTES, Kimble Div. of Owens/IL, 1001 Spruce St., Vineland, NJ 08360, Tel: 609-692-8500, TWX: 510-687-8967; *Sls. Mgr.*: Peter Davenport

KONTRON ELCTRNS., 630 Price Ave., Redwood City, CA 94062, Tel: 415-361-1012, TWX: 910-378-5207; Empl.: 200; *Sls. Mgr.*: Jeff Shahan

KOOLTRONIC, Hamilton Ave., Hopewell, NJ 08525, Tel: 609-466-3400, Telex: 84-3345; Empl.: 150; *Sls. Mgr.*: Gerald H. Freedman

KORRY ELECTRONICS, INC., 223 8th Ave. N., Seattle, WA 98109, Tel: 206-223-5400, TWX: 910-444-2295; Empl.: 410; *Sls. Mgr.*: Woody Hertzog

KRATOS DISPLAY SYSTEMS, 101 Cooper Court, Los Gatos, CA 95030, Tel: 408-395-3700, Telex: 171946; *Sls. Mgr.*: Bill Bourke

KRECKMAN, HERB, CO., Cresco, PA 18326, Tel: 717-595-2212; Empl.: 4

KR ELECTRONICS, INC., 91 Avenel St., Avenel, NJ 07001, Tel: 201-636-1900; Empl.: 25 ....**1A•1601**

KRL ELCTRNS., 160 Bouchard St., Manchester, NH 03103, Tel: 603-668-3210, 800-257-3300, TWX: 710-220-1662; Empl.: 65

KROHN CERAMICS, INC, See Centerflex Techn.

KROHN-HITE CORP., Avon Indl. Pk., Bodwell St., Avon, MA 02322, Tel: 617-580-1660, TWX: 710-345-0831; Empl.: 120; *Sls. Mgr.*: Craig S. Dunbar ....**3•1254, 1255**

Local Sales Offices & Reps

AL	Huntsville, Gentry Assocs.	205-534-9771
AZ	Phoenix, Odyssey 1	602-246-8846
AR	Eldorado, Kemp Engrg.	501-826-5869
CA	Inglewood, L&M South	213-674-6850
CA	San Jose, L&M Engrg.	408-292-3220
CO	Castle Rock, Odyssey 1	303-688-3555
CT	New Haven, McBar Assocs.	203-865-4376
FL	Ft. Lauderdale, Gentry Assocs.	305-791-8405
FL	Orlando, Gentry Assocs.	305-859-7450
FL	Tampa, Gentry Assocs.	813-886-0720
GA	Atlanta, Gentry Assocs.	404-998-2828
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
KS	Overland Park, Ramsey Assocs.	913-649-6996
LA	Gretna, Gentry Assocs.	504-367-3975
MD	Baltimore, Sci-Rep	703-385-0600
MA	Waltham, McBar	617-890-0233
MI	Detroit, EQS Sys.	313-961-3042
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	St. Louis, Ramsey Assocs.	314-878-5042
NJ	Englewood, Sci. Devices E.	201-871-3916
NM	Albuquerque, Odyssey 1	505-265-6645
NY	Rochester, Ossmann Instrs.	716-442-6990
NY	Saratoga Springs, Ossmann Instrs.	518-584-6519
NY	Syracuse, Ossmann Instrs.	315-437-7052
NC	Burlington, Gentry Assocs.	919-227-3639
OH	Chesterland, EQS Sys.	216-729-2222
OH	Columbus, EQS Sys.	614-228-3453
OH	Dayton, EQS Sys.	513-294-2476
OK	Tulsa, Kemp Engrg.	918-663-4501
OR	Portland, McLaren	503-297-2248
PA	Pittsburgh, EQS Sys.	412-261-2604
PA	Spring House, Scientific Devices East	215-643-3335
SC	Columbia, Gentry Assocs.	803-772-6786
TN	Knoxville, Gentry Assocs.	615-584-0281
TX	Dallas, Kemp Engrg.	214-931-7100
TX	Houston, Kemp Engrg.	713-466-1465
VA	Fairfax, Sci-Rep	703-385-0600
WA	Bellevue, McLaren	206-454-3400
WI	Milwaukee, Berndt Assocs.	414-545-8400

KRYSTINEL CORP., 126 Pennsylvania Ave., Paterson, NJ 07509, Tel: 201-345-8900, TWX: 710-988-5931; Empl.: 150 ....**2•1793**

Local Sales Offices & Reps

AZ	Phoenix, Charles T. Fink & Assoc.	602-992-9884
CA	Los Alamitos, Permag Pacific Corp.	213-594-6515
CA	Sunnyvale, Permag Sierra Corp.	408-738-1080
GA	Norcross, Permag Dixie Corp.	404-448-4998
IL	Elk Grove Vl., Permag Central Corp.	312-956-1140
MA	Billerica, Permag Northeast Corp.	617-273-2890
MN	Eden Prairie, Permag Minnesota Corp.	612-934-4635
NY	Hicksville, Permag Corp.	516-822-3311
OH	Toledo, Permag Magnetics Corp.	419-385-4621
TX	Richardson, Permag S.W.	214-699-1121

Local Distributors

CA	Los Alamitos, Permag Pacific Corp.	213-594-6515, 714-952-2091
CA	Sunnyvale, Permag Sierra Corp.	408-738-1080
GA	Norcross, Permag Dixie Corp.	404-448-4998
IL	Elk Grove Vl., Permag Central Corp.	312-956-1140
MA	Billerica, Permag Northeast Corp.	617-273-2890

KSI Kaiser Systems, Inc.
The High Voltage Power Supplies That Work

KSI, 33 Cherry Hill Dr., Danvers, MA 01923, Tel: 617-777-5102, Telex: 887159; FSC No.: 617-777-3340 ....**3•1646-1648**

KSW ELCTRNS. CORP., See Frequency Sources, KSW Semicond. Div.

K-SYSTEMS, INC., 3902 Lilac, Las Cruces, NM 88005, Tel: 505-526-3209; Empl.: 2; *Sls. Mgr.*: Alice Furphy

Local Sales Offices & Reps

MD	Bethesda, Fedmark, Inc.	301-986-9277
MA	Chelmsford, Bomara Assocs.	617-452-2299
PA	Pittsburgh, Dietrich & Assocs.	412-892-2929

KS kulite

KULITE SEMICONDUCTOR PRODS. INC., 1039 Hoyt Ave., Ridgefield, NJ 07657, Tel: 201-945-3000, Telex: 13-5458; Empl.: 250 ....**1B•1847**

Local Sales Offices & Reps

AL	Huntsville, Lee Associates	205-533-5896
AZ	Scottsdale, Dave Menegey Assocs.	602-994-9519
CA	Hollywood, B. J. Wolfe Entprs.	213-877-5518
CA	Walnut Creek, Dale-Dahl Assocs.	415-933-9595
CO	Boulder, Measurement Consultants	303-449-7506
DC	Baltimore, Reptron, Inc.	301-621-1313
FL	Osprey, Dick Ridgewell Co.	813-484-2020
IL	Park Ridge, E.I.A. Inc.	312-298-2290
IN	Indianapolis, EIA, Inc.	317-257-7231
MD	Baltimore, Reptron	301-799-7490
MA	Waltham, Daner-Hayes	617-894-7290
MI	Madison Heights, WKM Assoc.	313-588-2300
MN	New Hope, Trask Engrg.	612-537-2434
MO	St. Louis, Ozark Elctrn. Mktg.	314-423-7200
NH	Wilton, Daner-Hayes, Inc.	617-894-7290
NJ	Glen Gardner, Daner-Hayes, Inc.	617-894-7290
NM	Albuquerque, Amonette Entprs.	505-344-4143
NY	Brewster, Daner-Hayes, Inc.	617-894-7290
NY	Rochester, Daner-Hayes, Inc.	617-894-7290
OH	Cleveland, WKM Assocs.	216-267-0445
OH	Dayton, WKM Assocs	513-434-7500
OK	Edmond, Data Aids Assocs.	405-478-5000/01
PA	Doylestown, Daner-Hayes, Inc.	617-894-7290
PA	Pittsburgh, WKM Assocs.	412-892-2953
TX	Austin, Data Aids Assocs.	512-327-8600
TX	Dallas, Data Aids Assocs.	214-620-1551
UT	Salt Lake City, Measurement Conslts.	801-364-3174
VT	White River Junction, Daner-Hayes, Inc.	617-894-7290
WA	Seattle, Brett Assocs.	206-935-8054

KULKA SMITH, INC., 1913 Atlantic Ave., Manasquan, NJ 08736, Tel: 201-223-9400, TWX: 710-723-4410; Empl.: 500; *Sls. Mgr.*: John Chirico ....**2•1496-1501**

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn Co.	602-257-9015
CA	Los Angeles, E E Strassner	818-242-8823
CA	Redwood City, Hickey Ind. Sls.	415-368-3849
CT	North Haven, Coakley, Boyd & Abbett	800-225-8402
IL	Northbrook, Dolin Sls.	312-498-6770
KS	Shawnee Mission, Lowell-Kangas & Assocs.	913-631-3515
MA	Needham Hgts., Coakley, Boyd & Abbett	617-444-5470
MO	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
OH	Richfield, Bear Mktg.	216-659-3131
PA	Allison Park, K.W. Elctrns.	412-487-4300
PA	Trevose, P.S.A., Inc.	215-245-0513
WI	Milwaukee, D. Dolin Sls.	414-482-1111

Local Distributors

AL	Birmingham, MG Elctrns.	205-328-4525
AZ	Phoenix, Parts Elctrns.	602-258-6476
AZ	Tempe, Fisher/Brownell	602-967-1464
CA	Alhambra, Fisher/Brownell	818-289-0255
CA	Buena Park, RPS Elctrns.	714-521-5230
CA	Buena Park, Control Design	213-802-1371
CA	Cerritos, El-Com	213-404-2961
CA	Mountain View, Cornett Elctrns.	415-969-5420
CA	San Carlo, Control Design	415-592-4808
CA	San Diego, Elcom	213-404-2961
CA	San Diego, Fisher/Brownell	619-560-8545
CA	Santa Clara, Fisher/Brownell	408-988-6041
CO	Denver, Denver Wintronics	303-934-2406
CT	Stratford, Utronics	203-378-4201
CT	Wallingford, Midan	203-265-2077
FL	Casselberry, Fla. AFCOM Inc.	305-831-6630
FL	Largo, Electronic Precepts	813-596-2742
FL	Miami, Electronic Equip. Co.	305-871-3500
FL	Winter Park, Electronic Equip. Co.	305-644-4833
IL	Addison, Lectro Comps.	312-543-1680
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Hoffman Estates, Control Design	312-882-7232
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IL	Rockford, Mid West Associated	815-962-8036
IN	Indianapolis, Graham Elctrn. Supp.	317-634-8202
IN	Indianapolis, Control Design	317-788-4559
IA	Cedar Rapids, Vrbik-Berquist	319-366-8733
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
IA	Des Moines, Mid State Distrbg.	515-244-7231
IA	Marion, Control Design	313-373-2923
KS	Wichita, Radio Supp. Co.	316-267-5213
KY	Louisville, Peerless Elctrn. Equip.	502-637-7677
LA	New Orleans, W. B. Allen Supp.	504-525-8222
LA	New Orleans, Radio Parts	504-581-5959
MD	Baltimore, Resco/Baltimore	301-823-0070
MA	Newton, Greene Shaw Co.	617-969-8900
MA	Norwood, Gerber Elctrns.	617-329-2400
MI	Augusta, Great Lakes Elctrns.	616-731-4156
MI	Farmington Hills, Star-Tronic Distr.	313-477-7586
MI	Grand Rapids, Stotts Friedman	616-459-0216
MN	Minneapolis, Control Design	612-721-6555
MN	St. Paul, R. G. Ragon Elctrns.	612-488-0201
MO	Kansas City, Walters Radio Supp.	816-531-7015
MO	Maryland Hgts., L-Comp	314-291-6200
MO	St. Louis, Control Design	314-426-3150
NE	Omaha, Scott Elctrns. Supp.	402-466-8221
NJ	Prospect Park, Kappe Electrical Distrs.	201-790-1999
NM	Albuquerque, Walker Radio	505-247-2288
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Elmsford, Ancar Elctrns.	914-592-7100
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Mt. Vernon, Qar Indl. Elctrns.	914-699-2224
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Summit Distrs.	716-334-8110
NY	Rockville Center, Midway Indl.	516-764-2400
NC	Pineville, Control Design	704-588-4410
NC	Raleigh, Southeastern Radio Supp.	919-828-2311
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Cleveland, W. M. Pattison Supp.	216-441-3000
OH	Columbus, Electronics Mktg.	614-299-4161
OH	Dayton, John A. Becker Co.	513-226-1341
OK	Oklahoma City, Electro Entprs.	405-478-1752
OK	Oklahoma City, Electronic Supp.	405-232-5215
OR	Beaverton, Almac/Stroum	503-641-9070
OR	Portland, Eoff Elec. Co.	503-222-9411
OR	Portland, Radar Elec.	503-232-3404
PA	Altoona, Allegheny Elctrns.	814-946-0871
PA	Duquesne, Advacom	412-469-2601
PA	Erie, Rem Elctrns.	814-453-5626
PA	Huntingdon Valley, Shap Elctrns.	215-322-7150
PA	Malverne, Control Design	215-296-0150
PA	Montgomeryville, Pyttronics	215-643-2850
PA	Philadelphia, CAM/RPC Co.	215-698-4000
PA	Pittsburgh, CAM/RPC Co.	412-782-3770
PA	Reading, Barbey Elctrns.	215-376-7451
TN	Knoxville, Industrial Elctrns.	615-573-7135
TX	Dallas, Solid State Elctrns.	214-438-5700
TX	Dallas, Control Design	214-358-1441
TX	Ft. Worth, Industrial Elctrns.	817-731-7321
TX	Houston, Solid State Elctrns.	713-772-8483
TX	Richardson, Fisher/Brownell	214-235-3177
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Ra-Elco	801-487-0571
VA	Charlottesville, Virginia Radio Supp.	804-296-4184

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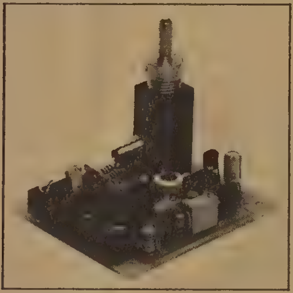
OEM PRODUCTS

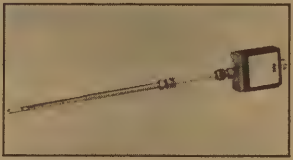
Kurz manufactures a wide line of basic airflow and mass flow transducers and is always eager to work with you on your OEM product requirements.



SERIES 501
Micropower Mass Flow Meter
The 501, the worlds smallest commercial mass flow meter, measures flows up to 5 slpm. The 501 is perfect for biomedical toxicology and instrumentation applications.

SERIES 565
DC Powered Mass Flow Meters
The compact 565 Series include linear 0-5 VDC outputs and are most often specified for flows from 10 sccm to 10 scfm. Popular with OEM's, the economical 565 operates on 15VDC.

SERIES 435DC
Linear Air Velocity Transducers
Powered by 15VDC, and available in self contained, bare board with cable and rack mount configurations, the 435DC features a linear 0-5VDC output.



SERIES 430DC
Air Velocity Transducers
Powered by 15VDC, the self contained 430DC features a non-linear 0-5VDC output.

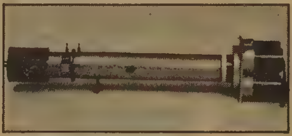
SERIES 430DC-VF
RS422 Frequency Output DC Powered Air Velocity Transducers
The 430DC-VF features a RS422 compatible output where 12KHz to 60KHz corresponds to zero to full scale. The high frequency output allows two-wire runs to lengths of several miles. The 430DC-VF operates on 15VDC, has 15 ft. of probe cable and a NEMA 1 electronics enclosure.

SERIES 280
Micropower Mass Flow Controlled Air Sampler
A miniature flow controller, the 280 combines the worlds smallest commercial mass flow meter, the 501, with the worlds smallest rotary carbon vane vacuum pump, the Series 290, to produce a compact, mass flow controlled, air sampler. The 280 can also function as a mass flow controlled gas supply, and can be computer controlled via an external setpoint feature.

KURZ
INSTRUMENTS INC.

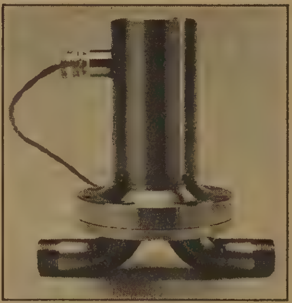
AIR VELOCITY

SERIES 415
2-Wire Linear Air Velocity Transducers
With linear 0-5 VDC outputs and 2-wire runs to over 1,000 ft., the popular 415 provides an industrial grade application solutions anywhere air flow is measured.



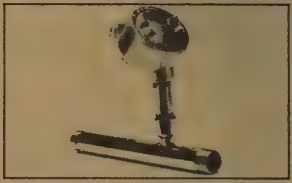
SERIES 400
Air Velocity Calibration Systems
Complete benchtop wind tunnel systems for calibrating a variety of air flow instrumentation and sensor.

SERIES 455
Stack Velocity Transducer
The 455 is designed for operation in the harshest environments and features Kurzs new all metal sensor.

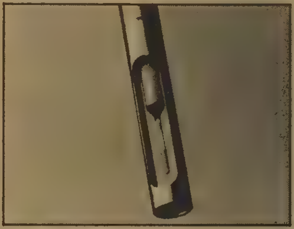


SERIES 730
Electric Rotary Ramp Metering Valve
A major breakthrough in valve technology invented by Dr. Kurz. This exclusive valve features single turn operation and a linear Cv from 0 to 100% of flow. The **730** Series valves alone allow new achievements in precise mass flow control.

MASS FLOW



SERIES 505
In Line Mass Flow Meters
Previously complex measurements are now made simple with Kurz mass flow sensors. Linear outputs, 2-wire hookups, NBS calibrations, corrosive gases—the 505 Series does it all!



SERIES 515/555
Insertion Mass Flow Meters
For larger pipes, the economical 515 Series includes a ball valve/retractor assembly designed for hot tapping into existing lines. Weld on the fitting, drill a hole in the line, insert the probe and you're ready to go!

MASS FLOW CONTROL

Kurz **7500** Mass Flow Control system are composed of a Kurz **505** Series Mass Flow Meter, a Kurz **710** Series Electric Valve P.I.D. Controller and a Kurz **730** Series Electric Rotary Ramp Valve.

Many more state of the art Sensor and Transducer Systems are available from Kurz. Kurz Mass Flow Technology makes complex measurements simple. Call one of our Applications Engineers today.

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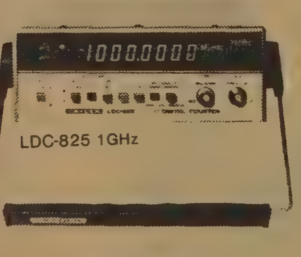

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CA	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Bloomfield, SIR Assoc.	203-243-9343
FL	Melbourne, Techn. Mktg. Assocs.	305-676-3776
FL	Orlando, Techn. Mktg. Assocs.	305-857-3760
FL	Pompano Beach, Techn. Mktg. Assocs.	305-942-0774
IL	Elk Grove Village, Control Sls.	312-595-2110
IN	Greenwood, Valentine & Assoc.	317-888-2260
IN	South Bend, Valentine & Assoc.	219-288-7070
KS	Leawood, Thunderbird Tech. Sls. & Svcs.	913-642-7220
KS	Wichita, Thunderbird Tech. Sls. & Svcs.	316-684-3941
MA	Bedford, SIR Assocs.	617-275-5550
MI	Jenison, R. C. Nordstrom & Co.	616-457-5762
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
MN	Bloomington, Merrill Franklin Co.	612-854-9446
MO	Maryland Heights, Thunderbird Tech. Sls. & Svcs.	314-567-6488
NY	Clark Mills, KLM-Garner Co.	315-853-6126
NY	N. Syracuse, KLM-Garner Co.	315-458-6214
NY	Oceanside, Bittan Assocs.	516-678-6222
NY	Pittsford, KLM-Garner Co.	716-381-8350
NC	Research Triangle Park, A. B. Andrews & Co.	919-544-1762
OH	Cleveland, Del Steffen & Assoc.	216-461-8333
OH	Dayton, Del Steffen & Assoc.	513-293-3145
OH	Lexington, Del Steffen & Assoc.	419-884-2313
PA	King of Prussia, Freedman-Malta Assoc.	215-337-9211
PA	Pittsburgh, Del Steffen & Assoc.	412-276-7366
TX	Richardson, Thunderbird Tech. Sls. & Svcs.	214-690-0763
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Vinton, A. B. Andrews & Co.	703-890-1128
WA	Bellevue, Testco	206-454-7422
WI	Thiensville, Control Sls.	414-242-4580

LEECRAFT MFG., 21-02 44th Rd., Long Island City, NY 11101, Tel: 212-392-8800, TWX: 710-582-2897; Empl.: 250; *Sls. Mgr.:* T. J. Marine .... **1B**•1089

Local Sales Offices & Reps

AL	Huntsville, L & D, Inc.	205-837-1469
AZ	Tempe, Tempe Assocs.	602-829-1901
CA	Los Angeles, Hartfield-Kennan-Freytag	213-225-1318
CO	Arvada, Arrowhead Sls. Co.	303-423-5556
CT	Bloomfield, Zaslow Sls.	203-242-7781
FL	Lighthouse Point, J. Krutek & Assoc.	305-941-6544
GA	Atlanta, L & D, Inc.	404-455-3483
ID	Boise, Doran Sls. Assoc.	208-343-9969
IL	Elmhurst, Hill Gray	312-832-4101
IN	Indianapolis, Needler Sls. Co.	317-255-8056
IA	Cedar Rapids, PMR Corp.	319-362-9177
KS	Overland Park, PMR Corp.	913-381-0004
KY	Nicholasville, W. H. Mathews	606-885-4943
MD	Woodbine, Naudain Assocs. Southern	301-442-2270
MA	Northboro, Zaslow Sls.	617-393-8150
MI	Livonia, Electronic Salesmasters	313-591-2433
MN	Bloomington, Northport Engrg.	612-854-5556
MO	Maryland Hgts., PMR Corp.	314-569-1220
NH	Londonderry, Zaslow Sls.	603-432-8907
NJ	Marlton, Naudain Assocs.	609-235-1801
NY	Great Neck, Tylinski Assocs.	516-466-9070
NY	Rochester, B. H. Tollefson Assoc.	716-271-4141
NC	Greensboro, L & D, Inc.	919-292-3201
OH	Beachwood, Elctrn. Sls. Masters	216-831-9555
OR	Forest Grove, Doran Sls. Assocs.	503-357-3333
PA	Philadelphia, Naudain Assocs.	609-235-1801
PA	Pittsburgh, Covert & Newman	412-531-2002
RI	Providence, Zaslow Sls.	401-351-0070
TN	Franklin, Groover & Assocs.	615-794-6344
TX	Arlington, Fralia & Assocs.	817-640-9101
TX	Stafford, Fralia & Assocs.	713-772-1572
UT	Salt Lake City, Arrowhead Sls.	801-261-1661
VA	Richmond, L & D, Inc.	804-794-7915
WA	Redmond, Doran Sls. Assocs.	206-885-1885
EXP	NY, Long Island City, Leecraft Intl. Corp.	212-392-8800

Local Distributors

CA	Alhambra, Fisher Brownell	213-289-0255
CA	El Monte, Kimball & Stark	213-444-2594
CA	Los Angeles, Western Electromotive	213-820-3777
CA	Sacramento, Sacramento Elec.	916-441-4821
CA	Santa Clara, Fisher Brownell	408-988-6041
CO	Denver, Denver Wintronics	303-934-2406
CT	Hartford, Allied Electric	203-527-6405
FL	Casselberry, Afcom	305-831-6630
FL	Miami, Electronic Equip.	305-871-3500
GA	Atlanta, Specialty Dist.	404-873-2521
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Niles, Industribution	312-966-5630
IL	Northbrook, Classic Comps.	312-272-9650
IN	Evansville, Hutch & Son	812-425-7201
IN	Fort Wayne, Graham Elect.	219-423-3422
IN	Indianapolis, Genesis Elect.	317-637-5571
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Wichita, RSC Electronics	316-267-5213
KY	Louisville, P. I. Burks	502-589-3960
LA	New Orleans, Southern Radio	504-524-2343
MD	Beltsville, Treeko Sls.	301-937-8260
MD	Rockville, Capitol Radio	301-881-2270
MA	Hingham, Sager Electrical Supp.	617-749-6700
MI	Ann Arbor, Wedemeyer Elect. Supp.	313-665-8611
MI	Grand Rapids, SF Elctrns.	616-459-0216
MI	Livonia, LWC Distrs.	313-464-7700
MI	Livonia, RS Elctrns.	313-525-1155
MN	Minneapolis, Newark Elect.	612-331-6350
MO	Kansas City, Electronics Supp.	816-931-0250
MO	Kansas City, LCOMP	816-221-2400
MO	Maryland Hgts., LCOMP	314-291-6200
NH	Hudson, C & H Elect.	603-882-1133
NJ	E. Hanover, State Elctrn. Parts	201-887-2550

NJ	Kenilworth, Federated Purchasers	201-272-0505
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NY	Buffalo, Genesee Radio	716-873-9661
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Elmsford, Ancar Elctrns.	914-592-7100
NY	Endwell, ASI Electronics	607-754-3823
NY	Hempstead, Electronic Equip.	516-538-5510
NY	New York, City Elec.	212-564-5454
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NY	Rockville Centre, Midway Ind. Elctrns.	516-764-2400
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Akron, Sun Radio	216-434-2171
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Cincinnati, United Radio	513-761-4030
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Warren, REM Elect.	216-373-1300
PA	McKeesport, Barno Radio	412-462-7574
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Philadelphia, Phila. Elect.	215-568-7400
PA	Reading, Barbey Elctrns.	215-376-7451
RI	Providence, Wm. Dandreta	401-861-2800
TN	Kingsport, Radio Elec. Supp.	615-247-8111
TN	Nashville, Electra Distributing	615-329-3971
TX	McKinney, Prime Distributing	214-231-0170
TX	Richardson, Fisher Brownell	214-235-3177
VA	Richmond, Sterling Elect.	804-226-2190
WA	Seattle, Pacific Elctrns.	206-575-1050
WI	Milwaukee, Indl. Elctrns.	414-276-1212

LEEDS & NORTHRUP INSTRS., A Unit of General Signal Corp., Sumneytown Pike, North Wales, PA 19454, Tel: 215-643-2000; Empl.: 4800; *Sls. Mgr.:* R. A. Diamond

Local Sales Offices & Reps

CA	Orange	714-937-1647; 213-924-1647
GA	Atlanta	404-938-8946
IL	South Holland	312-596-8480
IA	Bettandorf	319-355-6481
MA	Dedham	617-326-8816
NJ	Union	201-686-5200
NC	Winston-Salem	919-765-6580
OH	Beachwood	216-292-0020
PA	Horsham	215-441-5600
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TX	Richardson	214-234-3363
TX	Stafford	713-491-6000
WA	Seattle	206-451-9028
WV	Charleston	304-342-0385
WI	Milwaukee	414-774-6000

LEEPOXY PLASTICS, 3324 Ferguson Rd., Ft. Wayne, IN 46809, Tel: 219-747-7411; Empl.: 15

LEHIGHTON ELCTRNS., INC., Box 328, Dept M, Lehighton, PA 18235, Tel: 717-386-4156, 215-377-5990; Empl.: 55; *Sls. Mgr.:* George White; *Dist. Mgr.:* George White

LEIGH INSTRS. LTD., Frequency Control Div., C.R. Snelgrove Co., 141 Bond Ave., Don Mills, ON M3B 1M2, Canada, Tel: 416-447-8531, Telex: 06-966626, TWX: 610-492-1354; FSC No.: 02533; Empl.: 158; *Sls. Mgr.:* R. W. Parkins

LEKTRA LABS., 129-07 18th Ave., P.O. Box 222, College Point, NY 11356, Tel: 212-939-7171; Empl.: 45; *Sls. Mgr.:* Frank L. Chilton

LEL CO., 5 Burns Pl., Cresskill, NJ 07626, Tel: 201-569-8641; Empl.: 10

LEMO U.S.A. INC., P.O. Box 11006M, Santa Rosa, CA 95406, Tel: 707-578-8811, Telex: 340-933; FSC No.: 2P953; Empl.: 13; *Sls. Mgr.:* David A. Battaglia .... **2**•1503-1512

Local Sales Offices & Reps

CA	Los Angeles, Ezra Mintz Assocs.	213-670-5410
CA	Moraga, Ruppert Sls. & Engrg.	415-376-8040
CA	San Diego, Ezra Mintz Assocs.	619-565-4921
CA	San Jose, Ruppert Sls. & Engrg.	408-998-8717
CO	Littleton, Omega Ltd.	303-798-7040
FL	Indian Harbor Beach, Bill Toy Assocs.	305-773-5805
IL	Northbrook, Raines & Assocs.	312-498-0890
IA	Marion, M-S-B Assoc., Inc.	319-377-6261
KS	Shawnee Mission, M-S-B Assoc., Inc.	913-432-2131
MA	Lexington, Zieco	617-861-8300
MI	Detroit, Jack M. Thorpe Co.	313-779-6363
MN	Edina, Electro-Tech	612-927-5878
MO	St. Charles, M-S-B Assoc., Inc.	314-946-5577
NJ	Ho-Ho-Kus, Don J. Fisher Co.	201-652-0090
NY	Cooperstown, Lloyd Hart Assoc.	607-547-9333
NY	Rochester, Lloyd Hart Assocs.	716-244-3253
ND	Edina, Electro-Tech	612-927-5878
OH	Chesterland, K/T Depco	216-729-3588
OH	Troy, K/T Depco	513-335-3914
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Doylestown, T.O.E. Sls.	215-348-2212
PA	Pittsburgh, K/T Depco	412-487-8777
SD	Edina, Electro-Tech	612-927-5878
TX	Lewisville, Jim Hughes Co.	214-221-1536
TX	Stafford, Jesse B. Simms - Jim Hughes Co.	713-343-0673
WA	Seattle, Earl & Brown Co.	206-284-1121

LENCO ELCTRNS., INC., 1330 Belden St., McHenry, IL 60050, Tel: 815-344-2900; *Sls. Mgr.:* Lenard J. Duncan .... **1A**•2182, 2183

Local Sales Offices & Reps

AZ	Phoenix, Vari Tron Sls. Co.	602-992-3438
CA	Northridge, Myco Sls.	818-886-7101
CA	Palo Alto, TriRep	415-965-1822
FL	Lighthouse Point, NPM Assocs.	305-941-4586
IL	McHenry, Mesa Inc.	815-344-2820
KS	Mission, McAllister Assocs.	913-262-5500
MA	Framingham, Stone Comps.	617-875-3266
MI	Farmington Hills, KRW Sls.	313-476-6090
MI	Grand Rapids, KRW Sls.	616-363-2925
NJ	Oak Ridge, P.G. Assocs.	201-697-0128
NC	Fripp Island, NPM Assocs.	803-838-4438
OH	Columbus, KRW Sls.	614-464-1861
OH	Westlake, KRW Sls.	216-871-7521
PA	Oakmont, KRW Sls.	412-261-1323
TX	Dallas, Seaton Corp.	214-380-0414

LENCO ELCTRNS., INC., 300 N. Maryland St., Jackson, MO 63755, Tel: 314-243-3147, TWX: 910-760-1382; Empl.: 70; *Sls. Mgr.:* Robert N. Henson; *Dist. Mgr.:* P. A. Leonard

Local Sales Offices & Reps

CA	San Jose, Lenco Elctrns. Div.	408-356-0221
GA	Albany, Lenco Elctrns. Div.	912-436-4927
IL	Mt. Prospect, Lenco, Inc., Elctrns. Div.	312-392-5297
MD	Middletown, Lenco Elctrns. Div.	301-371-5588
TX	Euless, Lenco, Inc., Elctrns. Div.	817-540-0130

LENOX-FUGLE ELCTRNS., 100 Sylvania Pl., S. Plainfield, NJ 07080, Tel: 201-756-1164; Empl.: 25; *Sls. Mgr.:* Henry J. Lenox

LENOX INSTR., 111 E. Luray St., Philadelphia, PA 19120, Tel: 215-DA4-4543, TWX: 710-670-1440; Empl.: 40; *Sls. Mgr.:* William Lang

LENOX LASER, 615 Pittsfield Rd., Lenox, MA 01240, Tel: 413-499-4477; *Sls. Mgr.:* Joe D'Entremont; *Dist. Mgr.:* Joe D'Entremont

LENZ ELECTRIC MFG. CO., 1751 N. Western Ave., Chicago, IL 60647, Tel: 312-276-4454

LEONARD ELEC. PRODS., 85 Industrial Dr., Brownsville, TX 78521, Tel: 512-546-1625; Empl.: 150; *Sls. Mgr.:* Andrew C. Smith

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LESTRONICS, INC., 1840 Industrial Circle, Longmont, CO 80501, Tel: 303-443-6250, 800-525-6478, TWX: 910-320-0786; *Sls. Mgr.:* George Buys

LEXICON CORP. OF MIAMI, 1541 N. W. 65th Ave., Ft. Lauderdale, FL 33313, Tel: 305-792-4400, TWX: 510-955-4130; FSC No.: 7025-0011; Empl.: 40; *Sls. Mgr.:* Barry Sleight

LEXIDATA CORP., 755 Middlesex Tpke., Billerica, MA 01865, Tel: 617-663-8550, 800-472-4747, TWX: 710-347-1574; Empl.: 30; *Sls. Mgr.:* Lou Gennaro

LFE, Process Control Div., 55 Green St., Clinton, MA 01510, Tel: 617-835-1000, Telex: 92-3445, TWX: 710-347-1734; FSC No.: 20905; Empl.: 1500; *Sls. Mgr.:* Ray Grande; *Dist. Mgr.:* Bob Pugsley

LH RESEARCH, INC., 14402 Franklin Ave., Tustin, CA 92680, Tel: 714-730-0162, TWX: 910-595-2540; Empl.: 620; *Sls. Mgr.:* James Williams .. **3**•1650-1653

Local Sales Offices & Reps

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LIBERTY CONTROLS, 500 Brookforest Ave., Shorewood, IL 60435, Tel: 815-725-2241, TWX: 910-633-1557; Empl.: 60; *Sls. Mgr.:* Michael C. Maloney .... 1B•1494, 1495

Local Sales Offices & Reps

AL	Huntsville, R. W. Mitscher Co.	205-852-7676
CA	S. El Monte, H.M.C. Inc.	213-285-0485
CO	Englewood, Dynatech	303-773-2830
CT	Bloomfield, Wood Sls.	203-243-0457
FL	Ft. Lauderdale, Bolton Assocs.	305-491-6556
GA	Lawrence, R. W. Mitscher Co.	404-923-3239
IL	Downers Grove, Splon Assocs.	312-963-7011
IN	Ft. Wayne, Menze Sls.	219-747-5616
MD	Laurel, R. W. Mitscher Co.	301-498-6090
MA	Needham Hgts., Wood Sls. Corp.	617-444-1601
MI	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
MN	St. Paul, Countryman Assocs.	612-645-9151
NJ	Pennsauken, Vantage Sls.	609-663-6660
NY	Buffalo, R. W. Mitscher Co.	716-633-7970
NY	Lynbrook, H.L.J. Comptech	516-599-2999
SC	Columbia, R. W. Mitscher Co.	803-772-6240
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LIBERTY INTL. CORP., First Resistor & Condenser Co., Ltd., 2539 237th St., Suite F, Torrance, CA 90505, Tel: 213-539-6452, Telex: 182421 LIBERTY TRNC; Empl.: 5; *Sls. Mgr.:* Gary Lee

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CA	San Diego, Sigma Elctrns.	714-565-2000
MA	Waltham, Del Tech Sls.	617-894-4550

LICON DIV., 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; Empl.: 500; *Sls. Mgr.:* R. Schmidt; *Dist. Mgr.:* R. Scrivner

LIEBERT CORP., Programmed Power Div., 995 Benicia Ave., Sunnyvale, CA 94086, Tel: 408-245-8900, Telex: 499-1039; Empl.: 200; *Sls. Mgr.:* C. R. Harris

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LINCOLN INSTRS., 456 W. Montana St., Pasadena, CA 91103, Tel: 818-798-0733; Empl.: 8; *Sls. Mgr.:* Barbara J. Burchette .... 3•1334

Local Sales Offices & Reps

CA	Westminster, Transducer Systems Co.	714-840-5357
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OH	Cleveland, Tiby Co.	216-371-5335

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LINDEN ULTRANSONICS, INC., 55 Harvey Rd., Londonderry, NH 03053, Tel: 603-434-4323; *Sls. Mgr.:* Forest Kimball

LINDGREN RF ENCLOSURES, INC., 1228 Capitol Drive, Addison, IL 60101, Tel: 312-628-9100, Telex: 254708 dfld; FSC No.: 18234; *Sls. Mgr.:* Matthew Resch .... 2•1041

Local Sales Offices & Reps

CA	Santa Fe Springs, Wallace & Wallace	213-945-2908
CO	Denver, Westek Data Products, Inc.	303-232-2250
FL	Clearwater, Brennan Associates, Inc.	813-446-5006
FL	Melbourne Beach, Brennan Associates, Inc.	305-724-0854
IL	Addison, Lindgren R.F. Enclosures, Inc.	312-628-9100
MN	Stillwater, Ned Gordon & Associates	612-430-1572
NJ	Ocean, Gordon & Wallach	201-922-3014
NM	Albuquerque, Industrial Products Corp.	505-256-3561
NY	Ocean, Gordon & Wallach, Inc.	201-922-3014
OH	St. Marys, Thomas Shelby & Co., Inc.	419-394-3377
TX	Dallas, Tech Rep Marketing	214-241-2434
UT	Salt Lake City, Westek Data Products, Inc.	801-261-0999
VA	Springfield, Tech Reps, Inc.	703-569-6868
EXP	Durham, Sequence, (USA) Co., Ltd.	919-489-1146

LINEAR INSTRS., 500 Edison Way, Reno, NV 89502, Tel: 702-786-3636, Telex: 170044; Empl.: 90; *Sls. Mgr.:* David Powell

LINEAR MOTIONS CO., 17025 Dubesor St., Valinda, CA 91744. Tel: 818-918-7806; FSC No.: 5945; Empl.: 6; *Sls. Mgr.:* L. Wolby

LINEAR TECHNOLOGY CORP., 1630 McCarthy Blvd., Milpitas, CA 95035, Tel: 408-942-0810, Telex: 499-3977; *Sls. Mgr.:* Mike Christoff; *Dist. Mgr.:* Tom Johnson

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Tusar	602-998-3688
CA	Culver City, Bestronics	213-870-9191
CA	Irvine, Bestronics	714-261-7233
CA	San Diego, Harvey King	619-566-5252
CA	Sunnyvale, Emerging Technlg. Sls.	408-720-0240
CA	Woodland Hills, Bestronics	213-704-5616
CO	Wheatridge, Waugaman Assoc.	303-423-1020
FL	Altamonte Springs, Semtronic Assoc.	305-831-8233
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Arlington Heights, Micro Sls.	312-956-1000
IN	Indianapolis, Leslie M. DeVoe Co.	317-842-3245
IA	Hiawatha, Gassner & Clark	319-393-5763
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HI	Honolulu	808-841-0147
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MN	St. Paul	612-733-3300
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OR	Portland, RTS, Inc.	503-638-5670
WA	Vashon, RTS, Inc.	206-285-1363

MAGNETIC COILS INC., 411 Manhattan Ave., Babylon, NY 11704, Tel: 516-587-0510; Empl.: 50; *Sls. Mgr.:* John O. Williams 1A•2186-2191

MAGNETIC DEVICES INC., 5575 Kearny Villa Rd., San Diego, CA 92123, Tel: 619-279-7054; FSC No.: 13786; *Sls. Mgr.:* Dave Loughlin

MAGNETIC INSTRUMENTATION, 8350 E. 48TH ST., Indianapolis, IN 46226, Tel: 317-545-2102, Telex: 27-2111; Empl.: 23 3•1261

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CA	Aptos, Wasson & Assocs.	408-496-6011
EXP	NY, Irvington, Inter Technical Export Corp.	914-591-8822

MAGNETIC METALS CO., Hayes Ave. at 21st St., Camden, NJ 08105, Tel: 609-964-7842, TWX: 710-891-7054; Empl.: 500; *Sls. Mgr.:* Brian J. Sully

MAGNETICO INC., 182 Morris Ave., Holtsville, NY 11742, Tel: 516-654-1166; Empl.: 45 1A•2185

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CA	Woodland Hills, Interstate Mktg. Assoc.	213-883-7606

MAGNETICS, Box 391, Butler, PA 16003-0391, Tel: 412-282-8282, TWX: 710-373-3821; Empl.: 650; *Sls. Mgr.:* J. F. Huth

MAGNETIC SHIELD DIV., Perfection Mica Co., 750 North Thomas Dr., Bensenville, IL 60106, Tel: 312-766-7800, TWX: 910-256-4815; Empl.: 43 2•1911-1913

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FL	Orlando, MacKay, Smith & Assocs.	305-277-1513
GA	Atlanta, MacKay, Smith & Assocs.	404-449-7444
MA	Framingham, Gerald Rosen Co.	617-879-5505
MI	Detroit, A. Blumenberg Assoc.	313-968-3230
MI	Grand Rapids, A. Blumenberg Assoc.	616-456-7320
OK	Tulsa, Norcom	918-832-7747
TX	Dallas, Norcom	214-386-4888
TX	Houston, Norcom	713-933-6021
WA	Redmond, Halber Assocs.	206-882-0990

MAGNETIKA, INC., 4254 Glencoe Ave., Venice, CA 90292, Tel: 213-391-0391

MAGNETOELASTIC DEVICES, 326 Springside Ave., Box 625, Pittsfield, MA 01201, Tel: 413-445-5608

MAGNETRAN CORP., 5701 Savoy Lane, Houston, TX 77036, Tel: 713-785-4202; Empl.: 15

MAGNET SALES & MFG. CO. INC., 11250 Playa Court, Culver City, CA 90230-6127, Tel: 213-391-7213, 800-421-6692; FSC No.: 95-2916141; *Sls. Mgr.:* Anil Nanji; *Dist. Mgr.:* Anil Nanji 2•1794

MAGNOS, Old School House Rd., Harvard, MA 01451, Tel: 617-456-8880; Empl.: 4

MAGNUM ELEC., 6385 Dixie Hwy., Erie, MI 48133, Tel: 313-848-2555, TWX: 810-231-7160; Empl.: 105; *Sls. Mgr.:* Ronald Pitchford; *Dist. Mgr.:* Ronald Pitchford 2•1516-1518

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OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
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IN	Indianapolis	317-636-5353
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MN	Minneapolis	612-884-2881
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PA	Willow Grove	215-657-4250
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MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NM	Albuquerque, Southwestern Eng. & Equip. Co.	505-881-3677
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NC	Fayetteville, ZIM-TEK	919-485-2222
TX	Dallas, Southwestern Eng. & Equip. Co.	214-340-1741
VA	Fairfax, Schibley Assocs., Inc.	703-591-3008
WA	Seattle, SJI Corp.	206-763-8981

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MANGER ELEC. CO., INC., W. Henry St., Stamford, CT 06902, Tel: 203-348-7761; Empl.: 100; *Sls. Mgr.:* J. V. Judge

MANHATTAN ELECTRIC CABLE, 225 Passaic St., Passaic, NJ 07055, Tel: 201-779-8900, Telex: 137-387; Empl.: 125; *Sls. Mgr.:* Ed Harvey; *Dist. Mgr.:* Allan Marconi

MANHATTAN ELEC. CABLE CORP., 1 Station Plaza, Rye, NY 10580, Tel: 914-967-8000, Telex: 137-387; Empl.: 125; *Sls. Mgr.:* Edward J. Harvey

MANN, HENRY, INC., 3983 Mann Road, Huntingdon Valley, PA 19006, Tel: 215-355-7200, Telex: 6851160; Empl.: 105; *Sls. Mgr.:* Jacques Werth; *Dist. Mgr.:* James P. Massi

MANNESMANN TALLY CORP., 8301 S. 180th St., Kent, WA 98032, Tel: 206-251-5500, Telex: 32-0200

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CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Lakewood, Christee-Meade Co.	303-232-0287
IL	Highland Park, Thomas B. Hunter Assoc.	312-433-7000
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MI	Brighton, S.A.I. Mktg. Corp.	313-227-1786
MN	St. Louis Park, Lestronix	612-926-8466
MO	Leawood, Thunderbird	913-642-7220
MO	Maryland Hgts., Thunderbird	314-567-6488
NH	Salem, Sales Engrg.	603-893-5521
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OH	Dayton, S.A.I. Mktg. Corp.	513-435-3181
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VA	Richmond, Muncy Sales Assoc.	804-288-5720

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MARATHON BATTERY CO., 8301 Imperial Dr., Waco, TX 76714, Tel: 817-776-0650, TWX: 910-894-5203 MARATHON WAC; *Sls. Mgr.:* Walter H. Harder

MARATHON FLITE-TRONICS COMPANY, A Marathon Battery Co., 2525 N. Naomi St., Burbank, CA 91504, Tel: 213-841-3210, Telex: 69-1487; Empl.: 65

MARATHON SPECIAL PRODS., 13300 Van Camp Rd., Bowling Green, OH 43402, Tel: 419-352-8441, TWX: 810-499-2988; Empl.: 150; *Sls. Mgr.:* J. Campisi

MARCONI INSTRS., 100 Stonehurst Ct., Northvale, NJ 07647, Tel: 201-767-7250, TWX: 710-991-9752; *Sls. Mgr.:* A. Ramsden .... **3**•1258-1260

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CA	Los Alamitos, Scientific Devices—West	213-598-7678
CA	San Jose, Scientific Devices—West	408-554-0455
CA	Westminster, Marconi (Sls. Off.)	714-895-7182
FL	Ft. Lauderdale, Beacon Electrns. Assocs.	305-491-1054
GA	Atlanta, Beacon Electrns. Assocs.	404-256-9640
IL	Chicago, K.W. Meyers	312-882-4808
IN	Indianapolis, K. Meyers	317-243-6681
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MA	Framingham, Marketing East	617-879-3355
MA	Stoneham, Ken Corp.	617-926-5525
MN	Minneapolis, K.W. Meyers	612-920-7080
MO	Grandview, P. A. C.	816-737-3030
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NC	Raleigh, Beacon Electrns. Assoc.	919-787-0330
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MATHEMATICAL SYSTEMS DESIGN, INC., 2850 Ocean Park Blvd., Ste. 300, Santa Monica, CA 90405, Tel: 213-450-9851; *Sls. Mgr.:* William E. Schaff

MATRIX CORP., 2260 Distributors Dr., Indianapolis, IN 46241, Tel: 317-248-2036; Empl.: 10 .... **3•**1086

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MATRIX ENGINEERING CORP., 17000 S. Western Ave. 19, Gardena, CA 90247, Tel: 213-770-0521; Empl.: 7

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KS	Shawnee Mission, Comtel Midwest	913-722-1030
MA	Ashland, Poly Tek Assocs.	617-881-4741
MI	Southfield, Comtel-Instr.	313-258-2505
MN	Wayzata, Comtel Midwest	612-476-1551
MO	St. Louis, Comtel Midwest	314-991-5363
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WI	New Berlin, Comtel Midwest	414-544-6042

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MATROX ELCTRN. SYS., 5800 Andover Ave., Montreal, QU H4T 1H4, Canada, Tel: 514-735-1182, Telex: 05-825651; Empl.: 185; *Sls. Mgr.:* Ed Dwyer

Local Sales Offices & Reps

AL	Huntsville, Pentech Assocs.	205-881-9298
AZ	Phoenix, P.A.R. Assocs.	602-243-4267
CA	Santa Clara, Indl. Modules	408-988-1911
CA	Torrance, High-Tech Digital	213-378-5131
CO	Denver, P.A.R. Assoc.	303-371-4140
FL	Deerfield Beach, Pentech Assocs.	305-421-4989
GA	Marietta, Pentech Assocs.	404-424-1931
IL	Schaumburg, Micro-Tex	312-885-1131
IL	Waukesha, Micro-Tex	414-542-5352
IN	Indianapolis, Giesting & Assocs.	317-271-5183
MD	Baltimore, Burgin-Kreh	301-265-8500
MA	Lexington, Nova Sls.	617-861-1820
MI	Novi, Giesting & Assocs.	313-348-3811
MN	Minneapolis, Jen-Ray Sys.	612-831-5060
NY	Clark Mills, KLM Garner	315-381-8350
NY	North Syracuse, KLM Garner	315-458-6214
NY	Pittsford, KLM Garner	716-381-8350
NY	Pleasantville, ABC Elctrn. Sls.	914-796-8088
NY	Williston Park, ABC Elctrn. Sls.	516-747-6610
NC	Greensboro, Pentech Assocs.	919-852-6000
OH	Cincinnati, Giesting & Assocs.	513-521-8800
OH	Mentor, Giesting & Assocs.	216-942-3407
OR	Portland, Westerberg & Assocs.	503-297-1710
PA	Pittsburgh, Giesting & Assocs.	412-963-0727
TX	Austin, Mycrosystems Mktg.	512-452-2842
TX	Houston, Mycrosystems Mktg.	713-270-7198
TX	Richardson, Mycrosystems Mktg.	214-669-2380
UT	Centerville, P.A.R. Assoc.	801-292-8145
VA	Lynchburg, Burgin-Kreh	804-239-2626
WA	Bellevue, Westerberg & Assoc.	206-453-8881

MATSUO ELCTRNS., 12831 Western Ave., Ste. A, Garden Grove, CA 92641, Tel: 714-898-0707, TWX: 910-596-1828; Empl.: 854; *Sls. Mgr.:* Ken Rhines; *Dist. Mgr.:* Ken Rhines

MAUREY INSTR. CORP., 4555 W. 60th St., Chicago, IL 60629, Tel: 312-581-4555, TWX: 910-221-6025; FSC No.: 03942; Empl.: 50; *Sls. Mgr.:* E. Maurey; *Dist. Mgr.:* Louis Derdzinski ..**1A•**2041-2045; **1B•**1162

Local Sales Offices & Reps

FL	Orlando, ASI	305-851-7929
FL	Plantation, Innovative Mktg.	305-583-8895
WA	Vancouver, Sls. & Engrg. Assoc.	206-573-5161

Local Distributors

CA	Garden Grove, Allied Elctrns.	714-554-0731
CA	Santa Clara, Allied Elctrns.	408-727-1690
CO	Wheatridge, Allied Elctrns.	303-425-7144
CT	Ridgefield, PIC	203-451-1533
FL	Margate, Allied Elctrns.	305-973-3070
IL	Elgin, Allied Elctrns.	
MA	Wilmington, Allied Elctrns.	617-942-0150
MI	Westland, Allied Elctrns.	313-595-6565
MO	St. Louis, Allied Elctrns.	314-878-1229
NY	Mineola, Allied Elctrns.	516-248-2360
NC	Raleigh, Allied Elctrns.	919-821-0415
OH	Willoughby, Allied Elctrns.	216-951-0908
OK	Tulsa, Allied Elctrns.	918-663-7630
PA	Bala Cynwyd, Allied Elctrns.	215-267-6940
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Allied Elctrns.	713-932-7321
VA	Alexandria, Allied Elctrns.	703-836-5002
WA	Seattle, Allied Elctrns.	206-767-5772
WI	Milwaukee, Allied Elctrns.	414-463-2662
Can	Lachine, Montreal, Electrodesign	514-636-4838

MAURY MICROWAVE, 8610 Helms Ave., Cucamonga, CA 91730, Tel: 714-987-4715, TWX: 910-581-3408; FSC No.: 13047; Empl.: 40; *Sls. Mgr.:* D. A. Smith

MAXI-SWITCH CO., 9697 East River Rd., Minneapolis, MN 55433, Tel: 612-755-7660, TWX: 910-576-2690; Empl.: 100; *Sls. Mgr.:* Craig Stout

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MAXON PRECISION MOTORS, INC., 838 Mitten Rd., Burlingame, CA 94010, Tel: 415-697-9614, TWX: 910-375-2049; Empl.: 270; *Sls. Mgr.:* Steven E. Buller .... **1B•**1163

MAXWELL LABS., 8835 Balboa Ave., San Diego, CA 92123, Tel: 619-279-5100, TWX: 910-335-2063; Empl.: 300; *Sls. Mgr.:* William Fox (Prods.);Mike Plum (Magneform)

MCCOY ELECTRONICS CO., Sub. Oak Technology Inc., 100 Watts St., P.O. Box B, Mt. Holly Springs, PA 17065, Tel: 717-486-3411, TWX: 510-650-3548; Empl.: 600 .... **1A•**1374-1382

Local Sales Offices & Reps

AL	Huntsville, Oak Southeast	205-882-9296
CA	Huntington Bch., Oak Southwest	714-846-6691
CA	Los Altos, Oak Western	415-941-1237
CO	Colorado Springs, I. W. Strong & Assocs.	303-576-1962
CO	Denver, I. W. Strong & Assocs.	303-292-6900
CT	Meriden, JMG, Inc.	203-235-0819
FL	Altamonte Springs, Oak Southeast	305-831-5411
IL	Rolling Meadows, Oak Inds./Illinois	312-255-6150
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
MA	Norwood, JMG, Inc.	617-762-5333
MN	St. Louis Pk., Wagner Consits. Co.	612-922-6330
MO	N. Kansas City, Automatic Gen. Elctrn. Sls.	816-421-0426
NJ	Haddonfield, Gray Assocs.	609-429-5300
NY	Fayetteville, S. F. Foster Co.	315-637-5427
NY	New Rochelle, Ascor Elctrns.	914-235-8838
NY	Webster, S. F. Foster Co.	716-265-2072
NC	Raleigh, Oak Northeast	919-876-7591
OH	Cincinnati, Oak Inds./Ohio	513-851-4411
OR	Beaverton, Oak Northwest	503-643-0127
TX	Austin, R. F. Kimball Co.	512-443-5284
TX	Houston, R. F. Kimball Co.	713-840-0590
TX	Richardson, R. F. Kimball Co.	214-231-3447
EXP	NJ, Oradell, Sylvan Ginsbury Ltd.	201-261-3200

MCE SEMICONDUCTOR, 1111 Fairfield Dr., West Palm Beach, FL 33407, Tel: 305-845-2837, Telex: 513463; Empl.: 140

MCFADDEN SYS., INC., 8956 S. Atlantic Ave., South Gate, CA 90280-9990, Tel: 213-564-5958, Telex: 677161; FSC No.: 25750; Empl.: 28

MCG ELCTRNS., 12 Burt Dr., Deer Park, NY 11729, Tel: 516-586-5125, Telex: 645518; FSC No.: 29779; Empl.: 30 .... **1B•**1277-1280

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CT	Norwalk, Gemini Grp.	203-852-8173
LA	Covington, Svc. Elctrl. Sls.	504-893-2830

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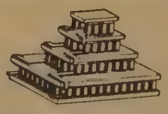

MS	Brandon, Svc. Elctrl. Sls.	601-992-9122
MO	St. Louis, Engrg. Svc. Co.	314-997-1515
NJ	Caldwell, Fred Urban	201-228-5249
NC	Greensboro, The Saylor Assocs.	919-292-0452

MCGILL MFG. CO., INC., Bearing Div., 909 N. Lafayette St., Valparaiso, IN 46383, Tel: 219-465-2200, Telex: 25-8446

MCGILL MFG. CO., INC., Electrical Div., 1002 N. Campbell St., Valparaiso, IN 46383, Tel: 219-465-2200, TWX: 910-690-4982; Empl.: 295; *Sls. Mgr.:* David Rickards (OEM Switch), Thomas Frary (Control Prods.); *Dist. Mgr.:* Thomas F. Morris .... 1B•1676

Local Sales Offices & Reps

AL	Decatur, Tenn Tech Sls.	205-350-0630
CA	S. El Monte, HMC Inc.	213-442-7970
CA	Santa Clara, Logan Sls.	408-496-0660
IN	Indianapolis, A. E. Fred Schaab	317-253-8689
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MA	Needham, Hgts. Newscott Co.	617-444-1923
MI	W. Bloomfield, OBE, Inc.	313-332-4900
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
MO	Ellisville, Larco Sls.	314-394-7141
NJ	Cherry Hill, Danco Elctrn. Sls.	609-424-5590
NY	Baldwin, C. Glianna	516-378-2700
NY	N. Syracuse, Advanced Comp. Corp.	315-699-2671
OH	Cleveland, Allied Entprs.	216-779-0080
SC	Columbia, H. Heaton	803-256-9230
TX	Dallas, Erickson Sls.	214-739-5833
UT	Salt Lake City, Sage Sls.	801-467-5451
WA	Seattle, SPS Elctrns.	206-323-4140

MCGUIRK ELECTRONICS CO. INC., York St. P.O. Box 101 S.V., Andover, MA 01810, Tel: 617-933-3500; FSC No.: 55902; Empl.: 10; *Sls. Mgr.:* V. James Stabile

MCI TRANSFORMER DIV., See Magnetic Coils Inc.

MCKINSTRY METAL WORKS, INC., 285 McKinstry Ave., Chicopee, MA 01013; Empl.: 80

MCL, INC., 10 North Beach Ave., La Grange, IL 60525, Tel: 312-354-4350, TWX: 910-683-1899; FSC No.: 16469; Empl.: 60; *Sls. Mgr.:* Frank Morgan .... 3•1390, 1391

Local Sales Offices & Reps

CA	Los Angeles, RF Associates	213-478-1586
CA	Palo Alto, RF Associates	415-494-3331
GA	Riverdale, MCL, Inc./Bob Lundy	404-996-6632
MA	Reading, Geder Assocs.	617-944-3105

MCLEAN ENGRG., Div. of Zero Corp., 70 Washington Rd., Princeton Junction, NJ 08550, Tel: 609-799-0100, TWX: 510-685-2543; FSC No.: 03522; Empl.: 135; *Sls. Mgr.:* William L. Sly; *Dist. Mgr.:* Craig A. Reed .... 2•1824, 1825

Local Sales Offices & Reps

CA	Cupertino, T. Snitzer Co.	408-257-8333
CA	Del Mar, T. Snitzer Co.	714-226-0305
CA	L.A., T. Snitzer Co.	213-836-6170
CO	Boulder, Component Prod. Sls.	303-530-2800
CT	North Haven, John E. Boeing Co.	800-343-4331
FL	Clearwater, R.I. Smith Assocs.	813-581-1492
FL	Ft. Lauderdale, R.I. Smith Assocs.	305-772-5100
FL	Orlando, R.I. Smith Assocs.	305-365-8077
IL	Elmhurst, Scott Assocs.	312-279-5681
LA	Gretna, M. F. Sls.	504-361-4343
MD	Hunt Valley, Marktron	301-628-1111
MD	Rockville, Marktron	301-251-8990
MA	Lexington, John E. Boeing Co.	617-862-2500
MI	East Detroit, J. Thorpe Co.	313-779-6363
MN	Minneapolis, Scott Elctrn. Sls.	612-929-2985
MO	Grandview, Harris-Hanson	816-763-6200
MO	St. Louis, Harris-Hanson	314-432-3611
NJ	Ridgewood, Hansen & Hughes	201-652-7055
NM	Albuquerque, Fry-Gates	505-262-1525
NY	Albany, Reagan/Compar Albany	518-489-4777
NY	Binghamton, Reagan/Compar	607-754-8946
NY	Fairport, Reagan/Compar Albany	716-271-2230
NY	New Hartford, Reagan/Compar Albany	315-732-3775
NY	New York, Hansen & Hughes	800-526-5114
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
OR	Wilsonville, R.T.S.	503-638-5670
PA	Huntingdon Valley, Inacker Sls.	215-947-5660
PA	Pittsburgh, Marlow Assocs.	412-367-8886
SC	Greenville, Sunbelt Sls.	803-877-9088
TN	Taft, Sunbelt Sls.	615-425-6164
TX	Dallas, J.A. Green Co.	214-631-7450
TX	Houston, Milco Mktg.	713-946-2841
UT	Salt Lake City, Component Prod. Sls.	801-262-0000
VA	Charlottesville, Marktron	804-973-5874
WA	Vashon, R.T.S.	206-285-1363

Local Distributors

CA	Los Angeles, Snitzer Supply	213-836-6170
MI	Ann Arbor, Wedemeyer Elctrn. Supp. Co.	313-665-8611
TX	Houston, R. V. Weatherford	713-688-7406
Can	Guelph, Ontario, Hammond Mfg. Co.	519-822-2960

MCLEAN MIDWEST, 4000 83rd Ave. N., Brooklyn Pk., MN 55443, Tel: 612-561-9400, Telex: 29-0883, TWX: 910-576-2951; *Sls. Mgr.:* J. Buyse .... 2•1826, 1827

3M CO., Carbonless/Related Prods Div Ind'l Optics, 3M Center, Bldg. 225-3S, St. Paul, MN. 55144, Tel: 612-733-4403, Telex: 29-7023, TWX: 910-563-3712; *Sls. Mgr.:* A. Rivard

3M-ELECTRONIC PRODUCTS DIVISION, 3M Center, Bldg. 225-1N-06, St. Paul, MN 55144, Tel: 612-733-7408 .... 2•1514, 1515

Local Sales Offices & Reps

AK	Anchorage	907-561-1030
CA	Los Angeles	213-726-6300
CA	So. San Francisco	415-761-1155
GA	Atlanta	404-447-7000
HI	Honolulu	808-422-2721
IL	Chicago	312-496-6500
MA	Boston	617-449-0300
MI	Detroit	313-477-5000
MN	St. Paul	612-733-3300
MO	St. Louis	314-997-8500
NJ	West Caldwell	201-575-2000
NC	High Point	919-889-7181
OH	Cincinnati	513-482-3100
OH	Cleveland	216-362-1700
PA	Philadelphia	215-728-5300
TX	Dallas	214-324-8100
WA	Seattle	206-244-7200

Local Distributors

AL	Huntsville, RM Alabama	205-852-1550
AL	Huntsville, Powell Electronics	205-539-2731
AZ	Tempe, Richey/Western Elctrns., Inc.	602-894-9251
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Irvine, Ratel Elctrns.	714-549-8611
CA	Irvine, Acacia Sls.	714-549-0954
CA	Los Angeles, Richey/Western Elctrns., Inc.	213-820-3777
CA	San Diego, Acacia Sls.	619-565-4365
CA	San Diego, Richey/Western Elctrns., Inc.	619-271-4511
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Santa Clara, Richey/Western Elctrns., Inc.	408-727-7411
CA	Sun Valley, Richey/Western Elctrns., Inc.	818-768-3800; 213-875-2862
CA	Sunnyvale, Acacia Sls.	408-745-7200
CO	Denver, Ragon Electronic Parts	303-744-3601
CO	East Haven, JV Elctrns.	203-469-2321
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Hamden, Impact Sls. Co.	203-281-1331
FL	Ft. Lauderdale, Power Elctrns.	305-979-5000
FL	Winter Park, Deanco	305-671-5100
GA	Atlanta, A.C. Equipment Co.	404-451-2747
GA	Marietta, Deanco	404-429-0126
IL	Chicago, Prehler	312-384-6100
IL	Lombard, RM Illinois	312-932-5150
IL	Mt. Prospect, Magnuson Elctrns.	312-956-0700
MD	Columbia, Powell Elctrns.	301-995-0410; 301-621-4070 in D.C.
MD	Gaithersburg, Deanco	301-948-5444
MA	Burlington, Schaal Assoc./Deanco	617-272-1506
MA	Canton, Impact Sls.	617-821-1500
MA	Westboro, Powell Elctrns.	617-366-6100
MI	Grand Rapids, RM Michigan	616-531-9300
MN	St. Paul, Ragon Elctrns.	612-642-2828
MO	Independence, Ragon Elctrns.	816-254-3410
MO	St. Charles, Lectronix	314-946-6424
NJ	Clifton, J-Mar Elctrns.	201-772-6400
NJ	Englewood, Powell Electronics	201-894-0800
NJ	Fairfield, Deanco	201-575-7960
NY	Farmingdale, Addem Distributors	516-752-9303
NY	Hauppauge, LI, Schaal Associates/Deanco	516-234-4600
NY	Ithaca, Deanco	607-257-4444
NY	Ronkonkoma, Zenith Wire & Cable	516-585-1444
NC	Cary, Powell Electronics	919-467-1212
NC	Charlotte, Elctrns. Mktg. Corp.	704-394-6195
OH	Columbus, Electronics Mktg. Corp.	614-299-4161
OH	Highland Heights, Elctrns. Mktg. Corp.	2 6-422-3411
OH	Middleburg Heights, Prehler	216-826-0110
OK	Tulsa, Norvell Elctrns.	918-663-1247
OR	Beaverton, Acacia Sls.	503-646-3377
OR	Lake Oswego, Moore Elctrns., Inc.	503-684-3100
OR	Wilsonville, Zepher Elctrns.	503-682-2929
PA	Philadelphia, Powell Elctrns.	215-365-1900
TX	Austin, Kent Elctrns.	512-834-1900
TX	Austin, Norvell Elctrns.	512-458-8106
TX	Dallas, Norvell Elctrns.	214-233-0020
TX	Houston, Kent Elctrns.	713-780-7770
TX	Houston, Norvell Elctrns.	713-777-1666
TX	Richardson, Kent Elctrns.	214-669-2600
UT	Midvale, Ratel Elctrns.	801-562-2600
WA	Seattle, Zepher Elctrns.	206-241-1980

3M CO., STATIC CONTROL SYS. DIV., 3M Center, Bldg. 225-4S-04, St. Paul, MN 55144, Tel: 612-733-9420, TWX: 910-563-3712; Empl.: 300; *Sls. Mgr.:* Mike Martin .... 3•1924, 1925

Local Sales Offices & Reps

AZ	Phoenix	602-934-7413; 800-221-1046
CA	Los Angeles	800-221-1045
CA	San Francisco	415-761-1155
CO	Denver	303-321-3873
DC	Washington	800-241-3669
FL	Orlando	800-241-3669
GA	Atlanta	800-241-3670
IL	Chicago	312-496-6553
MA	Boston	617-449-0300
MI	Detroit	800-323-4087
MN	St. Paul	800-392-0312
MO	St. Louis	314-997-8500
NJ	Newark	800-221-1454
NJ	West Caldwell	800-221-1454
NY	Syracuse	800-221-1455
NC	High Point	919-889-7181
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TX	Houston	800-442-8046
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3M CO. VISUAL PRODS./INDUS. OPTICS., See 3M Co. Carbonless Related Prods. Div.

MDB SYS., 1995 N Batavia St., Orange, CA 92665, Tel: 714-998-6900, TWX: 910-593-1339; Empl.: 200; *Sls. Mgr.:* William Wollam

MDF PRODUCTS INC., 7 Johnson Dr., Danbury, CT 06810, Tel: 203-743-3579, Telex: 499-8051; FSC No.: 60628; Empl.: 5 .... 3•1262

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Local Sales Offices & Reps

IA	Cedar Rapids, S & O Sls.	319-393-1845
MD	Columbia, Robert Elctrn. Sls.	301-995-1900
MA	Hudson, Data Rep.	617-481-0333
PA	Melrose Park, R. Meyers Assocs.	215-224-1663
VA	Richmond, Robert Elctrn. Sls.	804-276-3979

MEC A/S, Industriparken 23, Ballerup, DK-2750, Denmark, Tel: 452-973366, Telex: 35323

Local Sales Offices & Reps

AZ	Phoenix, Eltron	602-266-2164
CA	Brea, Masco	714-529-0867
CA	Mountain View, Switches Inc.	415-962-8649
CA	Orange County, Pacific Switch Controls Inc	714-953-1254
CA	Van Nuys, Pacific Switch Controls Inc	213-873-4802
CO	Aurora, Mountain View Mktg.	303-360-9641
FL	Fort Lauderdale, KSM Elctrns. Inc	305-971-5900
GA	Atlanta, KSM Elctrns. Inc	404-458-2013
IL	Downers Grove, Richmar Elctrns.	312-968-0118
IN	Indianapolis, Insul Reps	317-842-5203
MA	Needham, A&M Elctrns.	617-444-8170
MI	Brighton, AP Assocs.	313-229-6550
MN	Minneapolis, Elctrn. Comps. Grp.	612-559-0720
NY	Great Neck, M.O.S. Assocs.	516-487-3966
PA	Glenside, Wyncote Instrmn.	215-572-6500
TX	Richardson, Southern States Mktg.	214-238-7500
VA	Fairfax	701-591-1300
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301

MECHANICAL ENGRAVING, 4500 Bullard Ave, Bronx, NY 10470, Tel: 212-324-4455; FSC No.: 99040; Empl.: 35; *Sls. Mgr.:* Bernard W. Mandel

Local Sales Offices & Reps

CT	Huntington, Richard Jonassen & Assocs.	203-929-7987
IL	Chicago, Zinsmaster & Assocs.	312-870-7347
IL	Moline, Louis Turilli	309-797-2307
MO	Kansas City, Zinsmaster & Assocs.	816-333-6233
NH	Hillsboro, Richard Jonassen and Assocs.	603-464-3264

MECHANICAL ENTPRS., 461 Carlisle Dr., Herndon, VA 22070, Tel: 703-435-9496, TWX: 710-832-0942; Empl.: 25; *Sls. Mgr.:* R.H. Twyford .... 1B•1677, 1784, 1785

Local Sales Offices & Reps

CA	Irvine, Vale Elctrn.	714-551-4821; 619-693-0113;213-886-7101
CT	Bristol, Technlg. Prods.	203-583-0703
FL	Casselberry, Semi	305-695-3334
FL	Clearwater, SEMI	813-441-3902
FL	Ft. Lauderdale, SEMI	305-475-3686
IL	Arlington Heights, Coombs Assoc.	312-439-9810
IN	Ft. Wayne, Coombs Assoc.	219-747-7661
IA	Cedar Rapids, Coombs Assoc.	319-362-4116
MA	Brookline, Technlg. Prods.	617-731-0858
MI	Jackson, Norwood Scroggs Co.	517-750-1170
NJ	Parlin, JMR Sls., Inc.	201-727-5335
NY	Cooperstown, Fitzelle Assoc.	607-547-9333
NY	East Setauket, JMR Sls., Inc.	516-689-8871
NY	Rochester, Lloyd Hart Assoc.	716-225-4455
TX	Dallas, Stasco	214-239-4517
WI	Milwaukee, Coombs Assoc.	414-351-6123

Local Distributors

CA	Los Angeles, Electric Switches	213-660-1310
IL	Wheeling, Hawk Elctrns.	312-459-4030
NY	Mt. Vernon, Kintronics	914-668-9885

MECHANICAL PRODUCTS, Amstar, 1824 Kiver St., P.O. Box 729, Jackson, MI 49204, Tel: 517-782-0391, TWX: 810-253-0827; *Sls. Mgr.:* Bob Vangermeersch

MECHANICAL TECHN., 968 Albany Shaker Rd., Latham, NY 12110, Tel: 518-785-2353, TWX: 710-443-8150; Empl.: 1000; *Sls. Mgr.:* David W. Bender; *Dist. Mgr.:* David W. Bender

MECHANIZED ELECTRONIC ASSEMBLY DIV., Universal Instrs. Corp., P.O. Box 825, Binghamton, NY 13902, Tel: 607-772-7522, TWX: 510-252-1990; *Sls. Mgr.:* Gene Exley .... 3•1926

Local Sales Offices & Reps

MA	Marshfield, Universal Instrs. Corp.	617-834-6576
NY	Binghamton, Universal Instrs. Corp.	607-772-7472
PA	Hollidaysburg, Universal Instrs. Corp.	814-695-7324

MEDIA RECOVERY INC., Box 1407, Graham, TX 76046, Tel: 800-527-9497, 214-630-9625 (Texas), Telex: 73-2561; Empl.: 130; *Sls. Mgr.:* J. Ricciardi

Local Sales Offices & Reps

CA	San Francisco, Media Recovery	415-572-0167
CA	Van Nuys, Media Recovery of Cal	213-782-8978
CT	Hartford, Media Recovery of N.J.	203-528-9776
GA	Atlanta, Media Recovery	404-441-1547
MA	Boston, Media Recovery Inc.	617-843-8400
MI	Livonia, Media Recovery	313-421-4244
TX	Dallas, Media Recovery of Tex	214-630-9625
TX	Houston, Media Recovery of Tex	713-681-5464
TX	San Antonio, Media Recovery of Texas	512-349-5854

MEGA LOGIC, 9659 Natl. Rd., Brookville, OH 45309, Tel: 513-833-5222

MEGATEK CORP., 9605 Scranton Rd., San Diego, CA 92121, Tel: 619-455-5590, TWX: 910-335-2056; Empl.: 500; *Sls. Mgr.:* Robert A. Becker, Dir., North Amer. Sls.; *Dist. Mgr.:* Michel Schwab, Dir., International Sls.

MEGATEST, 880 Fox La., San Jose, CA 95131, Tel: 408-998-7110, TWX: 910-338-0259; Empl.: 225; *Sls. Mgr.:* Rick Carmichael

MEGATRAN ELECTRONIC POWER, Rising Sun Rd., Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 25; *Sls. Mgr.:* C. W. Harrison

MEISSNER INDS., 551 Rte. 10, Dover, NJ 07801, Tel: 201-366-1700; Empl.: 10 .... 1A•1889

MELCOR

MELCOR/MATERIALS ELCTRN. PRODS., 994 Spruce St., Trenton, NJ 08648, Tel: 609-393-4178, Telex: 84-3314; FSC No.: 32333; Empl.: 100; *Sls. Mgr.:* M.A. Levine .... 2•1828, 1829

MELCO SLS., See Mitsubishi Elctrns.

MELLES GRIOT, 1770 Kettering St., Irvine, CA 92714, Tel: 714-556-8200, Telex: 678-447; Empl.: 90; *Sls. Mgr.:* Richard P. Gluch

MEL-RAIN CONTROLS, 42974 M-43 Hwy., Paw Paw, MI 49079, Tel: 616-657-2527; FSC No.: 639; Empl.: 20; *Sls. Mgr.:* Howard F. Walter

MEL TEC, Div. Epsco, Inc., 411 Providence Hwy., Westwood, MA 02090, Tel: 617-329-1508, Telex: 95-1110, TWX: 710-348-0484; Empl.: 180

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier	205-536-1506
AZ	Scottsdale, Carl Carlburg Assocs.	
FL	Orlando, Currie, Peak & Frazier	305-855-0843
GA	Duluth, Currie, Peak & Frazier	404-476-3107
KS	Wichita, Kebco	316-733-1301
MD	Towson, Arbotek	301-825-0775
MI	Troy, C. B. Jensen	313-643-0506
MO	Maryland Heights, Kebco	314-576-4111
NM	Alburqueque, C. T. Carlburg & Assocs.	505-888-3883
NY	Melville, Long Island, Comtronic	516-249-0505
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
WI	Greenfield, Olympic	414-281-9294

MEMODYNE, 220 Reservoir St., Needham Hgts., MA 02194, Tel: 617-444-7000, Telex: 92-2537; Empl.: 40; *Sls. Mgr.:* N.H. Renaud .... 3•1087

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assoc.	205-882-0827
AZ	Tempe, Mar Tech Assocs., Inc.	602-968-4944
CA	Fullerton, Elctrn. Comp. Mktg.	714-879-9460
CA	Santa Clara, Nelson Elctrns. Sls.	408-980-1950
CO	Englewood, F. G. Mktg. Co.	303-795-9176
CT	Hamden, Burton Forrester Associates	203-248-4380
GA	Atlanta, Magaro & Assoc.	404-451-8862
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Elmhurst, Scott Assocs.	312-279-5681
KS	DeSoto, Midtec Assocs.	910-743-6565
MA	Braintree, Burton Forrester Assocs.	617-848-7234
MI	Detroit, EQS Sys.	313-961-3042
MO	Florissant, Midtec Assocs.	313-837-5200
NM	Albuquerque, Mar Tech Assocs., Inc.	505-821-2775
NY	Clark Mills, KLM Assocs.	315-853-6126
NY	Elmont, Crane & Egert Corp.	516-872-0800
NY	North Syracuse, KLM Assocs.	315-458-6214
NY	Pittsford, KLM Assocs.	716-381-8350
NC	Greensboro, Magaro & Assocs.	919-294-4783
OH	Chesterland, EQS Sys.	216-729-2222
OH	Columbus, EQS Sys.	614-228-3453
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Ambler, Denco Data Equip. Corp.	215-542-9876
PA	Pittsburgh, EQS Sys.	412-261-2604
TX	Houston, Acudata	713-488-8195
TX	Plano, Acudata	214-424-3567
UT	Englewood, F. G. Mktg. Co.	303-795-9176
WA	Bellevue, Topp Engrg. Sls.	206-747-5400

MEMOREX CORP., San Thomas at Central Expwy., Santa Clara, CA 95052, Tel: 408-987-1000; Empl.: 12,284

Memory
Protection
Devices inc.

MEMORY PROTECTION DEVICES INC., 320 Broad Hollow Rd., Farmingdale, NY 11735, Tel: 516-454-0340; *Sls. Mgr.:* Lou Asighieri; *Dist. Mgr.:* Sandy Silvani .... 2•1519

Local Sales Offices & Reps

AL	Huntsville, REP Inc.	205-881-9270
AZ	Phoenix, Stitzer & Dodd	602-944-2237
CA	Pleasonton, Moulthrop Sls.	415-846-0550
CA	San Diego, Tauber Assoc.	619-274-7242
CO	Denver, Comp. Sls. Inc.	303-759-1666
FL	Melbourne, Reynolds	305-259-7000
GA	Tucker, Rep Inc.	404-938-4358
IL	Chicago, Brock & Cushman	312-622-4110
IN	Indianapolis, Marketing Engr.	317-872-5665
KS	Olathe, Rush & West	913-764-2700
MA	Burlington, Conti Younger	617-273-1582
MI	Birmingham, Favco	313-644-0173
MN	Minneapolis, Electro Mark	612-881-3306
MO	Ballwin, Rush West	314-394-7271
NJ	Mt. Laurel, Comtek	609-235-8505
NY	Pittsford, Andres Comp.	716-381-3818
NY	Westchester Great Neck, Cooper Simon	516-487-1142
NC	Raleigh, Rep Inc.	919-851-3007
OH	Cleveland, Del Steffen	216-461-8333
OR	Tigard, Electronic Sources	503-684-0040
PA	Pittsburgh, Del Steffen	412-276-7366
TN	Jefferson City, Rep. Inc.	716-475-4105
TX	Dallas, Dunbar	214-239-7151
UT	Salt Lake City, Comp. Sls.	801-466-8623
WA	Bellevue, Elctrn. Sources	206-451-3500
WI	Menomonee Falls, Brock Cushman	414-255-2166

Local Distributors

AL	Huntsville, Resistacap, Inc.	205-881-9270
CA	Burlingame, Rose Elect	415-348-0483
CA	San Diego, Fauber Elect	619-272-7242
CA	San Jose, Cypress Elect	408-945-8400
CA	Van Nuys, Nesco	213-781-0505
CO	Denver, Denver/Wentronics	303-934-2406
FL	Dania, Summit Distr	305-920-6253
FL	Longwood, Intertec	305-834-7777
IL	Chicago, Prehler Elec	312-384-6100
IN	Indianapolis, Graham Elec	317-634-8202
MA	Canton, Impact Sales	617-821-1500
MA	Sharon, Adcour	617-784-9123
MI	Brighton, A. P. Sales	313-229-6550
MI	Farmington Hills, Prehler Elec	313-476-7084
MN	Burnsville, Power Group	612-890-1360
MN	Thief River Falls, Digi Key	218-681-6674
NJ	Bellmawr, Mid-Atlantic	609-931-5303
NJ	Plainfield, Mars Elec	201-757-4332
NY	Buffalo, Summit Dist	716-887-2800
OH	Cincinnati, Hughes Peters	513-351-2000
OH	Columbus, Hughes Peters	614-294-5351
OR	Beaverton, Almac	503-641-9070
PA	Allentown, Lehigh Elec	215-433-3045
TX	Dallas, Computer Comps.	214-239-0271
WA	Bellevue, Almac Elec	206-643-9997

Mepco//Electra

A NORTH AMERICAN PHILIPS COMPANY

MEPCO/ELECTRA, INC., North American Philips Corp., Corporate Headquarters, Columbia Rd., Morristown, NJ 07960, Tel: 201-539-2000, TWX: 710-986-7437; *Sls. Mgr.:* Michael F. Kirkowski; *Dist. Mgr.:* Robert G. Elko

MEPCO/ELECTRA, INC., North American Philips Corp., 11468 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-453-0332, TWX: 910-337-1120 .... **1A**•2046; **1B**•1012

Potentiometers (Cermet, Carbon) Industrial & Military

MEPCO/ELECTRA, INC., North American Philips Corp., 5900 Australian Ave., West Palm Beach, FL 33407, Tel: 305-842-3201, TWX: 510-952-7618 .... **1A**•1134; **1B**•1013

Tantalum Capacitors (Solid, Wet Slug, Chip) Military & Industrial

MEPCO/ELECTRA, INC., North American Philips Corp., Columbia Rd., Morristown, NJ 07960, Tel: 201-539-2000, TWX: 710-986-4737 .... **1A**•1136, 1890, 1891; **1B**•1012

Metal Film Resistors (Established Reliability-Hermetic) Thick Film Chips, Thick Film Networks, Non-Linear Resistors, Film Trimmer Capacitors

MEPCO/ELECTRA, INC., North American Philips Corp., 6071 St. Andrews Rd., Columbia, SC 29210, Tel: 803-772-2500, TWX: 810-666-2662 .... **1A**•1134-1136; **1B**•1013

DC Aluminum Electrolytic Capacitors (Computer Grade, Axial, Radial) Military, Industrial & Consumer, AC Motor Starts, Film Capacitors (Film/Foil, Metallized), Tantalum Capacitors (Foil)

MEPCO/ELECTRA, INC., North American Philips Corp., Airport Road, P.O. Box 760, Mineral Wells, TX 76067, Tel: 817-325-7871, TWX: 910-890-5855 .... **1A**•1891; **1B**•1012

Metal Film Resistors (General Purpose, Standard Precision, Ultra Precision, Standard Military, Established Reliability) Carbon Film Resistors, Precision Matched Sets

Local Sales Offices & Reps

AL	Huntsville, Macro-Mktg. Assoc.	205-883-9630
AZ	Tempe, Mepco/Electra	602-968-9573
CA	Harbor City, Refrigeration Comp.	213-325-3420
CA	Milpitas, Mepco/Electra	408-945-1020
CA	N. Hollywood, Mepco/Electra	818-982-7470
CA	San Diego, The Rep Co.	619-292-9001
CA	Santa Clara, I-Squared	408-988-3400
CO	Englewood, Thorson Rocky Mountain	303-779-0666
FL	Fern Park, Mepco/Electra	305-339-5073
FL	Ft. Lauderdale, Mepco/Electra	305-485-0115
GA	Norcross, Over & Over, Inc.	404-449-6205
IL	Bannockburn, Heth	312-295-8440
IL	Elk Grove Village, Oasis Sls.	312-640-1850
IL	Itasca, Mepco/Electra	312-773-3399
IN	Fort Wayne, Corrao Marsh, Inc.	219-637-5548
IN	Greenfield, Corrao Marsh, Inc.	317-894-0377
IN	Indianapolis, Corrao Marsh, Inc.	317-872-7157
IN	Indianapolis, Leslie M. Devoe Co.	317-842-3245
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Leawood, H. C. Heyde	913-649-8628
KS	Overland Park, PMR Corp.	913-381-0004
KS	Wichita, PMR Corp.	316-684-4141
MD	Columbia, Delta III Assoc.	301-730-4700
MA	Woburn, Mepco/Electra	617-935-6920
MI	Grand Rapids, Miltimore Sls.	616-942-9721
MI	Novi, Miltimore Sls.	313-349-0260
MN	Burnsville, Heth, Inc.	612-435-7876
MN	Edina, Mepco/Electra	612-835-5935
MN	Minneapolis, Comprehensive Technical Sls.	612-888-7011
MO	Maryland Heights, PMR Corp.	314-569-1220
NE	Lincoln, Lorenz Sls.	402-475-4660
NJ	Englewood Cliffs, Ed Glass Assocs.	201-592-0200
NJ	Marlton, B.G.R. Assocs.	609-983-1020
NJ	Morristown, Mepco/Electra	201-539-2000
NJ	Springfield, Gebhardt Mktg.	201-376-4415
NY	Rochester, Electra Sls. Corp.	716-461-5252
NY	Syracuse, Electra Sls. Corp.	315-463-1248
NC	Charlotte, Over & Over, Inc.	704-527-3070
NC	Raleigh, Over & Over	919-872-2262
OH	Dayton, Mepco/Electra	513-278-5842
OR	Beaverton, Mepco/Electra	503-643-5516
PA	Greensburg, Pro Mark	412-832-3800
TX	Richardson, Mepco/Electra	214-231-8274
UT	West Valley City, Thorson Rocky Mountain	801-973-7969
VA	Richmond, Mepco/Electra	804-359-1416
WA	Bellevue, Mepco/Electra	206-643-4555
WI	Wauwatosa, Larsen Assoc.	414-258-0529

Local Distributors

AL	Huntsville, Hamilton/Avnet	205-837-7210
AZ	Tempe, Shelley Elctrns., Inc.	602-894-2058
AZ	Tempe, Hamilton/Avnet	602-231-5100
AZ	Tempe, T.T.I.-AZ	602-966-1616
CA	Chatsworth, Shelley Elctrns., Inc.	213-998-3333
CA	Compton, Harper, S.I.D.	213-979-5090
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Costa Mesa, Avnet Elctrns.	714-754-6077
CA	Culver City, Hamilton Electro Sls.	213-558-2131
CA	Culver City, Hamilton/Avnet	213-558-2020
CA	Garden Grove, Hi-Rel Distrs.	714-898-9858
CA	Los Angeles, Western Electromotive	213-820-3777
CA	Mountain View, Shelley Elctrns., Inc.	415-969-1820
CA	N. Hollywood, T.T.I. West	213-982-0201
CA	Sacramento, Hamilton/Avnet	916-920-3120
CA	San Diego, Hamilton/Avnet	619-571-7500
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, TTI, Inc.	408-943-9155
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	San Jose, Eric Elctrns.	408-262-1111
CA	Santa Clara, Western Electromotive	408-727-7411
CA	Sun Valley, Q.C. Comps.	213-768-6111
CA	Sunnyvale, Hamilton/Avnet	408-743-3355
CA	Woodland Hills, Avnet Elctrns.	818-700-8668
CO	Boulder, Shelley Elctrns., Inc.	303-442-2718
CO	Denver, Ragon Elctrns.	303-774-0527
CO	Englewood, Hamilton/Avnet	303-740-1000
CT	Danbury, Hamilton/Avnet	203-797-2800
CT	New Haven, Greene Shaw Co.	203-397-0710
FL	Ft. Lauderdale, Dielco	305-973-8700
FL	Ft. Lauderdale, Hamilton/Avnet	305-971-2900
FL	Orlando, T.T.I. II	305-859-1000
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	St. Petersburg, Hamilton/Avnet	813-576-3930
FL	Tampa, Impala Elctrns.	813-885-4747
GA	Norcross, Hamilton/Avnet	404-447-7507
IL	Bensenville, Hamilton/Avnet	312-860-7700
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Nep Elctrns.	312-625-8400
IL	Rosemont, Advent Elctrns.	312-298-4210
IN	Carmel, Altex Elctrns., Inc.	317-848-1323
IN	Carmel, Hamilton/Avnet	317-844-9603
IN	Indianapolis, Advent Elctrns.	317-872-4910
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
KS	Overland Park, Hamilton/Avnet	913-888-8900
MD	Baltimore, Resco/Baltimore	301-823-0070
MD	Beltsville, Resco/Washington	301-937-9100
MD	Columbia, Hamilton/Avnet	301-995-3500
MD	Columbia, Aztech Elctrns.	301-995-1760
MA	Burlington, TLC Elctrns.	617-273-0140
MA	Newton, Greene-Shaw Co.	617-969-8900
MA	Woburn, Hamilton/Avnet	617-273-7500
MA	Woburn, T.T.I.	617-938-8800
MI	Grand Rapids, Hamilton/Avnet	616-243-8805
MI	Livonia, Hamilton/Avnet	313-522-4700
MI	Livonia, RepTron Elctrns.	313-525-2700
MN	Minneapolis, Merit Elctrns.	612-546-5383
MN	Minneapolis, Merit Elctrns.	612-546-5383
MN	Minnetonka, Hamilton/Avnet	612-932-0600
MN	St. Paul, Ragon Elctrns.	612-642-2828
MO	Earth City, Hamilton/Avnet	314-344-1200
MO	Independence, Ragon Elctrns.	816-254-3410
NJ	Cherry Hill, Hamilton/Avnet	609-424-0100
NJ	Clifton, J-Mar Elctrns.	201-772-6400
NJ	Fairfield, Hamilton/Avnet	201-575-3390
NM	Albuquerque, Hamilton/Avnet	505-765-1500
NY	Bohemia, T.T.I. Inc.	516-567-1500
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Central Islip, Semi-Cap Elctrns.	516-582-4400
NY	East Syracuse, Hamilton/Avnet	315-347-2641
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Hauppauge, Fairmont Elctrns.	516-231-3313
NY	Hempstead, Kahgan Comps.	516-538-2300
NY	Melville, Hamilton/Avnet	516-454-6060
NY	Rochester, Summit Distrs.	716-334-8110
NY	Rochester, Hamilton/Avnet	716-475-9130
NY	Rome, Rome Elctrns.	315-337-5400
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Hamilton/Avnet	919-829-8030
OH	Cleveland, Hamilton/Avnet	216-831-3500
OH	Columbus, RepTron Elctrns.	614-436-6675
OH	Dayton, Hamilton/Avnet	513-433-0610
OH	Englewood. Argent Electra	513-836-8633
OH	Fairborn, Aschbacher & Assocs.	513-252-7785
OK	Tulsa, Altair Co.	918-252-5781
OR	Beaverton, Almac Elctrns.	503-641-9076
OR	Lake Oswego, Hamilton/Avnet	503-635-8157
PA	McKean, Advacom, Inc.	814-476-7774
PA	Norristown, Century Elctrn. Corp.	215-631-5400
SC	Greenville, Hammond Elctrns.	803-233-4121
TX	Austin, Altair Co.	512-837-4470
TX	Austin, Hamilton/Avnet	512-837-8911
TX	Dallas, Computer Comp.	214-239-0271
TX	El Paso, Era Elctrns.	915-592-4126
TX	Ft. Worth, T.T.I. Inc.	817-429-1440
TX	Houston, Altair Co.	713-462-3029
TX	Houston, Hamilton/Avnet	713-780-1771
TX	Irving, Hamilton/Avnet	214-659-4111
TX	Richardson, Jaco Elctrns.	214-235-9575
TX	Richardson, Altair Co.	214-231-5166
UT	Salt Lake City, Hamilton/Avnet	801-972-2800
VA	Arlington, Arlington Elctrns.	703-521-2412
VA	Charlottesville, Virginia Radio Supp. Co.	804-296-4184
WA	Bellevue, Almac Elctrns. Corp.	206-643-9992
WA	Bellevue, Hamilton/Avnet	206-643-3950
WA	Kent, Shannon Ltd.	206-763-0545
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	New Berlin, NEP Elctrns., Inc.	414-785-9100
WI	New Berlin, R.M. Elctrns.	414-784-4420
WI	New Berlin, Hamilton/Avnet	414-784-4510

MERCURY PLASTICS, A UNIT OF ZERO CORP., 672 Fuller Rd., Chicopee, MA 01020, Tel: 413-592-5118, 413-267-5561, TWX: 710-354-1450; Empl.: 100; *Sls. Mgr.:* Douglas W. Griffith; *Dist. Mgr.:* Douglas W. Griffith

MERECO PRODUCTS DIV., Metachem Resins Corp., 1505 Main St., West Warwick, RI 02893, Tel: 401-828-4550; Empl.: 100; *Sls. Mgr.:* John E. Powell, Jr.

MERET, INC., 1815 24th St., Santa Monica, CA 90404-4998, Tel: 213-828-7496, Telex: 371-9305; Empl.: 23; *Sls. Mgr.:* David Medved .... **1B**•1116

Local Sales Offices & Reps

CA	Carmichael, Acquironics	916-487-9070
CA	West Covina, Eureka Tech. Sls.	213-331-8766
CO	Wheatridge, C-Tech	303-431-7025
FL	Melbourne, Star-Tec	305-727-2247
GA	Snellville, Oliver Engrg. Svcs.	404-972-2249
IL	Des Plaines, Synmark Sls. Co.	312-296-0180
MA	Brookline, Boston Elctrn. Corp.	617-566-3821
TX	Seabrook, Q-Max Mktg.	713-474-2233

MERIX CHEM. CO., 2234 East 75th St., Chicago, IL 60649, Tel: 312-221-8242; Empl.: 15; *Sls. Mgr.:* E. O. Sonneman; *Dist. Mgr.:* E. O. Sonneman

MERRILL, POB 308, 1316 Sumneytown Pike, Gwynedd Valley, PA 19437, Tel: 215-643-2116; FSC No.: 58624; Empl.: 10; *Sls. Mgr.:* Skip Hartman

MERRIMAC INDS., 41 Fairfield Pl., West Caldwell, NJ 07006, Tel: 201-575-1300, Telex: 6853128, TWX: 710-734-4314; FSC No.: 12457; Empl.: 225; *Sls. Mgr.:* Gary Tahlmore; *Dist. Mgr.:* T.V.R.O. Prods. Only - Laurie Festa

Local Distributors

AL	Birmingham, Long's Electrns.	205-956-9341
AR	Beebe, Odom Antenna	501-882-6485
AR	Littlerock, Intl. Video Comms.	501-771-2800
CO	Englewood, Echosphere Corp.	303-935-1909
KS	Oakley, Precision Satellite	913-672-3247
NC	Oxford, Channel Master	919-693-3141
OR	Bend, Wespercom Corp.	503-389-0996
PA	Bensalem, Eastern Instr.	215-245-6660

MERRIMACK MAGNETICS CORP., 121 Hale St., Lowell, MA 01851, Tel: 617-458-1487; Empl.: 450; *Sls. Mgr.:* L. J. Woods; *Dist. Mgr.:* R. O. Ross

MESUR-MATIC ELCTRNS., 50 Grove St., Salem, MA 01970-2294, Tel: 617-745-7000; Empl.: 29; *Sls. Mgr.:* Kosma L. Evangelidis

Local Sales Offices & Reps

AZ	Phoenix, Richard A. Mayes Co.	602-279-5243
CA	Claremont, Gandalf Elctrns.	714-626-5481
CO	Denver, Richard A. Mayes Co.	303-761-9447
IL	Maywood, KGA Engrg. Co.	312-343-6500
KS	Wichita, Electro Mechanical Assocs.	316-682-9433
MD	Glen Burnie, Macrotech Assocs.	301-437-5588
MO	Bridgeton, Electro Mechanical Assocs.	314-291-8661
NM	Albuquerque, Richard A. Mayes Co.	505-292-2330
NY	Latham, L-Tron Corp.	518-785-5032
PA	Glenside, Wyncote Instr.	215-572-6500

METAVAC, INC., 45-68 162nd St., Flushing, NY 11358, Tel: 212-HI5-0400; Empl.: 52; *Sls. Mgr.:* Clifford E. Sisler

METEREX CORP., 25 Industrial Park Rd., Hingham, MA 02043, Tel: 617-749-8100; Empl.: 5; *Sls. Mgr.:* K. Sharples

Distributor

METERMASTER, 5645 Jullson St., Los Angeles, CA 90040, Tel: 213-685-4340 ....pgs. 611, 675, 678, 715, 736, 769, 792

METHODE ELCTRNS., INC., 7444 W. Wilson Ave., Chicago, IL 60656, Tel: 312-867-9600, TWX: 910-221-2468; Empl.: 900; *Sls. Mgr.:* John Klimek; *Dist. Mgr.:* K. Lindsey

METHODE ELECTRONICS, INC., Interconnect Prods Div; 1700 Hicks Rd, Rolling Meadows, IL 60008, Tel: 312-392-3500, TWX: 910-687-0760; FSC No.: 95354; Empl.: 250; *Sls. Mgr.:* L. W. Ekstrom; *Dist. Mgr.:* L. W. Ekstrom

METHODS RESEARCH, 54D Asbury Ave., Farmingdale, NJ 07727, Tel: 201-938-6000; *Sls. Mgr.:* J. James Mandy

METIER MANAGEMENT SYS., INC., 10175 Harwin Dr., Ste. 100, Houston, TX 77449, Tel: 713-988-9100, Telex: 774367 (Metier Hou); *Sls. Mgr.:* Don Gammon

METIS, P.O. Box 1499, Bowie, MD 20716, Tel: 301-249-1702; Empl.: 2; *Sls. Mgr.:* Eric K. Pritchard

METRA INSTRS., 2056 Bering Dr., San Jose, CA 95131, Tel: 408-297-8530; Empl.: 16; *Sls. Mgr.:* Gary Heil

Local Sales Offices & Reps

AL	Birmingham, Regal Controls	205-991-6340
CA	Anaheim, R. D. Brunnemer & Assocs., Inc.	714-525-1644
CO	Wheatridge, Emcar Mktg., Inc.	303-424-0108
FL	Jacksonville, W. K. Hile Co., Inc.	904-731-5595
GA	Marietta, W. K. Hile Co., Inc.	404-424-8372
IL	Chicago, Synergy Sys., Inc.	312-2021
MI	Detroit, Automatic Controls Co.	313-533-8890
MO	Penton, Hi-Tech Elec. Inc.	314-343-6060
NH	Portsmouth, The Valve Co.	603-431-5251
NY	Buffalo, Robert F. Lamb Co., Inc.	716-874-4900
NY	Rochester, Robert F. Lamb Co., Inc.	716-323-1250
NC	Matthews, W. K. Hile Co., Inc.	704-847-9125
OH	Cincinnati, Automatic Controls Co.	513-522-1118
OH	Cleveland, Automatic Controls Co.	216-631-0333
PA	Jenkintown, PCD Corp.	215-887-9610
TX	Houston, Abcor	713-486-9251

METRAPLEX CORP., Berkshire Indl. Park, Bethel, CT 06801, Tel: 203-748-0606, TWX: 710-456-3959; *Sls. Mgr.:* Charles B. Weaver

METRIC SYS., 645 Anchors St., Ft. Walton Beach, FL 32548, Tel: 904-244-9600, Telex: 70-2447; FSC No.: 12339; Empl.: 437

METRIX INSTRUMENT CO., 1711 Townhurst, Houston, TX 77043, Tel: 713-461-2131, Telex: 77-5486; Empl.: 50; *Sls. Mgr.:* A. J. Bahry

METRON OPTICS INC., P.O. Box 690, Solana Beach, CA 92075-0690, Tel: 619-755-4477; Empl.: 12; *Sls. Mgr.:* P. S. Kempf

METROPOLE PRODUCTS INC., P.O. Box 10275, Alexandria, VA 22310, Tel: 703-971-8606, 703-971-7082, Telex: 908041 BAL; FSC No.: 55908; *Sls. Mgr.:* John DePaola

METROSONICS, Box 23075, Rochester, NY 14692-3075, Tel: 716-334-7300, Telex: 978330; Empl.: 80; *Sls. Mgr.:* W. Whitford; *Dist. Mgr.:* W. Whitford

METUCHEN CAPACITORS, INC., 420 Park Ave., Perth Amboy, NJ 08861, Tel: 201-442-0500, TWX: 710-998-0892; FSC No.: 55969; Empl.: 25; *Sls. Mgr.:* George Wolter ....**1A**•1138-1146, 1602, 1603; **2**•1524-1527

MEYERCORD, 365 E. North Ave., Carol Stream, IL 60187, Tel: 312-682-6200, Telex: 72-2449; Empl.: 500; *Sls. Mgr.:* J. O'Brlskie

MFE CORP., Instr. Div., Keewaydin Dr., Bldg. #1, Salem, NH 03079, Tel: 603-893-1921, Telex: 94-7477, TWX: 710-366-1887; *Sls. Mgr.:* Peter Schwartz; *Dist. Mgr.:* Jim Muckenhoupt

MF ELCTRNS. CORP., 10 Renewal Pl., New Rochelle, NY 10801, Tel: 914-576-6570, TWX: 710-563-0643; FSC No.: 08111; Empl.: 65; *Sls. Mgr.:* Bill Braverman; *Dist. Mgr.:* Bill Braverman ....**1A**•1384-1386

Local Sales Offices & Reps

AL	Huntsville, E.M.A.	205-837-7363
CA	Irvine, J. V. Earley & Assocs.	714-833-1806
CA	Sunnyvale, W. W. Posey Co.	408-746-0771
CO	Littleton, Quatra Inc.	303-795-3187
CT	Meriden, Orion Group	203-621-8371
FL	Hollywood, APM Assocs.	305-987-6720
FL	Longwood, APM Assocs.	305-869-6831
FL	Tampa, AMP Assocs.	813-886-2457
GA	Norcross, E.M.A.	404-448-1215
IL	Addison, Banner Tech. Sls.	312-279-6070
MI	Brighton, A.P.J. Assocs.	313-229-6550
MN	Minneapolis, Peterson Sls. & Assoc.	612-884-3483
NJ	Perth Amboy, Astro Rep.	201-826-8050
NY	Rochester, Sweetco Assocs.	716-225-2383
NY	Utica, Sweetco Assocs.	315-733-6721
NY	W. Babylon, Astro Rep.	516-422-2500
NC	Greenville, E.M.A.	803-233-4637
NC	Winston-Salem, E.M.A.	919-722-5151
OH	Dayton, APJ Assoc.	216-356-2424
OR	Portland, Controltek Sls.	503-641-0877
PA	Prospect Park, ELF Sls.	215-534-3340
TX	Austin, Matthews & Assocs.	512-479-0028
TX	Dallas, Matthews & Assocs.	214-931-0167
WA	Bellevue, Controltek Sls.	206-451-8163
WI	Mukwonago, Banner Tech. Sls.	414-363-5086

Local Distributors

CA	Sunnyvale, Pacesetter	408-734-5470

MG ELECTRONICS

MG ELECTRONICS, 32 Ranick Rd., Hauppauge, NY 11788, Tel: 516-582-3400, Telex: 645113; Empl.: 14; *Sls. Mgr.:* Mel Karasik; *Dist. Mgr.:* Stan Grey ....**3**•1037

M.I.A.L., See TRW/Capacitor Div.

MICA CORPORATION, 8536 National Blvd., Culver City, CA 90230, Tel: 213-837-8100, Telex: WU 664336, ITT 4720769; FSC No.: 06216; Empl.: 300

Local Sales Offices & Reps

AZ	Glendale, Method Engrg.	602-846-7901
CA	Sunnyvale, The Mica Corp.	408-738-1020
FL	Sarasota, James N. Lordi	813-365-2992
MA	Pinehurst, Mica	617-272-1558
MN	Hopkins, Mica	612-933-3811
NC	Greensboro, DMI	919-885-4634
TX	Dallas, Stevens Sls.	214-350-2476

MICAP ELCTRNS., INC., 592 Oak St., Copiague, NY 11726, Tel: 516-842-8866; FSC No.: 61544; Empl.: 6; *Sls. Mgr.:* Bernard Lefenfeld

MICHIGAN MAGNETICS, 203 W. Third St., Vermontville, MI 49096, Tel: 517-726-0590; Empl.: 95; *Sls. Mgr.:* B. L. Killinger ....**3**•1038, 1039

Local Sales Offices & Reps

CT	Kensington, N. Stachelek Co.	203-828-4587
MN	Minneapolis, Countryman Assoc.	612-645-9151
WA	Bellevue, Panoco	206-454-2503

MICOM SYSTEMS, INC., 20151 Nordhoff Street, Chatsworth, CA 91311, Tel: 818-998-8844, Telex: 687-497, TWX: 910-494-4910; *Sls. Mgr.:* Mark Vonarx; *Dist. Mgr.:* Mark Vonarx

MICREL, INC., 1235 Midas Way, Sunnyvale, CA 94086, Tel: 408-245-2500, TWX: 910-379-0007; Empl.: 120

MICROAVIONICS CORP., 3198-K Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-957-6904; Empl.: 15; *Sls. Mgr.:* B. H. Corzine ....**2**•1781

Local Sales Offices & Reps

AZ	Phoenix, Finn-Pat Co.	602-954-0301
TX	Houston, RCG Entprs.	713-955-7200

MICROBAR SYS., INC., 1121 San Antonio Rd., Palo Alto, CA 94303, Tel: 415-964-2862, TWX: 910-373-2047; *Sls. Mgr.:* Rich Boberg

MICROBOND DIV., PO Box 689, Altamonte Springs, FL 32701, Tel: 305-339-8298, Telex: 56-4303; *Sls. Mgr.:* William S. Hodges

MICROCAP, 11120 Roselle St., San Diego, CA 92121, Tel: 619-452-9812, Telex: 695073, TWX: 910-335-1607; *Sls. Mgr.:* Debbie Toscano ....**1A**•1186-1188

MICRO-CIRCUIT ENGRG., See MCE Semiconductor

MICRO-CIRCUITS CO., INC., Route 1 - Box 518, New Buffalo, MI 49117, Tel: 616-469-2727

MICRO COMPONENT TECHNLG., INC., P.O. Box 64013, St. Paul, MN 55164, Tel: 612-482-5100, Telex: 297422; Empl.: 500; *Sls. Mgr.:* James Gibson

MICROCOMPUTER POWER, 2272 Calle de Luna, Santa Clara, CA 95050, Tel: 408-988-0265, TWX: 910-338-7694; Empl.: 60; *Sls. Mgr.:* Jim Armstrong; *Dist. Mgr.:* Jim Armstrong

MICRO COMPUTER RENTALS, 742D Hampshire Rd., Westlake Village, CA 91361, Tel: 213-991-1704

MICRODATA CORP., 17481 Red Hill Ave., Irvine, CA 92705, Tel: 714-540-6730, TWX: 910-595-1764; Empl.: 375

MICRO DEVICES PRODUCT GROUP, Therm-O-Disc, Inc., 1320 South Main Street, P.O. Box 3538, Mansfield, OH 44907, Tel: 419-756-5005, Telex: 987455; *Sls. Mgr.:* J. A. Kight ....**1B**•1823

MICRO DIGITAL ASSOCS., INC., 12791 Western Ave., Unit C, Garden Grove, CA 92641, Tel: 714-891-2363; *Sls. Mgr.:* Ralph Moore; *Dist. Mgr.:* Ralph Moore

MICRODRY CORP., Golden Grain Macaroni Co., 3111 Fostoria Way, San Ramon, CA 94583, Tel: 415-837-9106, Telex: 33-5320; Empl.: 40; *Sls. Mgr.:* Al Katskee

MICRO ELECTRONIC SYS., INC., 87 Sand Pit Road, Danbury, CT 06810, Tel: 203-797-1441, 800-243-7254, Telex: 969659

MICROFLECT, 3575 25th S.E., Salem, OR 97302-0985, Tel: 503-363-9267, TWX: 510-599-0107; Empl.: 98; *Sls. Mgr.:* John J. Kranitz

MICRO INSTR., 2250 Micro Pl., Escondido, CA 92025, Tel: 619-746-2010, Telex: 882205 MICROINST ESCD; FSC No.: FSCM 24836; Empl.: 45; *Sls. Mgr.:* C. Marks

Local Sales Offices & Reps

CO	Conifer, Energy Equip. Sls.	303-674-8111
FL	Clearwater, Teqspec Inc.	813-725-2201
GA	Atlanta, Teqspec II	404-455-7222
MA	Natick, Wayland Engr. Sls.	617-655-6080
MO	Platte City, Stantec Sales	816-464-2211
NJ	Englewood Cliffs, Power Conversion & Conts.	201-569-0015
NC	Winston Salem, Teqspec III	919-723-8102
TX	Allen, Harris Tech. Sls.	214-727-2182

MICROLAB/FXR, 10 Microlab Rd., Livingston, NJ 07039, Tel: 201-992-7700, TWX: 710-994-4850; FSC No.: 00929; Empl.: 80

MICRO LAMPS, INC., 1N111 Linlar Rd., La Fox, IL 60147, Tel: 312-232-6001; *Sls. Mgr.:* R. Marimatsu

MICRO LOGIC CORP., P.O. Box 174, 100 2nd St., Hackensack, NJ 07602, Tel: 201-342-6518

MICROLOGIC, INC., 123 Water St., Watertown, MA 02172, Tel: 617-923-1700; *Sls. Mgr.:* Erick Kapust

MICROMETALS, 1190 N. Hawk, Anaheim, CA 92807, Tel: 714-630-7420, TWX: 910-591-1690; FSC No.: 12856; Empl.: 40; *Sls. Mgr.:* K. Baker, Jr.

Local Sales Offices & Reps

MA	Newton Upper Falls, Anchor Engrg.	617-964-6416
NY	Hempstead, Kahgan Sls.	516-538-2300
TX	Dallas, Southwest Elctrns.	214-690-9881

MICRO MODE PRODS., 1870 John Towers Ave., El Cajon, CA 92020, Tel: 619-449-3844, TWX: 910-331-1673; FSC No.: 15907; Empl.: 40; *Sls. Mgr.:* L. Moore; *Dist. Mgr.:* L. Moore

MICRO MO ELECTRONICS, INC., 742 2nd Ave. S., St. Petersburg, FL 33701, Tel: 813-822-2529, Telex: 807-982; Empl.: 25; *Sls. Mgr.:* Christine Contos .... **1B**•1164, 1165, 1849; **3**•1135

MICRO-MOUNTING DEVICES, 4092 Keith Dr., Campbell, CA 95008, Tel: 408-866-4626; FSC No.: 59058

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MICRONEL U.S., 2142F Industrial Ct., Sycamore Research Center, Vista, CA 92083, Tel: 619-727-7400; Empl.: 20; *Sls. Mgr.:* S. William Linko ... **2**•1830-1838

Local Sales Offices & Reps

MA	Lexington, Micronel U.S.-E.	617-862-1202

MICRONETICS, 36 Oak St., Norwood, NJ 07648, Tel: 201-767-1320, TWX: 710-991-9603; FSC No.: 54487; Empl.: 26; *Sls. Mgr.:* Gary Simonyan

MICRO NETWORKS, 324 Clark St., Worcester, MA 01606, Tel: 617-852-5400, Telex: 951808, TWX: 710-340-0067; Empl.: 300

MICRON INDS., 1830 N. 32nd Ave., Stone Park, IL 60165, Tel: 312-345-0788, Telex: 27-0248; FSC No.: 30882; Empl.: 100; *Sls. Mgr.:* Dave Hayes

MICRO-NOW INSTR. CO., INC., 8260 N. Elmwood St., P.O. Box 856, Skokie, IL 60077, Tel: 312-677-4700, Telex: RCA 297214-MICRO-UR; FSC No.: 33288; Empl.: 25; *Sls. Mgr.:* C. Arnow

Local Sales Offices & Reps

CA	Los Angeles, Mc Dougall/Mc Laughlin	213-477-8556
CA	Mountain View, Mark V Assoc.	415-964-6275
CO	Boulder, H. Bass Assocs.	303-499-7509
CT	North Haven, Pat Jenks Assoc.	203-239-6201
MA	Woburn, Pat Jenks Assoc.	617-938-0488
NM	Albuquerque, IMEC	505-344-2212
NY	Huntington Station, Metro-Mic	516-GE3-3333
PA	Melrose Park, Robert Meyers Assoc.	215-224-1663
TX	Dallas, Texas Avionics	214-368-3566
WA	Seattle, Datacom	206-285-2525

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Local Sales Offices & Reps

AZ	Scottsdale, Burke Hill & Assoc.	602-945-9116
CA	Laguna Hills, Cravins Assoc.	714-855-4327
CA	Northridge, Myco Sls.	213-886-7101
CA	Rancho Cordova, Alpha Omega Grp.	916-638-0480
CA	San Diego, Cerco	619-450-1754
CA	San Marino, Walls Assoc.	213-287-7276
CO	Denver, William Purdy Co.	303-777-1411
FL	DeBary, DJE Assoc.	305-668-6827
IL	Woodridge, Trend-Tronics	312-985-0626
MA	Canton, N E E S Co.	617-828-4835
NM	Albuquerque, Wm. J. Purdy Co.	505-266-7959
OH	Cleveland, Jim Finnigan & Co.	216-238-5905
OR	Beaverton, Wm. J. Purdy Co.	503-641-9373
UT	Salt Lake City, Wm. J. Purdy Co.	801-486-8557

Local Distributors

CA	Anaheim, A to Z Elctrns.	714-634-3620
CA	Burbank, TAW Elctrns.	213-846-3911
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Canoga Park, Myco-Vickers	213-340-2025
CA	Costa Mesa, Orange County Comps.	714-979-3597
CA	Industry, Ital Elctrn. Sls.	213-968-8515
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	Santa Ana, Compuserv	714-546-5140
IL	Des Plaines, Circuit Svc.	312-296-4412
MN	Minneapolis, Electronic Ctr.	612-371-5200
NE	Omaha, Radio Equip. Co.	402-341-7700
NH	Hampstead, Astrum Elctrns.	603-329-5656
NY	New Rochelle, Derf Elctrns.	914-235-4600
NY	Oceanside, Tritech	516-678-6222
OH	Toledo, J R Inds.	419-865-1408
PA	McKean, Advacom	814-476-7774
TX	Ft. Worth, Industrial Elect.	817-731-7321
UT	Provo, Central Utah Elctrns. Supp.	801-373-7522
UT	Salt Lake City, Nytronics	800-242-7612
Intl	Japan, Tokyo, Yoshico Intl.	03-230-2641

MICROPAC INDS., 905 E. Walnut St., Garland, TX 75040, Tel: 214-272-3571, TWX: 910-860-5186; Empl.: 135; *Sls. Mgr.:* Dick Schlueter

MICROPAC INDS., INC., General Sensors Div., 905 E. Walnut St., Garland, TX 75040, Tel: 214-272-3571, TWX: 910-860-5186; Empl.: 120; *Sls. Mgr.:* Richard Schlueter

MICRO PERIPHERALS INC., 9754 Deering Ave., Chatsworth, CA 91311, Tel: 213-709-4202, TWX: 910-494-1213; Empl.: 400; *Sls. Mgr.:* Keith Murphy; *Dist. Mgr.:* Robert Lewis

MICROPHASE, 587 Connecticut Ave., Norwalk, CT 06856, Tel: 203-866-8000, TWX: 710-468-0003; Empl.: 180; *Sls. Mgr.:* F. S. Parin

MICRO PLASTICS INC., 20821 Dearborn St., Chatsworth, CA 91311

MICRO PLASTICS INC., Highway 178 N., Flippin, AR 72634, Tel: 501-453-2261, Telex: 783-036; FSC No.: 13764; *Sls. Mgr.:* James H. Beijen; *Dist. Mgr.:* James H. Beijen

MICROPLEX, inc.

MICROPLEX, INC., 1977 State College Blvd., Anaheim, CA 92806, Tel: 714-979-8833, 714-634-1535; Empl.: 30 .... **1A**•1897

MICRO POWER INTL., INC., 9420 Activity Rd., San Diego, CA 92126, Tel: 619-271-0831

MICRO POWER SYS. INC., 3100 Alfred St., Santa Clara, CA 95050, Tel: 408-727-5350, TWX: 910-338-0154; FSC No.: 54186; Empl.: 305; *Sls. Mgr.:* Don Cavallo; *Dist. Mgr.:* Reed Neddermeyer

MICRO-PRODUCTS ENGRG. CO., 230 Ridgewood Ave., Newark, NJ 07108, Tel: 201-824-8467; Empl.: 100; *Sls. Mgr.:* Gerald Muller

MICROSCIENCE, INC., 110A Jerusalem Rd., Cohasset, MA 02025, Tel: 617-383-1622, Telex: 750-480; *Sls. Mgr.:* Toni Z. Drybanski

MICRO SEMICONDUCTOR, 2830 S. Fairview St., Santa Ana, CA 92704, Tel: 714-979-8220, TWX: 910-595-1576; FSC No.: 14552; Empl.: 250; *Sls. Mgr.:* M. Gregson; *Dist. Mgr.:* M. Gregson

MICROSONICS INC., 60 Winter St., Weymouth, MA 02188, Tel: 617-337-4200, TWX: 710-388-6833; FSC No.: 11869; Empl.: 165; *Sls. Mgr.:* Frank Manning .... **1A**•1383

Local Sales Offices & Reps

CA	Los Altos, Kolm Mktg.	415-948-2635
CA	Los Angeles, D & G	213-641-7976
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-443-2698
FL	Melbourne, Lawrence Assocs.	305-724-8294
MD	Ellicott City, V.P.I.	301-461-2525
MA	Needham, O'Sullivan & Murphy	617-449-4141
MO	Kansas City, EIR	816-452-7030
MO	Leesburg, EIR	314-245-6860
NJ	Cherry Hill, Danco	609-424-5590
NY	Melville, Metro Mics	516-271-6677
TX	Houston, Lear Assocs.	713-777-5509
TX	Richardson, Lear Assocs.	214-231-5388
WA	Seattle, John Spaulding	206-282-9173

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Local Sales Offices & Reps

CA	Orange	714-558-7400
CA	San Jose	408-977-3008
CO	Englewood	303-779-6439
CT	Hartford	203-695-4011
GA	Atlanta	404-982-2565
IL	Bensenville	312-860-3968
IA	Bettendorf	319-359-3441
MA	Newton	617-969-0265
MI	Southfield	313-424-3569
MN	Minneapolis	612-830-3516
MO	St. Louis	314-576-2518
NJ	Westfield	201-233-9200
NY	Elmsford	914-592-3200
NY	Rochester	716-424-2700
NC	Charlotte	704-364-4770
OH	Brooklyn Heights	216-459-6075
OH	Dayton	513-237-4075
PA	Valley Forge	215-666-8340
TX	Dallas	214-688-7533
TX	Houston	713-780-6651
WA	Bellevue	206-453-7591
WI	Brookfield	414-784-6260

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MICRO/SYS, 1011 Grand Central Ave., Glendale, CA 91201-3010, Tel: 818-244-4600, TWX: 910-588-1988; *Sls. Mgr.:* Ian Evans

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AL	Huntsville, Dixie Tech. Mktg	205-536-5938
CA	Anaheim, M.S.C.	714-978-0721
CA	Santa Clara, Zytronix	408-730-1263
FL	Maitland, Lobo Mktg. Assocs.	395-628-8911
FL	New Port Richey, Lobo Mktg. Assocs.	813-848-8578
FL	Tamarac, Lobo Mktg. Assocs.	305-735-2210
GA	Stone Mountain, Dixie Tech. Mktg.	404-962-2530
IN	Ft. Wayne, Augnat	219-483-0259
MD	Baltimore, Rep-Tron	301-799-7490
MA	Chelmsford, Bomara Assocs.	617-452-2299

MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	Minneapolis, Prairie Assocs.	612-559-7550
NJ	Ho-Ho-Kus, Alto Assocs.	201-447-1770
NY	Fayetteville, Maty Andrews Mfrs. Rep.	315-637-5291
NY	Lindenhurst, Alto Assocs.	516-957-2772
NY	New Rochelle, Alto Assocs.	914-834-3771
NC	Winston Salem, Dixie Tech. Mktg.	919-833-4711
OH	Akron, Augnat	216-273-1211
PA	Glenside, Wyncote Instrmntn. Co.	215-572-6500
PA	Pittsburgh, Augnat	912-281-8983
TX	Dallas, Dyna Mktg.	214-243-7994
TX	Houston, Dyna Mktg.	713-460-0314
WI	Waukesha, Computer and Sys. Sls.	414-544-1141

MICROSYSTEMS DEV. CORP. INC., 1560 Teaneck Rd., Teaneck, NJ 07666, Tel: 201-837-0051, Telex: 13-6479 Att. 296; *Sls. Mgr.:* L. G. Mansoor

MICROTECH, 1420 Conchester Hwy., Boothwyn, PA 19061, Tel: 215-459-3566; Empl.: 22; *Sls. Mgr.:* H. Carter

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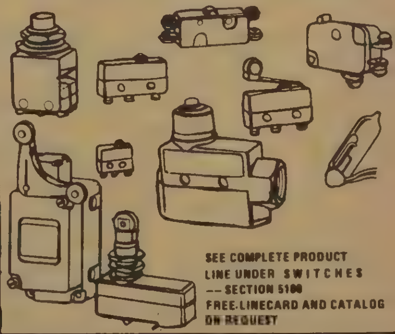

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MIZAR INC.

MIZAR INC., 302 Chester St., St. Paul, MN 55107, Tel: 612-224-8941, Telex: 469542; Empl.: 11; *Sls. Mgr.:* Susan Roth .... 3•1113

Local Sales Offices & Reps

AZ	Tempe, Foley, Tallent & Lee Inc.	602-894-2345
CA	Long Beach, B. K. & Associates	213-596-1233
CA	San Jose, Data-Rep Inc.	408-279-1212
FL	Melbourne, Star-Tec Co.	305-727-2247
MA	Waltham, Com-Sls. Inc.	617-890-0011
MN	Minneapolis, D. A. Case & Assoc.	612-888-8666
NJ	Springfield, Gebhardt Mktg. Inc.	201-376-4415
OH	Strongsville, Dolfuss Root & Co.	216-238-0300
PA	Hatboro, Electro-Rep Engrg.	215-674-4421
PA	Ivyland, Technico	215-322-5966
TX	Austin, Acudata, Inc.	512-346-4033
TX	Houston, Acudata, Inc.	713-580-2451

MKC ELCTRNS., 454 E. Donovan Rd., Kansas City, KS 66115, Tel: 913-371-1351; Empl.: 26

MKS INSTRS., INC., 22 Third Ave., Burlington, MA 01803, Tel: 617-272-9255, Telex: 94-9375; Empl.: 130

MOBILE-TRONICS CO., INC., Box 1022, Tustin, CA 92680, Tel: 714-768-4271; Empl.: 2

MODICON PROGRAMMABLE CONTROL DIV., Gould Inc., P.O. Box 83 S.V.S., Andover, MA 01810, Tel: 617-475-4700, Telex: 94-7402, TWX: 710-347-6610; *Sls. Mgr.:* Steven Mader (PC's); John Pemble (Motion Control); *Dist. Mgr.:* George Dannecker (Micro 84)

MODULAR COMPUTER SYSTEMS, P.O. Box 6099, Ft. Lauderdale, FL 33310, Tel: 305-974-1380, Telex: 52-2564, TWX: 510-956-9414; Empl.: 950

MODULAR AUDIO PRODS., Modular Devices Inc., 50 Orville Dr., Bohemia, NY 11716, Tel: 516-567-9620; *Sls. Mgr.:* S. Summer .... 3•1012

Local Sales Offices & Reps

CA	San Diego, Total Elctrns. Intl., Inc.	619-224-3291

MODULAR DEVICES, 50 Orville Dr., Bohemia, NY 11716, Tel: 516-567-9620; FSC No.: 52202; Empl.: 40; *Sls. Mgr.:* Julius Brick .... 3•1012, 1933

Local Sales Offices & Reps

NY	Rochester, T.T.A. North-Div. Tri-Tek Assoc.	716-271-6764
NY	Wantaugh, Tri-Tek Assocs.	516-221-7600
EXP	CA, San Diego, Total Elctrns. Int'l.	619-224-3291

MODULAR POWER SYS. INC., P.O. Box 180579, Austin, TX 78718-0579, Tel: 512-834-9262, Telex: 752-890; FSC No.: 58480; Empl.: 86; *Sls. Mgr.:* Manard Overall; *Dist. Mgr.:* Manard Overall

MODULAR SYSTEMS, 905 Albemarle St., Charlottesville, VA 22901, Tel: 804-295-7882; Empl.: 5; *Sls. Mgr.:* G. L. Blencowe

MODUTEC, 18 Marshall St., Norwalk, CT 06854, Tel: 203-853-3636, TWX: 710-468-2039; Empl.: 300; *Sls. Mgr.:* Lester A. Velez; *Dist. Mgr.:* William J. Betz .... 3•1335-1337

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assocs.	205-881-5031
AK	Anchorage, Denali Indl. Sls.	907-243-6283
AZ	Scottsdale, Luscombe Engrg. Co.	602-949-9333
AR	Little Rock, Beacon Elec. Assoc.	501-224-5449
CA	Campbell, Luscombe Engrg. Co.	408-370-2020
CA	Pasadena, Luscombe Engrg. Co.	213-684-2000
CO	Arvada, Arrowhead Sls. Co.	303-423-5556
FL	Clearwater, Beacon Elec. Assoc.	813-796-2378
FL	Ft. Lauderdale, Beacon Elctrn. Assoc.	305-491-1054
FL	Maitland, Beacon Elctrn. Assocs.	305-647-3498
FL	Melbourne, Beacon Elec. Assoc.	305-724-8010
GA	Atlanta, Beacon Elctrn. Assocs.	404-256-9640
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Arlington Hgts., Brainard-Wilson Mktg.	312-437-2700
IN	Carmel, Carter, McCormic & Peirce	317-844-4175
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
IA	Marion, M-S-B Assocs.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs.	913-432-2131
MD	Randallstown, Beacon Elec.	703-534-7200
MA	Canton, New England Elctrn. Sls. Corp.	617-828-4835
MI	Farmington, Carter, McCormic & Peirce	313-477-7700
MN	Minneapolis, R.J. Inc.	612-866-3661
MO	St. Charles, M-S-B Assocs.	314-946-5577
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NJ	Marmora, Holdsworth & Co.	609-398-4340
NM	Albuquerque, Amonette Entprs.	505-344-4143
NY	Bainbridge, R. W. Mitscher	607-697-7192
NY	Buffalo, R. W. Mitscher	716-633-7970
NY	N. Syracuse, R. W. Mitscher	315-458-1321
NY	Pittsford, R. W. Mitscher	716-586-4012
NY	Red Hook, R. W. Mitscher	914-758-8375
NY	Rochester, R. W. Mitscher	716-227-0839
NC	Greensboro, Beacon Elctrn. Assoc.	919-275-9997
NC	Raleigh, Beacon Elctrn.	919-787-0330
OH	Cleveland, Carter, McCormic & Peirce	216-779-5100
OH	Englewood, Carter, McCormic & Peirce	513-836-0951
OR	Beaverton, Barrett-Squibb & Assoc.	503-644-2550
PA	Monroeville, Carter, McCormic & Peirce	412-372-4415
PA	Newtown Square, Holdsworth & Co.-SWR	215-356-8550
TX	Houston, Scientific Sls. Co.	713-460-9170
TX	Richardson, Scientific Sls. Co.	214-231-6541
UT	Salt Lake City, Arrowhead Sls.	801-261-1661
VA	Fairfax, Beacon Elctrns.	703-591-1300
VA	Forrest, Beacon North	804-239-8486
WA	Redmond, Barrett Squibb, Inc.	206-885-6991
WI	Colgate, Rep-1 Assoc.	414-628-4016
EXP	Freeport, Minthorne	516-546-4700

Local Distributors

AL	Birmingham, Brownell Electro	205-322-3374
AL	Huntsville, Component Distrs.	205-883-7501
AL	Mobile, Brownell Electro	205-479-8581
AR	Little Rock, Component Distrs.	501-227-6278
CA	Inglewood, Force Elctrns.	213-776-1324
CA	Los Angeles, Erlanger Sls.	213-731-2238
CA	Los Angeles, Erlanger Sls. Co.	213-731-2238
CA	Santa Clara, Fisher-Brownell	408-988-6041
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
FL	Miami, Brownell Electro	305-591-3215
FL	Orlando, Brownell Electro	305-843-6770
GA	Hapeville, Brownell Electro	404-762-5181
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, Meter Master	312-593-8650
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
MD	Gaithersburg, Pioneer Instrumentation	301-921-0660
MA	Canton, E.D.S. Inc.	617-828-4835
MA	Woburn, Brownell Electro	617-935-7820
MA	Woburn, Abbott Elctrns.	617-935-2040
MI	Ferndale, RAM Meter	313-398-6767
MO	St. Louis, Olive Elctrns.	314-426-4500
NJ	Belleville, Miscorp	201-751-1190
NJ	Fairfield, Ampower Elctrn. Instr.	201-227-7720
NJ	S. Plainfield, Brownell Electro	201-753-4600
NY	Clarence, Trott Elctrns.	716-634-8500
NY	New York, Brownell Electro	212-691-1171
NY	Pittsford, Trott Elctrns.	716-586-8251
NC	Charlotte, Brownell Electro	704-597-1270
NC	Raleigh, Brownell Electro	919-876-6524
NC	Raleigh, Component Distrs.	919-781-0262
OH	Cleveland, Weschler Elec. Co.	216-238-2550
OH	Cleveland, Pioneer Instrumentation	216-587-3600
OH	Dayton, Pioneer Instrumentation	513-236-9900
PA	Norristown, Kimberly-James Co.	215-666-7286
SC	Columbia, Brownell Electro	803-772-6111
TN	Chattanooga, Techni-Tronics	615-875-5449
TN	Knoxville, Brownell Electro	615-966-3441
TN	Memphis, Brownell Electro	901-795-8483
TN	Nashville, Brownell Electro	615-889-8230
TX	Dallas, Inotek Corp.	214-243-7000
TX	Ft. Worth, Inotek Corp.	817-831-2126
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Brownell Electro	713-699-1981
TX	Houston, Inotek Corp.	713-688-4494
TX	Houston, American Analog	713-941-7265
WA	Seattle, Eicher-Richards Co.	206-523-7888
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Milwaukee, E-M Instrs.	414-272-7799

MODU-TEL CORP., 1429 N. Halstead, Hutchinson, KS 67501, Tel: 316-662-3302, Telex: 469331 COMTRON CI; Empl.: 5; *Sls. Mgr.:* Paul Bascom

MOHAWK DATA SCIENCES, MDS Center, Herkimer, NY 13350, Tel: 315-866-5300, Telex: (71)662032; Empl.: 4500

MOHAWK WIRE & CABLE CORP., 9 Mohawk Drive, Leominister, MA 01453, Tel: 617-537-9961

MOLDCON CORP., 221 Interstate Dr., W. Springfield, MA 01089, Tel: 413-736-0371, TWX: 710-350-6463; *Sls. Mgr.:* James Loeffler

MOLDING TECHNOLOGY INC., See MTI

MOLDTRONICS, INC., 707 Roger St., Downers Grove, IL 60515, Tel: 312-968-7000, TWX: 910-695-3537; Empl.: 140; *Sls. Mgr.:* Jim Arnold

Local Sales Offices & Reps

CA	Topauga, S-J-N Sales	213-455-1813
FL	Vero Beach, Peter Martinet	305-567-8413
IL	Downers Grove, Momak Sales	312-963-6400
IN	Indianapolis, Butler Sls. & Engrg.	317-253-5143
MN	St. Paul, PDO Comps.	612-690-5215
OH	Dayton, H. G. Lake Co.	513-277-8181
PA	Lancaster, Thomas G. Armstrong Assoc.	717-397-2942
RI	Wickford, R. P. Morrison Co.	401-295-5692

MOLECU-WIRE, P.O. Box 495, Farmingdale, NJ 07727, Tel: 201-938-9473, TWX: 710-723-6943; Empl.: 175

Local Sales Offices & Reps

CA	Montrose, Roger D. Dahl	213-245-3817
CT	Orange, KLS Sls.	203-795-6210
IL	Northbrook, Jack Norlie Assocs.	312-498-3657
KS	Shawnee Mission, B.C. Elctrn. Sls.	913-342-1211
NC	Charlotte, QED	704-525-3053
PA	Ligonier, Patterson Elec.	412-238-6238
WA	Seattle, Comptronics	206-284-4842
WI	Mequon, Robco	414-241-3348

MOLEX, 2222 Wellington Ct., Lisle, IL 60532, Tel: 312-969-4550, TWX: 910-695-3227; Empl.: 2,200; *Sls. Mgr.:* Gregg Johnson; *Dist. Mgr.:* Pat Weber

Local Sales Offices & Reps

AL	Huntsville, Dennis Andrew	404-396-6120
AZ	Scottsdale, Luscombe Engrg. Co.	602-949-9333
AR	Little Rock, Glenn Montgomery	501-666-0260
CA	Costa Mesa, Molex (W Reg. Off.)	714-241-8588
CA	Encino, Dow Lebowski	714-241-8588
CA	Mission Viejo, Tony Scutetta	714-241-8588
CA	San Diego, Al Batza	619-241-8588
CA	Sunnyvale, Molex	408-773-0505
CO	Englewood, Thorson Rocky Mountain	303-779-0666
CT	West Hartford, Randy Stone	617-935-8983
FL	North Palm Beach, Chuck Vincent	404-396-6120
FL	St. Petersburg, Molex	404-396-6120
GA	Atlanta, Molex (SE Reg. Off.)	404-396-6120
IL	Crystal Lake, E.S. Healy & Assocs.	815-459-4386
IN	Connersville, George Allen	317-844-8986
IN	Indianapolis, Steve Byrne	317-844-8986
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
KY	Louisville, Glen Towater	404-396-6120
KY	Taylorsville, Jim Lieb	404-396-6120
MD	Bethesda, Molex	404-396-6120
MA	Mansfield, Paul Hansen	617-935-8983
MA	Marblehead, Pete Evans	617-935-8983
MA	Woburn, Molex (E Reg. Off.)	617-935-8983
MI	Grand Rapids, Mark Fluga	616-957-1205
MI	Royal Oak, Schwegman & Assocs.	313-542-6767
MN	Edina, Mark Boe	612-893-9029

MO	Gladstone, Mark Rider	214-247-7117
MO	Independence, Dy-Tronix Inc.	816-373-6600
NJ	Washington, Oscar Cobian	201-267-8014
NY	Webster, Joe Schmitt	716-223-6899
NC	Raleigh, Molex Inc.	404-396-6120
OH	Geneva, Bill Hyslop	216-466-9244
OR	Lake Oswego, Gary Rohde	503-636-7558
PA	Rosemont, Ed M. Sullivan	617-935-8983
TN	Knoxville, Insul Reps.	615-691-7586
TX	Austin, Daniel Daneff	512-453-1398
TX	Dallas, Dale Otten	214-247-7117
TX	Manchaca, Max Bassler	512-453-1398
UT	West Valley, Thorson Rocky Mountain	801-973-7969
WA	Redmond, Molex	206-881-2042
PR	Hato Rey, Max Anderson Co.	809-751-2202

MOLON MOTOR & COIL CORP., 3737 Industrial Ave., Rolling Meadows, IL 60008, Tel: 312-259-8700, TWX: 910-687-0428; Empl.: 350; *Sls. Mgr.:* J. Bailey

MONITOR LABS, INC., 10180 Scripps Ranch Blvd., San Diego, CA 92131, Tel: 619-578-5060, Telex: 182794

MONITOR PC

MONITOR PRODS. CO., INC., 502 Via Del Monte, Oceanside, CA 92054, Tel: 619-433-4510, TWX: 910-322-1381; FSC No.: 54331 **1A**•1387-1389

Local Sales Offices & Reps

AL	Huntsville, CSR Elctrns.	205-533-2444
AZ	Phoenix, Eltron	602-266-2164
CA	Encino, Great American Rep Co.	818-990-4870
CA	Mountain View, West Mark Assocs.	415-969-1700
CA	San Diego, Rep Co.	619-292-9001
CA	Tustin, Great American Rep. Co.	714-832-8113
CO	Aurora, Electrodyne	303-695-8903
CT	Woodbury, Lindco Assocs.	203-263-0629
FL	Lake Worth, Tech-Rep Assocs.	305-968-7792
FL	Melbourne Beach, Tech-Rep Assocs.	305-725-4655
FL	St. Petersburg, Tech-Rep Assocs.	813-577-2779
GA	Atlanta, CSR Elctrns.	404-396-3720
IL	Downers Grove, Momak Sls.	312-963-6400
IA	Davenport, Ensco Rep	319-386-6600
KS	Overland Park, Ensco Rep	913-381-7557
KS	Wichita, Ensco Rep	316-683-1070
MA	Stow, Today Comps. Sls.	617-897-7500
MN	Eden Prairie, Elctrn. Innovators	612-941-0830
MO	Maryland Heights, Ensco Rep	314-423-3935
NY	Nekvukke, Parallax	516-351-1000
NC	Matthews, CSR Elctrns.	704-847-1927
NC	Raleigh, CSR Elctrns.	919-878-9200
OH	Dayton, Berberich & Assocs.	513-433-0342
OR	Aloha, Micro Sales	503-642-1818
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TX	Austin, Mil-Rep Assocs.	512-258-2828
TX	Houston, Mil-Rep Assocs.	713-937-0127
TX	Richardson, Mil-Rep Assocs.	214-644-6731
UT	Salt Lake City, Electrodyne	801-486-3801
VA	Fairfax, Beacon North	703-591-1300
WA	Bellevue, Micro Sales	206-451-0568
WI	Mukwonago, Momak Sls.	414-363-7744

MONOLITHIC COMPONENTS CORP., 6828 Nancy Ridge Drive, San Diego, CA 92121, Tel: 619-457-1727

MONOLITHIC SYS., 84 Inverness Circle E., Englewood, CO 80112, Tel: 303-790-7400, Telex: 45-4498; Empl.: 100; *Sls. Mgr.:* Mike Hart

MONSANTO CO., 800 N. Lindbergh Blvd., St. Louis, MO 63167, Tel: 314-694-1000, Telex: 44-7282 **2**•1085-1087

MONSANTO-ELECTRONICS DIV., See General Instr., Optoelctrns. Div.

MOODY TOOLS, 43 Crompton Ave., E. Greenwich, RI 02818, Tel: 401-885-0911; Empl.: 11; *Sls. Mgr.:* J. H. Moody; *Dist. Mgr.:* D .H. Moody

Local Sales Offices & Reps

CA	San Carlos, W. M. S. Co.	415-591-7043
CO	Denver, A-E-S	303-777-8733
FL	Winter Park, Floritronics	305-886-4818
IL	Palatine, Witz-Knight, Inc.	312-358-5990
KS	Overland Park, Modern Mktg. Co.	913-341-2426
MD	Baltimore, Coastline Sls. Co.	301-828-8520
NY	New York, Lane-Mizner Assocs.	212-889-9711
NY	Orchard Park, S & B Indl. Sls.	716-662-5988
OH	St. Marys, Thomas Shelby & Co.	419-394-3377
OR	Portland, Joseph V. BeLusko Co.	503-222-4279
RI	Barrington, Kilburn Assocs.	401-437-1839
EXP	IL, Northbrook, Vaco/Intl.	312-564-3300

MORRIS, J. I., CO., 372 Elm St., Southbridge, MA 01550, Tel: 617-764-4394; Empl.: 45

MORRIS ENTPRS., 16799 Schoenborn St, Sepulveda, CA 91343, Tel: 213-894-9103, Telex: 6-74681, TWX: 910-496-1525; FSC No.: 54918; Empl.: 40; *Sls. Mgr.:* J. Dumpert

MOSS CO., See Electron General

MOTION CONTROL DEVICES, INC., 80 Steadman St., Lowell, MA 01851, Tel: 617-454-3704, Telex: 955318-INTL-DIV-ATTEN-MCD-I; Empl.: 25; *Sls. Mgr.:* Joe Laliberte

MOTOROLA INC., Auto. & Indl. Elctrns. Grp., 1299 E. Algonquin Rd., Schaumburg, IL 60196, Tel: 312-576-4850, Telex: 722443; *Sls. Mgr.:* Jay A. Bonk

MOTOROLA INC.

Component Products

MOTOROLA, INC., Compt. Divs. Clock Oscillator Dept., 2553 N. Edgington, Franklin Park, IL 60131, Tel: 312-451-1000, TWX: 910-227-0799; Empl.: 1400; *Sls. Mgr.:* Barnie III; *Dist. Mgr.:* Ted Hoffman **1A**•1390, 1391; **3**•1413

Local Sales Offices & Reps

AL	Huntsville, R. O. Whitesell	205-883-5110
AZ	Scottsdale, Thorson Desert States	602-998-2444
AR	Ft. Smith, Electra Reps.	501-452-4030
CA	Campbell, Kottmeier Assocs.	408-866-5153
CA	Fullerton, Groh Assoc.	714-738-7150
CO	Englewood, Thorsen Co.	303-779-0666
FL	Clearwater, Perrott Assocs.	813-443-5414
FL	Orlando, Perrott Assocs.	305-298-7748
FL	Sunrise, Perrott Assocs.	305-792-2211
GA	Norcross, Glen White Assoc.	404-441-1447
IL	Rolling Meadows, KMA Sls. Co.	312-398-5300
IN	Fort Wayne, R. O. Whitesell	219-432-5591
IN	Indianapolis, R. O. Whitesell	317-359-9283
IA	Cedar Rapids, Comstrand	319-377-1575
MD	Timonium, Glen White Assoc.	301-252-6360
MA	Natick, Wayland Engrg. Sls.	617-655-6080
MI	Southfield, R. O. Whitesell Assoc.	313-559-5454
MI	St. Joseph, R. O. Whitesell Assoc.	616-983-7337
MN	Minneapolis, Comstrand	612-788-9234
MO	St. Louis, Abrams Assoc.	314-569-0447
NM	Albuquerque, Thorsen Desert States	505-293-8555
NY	Great Neck, Trionic Assoc.	516-466-2300
NY	Rochester, Ossmann Comp. Sls.	716-442-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NC	Raleigh, Glen White Assoc.	919-787-7016
OH	Cincinnati, R. O. Whitesell	513-521-2290
OH	Cleveland, R.O. Whitesell & Assoc.	216-447-9020
OH	Columbus, R. O. Whitesell	614-888-9396
OH	Dayton, R. O. Whitesell	513-298-9546
OK	Tulsa, H. J. Daly Co.	918-494-7711
OR	Tigard, Elctrn. Sources	503-684-0040
PA	Glenside, Koebert Assoc.	215-887-2310
PA	Pittsburgh, R. O. Whitesell	412-963-6161
TN	Gray, Glen White Assoc.	615-477-8850
TX	Dallas, Electra Reps.	214-387-3594
TX	Houston, Electra Reps.	713-530-2208
UT	West Valley City, Thorsen Co.	801-973-7969
VA	Colonial Beach, Glen White Assoc.	804-224-7764
VA	Lynchburg, Glen White Assoc.	804-237-6291
WA	Bellevue, Electronic Sources	206-451-2530
WI	Milwaukee, KMA Sls. & Co.	414-259-1771
EXP	IL, Franklin Pk., Motorola	312-451-1000

MOTOROLA INC.

MOTOROLA SEMICONDUCTOR PRODS. SECTOR, Adv. 72, Box 20912, Phoenix, AZ 85036, Tel: 602-244-6900, TWX: 910-951-1334; FSC No.: 04713; *Sls. Mgr.:* Brian Hilton; *Dist. Mgr.:* John Dunleavy **1A**•1667-1677, 2086, 2099-2105; **1B**•1117; **3**•1114-1116

Local Sales Offices & Reps

AL	Huntsville	205-830-1050
AZ	Phoenix, (General Motors Grp.)	602-244-7125
AZ	Phoenix	602-244-7100
CA	Encino/Sherman Oaks	213-986-6850, 213-872-1504
CA	Los Angeles	213-445-5585
CA	Orange	714-634-2844
CA	San Diego	619-560-4644
CA	San Jose	408-985-0510
CO	Colorado Springs	303-599-7404
CO	Denver	303-773-6800
CT	New Haven/Hamden	203-281-0771
DC	Washington	301-577-2600
FL	Casselberry/Maitland	305-831-3422
FL	Pompano Bch./Ft. Lauderdale	305-491-8141
FL	St. Petersburg	813-576-6030
GA	Atlanta	404-256-0222
IL	Chicago/Schaumburg	312-576-7800
IN	Ft. Wayne	219-484-0436
IN	Indianapolis	317-849-7060
IN	Kokomo	317-457-6634
IA	Cedar Rapids	319-373-1328
KS	Kansas City/Mission	913-384-3050
MD	Hyattsville	301-577-2600
MA	Berlin	617-562-3856
MA	Burlington	617-273-5020
MI	Detroit/Westland	313-261-6200
MN	Minneapolis	612-545-0251
MO	St. Louis	314-872-7681
NJ	River Edge	201-488-1200
NY	Hauppauge	516-231-9000
NY	Pittsford	716-248-5494
NY	Poughkeepsie/Fishkill	914-473-8102
NY	Syracuse	315-455-7373
NC	Raleigh	919-876-6025
OH	Cleveland	216-461-3160
OH	Columbus/Worthington	614-846-9460
OH	Dayton	513-294-2231
OK	Tulsa	918-664-5227
OR	Portland	503-641-3681
PA	Philadelphia/Horsham	215-443-9400
TN	Knoxville	615-690-5592
TX	Austin	512-452-7673
TX	Dallas	214-931-9222
TX	Houston	713-783-6400
UT	Salt Lake City	801-539-1190
VA	Charlottesville	804-977-3691
WA	Bellevue	206-454-4160
WA	Seattle Access	206-622-9960
WI	Milwaukee/Wauwatosa	414-476-5554

Motorola Systems Reps.

AL	Huntsville, EMA	205-830-4030
CA	Inglewood, Basic Sys. Corp.	213-673-4300
CA	San Diego, Basic Sys. Corp.	619-999-6566
CA	Santa Clara, Basic Sys. Corp.	408-727-1800
CT	Goshen, Northern Computer Sls.	203-491-3585
GA	Norcross, EMA	404-329-0530
IL	Northbrook, Marketech Assoc.	312-291-0315
IN	Carmel, Carter, McCormic & Peirce	317-844-4175
MA	Westwood, Northern Computer Sls.	617-326-3454
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Minneapolis, P.S.I. Co.	612-944-8545
MO	Independence, Dy-Tronix	816-373-6600
NY	Elmont, Crane & Egert Corp.	516-872-0800
NC	Raleigh, EMA	919-781-9369
OH	Cleveland, Carter, McCormic & Peirce	216-779-5100
OH	Dayton, Carter, McCormic & Peirce	513-836-0951
OR	Beaverton, Thorson Co. Northwest	503-644-5900
PA	King of Prussia, K.S.I.	215-783-6440
PA	Monroeville, Carter, McCormic & Peirce	412-372-4415
TN	Jonesboro, EMA	615-753-5844
WA	Bellevue, Thorson Co. Northwest	206-455-9180

Local Distributors

AL	Huntsville, Schweber Elctrns.	205-882-2200
AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AL	Huntsville, Pioneer/Huntsville	205-837-9300
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Phoenix, Kierulff Elctrns.	602-243-4101

AZ	Tempe, Hamilton/Avnet Elctrns.	602-231-5100
AZ	Tucson, Kierulff Elctrns.	602-624-9986
CA	Anaheim, Zeus Comps. West	714-632-6880
CA	Canoga Park, Schweber Elctrns.	213-999-4702
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4111
CA	Costa Mesa, Avnet	714-754-6155, 213-558-2345
CA	Culver City, Hamilton Electro Sls./L.A.	213-558-2000
CA	Culver City, Hamilton/Avnet	213-558-2000
CA	Irvine, Schweber Elctrns.	213-537-4321
CA	Los Angeles, Kierulff Elctrns.	213-725-0325
CA	Palo Alto, Kierulff Elctrns.	415-968-6292
CA	Roseville, Bell Inds.	916-969-3100
CA	Sacramento, Hamilton/Avnet Elctrns.	916-925-2216
CA	Sacramento, Schweber Elctrns.	916-929-9732
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	San Diego, Hamilton/Avnet Elctrns.	619-571-7510
CA	San Diego, Kierulff Elctrns.	619-278-2118
CA	Santa Clara, Schweber Elctrns.	408-748-4700
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Hamilton/Avnet Elctrns.	408-743-3360
CA	Tustin, Kierulff Elctrns.	714-731-5711
CA	Woodland Hills, Hamilton/Avnet Elctrns.	213-887-2353
CO	Denver, Hall-Mark Elctrns.	303-694-1662
CO	Denver, Kierulff Elctrns.	303-790-4444
CO	Denver, Hamilton/Avnet Elctrns.	303-740-1017
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Danbury, Hamilton/Avnet Elctrns.	203-797-2800
CT	Danbury, Schweber Elctrns.	203-792-3500
CT	Norwalk, Pioneer-Harvey/Norwalk	203-853-1515
FL	Altamonte Springs, Pioneer/Florida	305-834-9090
FL	Altamonte Springs, Schweber Elctrns.	305-331-7555
FL	Ft. Lauderdale, Pioneer/Ft. Lauderdale	305-771-7520
FL	Ft. Lauderdale, Kierulff Elctrns.	305-486-4004
FL	Ft. Lauderdale, Hamilton/Avnet Elctrns.	305-971-2900
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Hollywood, Schweber Elctrns.	305-927-0511
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	St. Petersburg, Hamilton/Avnet Elctrns.	813-576-3930
FL	St. Petersburg, Kierulff Elctrns.	813-576-1966
GA	Atlanta, Schweber Elctrns.	404-449-9170
GA	Norcross, Kierulff Elctrns.	404-447-5252
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Hamilton/Avnet Elctrns.	404-447-7507
GA	Norcross, Pioneer/Atlanta	404-448-1711
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IL	Bensenville, Hamilton/Avnet Elctrns.	312-860-7700
IL	Chicago, Bell Inds.	312-982-9210
IL	Chicago, Newark Elctrns. Corp.	312-638-4411
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Elk Grove Village, Kierulff Elctrns.	312-640-0200
IL	Elk Grove Village, Schweber Elctrns.	312-364-3750
IN	Indianapolis, Hamilton/Avnet Elctrns.	317-844-9333
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IN	Indianapolis, Graham Elctrns. Supp.	317-634-8202
IA	Cedar Rapids, Schweber Elctrns.	319-373-1417
KS	Overland Pk., Hamilton/Avnet Elctrns.	913-888-8900
KS	Shawnee Mission, Hall-Mark Elctrns.	913-888-4747
MD	Baltimore, Kierulff Elctrns.	301-636-5800
MD	Baltimore, Hall-Mark Elctrns.	301-796-9300
MD	Gaithersburg, Schweber Elctrns.	301-840-5900
MD	Gaithersburg, Pioneer/Washington	301-948-0710
MD	Hanover, Hamilton/Avnet Elctrns.	301-621-5410
MA	Bedford, Schweber Elctrns.	617-275-5100
MA	Boston, Kierulff Elctrns.	617-667-8331
MA	Boston, Lionex Corp.	617-272-9400
MA	Burlington, Zeus Comps.	617-273-0750
MA	Needham, Impact Sls. Co.	617-821-1500
MA	Woburn, Hamilton/Avnet Elctrns.	617-935-9700
MI	Grand Rapids, Hamilton/Avnet Elctrns.	616-243-8805
MI	Livonia, RS Elctrns.	313-525-1155
MI	Livonia, Schweber Elctrns.	313-525-8100
MI	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Madison Hgts., McNaughton-McKay Elec. Co.	313-399-7500
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Eden Prairie, Schweber Elctrns.	612-941-5280
MN	Edina, Kierulff Elctrns.	612-941-7500
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MN	Minnetonka, Hamilton/Avnet Elctrns.	612-932-0600
MO	Earth City, Hall-Mark Elctrns.	314-291-5350
MO	Earth City, Hamilton/Avnet Elctrns.	314-344-1200
MO	Maryland Hgts., Kierulff Elctrns.	314-739-0855
MO	St. Louis, Schweber Elctrns.	314-739-0526
NJ	Cherry Hill, Hall-Mark Elctrns.	609-424-7300
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-424-0110
NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Fairfield, Kierulff Elctrns.	201-575-6750
NJ	Fairfield, Schweber Elctrns.	201-227-7880
NJ	Fairfield, Hamilton/Avnet Elctrns.	201-575-3390
NJ	Pinebrook, Pioneer-Harvey/Pinebrook	201-227-1262
NM	Albuquergue, Alliance Elctrns.	505-292-3360
NM	Albuquerque, Bells Inds.	505-292-2700
NM	Albuquerque, Hamilton/Avnet Elctrns.	505-765-1500
NY	Binghamton, Pioneer-Harvey/Binghamton	607-748-8211
NY	E. Syracuse, Hamilton/Avnet Elctrns.	315-437-2641
NY	Fairport, Pioneer-Harvey/Rochester	716-381-7070
NY	Hauppauge, Pioneer/Military	516-231-9200
NY	Hauppauge, Lionex Corp.	516-273-1660
NY	Melville, Hamilton/Avnet Elctrns.	516-454-6060
NY	Port Chester, Zeus Comps.	914-937-7400
NY	Rochester, Hamilton/Avnet Elctrns.	716-475-9130
NY	Rochester, Schweber Elctrns.	716-424-2222
NY	Westbury, Schweber Elctrns.	516-334-7474
NY	Woodbury, Pioneer-Harvey/Woodbury	516-921-8700
NC	Greensboro, Kierulff Elctrns.	919-872-8410
NC	Raleigh, Hall-Mark Elctrns.	919-872-0712
NC	Raleigh, Hamilton/Avnet Elctrns.	919-878-0810
OH	Beachwood, Schweber Elctrns.	216-464-2970
OH	Centerville, Hamilton/Avnet Elctrns.	513-433-0610
OH	Cincinnati, Graham Elctrns.	513-772-1661
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Cleveland, Hall-Mark Elctrns.	216-473-2907
OH	Cleveland, Hamilton/Avnet Elctrns.	216-831-3500
OH	Dayton, Schweber Elctrns.	513-439-1800
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Tulsa, Schweber Elctrns.	918-622-8000
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
OK	Tulsa, Kierulff Elctrns.	918-252-7537
OR	Beaverton, Almac Elctrns. Corp.	503-641-9070
OR	Lake Oswego, Hamilton/Avnet Elctrns.	503-635-8831
OR	Portland, Kierulff Elctrns.	503-641-9150
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	Horsham, Schweber Elctrns.	215-441-0600
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
PA	Pittsburgh, Schweber Elctrns.	412-782-1600
TX	Austin, Pioneer/Austin	512-835-4000
TX	Austin, Hall-Mark Elctrns.	512-258-8848
TX	Austin, Schweber Elctrns.	512-458-8253
TX	Austin, Kierulff Elctrns.	512-835-2090
TX	Austin, Hamilton/Avnet Elctrns.	512-837-8911
TX	Dallas, Hall-Mark Corp.	214-343-5000
TX	Dallas, Schweber Elctrns.	214-661-5010
TX	Dallas, Kierulff Elctrns.	214-343-2400
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, Hall-Mark Elctrns.	214-341-1147
TX	Houston, Pioneer/Houston	713-988-5555
TX	Houston, Hall-Mark Elctrns.	713-781-6100
TX	Houston, Schweber Elctrns.	713-784-3600
TX	Houston, Kierulff Elctrns.	713-530-7030
TX	Houston, Hamilton/Avnet Elctrns.	713-780-1771
TX	Irving, Hamilton/Avnet Elctrns.	214-659-4111
UT	Salt Lake City, Kierulff Elctrns.	801-973-6913
UT	Salt Lake City, Hamilton/Avnet Elctrns.	801-972-2800
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Hamilton/Avnet Elctrns.	206-643-3950
WA	Seattle, Almac Elctrns. Corp.	206-643-9992
WA	Tukwila, Kierulff Elctrns.	206-575-4420
WI	Brookfield, Schweber Elctrns.	414-784-9020
WI	New Berlin, Hamilton/Avnet Elctrns.	414-784-4510
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000
WI	Waukesha, Bell Inds.	414-784-0235
WI	Waukesha, Kierulff Elctrns.	414-784-8160

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Local Sales Offices & Reps

CA	San Jose, McFarland Assocs. Corp.	408-286-9333
CO	Englewood, Integrated Motion Sys.	303-762-1817
FL	Melbourne, R-Concept	305-725-6993
IN	Beech Grove, Control Sls.	317-353-6094
KS	Shawnee Mission, L.S.C. Inc.	913-362-2121
MA	Southborough, Motion Engrg.	617-485-2144
MI	Livonia, Electrolines	313-591-2428
MN	St. Paul, Northstar Motion & Control Co.	612-770-5311
NY	Clark Mills, KLM Garner	315-853-6126
OH	Chesterland, KT/Depco	216-729-3588
PA	Audubon, Holmes Assocs.	215-666-0636
PA	Pittsburgh, Greye Glass Assocs.	412-366-6664
VA	Roanoke, Engrg. & Mktg. Corp. of Virginia	703-986-1410
WI	Milwaukee, Schreiber-Arterburn	414-545-7800

Distributor

MOUSER ELECTRONICS, 11433 Woodside Ave., Santee, CA 92071, Tel: 619-449-2222, TWX: 910-331-1175; Empl.: 200; *Sls. Mgr.:* Jerry Tallent p.731

MOUSER ELECTRONICS, 2401 Hwy. 287 North, Mansfield, TX 76063, Tel: 817-483-4422 ..... p.731

MOUSE SYS. CORP., 2336H Walsh Ave., Santa Clara, CA 95051, Tel: 408-988-0211, Telex: 467848; *Sls. Mgr.:* Evelyn Boyd; *Dist. Mgr.:* Barbara Marsh-Wetherell

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MPB CORP., Precision Park, Keene, NH 03431, Tel: 603-352-0310, TWX: 710-366-1801; Empl.: 1600

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MPH ELCTRNS., 2660 Loma Ave., S. El Monte, CA 91733, Tel: 213-442-7818; *Sls. Mgr.:* A. Pastecci

MPI, 4426 S. Century Dr., Salt Lake City, UT 84107, Tel: 800-821-8848; *Sls. Mgr.:* Jamie Johnston

MSI DATA CORP., 340 Fischer Ave., Costa Mesa, CA 92626, Tel: 714-549-6000, TWX: 910-595-1719; Empl.: 750; *Sls. Mgr.:* J. Falvey; *Dist. Mgr.:* S. Altice

MSI ELECTRONICS, INC., 34-32 57th St., Woodside, NY 11377, Tel: 212-672-6500, Telex: 424431; FSC No.: 18518; Empl.: 25; *Sls. Mgr.:* A. Lederman

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FL	Riverview, R. C. Simon & Co.	813-669-1947
GA	Keenesaw, BWS Mktg.	404-448-7759
IL	McHenry, Mesa, Inc.	815-344-2820
IN	Ft. Wayne, Menze Sls. Inc.	219-747-5616
MD	Laurel, CSDS Inc.	301-490-3800
MA	Framingham, Stone Comp. Sls.	617-875-3266
NY	Plainview, R. Smith Assocs.	516-681-3155
PA	Jenkintown, Arnold Assocs.	215-887-7870
TX	Richardson, Eagle Mktg. Inc.	214-238-5383
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Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
AZ	Tempe, SSA Sales	602-829-9338
CA	San Diego, Bestronics	619-452-5500
CA	Santa Ana, SC Cubed	714-731-9206
CA	Santa Clara, Criterion Mfg.	408-988-6300
CA	Thousand Oaks, SC Cubed	805-496-7307
CO	Littleton, Simpson Assoc.	303-794-8381
CT	Ridgefield, Phoenix Sls.	203-438-9644
FL	Apopka, G.F. Bohman	305-886-1882
FL	Ft. Lauderdale, Bohman Assoc.	305-979-0008
GA	Stone Mountain, 20th Century	404-292-7088
IL	Arlington Hgts., Micro Sls.	312-956-1000
IN	Fort Wayne, Given Corp.	219-432-5585
IA	West Des Moines, SPS Assoc.	515-225-0607
KS	Olathe, SPS Assoc.	913-764-4460
MD	Ellicott City, Marketing Tech Inc.	301-862-1882
MA	Reading, Kanan	617-944-8484
MI	Detroit, Rathsburg Assoc.	313-882-1717
MN	Bloomington, Com-Tek Sls.	612-888-7011
NE	Panama, SPS Assoc.	800-228-3018
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NJ	Marlton, BGR	609-983-1020
NM	Albuquerque, SSA	505-881-8877
NC	Smithfield, ADI	919-934-8136
OH	Dayton, Lyons Corp.	513-278-0714
OH	Richfield, Lyons Corp.	216-659-9224
SC	Fort Mill, ADI	803-547-2115
TN	Knoxville, 20th Century	615-966-3608
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, Mech-Tron Mktg.	214-343-3786
TX	Houston, Mech-Tron Mktg.	713-462-1432
UT	Midvale, Simpson Assoc.	801-566-3691
VA	Lynchburg, Marketing Tech Inc.	804-384-6459
WA	Redmond, Quadra Sls.	206-883-3550

Local Distributors

AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Wyle Distr. Grp.	602-249-2232
AZ	Phoenix, Sterling Elect.	602-258-4531
AZ	Tempe, CSC Distr.	602-966-0764
AZ	Tempe, Bell Inds.	602-966-7800
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	Irvine, Ryno Elctrns.	714-261-2500
CA	San Diego, Ryno Elctrns.	619-292-6022
CA	Santa Clara, Capacitors Unltd.	408-946-7676
CA	Santa Clara, Wyle Distr. Grp.	408-727-2500
CA	Tustin, Image Elctrns.	714-730-0303
CO	Thornton, Wyle Distr. Grp.	303-457-9953
CO	Wheatridge, Bell Inds.	303-424-1985
CT	E. Haven, J. V. Elctrns.	203-469-2321
CT	Norwalk, Pioneer Elctrns.	203-853-1515
CT	Orange, Milgray Elctrns.	203-795-0711
CT	Wallingford, Mid-State Elect.	203-265-9900
FL	Orlando, Pioneer Elctrns.	305-834-9090
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Norcross, Pioneer Elctrns.	404-448-1711
IL	Elk Grove, Pioneer Elctrns.	312-437-9680
IL	Hoffman Estates, Inter Comp	312-843-2040
IN	Indianapolis, Advent	317-872-4910
IN	Indianapolis, Pioneer/IN	317-849-7300
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Beltsville, Resco/Wash.	301-937-9100
MD	Gaithersburg, Pioneer	301-921-0660
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Burlington, Milgray Elctrns.	617-272-6800
MA	Burlington, J.V. Elctrns.	617-273-4300
MA	Lexington, Pioneer Elctrns.	617-861-9200
MI	Livonia, RS Elctrns.	313-525-1155
MI	Livonia, Pioneer Elctrns.	313-525-1800
MN	Bloomington, NWR	612-854-7329
MN	Minneapolis, Stark Elctrns.	612-832-1325
MN	Minnetonka, Pioneer Elctrns.	612-935-5444
MO	St. Louis, Olive Elctrns.	314-426-4500
NJ	Berlin, GCI	609-768-6767
NJ	Marlton, Milgray Elctrns.	609-983-5010
NJ	Mt. Laurel, P.A.C. Elctrns.	609-778-1526
NJ	Pinebrook, Pioneer Elctrns.	201-575-3510
NM	Albuquerque, Sterling Elect.	505-884-1900
NY	Binghamton, Pioneer Elctrns.	607-748-8211
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Woodbury, Pioneer Elctrns.	516-921-8700
NC	Charlotte, Pioneer Elctrns.	704-527-8188
NC	Raleigh, Century Elctrns.	918-872-2203
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Cleveland, Pioneer Elctrns.	216-587-3600
OH	Dayton, Pioneer Elctrns.	513-236-9900
OK	Tulsa, Radio Inc.	918-587-9123
OR	Hillsboro, Wyle Distr. Grp.	503-640-6000
OR	Portland, Radar Elctrns.	503-232-3404
PA	Horsham, Pioneer Elctrns.	215-674-4000
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UT	West Valley City, Wyle Distr. Grp.	801-974-9953
VT	Richmond, Sterling Elect.	804-226-2190
WA	Bellevue, Wyle Distr. Grp.	206-453-8300
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Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-533-3509
AZ	Glendale, Heath Group	602-938-8308
AZ	Phoenix, Heath Group	602-944-4340
CA	Downey, Ungar Sls. Assocs.	213-923-1467
CA	Gardena, Ungar Sales Co.	213-538-2811
CA	Reseda, Ungar Sls. Assocs.	213-342-2671
CA	San Francisco, Maddox Sls.	415-647-5560
CO	Colorado Springs, Norris & Warren Co.	303-576-8697
CO	Denver, Norris & Warren	303-759-1676
FL	Ft. Lauderdale, Cartwright & Bean	305-735-4900
FL	Orlando, Cartwright & Bean	305-422-4531
FL	Tampa, Cartwright & Bean Inc.	305-422-4531
GA	Atlanta, Cartwright & Bean	404-233-2939
IL	Libertyville, R. Klipp Assocs.	312-367-4676
IN	Indianapolis, Sukup & Cox	317-253-5501
KS	Shawnee Mission, K & M Sls.	913-262-1444
MA	Lynn, Keene Sls.	617-595-2300
MA	Springfield, Keene Sls. Co. Inc.	413-785-1158
MI	Ferndale, Hilltronics	313-398-5556
MN	Minneapolis, Boerger & Associates	612-560-3435
MS	Jackson, Cartwright & Bean	601-981-1368
NJ	Medford, Champion Elctrn. Sls.	609-654-0475
NY	Port Washington, Joseph Assocs.	516-883-1829
NY	Webster, Bieniek & Assocs.	716-872-0387
NC	Charlotte, Cartwright & Bean	704-377-5673
NC	Raleigh, Cartwright & Bean	919-781-6560
OH	Akron, Arrow Mktg.	216-733-8901
OH	Mogadore, Arrow Mktg. Co.	216-733-8901
OR	Portland, Jud LeBrun	503-244-6805
TN	Knoxville, Cartwright & Bean	615-693-7450
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Waco, Jabs Sls.	817-776-3236

M. U. INC., P.O. Box 1007, Oceanside, CA 92054, Tel: 619-757-7576

MUIRHEAD, 1101 Briston Rd., Mountainside, NJ 07092, Tel: 201-233-6010, Telex: 13-8275; Empl.: 60; *Sls. Mgr.:* Gerald M. Pochurek

MULTI-AMP CORP., Indian Head Corp., 4271 Bronze Way, Dallas, TX 75237, Tel: 214-333-3201, TWX: 910-861-9052; Empl.: 350; *Sls. Mgr.:* Robert D. Libbey

MULTICORE SOLDERS, Cantiague Rock Rd., Westbury, NY 11590, Tel: 516-334-7997, TWX: 510-222-5185; Empl.: 1000

MULTI-PLATE CO., INC., 2362 Lu Field Rd., Dallas, TX 75229, Tel: 214-243-1557; *Sls. Mgr.:* David A. Bartley

MULTI PRODS. INTL., 218 Little Falls Rd., P.O. Box 238, Cedar Grove, NJ 07009, Tel: 201-239-8183, Telex: 13-0430; Empl.: 25; *Sls. Mgr.:* LeRoy Gray .... **1A•**1147, 2206, 2207; **3•**1658

Local Sales Offices & Reps

AL	Huntsville, Elctrns Mfrs. Agts	205-830-4030
AZ	Tempe, Tempe Assoc.	602-831-6720
AR	Little Rock, Erickson Sls. Inc.	501-225-7379
CA	Campbell, Kottmeier Assoc.	408-866-5153
CA	El Monte, Cook Entprs	213-686-2120
FL	Coral Springs, PC Electronic Sales	305-755-3980
GA	Atlanta, Elctrn. Mfrs. Agts.	404-529-0530
IL	Chicago, Esco Assoc.	312-763-0800
IN	Frankfort, C-S Elctrns. Sls.	317-659-1874
KS	Overland Park, Electri-Rep	913-649-2168
LA	Chalmette, Erickson Sls. Inc.	504-271-1976
MA	Norwood, Mac Innis Co.	617-762-8090
MI	Jenison, R.C. Nordstrom & Co	616-457-5762
MI	Southfield, R. C. Nordstrom & Co.	313-559-7373
MN	St. Paul, Proud Industries	612-646-9428
NJ	Cedar Grove, Legtonics Assoc.	201-239-4098
NJ	Cedar Grove, Legtronics Assoc.	201-239-4098
NC	Raleigh, Elctrns. Mfg. Agent	919-781-4139
OK	Oklahoma City, Erickson Sls. Inc.	405-682-2947
OR	Portland, Eltech	503-238-0805
PA	Albrightsville, Centurion Linear	717-722-0166
TN	Knoxville, Elctrn. Mfrs. Agents	615-966-1286
TX	Austin, Erickson Sls. Inc.	512-445-2952
TX	Dallas, Erickson Sls. Inc.	214-739-5833
TX	Houston, Erickson Sls. Inc.	713-980-9606
WA	Bellevue, Eltech	206-643-4330

MULTITECH ELCTRNS. INC., 195 W. El Camino Real, Sunnyvale, CA 94086, Tel: 408-773-8400, Telex: 176004 MAC SUVL; *Sls. Mgr.:* James Tseng

MULTI-TECH INDS., 64 South Main St., P.O. Box A, Marlboro, NJ 07746, Tel: 201-431-0550; Empl.: 40; *Sls. Mgr.:* James L. Bernard

MULTI-TECH SYSTEMS, INC., 82 Second Ave. S.E., New Brighton, MN 55112, Tel: 612-631-3550, TWX: 910-563-3610; *Sls. Mgr.:* Thomas Heimerman; *Dist. Mgr.:* Peter Hanlon

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MULTIWIRE DIV., Kollmorgen Corp., Andrews Rd., Hicksville, NY 11801, Tel: 516-938-2000, TWX: 510-223-0639

Local Sales Offices & Reps

CA	Anaheim, Multiwire West	714-632-7770
NH	Nashua, Multiwire New England	603-889-0083
NY	Hicksville, Advanced Mfg. Grp.	516-938-2000
NY	Hicksville, Multiwire	516-933-8300; 800-447-0007

MUPAC, 10 Mupac Dr., Brockton, MA 02401, Tel: 617-588-6110, TWX: 710-345-8458; Empl.: 100

Local Distributors

CA	San Francisco, Peters - de Laet, Inc.	415-873-9595
CA	Santa Clara, Peters - de Laet, Inc.	408-727-9440
CT	Wallingford, Sager Electrical Supp. Co.	203-265-4600
MA	Hingham, Sager Electrical Supp. Co.	617-749-6700

MURA CORP., 177 Cantiague Rock Rd., Westbury, NY 11590, Tel: 516-935-3640, Telex: 967-879; Empl.: 165; *Sls. Mgr.:* William Mercurio .. **1A**•2047; **1B**•1090; **2**•2109; **3**•1040, 1041

Local Sales Offices & Reps

AL	Huntsville, DHR Mktg., Inc.	205-533-5165
CA	Los Alamitos, Santana Sls.	714-827-9100
CA	San Diego, Littlefield & Smith Assocs.	619-455-0055
CA	San Jose, Frequency Control Assocs.	408-446-0200
CA	Saratoga, Frequency Control Assocs.	408-446-0200
CT	Manchester, G. M. Assocs.	203-646-4443
FL	Casselberry, HAI Elctrns., Inc.	305-831-4892
FL	Coral Springs, HAI	305-752-7520
GA	Atlanta, DHR Mktg.	404-451-9848
IL	Highland Park, Bransky Sls.	312-433-2375
IN	Indianapolis, Elctrn. Reps.	317-894-1414
IA	Bettendorf, Weisler & Assocs., Inc.	319-344-0566
IA	Davenport, Weisler Assocs.	319-386-5905
LA	Manderville, Design Mktg.	713-237-2319
MA	Framingham, G.M. Assocs.	617-872-4871
MN	Minneapolis, O.E.M. Elctrl. Sls., Inc.	612-559-2448
MS	Jackson, Welch & Doby, Inc.	601-932-5534
MO	Ellisville, Weisler Assocs.	314-394-4543
MO	N. Kansas City, Weisler Assocs.	816-421-1679
NH	Exeter, G. M. Assocs.	603-778-7472
NY	Jericho (Downstate), J-Square Mktg., Inc.	516-935-3200
NC	Charlotte, DHR Mktg., Inc.	704-335-1215
NC	Greensboro, DHR Mktg., Inc.	919-273-2671
NC	Raleigh, DHR Mktg.	919-876-5450
OH	Cleveland, Arthur H. Baier & Assocs.	216-461-6161
OH	Dayton, Arthur H. Baier & Assocs.	513-276-4128
OK	Broken Arrow, Design Mktg., Inc.	918-258-8656
OR	Portland, Jas J. Backer Co.	503-297-2218
OR	Salem, Jas J. Backer Co.	503-362-0717
PA	Stewartstown, Eastern Comps.	301-323-7104
PA	W. Conshohocken, Eastern Comps.	215-825-8610
SC	Greenville, DHR Mktg.	803-235-3594
TN	Knoxville, DHR Mktg., Inc.	615-584-5286
TN	Memphis, Welch & Doby, Inc.	901-683-8099
TX	Conroe, Design Mktg., Inc.	713-273-2319
TX	Dallas, Design Mktg., Inc.	214-680-9767
TX	Hurst, Design Mktg.	817-268-2004
TX	Round Rock, Design Mktg., Inc.	512-255-9896
VA	Manassas, Eastern Comps.	703-471-1025
WA	Seattle, Jas J. Backer Co.	206-285-1300
WI	Cedarburg, Bransky Sls.	414-377-6837

Local Distributors

AZ	Phoenix, Elctrn. Parts	602-277-7281
AR	Little Rock, Carlton-Bates	501-462-9100
CA	Costa Mesa, Marvac Elec.	714-540-3280
CA	Dublin, Valley Elctrns.	415-829-5960
CA	Lakeside, Mouser Corp.	714-449-2220
CA	Mt. View, U-DO Elctrns.	415-968-8894
CA	N. Hollywood, Mitchell Co.	213-875-1552
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Sacramento, Sacramento Elctrns.	916-441-4821
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	Sunnyvale, Com-Kyl	408-734-9660
CO	Colorado Springs, Colorado Springs Walker Elec.	303-636-1661
CO	Denver, Fistell's	303-629-1312
CO	Denver, Denver Walker Elec.	303-935-2401
CO	Denver, Elctrn. Parts	303-744-1992
CT	W. Hartford, Signal Center	203-233-8551
FL	Ft. Lauderdale, Southeastern Elctrns.	305-536-4131
FL	Miami, Gulf Elctrns.	305-592-6538
FL	Miami, Electro Standards	305-663-6973
FL	Tallahassee, Dell Elctrns.	904-224-5145
ID	Twin Falls, Idaho Central Elctrns.	
IL	Chicago, McMaster-Carr	312-834-9600
IL	La Salle, Warren Radio	815-223-4028
IL	Rockford, Jay Tronics	851-965-8786
IN	Evansville, Ohio Valley Sound	812-425-6173
IN	Evansville, Hutch & Son	812-425-7201
IN	Michigan City, Tri-State Elctrns.	219-872-5551
IA	Des Moines, Mid State Dist.	515-244-7231
LA	New Orleans, Wm. B. Allen Co.	504-525-8222
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MS	Jackson, Ellington Elctrns.	601-355-0561
MO	St. Louis, Olive Elctrns.	314-426-4500
MT	Missoula, Northwest Distrs.	406-543-5181
NE	Lincoln, Scott Elctrns.	402-466-8221
NJ	Edison, Willian Elctrns.	201-985-3700
NJ	Marlton, Resco Elctrns.	609-983-6552
NJ	Raritan, Masters Supp.	201-725-3533
NM	Carslbad, Indl. Elctrns.	505-887-1121
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Jamaica, All State Elctrns.	212-739-3916
NY	Levittown, Eddie Elctrns.	
NY	NYC, B&B Elctrns.	212-446-5120
NY	NYC, Barry Elctrns.	212-925-7000
NY	Plainview, Atlas West	516-576-9100
NC	Charlotte, United Elctrns. Supp.	704-372-2650
ND	Fargo, S&S Elctrns.	701-237-5003
OH	Columbus, Whitehead Radio	614-224-1186
OH	Columbus, Comps. Unltd.	614-252-0728
OH	Freemont, J&B Elctrns.	419-332-9334
OR	Beaverton, Norvac Elctrns.	503-644-1025
PA	Philadelphia, Almo Elctrns.	215-698-4000
PA	Pittsburgh, CRS Elctrns.	412-431-7700
TX	Dallas, Wholesale Radio	214-824-3001
TX	Ft. Worth, Indl. Elctrns.	817-731-7321
TX	Houston, Lenert Co.	713-225-1465
WA	Seattle, Westlake Distrs.	206-282-3660
WV	Arlington, Arlington Elctrns.	703-524-2412
WV	Fairmont, State Elctrns.	304-366-4520
WI	Madison, Superior Elctrns.	608-257-1477
WI	Madison, Satterfield Elctrns.	608-257-4801
WI	Oskosh, Elctrn. Inds.	414-235-8930

MURATA ERIE NORTH AMERICA, INC., 1148 Franklin Rd., S.E., Marietta, GA 30067, Tel: 404-952-9777, Telex: 54-2329, TWX: 810-766-1531; Empl.: 1800; *Sls. Mgr.:* Jack Driscoll; *Dist. Mgr.:* C. Augello ....**1A**•1148-1151, 1394, 1395, 1576, 1604, 1605, 1903-1905, 2016, 2048, 2049, 2107, 2209; **3**•1042, 1659

Local Sales Offices & Reps

AL	Huntsville, Jack W. Harvey & Assocs.	205-536-4414
AZ	Scottsdale, Murata Erie N. America	602-941-2667
CA	Los Altos, Recht. Assocs.	415-964-6321
CA	Palo Alto, Murata Erie North America	415-327-1520
CA	Santa Ana, Murata Erie North America	714-835-4822
FL	Maitland, Murata Erie North America	305-644-0954
FL	Plantation, Innovative Mktg., Inc.	305-583-8895
GA	Marietta, Murata Erie N. America	404-952-9777
IL	Des Plaines, Murata Erie North America	312-297-5560
IN	Ft. Wayne, Murata Erie North America	219-484-1528
IN	Indianapolis, Jack Harvey & Assocs.	317-872-1031
IN	Kokomo, Jack Harvey & Assocs.	317-453-4260
MD	Columbia, Murata Erie North America	301-992-6612
MA	Wakefield, Murata Erie North America	617-245-7880
MN	Plymouth, Murata Erie North America	612-553-1594
NJ	Springfield, Radix	201-467-4970
NC	Greensboro, Murata Erie North America	919-299-1905
OK	Tulsa, Murata Erie N. America	918-663-2882
OR	Beaverton, Caruso & Northcutt, Inc.	503-646-4973
TN	Johnson City, Jack Harvey & Assocs.	615-928-7588
TX	Richardson, Murata Erie North America	214-238-8211
WA	Bellevue, Caruso & Northcutt, Inc.	206-454-9699

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, R.V. Weatherford	602-272-7144
AZ	Tempe, Arrow Elctrns.	602-968-4800
AZ	Tempe, Powell Elctrns.	602-967-7538
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Anaheim, R.V. Weatherford Co.	714-547-0981
CA	Belmont, Varitech Elctrns.	415-593-3300
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Costa Mesa, Powell Elctrns.	714-754-1717
CA	Garden Grove, Inductive Prods. Inc.	714-892-7749
CA	Garden Grove, Natl. Capacitor Supp.	213-598-9611
CA	Glendale, R.V. Weatherford Co.	213-849-3451
CA	Inglewood, Newark Elctrns.	213-678-0441
CA	Mountain View, Shelly Elctrns.	415-969-1820
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	Pomona, R.V. Weatherford Co.	714-623-1261
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Diego, R.V. Weatherford Co.	714-695-1700
CA	San Diego, Arrow Elctrns.	714-565-4800
CA	Santa Clara, Pyramid Elctrns. Supp.	408-727-9810
CA	Santa Clara, Intl. Standard Comps.	408-496-0411
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Sunnyvale, R.V. Weatherford Co.	408-738-8694
CA	Sunnyvale, Capsco	408-734-3020
CA	Sunnyvale, Powell Elctrns.	408-739-4321
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Denver, Newark Elctrns.	303-423-7941
CO	Denver, R.V. Weatherford Co.	303-428-6900
CO	Englewood, Time Electrns.	303-850-7701
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Orange, Milgray Elctrns.	263-795-0711
CT	Wallingford, Cronin Elctrns.	203-265-3134
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
FL	Ft. Lauderdale, Powell Elctrns.	305-979-5000
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
GA	Norcross, Newark Elctrns.	404-448-1300
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Inds.	312-982-9210
IL	Rosemont, Advent Elctrns.	312-297-6200
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IA	Cedar Rapids, Advent Elctrns. Inc.	319-363-0221
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Baltimore, Resco	301-823-0070
MD	Beltsville, Resco	301-937-9100
MD	Columbia, Time Elctrns.	301-964-3090
MD	Columbia, Powell Elctrns.	301-621-4070
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Burlington, Milgray Elctrns.	617-272-6800
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Westboro, Powell Elctrns.	617-366-6100
MA	Woburn, Time Elctrns.	617-935-8080
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-7220
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Grand Rapids, Arrow Elctrns.	616-243-0912
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, The Joel Co.	612-545-5669
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	St. Louis, Time Elctrns.	314-391-6444
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Englewood, Powell Elctrns.	201-894-0800
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NJ	Whippany, Tonar Inds.	201-884-1400
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Buffalo, Newark Elctrns.	716-892-4321
NY	Farmingdale, Arrow Elctrns.	516-293-6363
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Hauppauge, Fairmont Elctrns.	516-231-3313
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Lynbrook, Varitech Elctrns.	516-593-9300
NY	Melville, Arrow Elctrns.	516-391-1485
NY	Pittsford, Milgray Elctrns.	711-385-9330
NY	Rochester, Arrow Elctrns.	716-275-0300
NC	Cary, Powell Elctrns.	919-467-1212
NC	Charlotte, Elctrn. Mktg. Corp.	704-394-6195
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Raleigh, Resco/Raleigh	919-781-5700
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Cleveland, Newark Elctrns.	216-361-4700
OH	Columbus, Elctrn. Mktg. Corp.	614-299-4161
OH	Columbus, Newark Elctrns.	614-451-0002
OH	Dayton, Elctrn. Mktg. Corp.	513-439-3441
OH	Highland Hts., Elctrn. Mktg. Corp.	216-442-3441
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Arrow Elctrns.	918-665-7700
OR	Lake Oswego, Moore Elctrns.	503-684-3100
OR	Portland, Newark Elctrns.	503-257-0741
OR	Tigard, Arrow Elctrns.	503-684-1690
PA	Broomall, Time Elctrns.	215-359-1200
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Versailles, Newark Elctrns.	412-834-8504
TX	Addison, R.V. Weatherford Co.	214-931-7333
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Dallas, Powell Elctrns.	214-350-4186
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Houston, R.V. Weatherford Co.	713-688-7406

UT	Salt Lake City, Arrow Elctrns.	801-539-1135
VA	Richmond, Arrow Elctrns.	804-282-0413
WA	Bellevue, Arrow Elctrns.	206-634-4800
WA	Seattle, R.V. Weatherford Co.	206-575-1340
WI	Oak Creek, Arrow Elctrns.	414-764-6600
WI	Waukesha, Bell Inds.	414-784-0235

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MUSHIELD CO., Div. Bomco, Inc., 121 Madison St., P.O. Box W, Malden, MA 02148, Tel: 617-321-4410; FSC No.: 22780; Empl.: 10; *Sls. Mgr.:* Mark Standley ..... 2•1915

Local Sales Offices & Reps

CA	Los Angeles, Yarbrough Sls.	213-254-5101
CA	San Anselmo, Technology Sys.	415-459-2774
CO	Littleton, The McCarthy Co.	303-773-0643
GA	Atlanta, Biondo Assoc.	404-394-9640
MA	Newtonville, Shain Assocs.	617-965-3060
MN	Edina, Wendell Lee & Assoc.	612-831-5056
OH	Akron, Augnat Assoc.	216-273-1211
PA	Orwigsburg, Jase Assoc.	717-366-1109
TX	Cypress, Wessco	713-469-7814

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NAMCO CONTROLS, An Acme-Cleveland Co., 7567 Tyler Blvd., Mentor, OH 44060, Tel: 216-946-9900, Telex: 24-1566; Empl.: 200; *Sls. Mgr.:* Jon Slaybaugh, V.P./Sales-Mktg.

NAMCO-LEUZE, A Namco Controls Affiliate Co., 7567 Tyler Blvd., Mentor, OH 44060, Tel: 216-946-9900, Telex: 24-1566; *Sls. Mgr.:* Jon Slaybaugh, V.P./Sales-Mktg.

NAMIKI PRECISION JEWEL CO., LTD., 15 Essex Rd., Paramus, NJ 07652, Tel: 201-368-8310, TWX: 710-990-1273; FSC No.: 201-569-2170

NANMAC CORP., 9 Mayhew St., Framingham, MA 01701, Tel: 617-872-4811; Empl.: 32; *Sls. Mgr.:* G. Nanigian; *Dist. Mgr.:* J. Manigian

NARDA MICROWAVE CORP., 435 Moreland Rd., Hauppauge, NY 11788, Tel: 516-231-1700, TWX: 510-221-1867; *Sls. Mgr.:* John Coppola

NASHUA CORP., 44 Franklin St., Nashua, NH 03061, Tel: 603-880-2889, Telex: 943406; *Sls. Mgr.:* Chet Mielcarz

NATEL ENGRG. CO., INC., 4550 Runway St., Simi Valley, CA 93063, Tel: 805-581-3950, TWX: 910-494-1959; Empl.: 89 ..... 1A•1678, 1679

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Distributor

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NATIONAL CONTROLS CORP., 931 N. DuPage Ave., Lombard, IL 60148, Tel: 312-932-6900; Empl.: 200

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CA	Hayward	415-493-1100
CO	Englewood	303-797-8448
IL	Elk Grove Village	312-593-8100
OR	Portland	503-620-9400
TX	Houston	713-464-8555

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NATIONAL INSTRUMENTS, 12109 Technology Blvd., Austin, TX 78759, Tel: 512-250-9119, Telex: 756737 NAT INST AUS; *Sls. Mgr.:* Don Nadon ..... 3•1266

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CA	Mountain View, Thorson West	415-964-9300
CO	Castle Rock, Odyssey 1	303-688-3555
IL	Elmhurst, Sector Engrg. Sls.	312-530-7850
IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
MD	Linthicum, KD Assocs.	301-859-5151
MA	Reading, Scheinfein Assocs.	617-944-2304
MN	Bloomington, Sector Engrg. Sls.	612-888-6920
NM	Albuquerque, Odyssey	505-265-6645
OH	Chesterland, EQS Systems	216-729-2222
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280

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IN	Indianapolis, Sector Engrg. Sls.	317-842-1120
MD	Linthicum, KD Assocs.	301-859-5151
MA	Reading, Scheinfein Assoc.	617-944-2304
MN	Bloomington, Sector Engrg. Sls.	612-888-6920
NM	Albuquerque, Odyssey 1	505-265-6645
OH	Chesterland, EQS	216-729-2222
WI	Milwaukee, Sector Engrg. Sls.	414-352-8280

NATIONAL MICRONETICS, Route 28, West Hurley, NY 12136, Tel: 914-338-0333, TWX: 510-247-8046; Empl.: 900; *Sls. Mgr.:* P. A. Rivelli

NATIONAL POWER TECHNLG., Natl. Technlg., 2111 Howell Ave., Anaheim, CA 92806, Tel: 714-937-1301; Empl.: 85; *Sls. Mgr.:* Harold Myers ..... 3•1660

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CA	Canoga Park, Cummings & Assocs.	818-340-6035
CA	Palo Alto, Abbott Engrg. Co., Inc.	415-968-2265
CA	San Diego, Mesa Engrg.	619-278-8021
CO	Denver, Cummings & Assocs.	303-455-6860
FL	Orlando, Gillum Sls., Inc.	305-857-2110
KY	Ft. Mitchell, G. W. Thelen	606-341-8181
MD	Randallstown, Beacon North	301-655-2265
MA	Chelmsford, Encotronics	617-256-4207
NY	Wantagh, Bytec	516-781-7400; 201-531-7792
OH	Medina, G. W. Thelen	216-727-1293
TX	Irving, Kite Elctrn. Sls. Co., Inc.	214-438-9336
UT	Salt Lake City, Cummings & Assocs.	801-263-8131
VA	Fairfax, Beacon North	703-591-1300
VA	Forest, Beacon North	804-239-8486
WA	Bellevue, Underwood-Hanify	206-451-8223
WA	Vancouver, Underwood-Hanify	206-695-2311
WI	Greenfield, Olympic	414-281-9294

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NATIONAL SEMICONDUCTOR OPTOELECTRONICS, 365 Jordan Road, Troy, NY 12180-8396, Tel: 518-271-2100, TWX: 710-444-4962; *Dist. Mgr.:* Donna McLaughlin

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NATIONAL SONICS/XERTEX CORP., 250 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-273-6600, Telex: 14-4545; Empl.: 140; *Sls. Mgr.:* John Kristoffersen

NATIONAL-STANDARD CO., 601 N. 8th, Niles, MI 49120, Tel: 616-683-8100, Telex: 25-8453, TWX: 810-270-3153; Empl.: 1000; *Sls. Mgr.:* J. L. Dayton; *Dist. Mgr.:* J. L. Dayton

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AZ	Phoenix, Finn-Pat Co.	602-954-0301
CA	Garden Grove, West Elctrn. Sls. Co.	714-898-0120
CA	San Diego, CK Associates	619-279-0420
CA	Santa Ana, Electrotechnical Sales	714-546-9305
CA	Sunnyvale, Ward Elctrn. Packaging Sls.	408-730-0993
CO	Denver, Donohue Sls. Co.	303-455-1719
CT	Wallingford, Marathon Sls. Ltd.	
FL	Kissimmee, Southeastern First Rep	305-846-1306
FL	Melbourne, Southeastern First Rep	305-784-4723

FL	North Palm Beach, Southeastern First Rep	305-844-3758
GA	Atlanta, Southeastern First Rep	404-393-2073
IL	Chicago, Electro-Mech Sls. Co.	312-777-0554
IN	Columbus, Tech. Reps.	812-376-9226
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MA	Hopkinton, Marathon Sls. Ltd.	617-435-6984
MI	Union Lake, Randall Sales Inc.	313-363-7129
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Louis, Beams Co.	314-569-1069
NJ	Cherry Hill, Ned Krouse Assocs.	609-424-3543
NJ	Nutley, Falk-Baker Assocs.	201-661-2430
NY	E. Syracuse, Nycom	315-437-8343
NC	Raleigh, RepCo Mktg.	919-787-7887
OH	Akron, Imtech	216-666-1185
OH	Dayton, Imtech	513-278-6507
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Pittsburgh, Imtech	412-344-0844
TN	Greeneville, Dimark	615-639-0113
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
TX	Round Rock, Allied Comps.	512-244-1166
UT	Salt Lake City, Meridian Mktg.	801-968-4177
WA	Bellevue, Panoco	206-454-2503

Local Distributors

AZ	Phoenix, Tri-Tek, Inc.	602-995-9352
CA	Anaheim, Besco Industries	714-635-0380
CA	Haywood, Allied Elctrns.	415-487-5250
CA	Industry, Ital Electronics	818-968-8515
CA	Redondo Beach, Mark Elctrns.	213-772-2141
CA	San Jose, Besco Industries	408-946-8980
CA	Santa Ana, Compu Serv	714-546-5140
CA	Santa Ana, CR Elctrns.	714-556-2040
CO	Arvada, Denver Wintronics	303-431-7161
CO	Denver, CSID	303-292-9594
CT	Bethel, Heilind Elctrns.	203-797-8600
FL	Pompano Beach, Components South	305-971-0350
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Franklin Park, Besco Industries	312-451-1230
IN	Fort Wayne, Graham Elctrn.	219-423-3422
IN	Indianapolis, Graham Elctrn.	317-634-8202
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Lynn, Land Elctrns.	617-592-2220
MN	Fridley, Voyager Elctrns. Corp.	612-571-7766
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NH	Hudson, Heilind Elctrns.	603-883-9536
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NY	Rochester, Summit Distributors	716-334-8110
NC	Winston-Salem, Kirkman Elctrns. Inc.	919-722-9131
OH	Centerville, Charles V. Clark	513-435-3000
OR	Portland, United Radio Supp.	503-233-7151
PA	Huntingdon Valley, Shap Elctrns.	215-322-7150
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Local Sales Offices & Reps

AZ	Phoenix, Coker Assoc.	602-277-7148
AR	Fort Smith, Electro-Related Prod.	501-452-4130
CA	Redwood City, National Wire & Cable	415-365-1952
CA	San Diego, McKinley Elctrn. Sls.	619-271-7221
CA	Santa Clara, Ross Mktg.	408-988-8111
CO	Arvada, Arrowhead Sls.	303-423-5556
FL	Altamonte Springs, Gugel-Tuttle Assocs.	305-788-0845
FL	Orlando, National Wire & Cable	305-898-3801
GA	Lawrenceville, Tek-Rep Mktg.	404-963-1600
HI	Hilo, Kirco Corp.	808-959-3888
IL	Northfield, H. S. Tollaksen	312-441-6644
KS	Baxter Springs, P.M.I. Sls.	316-856-2133
MD	Glen Burnie, Faion Lott	301-744-4611
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MI	Livonia, Luebbe Sls.	313-477-3131
MN	Edina, Electro Sls. Inc.	612-941-2143
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NY	Sodus, Kehoe Comp. Sls.	315-483-9122
OH	Cincinnati, Luebbe Sls.	513-891-5770
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Dayton, Luebbe Sls.	513-294-0426
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NAUGLER ENGRG., Off Dunham Rd., Beverly, MA 01915, Tel: 617-922-5634; FSC No.: 05222; Empl.: 10; *Sls. Mgr.:* Charles A. Osborn

NAZ-DAR INTL., 1087 N. Branch St., Chicago, IL 60622, Tel: 312-943-8338, Telex: 25-3303; Empl.: 53; *Sls. Mgr.:* Don Finwall; *Dist. Mgr.:* Don Finwall

N.C.E., Mail Station 331, 9925 Lyndale Ave. S., Bloomington, MN 55420, Tel: 612-890-1360; *Sls. Mgr.:* Hortense M. Rowe .... 3•1420, 1421

NCR COMTEN, INC., NCR Corp., 2700 Snelling Avenue N., St. Paul, MN 55113, Tel: 612-638-7777, Telex: 6879018 COMTEN, TWX: 910-563-3661; FSC No.: 7025-0010; *Sls. Mgr.:* Lewis M. Meador

NCR MICROELECTRONICS DIV., NCR Corp., 8181 Byers Rd., Miamisburg, OH 45342, Tel: 800-543-5618, 513-866-7471, Telex: 241669 NCR NVEM MSBG; FSC No.: 60924; *Sls. Mgr.:* W. David Major

NCR CORP., Terminal Sys Div., Babcock Hall, Terrace Hill, Ithaca, NY 14850, Tel: 607-273-5310

NEC ELCTRNS. USA INC., NEC Electron Div., 252 Humboldt Ct., Sunnyvale, CA 94086, Tel: 408-745-6520, Telex: 35-7475, TWX: 910-339-9539; *Sls. Mgr.:* Robert Buchanan; *Dist. Mgr.:* Jason Stewart

NEC INFOR. SYS., 5 Militia Dr., Lexington, MA 02173, Tel: 617-862-3120, Telex: 92-3434; Empl.: 250; *Sls. Mgr.:* Harry Segal

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NELSON STUD WELDING TRW INC., 28th & Toledo Ave., Lorain, OH 44055, Tel: 216-245-6931, Telex: 980466; Empl.: 350; *Sls. Mgr.:* B. Robinson

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LA	Baton Rouge, Control Sys. Consultants	504-292-1462
MD	Baltimore, Wistex, Inc.	301-366-6303
NE	Lincoln, Jim Otis & Assocs.	402-474-2390
NY	Albany, L-Tron Assocs. Corp.	518-482-1987
NY	Rochester, L-Tron Assocs. Corp.	716-436-4410
OH	Cincinnati, Anderson-Bolds	513-528-5680
OH	Cleveland, Anderson-Bolds	216-229-4700
PA	Wayne, Wistex, Inc.	215-687-5930
UT	Sandy, Priz Co.	801-571-7311
WI	Brookfield, BII, Inc.	414-783-5252

Local Distributors

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KY	Louisville, Main Elec.	502-587-6511
MN	St. Paul, Century Controls	612-222-7355
NC	Charlotte, General Elctrn. of Charlotte	704-568-6793
SC	Charleston, Flow Control	803-722-0176
TX	Houston, Quality Instr. Lab	713-524-0528

NETCOM, 3002 Commercial Ave., Northbrook, IL 60062, Tel: 312-564-5100, TWX: 910-686-5478; FSC No.: 57193; Empl.: 85; *Sls. Mgr.:* Wayne Roeder

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GA	Atlanta, Millar Elctrns.	404-261-6160
IL	Northbrook, Steffey Mktg.	312-480-3575
IN	Fort Wayne, N. Browning & Co.	219-432-9738
KS	Kansas City, BC Elctrn. Sls.	913-342-1211
KS	Wichita, BC Elctrn. Sls.	316-942-9840
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MD	Wheaton, Taub Sls.	301-942-3100
MA	Braintree, Anderson Sls.	617-848-9194
MI	Ann Arbor, Audio Mktg. Concepts	313-663-9733
MN	Golden Valley, Ambassador Indl. Mktg.	612-542-8437
MO	Bridgeton, BC Elctrn. Sls.	314-291-1101
NJ	Englewood, Baum & Epstein Assocs.	212-564-4105
NY	Baldwinsville, Darmstedter Assocs.	315-638-1261
NC	Raleigh, Millar Elctrns.	919-787-9564
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Erie, N. Browning & Co.	814-456-6435
TX	Dallas, Dimenson Mktg.	214-348-9657
WA	Seattle, Earl & Brown Co.	206-284-1121

NEW ENGLAND INSTR., 14 Kendal Lane, Natick, MA 01760, Tel: 617-875-9711, TWX: 710-346-0398; Empl.: 600

NEW ENGLAND SMELTING WORKS, INC., 502 Union St., W. Springfield, MA 01090, Tel: 413-734-6491; FSC No.: 3439; Empl.: 35; *Sls. Mgr.:* David R. Saffer

Local Sales Offices & Reps

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AZ	Phoenix, PLS Assocs.	602-246-6614
CA	Campbell, Luscombe Engrg. Co.	408-370-2020
CA	Pasadena, Luscombe Engrg. Co.	213-684-2000
CO	Englewood, PLS Assocs.	303-773-1218
FL	Orlando, Gra-Mar	305-894-3351
IL	Arlington Hgts., Brainard-Wilson	312-437-2700
IN	Carmel, Brainard-Wilson	317-844-2800
KS	De Soto, Midtec Assocs.	913-441-6565
LA	Baton Rouge, Alpha Engrg.	504-769-3740
MD	Perry Hall, Electra-Tech	301-256-2723
MA	Bedford, Eastronix, Inc.	617-275-5775
MI	Farmington, Amtech Reps.	313-474-8300
MN	Eden Prairie, Rockmore Sls. Corp.	612-941-1390
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Parlin, JMR Sls.	201-727-5335
NM	Albuquerque, PLS Assocs.	505-345-5501
NY	East Setauket, JMR Sls., Inc.	516-689-8871
NY	Skaneateles, ADN Entprs.	315-685-8991
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OH	Strongsville, Dolfuss-Root & Co.	216-238-0300
PA	Bridgeville, Dolfuss-Root & Co.	412-221-4420
PA	King of Prussia, J. E. Cuesta & Co., Inc.	215-265-5800
TX	Addison, Associated Dynamics, Inc.	214-387-3800
TX	Sugarland, Alpha Engrg.	713-491-4505
UT	Midvale, PLS Assocs.	801-566-0671
VA	Dumfries, Electra-Tech	703-670-6962
WI	Menomonee Falls, Brainard-Wilson	414-255-3400

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AL	Birmingham, Brownell-Electro, Inc.	205-322-3374
AL	Muscle Schoals, Jones Elctrns.	205-383-1241
AZ	Phoenix, Metermaster	602-437-1425
AZ	Scottsdale, Beta Distrs.	602-947-7841
CA	Costa Mesa, FLW, Inc	714-751-7512
CA	Hayward, FLW, Inc.	415-487-2222
CA	Los Angeles, EIL Instrs., Inc.	213-685-7020
CA	Los Angeles, Metermaster	213-685-4340
CA	Van Nuys, FLW, Inc.	818-989-5238
CO	Englewood, Beta Distrs.	303-779-4494
CT	Middletown, EIL Instrs., Inc.	203-346-6646
FL	Miami, Brownell Electro, Inc.	305-591-3215
GA	Atlanta (Hapeville), Brownell Electro	404-762-5181
GA	Marietta, FLW, S.E.	404-424-1731
IL	Chicago, Data Elctrns. Co.	312-283-0300
IL	Elk Grove Village, Metermaster	312-593-8650
IN	Indianapolis, Data Elctrns.	317-359-5368
IA	Davenport, Universal Precision Instr.	319-326-5757
KS	Kansas City, Kornfeld Thorp	913-321-7070
KY	Louisville, EIL Instrs.	502-454-3420
LA	Baton Rouge, Beta Distrs.	504-924-6826
MD	Gaithersburg, Pioneer Instrs.	301-921-0660
MD	Sparks, EIL Instr.	301-771-4800
MA	Waltham, Calibron Instrs.	617-894-6440
MI	Livonia, Pioneer Instr.	313-525-1800
MI	Madison Heights, NIDI	313-588-2300
MN	Plymouth, Data Elctrns.	612-559-1434
MO	St. Louis, Universal Precision Inst.	314-394-4693
NJ	North Caldwell, Hosica Labs.	201-256-7724
NM	Albuquerque, Beta Distrs.	505-299-7658
NY	Buffalo, Robert F. Lamb Co.	716-874-4900
NY	Clarence, Trott Elctrns.	716-634-8500
NY	Hauppauge, EIL Instrs., Inc.	516-231-6333
NY	NYC, Brownell Electro	212-691-1171
NY	Rochester, Robert F. Lamb Co.	716-323-1250
NC	Concord, FLW Southeast	704-782-6615
NC	Raleigh, Brownell Electro	919-876-6524
OH	Cleveland, Weschler Elec.	216-238-2550
OH	Cleveland, Metermaster	216-651-4100
OH	Cleveland, Pioneer Instr.	216-587-3600
OH	Dayton, EIL Instrs., Inc.	513-435-2134
OH	Dayton, Pioneer Instr.	513-236-9900
OH	Dayton, NIDI	513-434-7500
OK	Tulsa, Inotek	918-622-8570
OR	Portland, Westcon	503-283-0132
PA	Pittsburgh, Pioneer Instr.	412-782-2300
TN	Memphis, FLW Southeast	901-345-3563
TN	Nashville, Brownell Electro, Inc.	615-889-8230
TX	Austin, Beta Distrs.	512-452-0199
TX	Dallas, Dallas Meter Tek	214-349-6044
TX	Dallas, Inotek	214-243-7000
TX	Ft. Worth, Inotek	817-831-2126
TX	Garland, Metermaster	214-271-5671
TX	Houston, American Analog	713-941-7265
TX	Houston, Inotek	713-688-7000
TX	Houston, Beta Distrs.	713-688-9971
TX	Richardson, Beta Distrs.	214-231-2573
UT	Murray, Beta Distrs.	801-262-3000
VA	Richmond, Metermetrics	804-275-1431
WA	Seattle, EIL Instrs., Inc.	206-762-0880
WI	Milwaukee, E-M Instrs.	414-272-7799

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NEW-TONE ELECTRONICS, INC., 44 Farrand St., Bloomfield, NJ 07003, Tel: 201-748-5089, TWX: 710-994-4780; Empl.: 50; *Sls. Mgr.:* Dominick Gagliano

N.Y. TESTING LABS., INC., 81 Urban Ave., Westbury, NY 11590, Tel: 516-334-7770, TWX: 212-297-1449; Empl.: 50

NIC COMPONENTS CORP., 238 Rte. 109, Farmingdale, NY 11735, Tel: 516-694-0060, 800-645-9333, Telex: 221-228; Empl.: 50; *Sls. Mgr.:* Ronald J. Travis; *Dist. Mgr.:* Nancy Lamendola .... **1A**•1152, 1153, 1906

Local Sales Offices & Reps

AL	Huntsville, Novus Group	205-881-2207
AZ	Phoenix, Sterling Elctrns.	602-258-4531
AZ	Phoenix, Tech Sls.	602-246-1614
AR	Little Rock, Carlton Bates	501-562-9100
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	Mission Viejo, Par Mktg.	714-768-6021
CA	Redwood City, James S. Heaton Co.	415-367-9000
CA	San Diego, Ryno	619-292-6022
CA	San Diego, Bestronic South	619-452-5500
CA	Santa Ana, Projections Unlimited	714-641-1472
CA	Sun Valley, QC Comps.	213-768-6111
CT	Bloomfield, SLR Assocs.	203-243-9343
CT	Danbury, Pilgrim Elctrns.	203-792-7274
FL	Clearwater, Perrott Assocs.	813-443-5214
FL	Largo, Graham Elctrns.	813-541-4434
IL	Champaign, Klaus Radio	217-356-1896
IL	Lisle, W. G. Controls	312-963-5954
IL	Melrose Park, Belford Elctrns,	312-865-2400
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Elctrn. Rep. Inc.	317-894-1414
IA	Cedar Rapids, Deeco	319-365-7551
KS	Shawnee Mission, K&M Sls.	913-262-1444
KY	Louisville, Peerless	502-637-7674
LA	Harvey, AFG	504-368-9696
MD	Baltimore, Burgin-Kreh Assocs.	301-265-8500
MD	Rockville, MS Elctrns.	301-340-6400
MA	Bedford, SLR Assocs.	617-275-5550
MA	Burlington, TLC	617-273-0140
MI	Detroit, Burcaw Co.	313-533-7700
MI	Grand Rapids, SF Elctrns.	616-459-0216
MI	Livonia, Reptron	313-525-2700
MN	Bloomington, NWR	612-854-7329
MN	Golden Valley, Ambassador Ino Mktg.	612-542-8437
NH	Londonderry, S Squared	603-434-2033
NJ	Perth Amboy, Sterling	201-442-8000
NJ	Union, Cougar	201-687-7722
NY	Hauppauge, Belmont Elctrns.	516-273-1333
NY	Jericho, J-Square Mktg. Inc.	516-935-3200
NY	Suffern, M&M Assoc.	914-368-0583
NC	Greensboro, United Sls.	919-674-9849
OH	Cincinnati, Stegman Blaine Mktg. Inc.	513-729-1969
OH	Cincinnati, Graham Elctrns.	513-772-1661
OH	Dayton, Dulian	513-445-0424
OH	Vandalia, Stegman Blaine Mktg. Inc.	513-890-7975
OR	Beaverton, ACACIA	503-646-3377
PA	Philadelphia, Paragon Sls.	215-563-7060
TN	Nashville, Graham	615-242-2682
TX	Dallas, Heiland Elctrns.	214-351-2050
TX	Dallas, Design Mktg.	214-680-9767
TX	Hurst, Design Mktg.	817-268-2004
UT	S. Jordan, Mac III	801-566-3781
EXP	New York Farmingdale, NIC Comps. Corp.	516-694-0060

NICHICON (AMERICA) CORP., 927 E. State Pkwy., Schaumburg, IL 60195, Tel: 312-843-7500, Telex: 20-6577; FSC No.: 312-843-2798; *Sls. Mgr.:* Russ Edwards; *Dist. Mgr.:* Robert Poteracki .... **1A**•1154-1159

Local Sales Offices & Reps

AL	Huntsville, Intrep Assocs.	205-533-1730
AZ	Phoenix, Compass Mktg.	602-266-5400
CA	Huntington Bch., J. J. Riley & Assoc.	714-841-1411
CA	Santa Clara, I2 Inc.	408-988-3400
CO	Denver, West Inc.	303-692-0131
CT	Stratford, Gerald Rosen Co.	203-375-5456
FL	Clearwater, Delmac Sls.	813-447-5192
FL	Miami, Delmac Sls.	305-726-1330
FL	Orlando, Delmac Sls.	305-898-4688
GA	Norcross, Intrep Assocs.	404-449-8680
IL	Chicago, IRI	312-647-7755
IN	Indianapolis, Jack Harvey Assoc.	317-453-4260
MA	Framingham, Gerald Rosen Co.	617-879-5505
MI	Gross Pointe, Greiner Assoc.	313-499-0188
MN	Minneapolis, R. W. Marshall	612-929-0457
MO	Earth City, Centech	314-291-4230
MO	Raytown, Centech	816-358-8100
NJ	Springfield, Radix Inc.	201-467-4970
NM	Albuquerque, Compass Mktg.	505-292-7377
NY	Syracuse, T-Squared Elctrns.	315-463-8592
NY	Victor, T-Squared Elctrns.	716-924-9101
NC	Raleigh, Zucker Assoc.	919-782-8433
OH	Columbus, KW Elctrn. Sls.	614-888-0483
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Hgts., KW Elctrn. Sls.	216-491-9177
PA	Allison Park, KW Elctrn. Sls.	412-287-4300
PA	Huntingdon Valley, Omega Elctrns.	215-947-4135
TX	Austin, Southern States Mktg.	512-452-9459
TX	Dallas, Southern States Mktg.	214-238-7500
TX	Houston, Southern States Mktg.	713-558-4900
WA	Bellevue, Venture Elctrns.	206-454-4594
WI	Milwaukee, IRI	414-259-0965

Local Distributors

AL	Huntsville, Hall Mark Elctrns.	205-837-8700
AZ	Phoenix, TTI	602-966-1616
AZ	Phoenix, Hall-Mark	602-437-1200
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	Irvine, Ryno Elctrns.	714-261-2500
CA	Irvine, Integrated Elctrns.	714-660-1055
CA	Irvine, Kelex Elctrns.	714-863-1230
CA	Sacramento, Integrated Elctrns.	916-424-4297
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Diego, Hall-Mark	619-268-1201
CA	San Diego, Ryno Elctrns.	619-252-6022
CA	San Jose, Shelley Elctrns.	408-942-9111
CA	San Jose, Eric Electronics	408-262-1111
CA	San Jose, Integrated Electronics	408-287-6488
CA	Sunnyvale, Hall-Mark	408-773-9990
CO	Boulder, Shelley Elctrns.	303-442-2718
CO	Denver, Integrated Elctrns.	303-292-6121
CO	Denver, Hall-Mark	303-694-1662
CT	Hamden, Almo	203-288-6556
CT	Wallingford, Cronin Elctrns.	203-265-3134
CT	Wallingford, Sager Elctrns.	203-265-4600
FL	Clearwater, Hall-Mark	813-530-4543

FL	Ft. Lauderdale, Hall-Mark	305-971-9280
FL	Orlando, Hall Mark Elctrns.	305-855-4020
FL	Orlando, T.T.I 2	305-859-1000
FL	Tampa, Reptron	813-855-4656
GA	Norcross, Hall-Mark	404-447-8000
GA	Norcross, Spectrum	404-448-1516
L	Arlington Hts., Reptron	312-593-7070
L	Bensenville, Hall Mark Elctrns.	312-860-3800
L	Chicago, Century Elctrns.	312-777-9700
L	Elkgrove, GBL/Goold	312-593-3220
L	Hoffman, Estates Intercomp	312-843-2040
N	Ft. Wayne, Graham Elctrns.	619-423-3422
N	Indianapolis, Advent Elctrn.	317-872-4910
A	Cedar Rapids, Deeco	319-365-7551
KS	Lenexa, Hall Mark Elctrns.	913-888-4747
MD	Baltimore, Hall Mark Elctrns.	301-796-9300
MD	Rockville, Almo Elctrn.	301-251-1161
MA	Canton, Almo	617-821-1450
MA	Hingham, Saager Elctrn.	617-749-6700
MA	Needham, Cronin Elctrn.	617-449-5000
MA	Woburn, T.T.I.	617-938-8800
MA	Woburn, Hall-Mark Electr.	617-935-9777
MI	Livonia, Reptron	313-525-2700
MN	Bloomington, Hall Mark Elctrns.	612-854-3223
MN	Minneapolis, Joel	612-545-5669
MO	Earth City, Hall Mark Elctrns.	314-291-5350
NJ	Cherry Hill, Hall Mark Elctrns.	609-424-7300
NJ	Fairfield, Hall-Mark	201-575-4415
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NY	Buffalo, Summit	716-887-2800
NY	Hauppauge, Fairmont	516-231-3313
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Rochester, Masline	716-546-5373
NY	Rome, Rome Elctrns.	800-962-2153
NY	Ronkonkoma, Hall-Mark	516-737-0600
NC	Charlotte, Dixie	704-377-5413
NC	Raleigh, Hall Mark Elctrns.	919-872-0712
NC	Raleigh, Resco/Raleigh	919-781-5700
NC	Winston-Salem, Dixie	919-724-5961
OH	Cincinnati, Hall-Mark	513-563-5980
OH	Dayton, Pioneer	513-236-9900
OH	Englewood, Argent Inds.	513-836-8633
OH	Solon, Hall-Mark	216-349-4632
OH	Solon, Repco	216-248-8900
OH	Westerville, Hall Mark Elctrns.	614-891-4555
OK	Tulsa, Hall Mark Elctrns.	918-665-3200
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Harrisburg, Cumberland	717-232-5999
PA	Harrisburg, Advacom	717-545-5674
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Almo	215-698-4000
SC	Columbia, Dixie	803-779-5332
TN	Knoxville, Dixie	615-938-4131
TX	Austin, Hall-Mark	512-258-8848
TX	Dallas, Captronics	214-340-3592
TX	Dallas, Hall Mark Elctrns.	214-341-1147
TX	Ft. Worth, T.T.I 2	817-831-0441
TX	Houston, Hall-Mark	713-781-6100
WA	Bellevue, Integrated Electr.	206-455-2727
WA	Bellevue, Bell Inds.	206-747-1515
WI	Oak Creek, Hall Mark Elctrns.	414-761-3000

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NICOLET INSTR. CORP., Oscilloscope Div., 5225 Verona Rd., Madison, WI 53711, Tel: 608-271-3333, TWX: 910-286-2737; Empl.: 525; *Sls. Mgr.:* Dean Dawson

Local Sales Offices & Reps

AZ	Phoenix, Axtec Entprs.	602-944-9185
CA	Los Angeles, Nicolet Instr.	714-549-7611
CA	San Diego, Nicolet Instr.	619-454-6274
CA	San Jose, Nicolet Instr.	408-946-3310
CO	Littleton, Aztec Entprs.	303-795-0250
FL	Valrico, Nicolet Instr.	813-685-0444
GA	Tucker, Nicolet Instr.	404-491-0127
IL	Chicago, Nicolet Instr.	312-843-2905
MD	Lanham, Nicolet Instr.	301-459-2940
MA	Burlington, Nicolet Instr.	617-273-4404
MI	Brighton, Nicolet Instrument	313-229-4655
MN	Minneapolis, Nicolet Instr.	612-933-0048
MO	St. Louis, Nicolet Instr.	314-821-2868
NJ	Cherry Hill, Nicolet Instr.	609-665-5100
NJ	Cranford, Nicolet Instr.	201-276-6677
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Schenectady, Nicolet Instr.	518-346-2503
NC	Charlotte, Nicolet Instr. Corp.	704-364-0240
OH	Chardon, Nicolet Instr.	216-951-8249
OH	Hamilton, NIC Inst.	513-868-3611
PA	Beaver Falls, Nicolet Instrument	412-847-0100
TX	Plano, Nicolet Instr.	214-422-4014
UT	Salt Lake City, Aztec Entprs.	801-621-1655
WA	Edmonds, Nicolet Instr. Corp.	206-771-2400
WI	Madison, Nicolet Instr.	608-273-5008

NICOLET PARATRONICS, 201 Fourier Ave., Fremont, CA 94539, Tel: 415-490-8300, TWX: 910-381-7030; FSC No.: 6625; Empl.: 95; *Sls. Mgr.:* Ernie Marsh

Local Sales Offices & Reps

AL	Huntsville, Magaro & Assocs.	205-882-0827
AZ	Phoenix, Zeus	602-263-6022
CA	Carson, Amasco	213-516-8561
CA	Sunnyvale, Amasco	408-733-8690
CO	Denver, Zeus	303-321-4246
CT	Danbury, Martindale Assoc.	203-748-2253
FL	Orlando, Datarep, Inc.	305-843-5224
FL	Tampa, Datarep, Inc.	813-962-7555
GA	Atlanta, Magaro & Assocs.	404-451-8862
IL	Downers Grove, Charles Menshek	312-964-8700
IN	Carmel, Carter, McCormic, & Peirce, Inc.	317-844-4175
MD	Burtonsville, Eastern Instr.	301-384-8500
MA	North Reading, Martindale Assoc.	617-942-0514
MI	Farmington, Carter, McCormic, & Peirce, Inc.	313-477-7700
MO	Kansas City, Eir Company	816-452-7030
MO	Leasburg, Eir Company	314-895-4100
NJ	Ridgefield, Rical Assocs.	201-945-5250
NM	Albuquerque, Zeus Elctrns.	505-256-9831
NY	Earlton, Martindale-Paul, Inc.	518-634-7617
NY	Rochester, Martindale-Paul, Inc.	716-288-8611
NY	Syracuse, Martindale-Paul, Inc.	315-432-1141
NC	Greensboro, Magaro & Assocs.	919-294-4783
OH	Englewood, Carter, McCormic & Peirce, Inc.	513-836-0951
OH	Fairview Park, Carter, McCormic, & Peirce, Inc.	216-779-1700
PA	Jenkintown, Monument Techn. Assoc.	215-884-3737
PA	Monroeville, Carter, McCormic & Peirce, Inc.	412-372-4415
TX	Austin, Testech	512-327-7033
TX	Houston, Testech	713-956-0837
TX	Richardson, Testech	214-644-5010
UT	Salt Lake City, Zeus Elctrns.	801-534-0500
VT	Jericho, Martindale Assocs.	802-899-2329
WA	Edmond, Nicolet Instrument Corp.	206-771-2400

NISSEI SANGYO AMERICA, LTD., 1701 Golf Rd., Ste. 401, Rolling Meadows, IL 60008, Tel: 312-981-8989, Telex: 28-0547, TWX: 910-233-5865; *Sls. Mgr.:* Y. Hamada

NITRON, 10420 Bubb Rd., Cupertino, CA 95014, Tel: 408-255-7550, TWX: 910-338-0222; Empl.: 150; *Sls. Mgr.:* R. Gardner

NITTO DENKO AMERICA, INC., 27 Seaview Blvd., Port Washington, NY 11050, Tel: 516-484-9700, Telex: 96-1386; *Sls. Mgr.:* Steven E. Schoenstadt

NJE CORPORATION, Box 50, Culver Rd., Dayton, NJ 08810, Tel: 201-329-4611, TWX: 710-480-5674; FSC No.: 98380; Empl.: 125; *Sls. Mgr.:* John M. Slavik .... 3•1661

Local Sales Offices & Reps

AZ	Phoenix, Sigma Engrg. Sls.	602-241-1334
CA	Garden Grove, Elsco Elctrns.	714-891-4621
CO	Englewood, F. G. Mktg.	303-795-9176
CT	Ansonia, R. H. Sturdy Co.	203-734-2186
ID	Boise, Underwood Hanify Co.	208-343-0964
IA	Davenport, Ensco Rep	319-386-6600
KS	Overland Park, Ensco Rep	913-381-7557
KS	Wichita, Ensco Rep	316-683-1070
MA	Salisbury, R. H. Sturdy Co.	617-465-1505
MA	Wellesley Hills, R. H. Sturdy Co.	617-235-2330
MI	Brighton, A. P. Assocs.	313-229-6550
MN	Edina, Grayden & Flemmer	612-941-1120
MO	Maryland Heights, Ensco Rep	314-423-3935
NY	Clark Mills, KLM Garner	315-853-6126
NY	N. Syracuse, KLM Garner	315-458-6214
NY	Pittsford, KLM Garner	716-381-8350
OH	Englewood, Allen Nace Co.	513-836-0931
OH	Richfield, Allen Nace Co.	216-659-7178
PA	Glenshaw, Allen Nace Co.	412-487-1217
WA	Bellevue, Underwood Hanify Co.	206-451-8223
WA	Vancouver, Underwood Hanify Co.	503-641-4463
EXP	NJ, Dayton, NJE Corp.	201-329-4611

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NKK SWITCHES OF AMERICA, INC., 14415 N. Scottsdale Rd., Ste. 600, Scottsdale, AZ 85260, Tel: 602-991-0942, TWX: 910-950-1167; FSC No.: FSCN 63426; *Sls. Mgr.:* Samuel L. Porcelli; *Dist. Mgr.:* Samuel L. Porcelli .... **1B**•1723-1731

Local Sales Offices & Reps

AL	Huntsville, Over & Over	205-837-7105
AZ	Scottsdale, Mahaffey & Assocs.	602-991-9790
CA	Granada Hills, C & W Component Sls.	213-368-4032
CA	Mountain View, Caltron Components Corp.	415-964-3244
CA	San Diego, McKinley Elctrn. Sls.	619-271-7221
CO	Parker, TMA of Colorado	303-841-3435
FL	Orlando, Over & Over, Florida, Inc.	305-857-4057
GA	Norcross, Over & Over	404-449-6205
IL	Rolling Meadows, KMA Sales	312-398-5300
IN	Fort Wayne, Frank E. Kahsar Sls.	219-422-0311
IN	Indianapolis, Frank E. Kahsar Sls.	317-888-8396
KS	Merriam, Midwest Tech. Sls.	913-236-8557
MA	Needham Hgts., Newscott Co.	617-444-1923
MN	Minnetonka, SAI Mktg. Corp.	612-935-0777
MS	Jackson, Welch & Doby, Inc.	601-932-5534
NY	De Ruyter, NET Sales Co.	315-662-7996
NY	Fairport, NET Sales Co.	716-467-4538
NY	Oceanside, Bittan	516-678-6222
NY	Troy, NET Sales Co.	716-467-4538
NY	Webster, NET Sales Co.	716-467-4538
NC	Charlotte, Over & Over	704-527-3070
NC	Raleigh, Over & Over	919-872-2262
OH	Cincinnati, Frank E. Kahsar Sls.	513-922-3133
OH	Hudson, Frank E. Kahsar Sls.	216-650-1089
OR	Portland, James J. Backer, Inc.	503-297-8744
OR	Salem, James J. Backer, Inc.	503-362-0717
PA	West Conshohocken, Eastern Comps. Sls.	215-825-8610
RI	Stewartstown, Eastern Comps. Sls.	301-323-7104
TX	Dallas, Rem Air Components Corp.	214-234-1069
UT	Salt Lake City, TMA of Colorado	801-483-1009
VA	Manassas, Eastern Comps. Sls.	703-471-1025
WA	Seattle, James J. Backer, Inc.	206-285-1300
WI	Milwaukee, KMA Sales	414-259-1771

Local Distributors

AZ	Phoenix, Dalis Elctrn. Supply	602-275-2885
AZ	Tempe, Powell Elctrns.	602-438-1505
CA	Burlingame, Rose Electronic Dist. Co.	415-348-2740
CA	San Diego, Shanks & Wright	619-239-0176
CA	San Dimas, Mrs. Switch, Inc.	714-599-6639
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Torrance, Cypress Elctrns.	213-533-6005
CA	Tustin, Western Switches & Controls	714-731-4333
CO	Arvada, Denver Wintronics	303-431-7161
CO	Aurora, Jet Elctrns. Supp. Co.	303-364-1000
CT	Danbury, Pilgrim Elctrns.	203-792-7274
CT	Stamford, Bond Elctrns.	203-348-2663
FL	Miami, Elctrn. Equip. Co.	305-871-3500
FL	West Palm Beach, Nurmi Elctrn. Supply	305-686-8553
IL	Wheeling, Hawk Elctrns.	312-459-4030
IN	Fort Wayne, Graham Elctrns. Supply	219-423-3422
IN	Indianapolis, Graham Elctrns. Supply	317-634-8202
IN	Indianapolis, MAR Elctrn.	317-875-4510
KS	Wichita, Radio, Inc.	316-264-2798
KS	Wichita, Air Technics	316-267-2849
MD	Kensington, Marine Air Supply Co.	301-949-9560
MA	Boston, Controller Svc. & Sls.	617-269-1300
MA	Woburn, EPC, Inc.	617-935-0400
MI	St. Clair Shores, Spemco Switches	313-771-2700
MN	Minneapolis, The Joel Co.	612-545-5669
MO	St. Louis, Franklin Elctrns.	314-993-5333
NJ	Englewood, Powell	201-894-0800
NY	Hempstead, Elctrn. Equip. Co.	516-538-5510
NY	Mt. Vernon, Kin-Tronics	914-668-9882
NY	Oceanside, Tritech Elctrn. Distr.	516-678-6222
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rome, Rome Elctrns.	315-337-5400
NY	Troy, Trojan Elctrn. Supp. Co.	518-274-4481
NC	Cary, Powell Elctrns.	919-467-1212
OH	Cincinnati, Schuster Elec. Co.	513-489-1400
OH	Twinsburg, Schuster Elec. Co.	216-425-8134
OK	Oklahoma City, Radio, Inc.	405-789-0741
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Lake Oswego, Rose Elctrn. Distr. Co.	503-635-8823
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Wayne, Peak Elctrns. Corp.	215-293-9000

TN	Chattanooga, Techni-Tronics	615-875-5449
TX	Austin, Southwest Elctrns.	512-837-8971
TX	Dallas, Wallace Elctrns. Co.	214-340-0400
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, Powerline Prods.	713-578-3222
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Stafford, Southwest Elctrns.	713-491-4900
WA	Seattle, Priebe Elctrns.	206-682-8242
WI	Hartland, GW Elctrns.	414-367-6003

NKR PRECISION MFG., Rte. 17M, Box 333, Harriman, NY 10926, Tel: 914-782-8562; Empl.: 17

NL BEARINGS/NL INDUSTRIES INC., PO Box 934, Toledo, OH 43694, Tel: 419-381-3100; Empl.: 1000; *Sls. Mgr.:* James Doherty; *Dist. Mgr.:* B. Sexauer

NMB CORP., MOTOR DIV., 9730 Independence Ave., Chatsworth, CA 91311, Tel: 213-709-1555

NOBEX DIV., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, CA 94010, Tel: 415-342-8170, TWX: 910-374-2840; FSC No.: 32767; Empl.: 35

NOBLE U.S.A., INC., 151 Stanley St., Elk Grove Vllg., IL 60007, Tel: 312-364-6038, Telex: 206745; FSC No.: 1-3123646045; *Sls. Mgr.:* Vyto Omilijonas; *Dist. Mgr.:* Vyto Omilijonas

NOLATRON, P.O. Box 4042, Harrisburg, PA 17111, Tel: 717-564-3398; Empl.: 10

NOLL, J. A., CO., P.O. Box 447, Cumberland, MD 21502, Tel: 301-777-7887; *Sls. Mgr.:* P. Carson; *Dist. Mgr.:* P. Carson

NON-LINEAR SYSTEMS/DIV. OF KAYPRO CORP., 533 Stevens Ave., Solana Bch., CA 92075, Tel: 619-481-3900, TWX: 910-322-1132; Empl.: 55; *Sls. Mgr.:* Ben W. Fisher; *Dist. Mgr.:* Jeanne Simmons

Local Sales Offices & Reps

GA	Norcross, Hollingsworth & Still	404-447-1700
MA	N. Scituate, W. A. Hendrickson Co.	617-545-0652
OH	Dayton, Shamrock Elctrn. Sls.	513-258-1227
PA	Abington, Mid-Atlantic Sls.	215-657-2815
TX	Dallas, Berthold Sls.	214-328-0067

Local Distributors

AZ	Phoenix, Metermaster	602-273-7331
CA	Costa Mesa, Marvac Elctrns.	714-540-3280
CA	Garden Grove, Allied Electronics	714-554-0731
CA	Hayward, Allied Electronics	415-487-5250
CA	Irvine, Meter Craft	714-979-1420
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Los Angeles, Metermaster	213-685-4340
CA	Oakland, Western Electro. Mech.	415-452-1936
CA	Palo Alto, Metermaster	415-968-0313
CA	San Diego, Metermaster	619-560-4841
CA	San Jose, Allied Electronics	408-727-1690
CA	Santa Clara, Eil Instruments	408-272-0396
FL	Ft. Lauderdale, Allied Electronics	305-486-0550
FL	Miami, Brownell Electro	305-591-3215
FL	Orlando, Brownell Electro	305-843-6770
FL	Palm City, Eil Instruments	305-725-8300
GA	Atlanta, Allied Electronics	404-237-3366
GA	Atlanta, Metermaster	404-446-0166
GA	Atlanta, Brownell Electro	404-762-5181
IL	Bridgeview, Eil Instruments	312-430-2292
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elk Grove, Metermaster	312-593-8650
IL	Niles, Joseph Elctrns.	312-297-4200
IL	Peoria, Klaus Radio	309-691-4840
IN	Indianapolis, Eil Instruments	317-545-1373
KY	Louisville, Eil Instruments	502-637-7677
LA	Harahan, Indus. Instru. Works	504-733-8355
LA	Shreveport, Indl. Elctrns. Supp.	318-222-9459
MD	Elkridge, Sunshine Sci. Instrs.	301-796-5600
MD	Marlow Heights, Allied Electronics	301-423-0161
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MD	Sparks, E. I. L. Instrs	301-252-1260
MA	Boston, Allied Electronics	617-942-0150
MA	Burlington, E.I.L. Instrs.	617-272-9450
MA	Hingham, Sager Electrical Supply	617-542-2281
MI	Ferndale, Ram Meter	313-547-1000
MN	Minneapolis, Instrumentation Serv.	612-544-8916
MO	Kansas City, Electronic Supply	816-931-0250
MO	St. Louis, Eil Instruments	317-545-1373
NV	Las Vegas, Hurley Electronics	702-384-5666
NJ	N. Caldwell, Hosica Labs	201-256-7724
NJ	So. Plainfield, Brownell Electro	201-753-4600
NM	Albuquerque, Electronic Parks	505-293-6161
NY	Albany, Edwin E. Taylor	518-438-7811
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Hauppauge, Eil Instruments	516-231-6333
NY	Mineola, Allied Electronics	516-248-2360
NY	New York, Advance Electronics	212-687-2224
NY	Port Chester, Wise Electronics	914-939-3940
NY	Rochester, Eil Instruments	716-424-5750
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Charlotte, Brownell Electro	704-597-1270
NC	Raleigh, Brownell Electro	919-876-6524
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, Metermaster	216-651-4100
OH	Columbus, Hughes Peters	614-294-5351
OH	Dayton, Eil Instruments	513-435-2134
OH	Wickliffe, Gateway-Megatech	216-944-8565
OH	Willoughby, Allied Electronics	216-951-0908
OK	Oklahoma City, Trice	405-524-4411
OK	Tulsa, Trice	918-585-5718
OK	Tulsa, Radio Inc.	918-587-9123
OR	Portland, United Radio Supply	503-434-2171
PA	Bala Cynwyd, Allied Electronics	215-667-6940
PA	Philadelphia, Sunshine Sci. Instrs.	215-673-5600
PA	Pittsburgh, CAM/RPC	412-782-3770
PA	Pittsburgh, Eil Instruments	412-731-5230
PA	Reading, Barbey	215-376-7451
PA	York, Cumberland	717-845-8791
SC	Columbia, Dixie Electronics	803-779-5332
TN	Chattanooga, Curle Elctrns.	615-266-4728
TN	Knoxville, Brownell Electro	615-966-3441
TN	Memphis, Brownell Electro	901-795-8487
TN	Nashville, Brownell Electro	615-889-8230
TX	Austin, Electrotex	512-454-0318
TX	Dallas, Eil Instruments	214-931-1236
TX	Dallas, Metermaster	214-271-5671
TX	Dallas, Dallas Meter Tek	214-349-6044
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Allied Electronics	713-681-2983
TX	Houston, Electrotex	713-526-3456
TX	Houston, Eil Instruments	713-271-3100
TX	San Antonio, Sherman Elctrns.	512-224-1001
VA	Alexandria, Eil Instruments	703-354-4330
VA	Virginia Beach, Eil Instruments	804-499-3746
WA	Seattle, Allied Electronics	206-547-2827
WA	Seattle, Eil Instruments	206-762-0880
WA	Seattle, Eicher-Richards Co.	206-523-7888
WI	Milwaukee, Allied Electronics	414-355-8866

NORELCOM INDS., 63 Marine St., Farmingdale, NY 11735, Tel: 516-249-7245; Empl.: 55; *Sls. Mgr.:* Richard E. Thaw; *Dist. Mgr.:* Regina Vena

NORITAKE ELCTRNS., INC., Noritake Co., Ltd. (Japan), 22410 Hawthorne Blvd., #6, Torrance, CA 90505, Tel: 213-373-6704, Telex: 67-4910; *Sls. Mgr.:* T. Ohki

NORLAND, Norland Dr., Ft. Atkinson, WI 53538, Tel: 414-563-8456, Telex: 26-5448; Empl.: 275; *Sls. Mgr.:* Robert J. Millar

Local Sales Offices & Reps

CA	San Jose, Norland	408-972-2248
FL	Orlando, Micro Spec	305-299-6508
MD	Silver Spring, Seltronics	301-589-3391
MI	Coloma, Norland	800-558-0158
MI	Farmington Hills, Anderson Elctrns.	313-553-7600
NM	Las Cruces, Sota-Com	505-523-4480
NY	Rensselaer, Norland	518-477-2329
SC	Rock Hill, Micro Spec	803-366-3015
TX	Arlington, Norland	817-261-5284
WA	Bellevue, Showalter Instrs.	206-746-7970

NORPLEX DIV., 10 V.O.P. Plaza, Des Plaines, IL 60016, Tel: 312-391-2000

NORSAL INDS., 85 D Hoffman Lane So., Central Islip, NY 11722, Tel: 516-234-1200, TWX: 510-227-1045; *Sls. Mgr.:* Lauren Kent

Local Sales Offices & Reps

CA	El Segundo, Fetty/Schoenduve, Inc.	213-322-4991
CA	Santa Clara, Donahue Assocs.	408-727-6694
GA	Kennesaw, BWS Mktg.	800-824-7888
MD	Pasadena, Spectro-Lambda Inc.	301-279-2010
MA	Lexington, Eugene Delfino Inc.	617-862-1118
MN	Minneapolis, Deming & Assocs.	612-888-5000
OH	Dayton, Frederick Ohmer Assoc.	513-434-1454
OH	Dayton, Ohmer Assocs.	513-434-1454
PA	Elkins Park, Snow Assocs.	215-379-4700
TX	Dallas, Texas Microwave	214-351-4773
WA	Seattle, Datacom	206-285-2525
EXP	NY, Central Islip, Norsal Export, Ltd.	516-234-1200

Local Distributors

CA	El Segundo, Fetty/Schoenduve, Inc.	213-322-4991
CA	Santa Clara, Donahue Assocs.	408-727-6694
GA	Kennesaw, BWS Mktg.	800-824-7888
MD	Pasadena, Spectro-Lambda, Inc.	301-279-2010
MA	Lexington, Eugene Delfino, Inc.	617-862-1118
MN	Minneapolis, Deming & Assocs.	612-999-5000
OH	Dayton, Frederick Ohmer Assocs.	513-434-4454
PA	Elkins Park, Snow Assocs.	215-379-4700
TX	Dallas, Texas Microwave	214-351-4773
WA	Seattle, Datacom	206-285-2525

NORTH AMERICAN PHILIPS CONTROLS CORP., See Airpax Corporation, Cheshire Div.

NORTH AMERICAN PHILIPS LIGHTING, Bank St., Hightstown, NJ 08520, Tel: 609-448-4000, TWX: 510-685-5651; Empl.: 600; *Sls. Mgr.:* C. J. Lehmann

NORTH AMERICAN PRINTED CIRCUIT DIV., Tyco Labs., Inc., Box 145, Stafford, CT 06075, Tel: 203-684-2703; Empl.: 230

NORTH AMERICAN SOAR CORP., 11126 Cornell Ave., Cherry Hill, NJ 08002, Tel: 609-488-1060; Empl.: 7; *Sls. Mgr.:* Robert Liska ....3•1267-1275, 1360, 1372-1374

NORTH ATLANTIC INDS., Instrument Div., 60 Plant Ave., Hauppauge, NY 11788, Tel: 516-582-6500, TWX: 510-227-9660; FSC No.: 07342; Empl.: 320; *Sls. Mgr.:* K. Salz ....3•1277, 1345

Local Sales Offices & Reps

AZ	Phoenix, Aztec Entprs.	602-944-9185
CA	Cupertino, T. Louis Snitzer Co.	408-257-8333
CA	Delmar, T. Louis Snitzer Co.	714-226-0305
CA	Los Angeles, T. Louis Snitzer Co.	213-836-6170
CO	Littleton, Aztec Entprs.	303-795-0250
CT	Enfield, Meco	800-225-3409
FL	Cocoa Beach, TeqSpec	305-783-3444
FL	Palm Harbor, Teqspec	813-785-2296
GA	Atlanta, Teqspec II	404-399-6780
IL	Chicago, Pat Lind Elctrns.	312-726-3513
IN	Indianapolis, Pat Lind Elctrns.	317-632-7444
MD	Wheaton, Brimberg Sls. Co.	301-946-2670
MA	Reading, Meco	617-944-6660
MI	Madison Hgts., WKM Assoc.	313-588-2300
MN	Circle Pines, P. Lind	612-786-5770
NM	Albuquerque, Aztec Entprs.	505-262-1688
NC	Winston-Salem, Teqspec III	919-723-8102
OH	Cleveland, WKM Assoc.	216-524-5930
OH	Dayton, WKM Assoc.	513-434-7500
OR	Beaverton, Northwest Test & Meas.	503-646-9966
PA	Philadelphia, Tech. Instr. Sls.	215-836-2222
PA	Pittsburgh, WKM Assoc.	412-892-2953
TN	Morristown, Teqspec	615-587-0980
TX	Houston, Scientific Sls.	713-460-9170
TX	Richardson, Sci. Sls.	214-231-6541
UT	Ogden, Aztec Entprs.	801-621-1655
WA	Redmond, Northwest Test & Meas.	206-881-8857
WI	Milwaukee, Pat Lind Elctrns.	414-224-0146

NORTHEAST SCIENTIFIC CORP., 30 Wetherbee St., Acton, MA 01720, Tel: 617-263-2711; Empl.: 10; *Sls. Mgr.:* C. Moritz

NORTHERN ENGRG. LABS., See Midland-Ross Corp., NEL Unit

NORTHERN PRECISION LABS., 11 Madison Rd., Fairfield, NJ 07006, Tel: 201-227-4800, TWX: 710-734-4301; Empl.: 95; *Sls. Mgr.:* M.P. Nigro

NORTH HILLS ELCTRNS., Alexander Pl., Glen Cove, NY 11542, Tel: 516-671-5700, Telex: 64-0476; FSC No.: 98821; Empl.: 85; *Sls. Mgr.:* H. H. Marx ....1A•1247, 1774, 2210; 3•1393, 1662

Local Sales Offices & Reps

MA	Burlington, Microwave Comps. Mktg.	617-273-3106
MN	Minneapolis, Hei-Lite Sls.	612-861-6051

NORTHLAKE ENGRG., 999 Anita Ave., Antioch, IL 60002, Tel: 312-395-5710; FSC No.: 50638; Empl.: 100; *Sls. Mgr.:* M. R. Whitman

NORTHWEST MICROCIRCUITS, 2115 N. College, Newburg, OR 97132, Tel: 503-538-7081; Empl.: 5; *Sls. Mgr.:* Wm. H. Ferwalt

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NORTHWEST MICRO produces custom Hybrid Circuits from customer schematics, layouts, or film positives. Turn around time for prototypes runs 4 to 6 weeks with engineering costs usually ranging from $500 to $900. NWμ also does complete circuit design to customer performance specifications. Hybrid ckt experience includes voltage regulators, R & RC networks, digital & analog timing, and medical products. Services include solder sealing of flat packs and chip carriers for hermeticity.

NORTON, One New Bond St., Worcester, MA 01606, Tel: 617-853-1000, Telex: 920428, TWX: 710-340-1126; Empl.: 19000

NORTON ASSOCS., 10 Di Tomas Ct., Copiague, NY 11726, Tel: 516-842-4666; FSC No.: 08739

NORTON CHEMPLAST, 31-150 Dey Rd., Wayne, NJ 07470, Tel: 201-696-4700, TWX: 710-988-5834; Empl.: 300; *Dist. Mgr.:* Wes Wheeler

NORTRAN, Power Elctrns. Corp., 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334, TWX: 510-297-4462; *Sls. Mgr.:* Robert S. Karstedt

NOTHELFER WINDING LABS, See NWL Transformers

NOUMENON CORP., 512 Westline Dr., Alamdea, CA 94501, Tel: 415-521-2145, Telex: 176340; *Sls. Mgr.:* Michael C. Mead

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NOVA ELEC., 263 Hillside Ave., Nutley, NJ 07110, Tel: 201-661-3434, Telex: 219077; FSC No.: 29019; Empl.: 50; *Sls. Mgr.:* Carlton C. Applegate ....**3•**1895

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs.	205-837-4304
AZ	Phoenix, Adtek	602-931-9289
CA	Los Alamitos, Sci. Devices	213-598-7678
CA	San Diego, Sci. Devices	619-279-6642
CA	San Jose, Sci. Devices	408-554-0455
CO	Boulder, Sci. Devices	303-449-9466
CO	Denver, Sci. Devices	303-449-9466
FL	Orlando, Data Rep	305-843-5224
L	Chicago, Ampol Svcs. & Engrg.	312-685-1350
N	Carmel, CMP	317-844-4175
KS	Shawnee Mission, W. Hickman	913-362-4300
LA	Abbeville, Data Mktg. Assoc.	318-989-1265
MD	Silver Spring, Spectro Sls.	301-949-8261
MA	Wakefield, Bordewieck Engrg.	617-659-4915
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Eden Prairie, Compusite	612-944-8552
MO	St. Louis, F. Gilliam	314-961-5555
NJ	Northvale, Comp-Tran	201-768-2060
NY	Binghamton, Tae-Rep	607-772-6952
NY	Fishkill, Tae-Rep	716-586-8710
NY	Rochester, Tae-Rep	716-586-8710
NC	Charlotte, J. Rudisill Assoc.	704-377-6901
OH	Cleveland, CMP	216-779-5100
OH	Englewood, CMP	513-836-0951
OK	Oklahoma City, Data Mktg. Assoc.	918-496-1497
PA	Bala Cynwyd, Electrical Distribution	215-665-5654
PA	Monroeville, CMP	412-372-4415
TX	Austin, Data Mktg. Assoc.	512-451-5174
TX	Dallas, Data Mktg. Assoc.	214-661-0300
TX	Houston, Data Mktg. Assoc.	713-780-2511
TX	San Antonio, Data Mktg. Assoc.	512-342-3031
VA	Richmond, J. Rudisill Assoc.	704-377-6901
WA	Seattle, Al Smith Co.	206-746-6770

NOVA TRAN, 100 Deposition Dr., Clear Lake, WI 54005, Tel: 715-263-2333; FSC No.: 56643; Empl.: 45; *Sls. Mgr.:* R. Schley

NOVATRONICS, Box 878, Pompano Beach, FL 33061, Tel: 305-942-5200, TWX: 510-956-9878; Empl.: 225; *Sls. Mgr.:* W. G. Peters

NRD, Mark IV Inds., 2937 Alt Blvd. N., Grand Island, NY 14072, Tel: 716-773-7634, Telex: 91578 NRD GRDI; *Sls. Mgr.:* James R. Curtis; *Dist. Mgr.:* Larry Keating

NSD, 10936 Portal Dr., Los Alamitos, CA 90720, Tel: 714-527-4896; *Sls. Mgr.:* Paul Pomerantz; *Dist. Mgr.:* Paul Pomerantz

NTK

NTK TECHNICAL CERAMICS, NGK Spark Plugs (U.S.A.), Inc., 1701 N. Greenville Ave. #205, Richardson, TX 75081, Tel: 214-235-8332; FSC No.: 95-246-1286; *Sls. Mgr.:* K. C. Ogawa; *Dist. Mgr.:* Mark Ota ....**1A•**1396, 1397; **1B•**1853; **3•**1043

Local Sales Offices & Reps

AL	Huntsville, L&D, Inc.	919-292-3201
CA	Culver City, DeAngelo Rothman and Co. Inc.	213-827-2202
CA	San Jose, Frequency Control Assocs.	408-446-0200
CT	Bloomfield, Zaslow Sales Co.	203-242-7781
FL	Maitland, D.J. Ellis & Assocs. Inc.	305-645-1101
GA	Atlanta, L&D Inc.	404-455-3483
IN	Indianapolis, Intl. Elctrns. Corp. of Indiana	317-257-8115
IN	Scottsburg, Intl. Elctrns. Corp. of Indiana	812-752-4611
IA	Chanhassen, Barnes Sls. Assocs.	612-934-2907
KS	Overland Park, Barnes Midwest Sls.	913-341-9317
MD	Baltimore, Espy Sls. Co.	301-441-6982
MI	Ann Arbor, Elliott Sls. Co.	313-662-4087
MN	Chanhassen, Barnes Sales Assocs.	612-934-2907
NJ	Boonton, Pafi Assocs.	201-335-0680
NY	Smithtown, Pafi Assocs.	516-360-0940
NC	Raleigh, L&D Inc.	919-876-5301
PA	Rydal, Espy Sls. Assocs.	215-576-0780
TN	Seymour, Espy Sls. Assocs.	315-573-6511
VA	Richmond, Espy Sls. Assocs.	804-359-0125
WA	Seattle, Northmar Inc.	206-524-5170

NUCLEAR RESCH. CORP., 125 Titus Ave., Warrington, PA 18976, Tel: 215-343-5900, Telex: 510-665-8525 NRC WNTN; FSC No.: 96696; Empl.: 85; *Sls. Mgr.:* D.T. McIntyre, V.P.

NUCLEONIC PRODS., See Thomson-CSF Comps. Corp., Passive Comps. Div.

NU-CONCEPT COMPUTER SYS., Rte. 309 & Advance La., Colmar, PA 18915, Tel: 215-822-8400; Empl.: 17; *Sls. Mgr.:* Thomas Dvorak

NU DATA, 32 Fairview Ave., Little Silver, NJ 07739, Tel: 201-842-5757, Telex: 132405, TWX: 710-722-5754; Empl.: 20; *Sls. Mgr.:* S. L. Houcke

NUMARK ELCTRNS. CORP., 503 Raritan Ctr., Edison, NJ 08817

NUMERIX CORP., 320 Needham St., Newton, MA 02161, Tel: 617-964-2500, Telex: 948032; *Sls. Mgr.:* Harold Messias

NU-METRICS, P.O. Box 800, Connellsville, PA 15425, Tel: 412-628-0400; Empl.: 12; *Sls. Mgr.:* Waide Miller

NURAD, INC., 2165 Druid Pk. Dr., Baltimore, MD 21211, Tel: 301-462-1700, TWX: 710-234-1071; Empl.: 80

NWL TRANSFORMERS

NWL TRANSFORMERS, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 230; *Sls. Mgr.:* C. W. Harrison ....**1A•**2211; **3•**1663

NWL TRANSFORMERS, Megatran Electronic Power, Rising Sun Rd., P.O. Box 358, Bordentown, NJ 08505, Tel: 609-298-7300, TWX: 510-685-3645; Empl.: 195; *Sls. Mgr.:* C. W. Harrison ....**3•**1663

NYE, WILLIAM F., INC., P.O. Box G-927, New Bedford, MA 02742-0927, Tel: 617-996-6721, Telex: 940807; Empl.: 15

NYLTITE, 3451 S. Clinton Ave., S. Plainfield, NJ 07080, Tel: 201-561-1300; *Sls. Mgr.:* Frances Gould

Nytronics Components Group, Inc.

NYTRONICS COMPS. GROUP INC., Orange St., Darlington, SC 29532, Tel: 803-393-5421, TWX: 810-665-2182; FSC No.: 83125; Empl.: 450 ....**1A•**1160-1172, 1218, 1248-1267, 1554-1557, 1907-1909

Local Sales Offices & Reps

AL	Huntsville, B.C.I.	205-539-4411
AZ	Tucson, Clemick Neenan & Assoc.	802-749-4003
CA	San Diego, Clemick Neenan & Assocs.	619-268-8540
CA	Sherman Oaks, Clemick Neenan & Assocs.	213-990-3150
CA	Sunnyvale, W.W. Posey	408-746-0771
CO	Denver, Component Sls.	303-759-1666
GA	Chamblee, B.C.I.	404-455-0405
IL	Rolling Meadows, Sumer Inc.	312-991-8500
IN	Indianapolis, Southern Sls.	317-875-8750
KS	De Soto, Mid-Tec Assoc.	913-441-6565
MA	Bedford, F.R. Lesser	617-275-7558
MI	Rockford, H.C. Heym Assoc.	616-874-7443
MN	Minneapolis, Dunlop Consits.	612-529-7626
MO	Florissant, Mid-Tec Assoc.	314-837-5200
NJ	West Orange, National Atlantic	201-731-0703
NY	Pittsford, W.A. Franklin Sls.	716-248-8251
NY	Valley Cottage, LRC Assocs.	914-268-4435
NC	Charlotte, B.C.I. Inc.	704-567-0473
NC	Raleigh, B.C.I.	919-781-9426
OH	Akron, Imtech	216-666-1185
OH	Dayton, Imtech	513-278-6507
OK	Tulsa, Design Mktg.	918-742-2589
PA	Narberth, Bresson Assocs.	215-664-6460
TX	Dallas, Design Mktg.	214-680-9767
TX	Round Rock, Design Mktg.	512-255-9896
UT	Salt Lake City, Component Sls.	801-466-8623
VA	Lynchburg, Bresson Assocs.	703-237-1304
WA	Bellevue, Eltec	206-643-4330
WI	Brookfield, Sumer, Inc.	414-784-6641

Local Distributors

CA	Garden Grove, Hi Rel	213-594-9571
CA	Gardena, Bell Inds.	213-515-1800
CA	San Diego, Mock III	619-560-0515
CA	Sunnyvale, Bell Inds.	408-734-8570
CO	Denver, Newark Elec.	303-757-3351
CO	Wheatridge, Bell Inds.	303-424-1985
FL	Ft. Lauderdale, Newark Elect.	305-587-2372
IL	Chicago, Newark Elect.	312-638-4411
IL	Chicago, Bell Inds.	312-982-9210
IN	Indianapolis, Graham Elect.	317-634-8202
IA	Cedar Rapids, Newark Elect.	312-362-1171
MD	Baltimore, Radio Elect.	301-823-0070
MD	Beltsville, Newark Elec.	301-937-5085
MA	Needham, Cronin Elctrns.	617-449-0500
MA	Waltham, Sterling Elec.	617-894-6200
MN	Minneapolis, Newark Elect.	216-361-4700
MN	Minneapolis, Joel Co.	612-545-5669
NJ	Kenilworth, Newark Elect.	201-272-8410
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hauppauge, Fairmont Elctrns.	516-231-3313
NY	Hauppauge, Jaco Elect.	516-273-5500
NY	Plainview, ACI Elect.	516-293-6630
NY	Rome, Rome Elect.	315-337-5400
NC	Raleigh, Radio Elec. Svc.	919-781-5700
OH	Centerville, C.V. Clark	513-435-3000
OH	Cleveland, Newark Elect.	216-361-4700
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Montgomeryville, Pyttronic Inds.	215-643-2850
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Philadelphia, Herback Rademan	215-426-1700
TX	Dallas, Wholesale Elect.	214-824-3001
UT	Salt Lake City, Newark Elect.	801-486-1048
WA	Bellevue, Bell Inds.	206-747-1515
WI	Brookfield, Newark Elect.	414-781-2450

OAK MATERIALS GROUP INC., Laminates Div., 174 N. Main St., Franklin, NH 03235, Tel: 603-934-5736, TWX: 510-298-1170; FSC No.: 53240

OAK Switch Systems Inc.

OAK SWITCH SYS., 100 S. Main St., Crystal Lake, IL 60014, Tel: 815-459-5000, Telex: 72-2447, TWX: 910-634-3353; FSC No.: 76854; Empl.: 1200 ....**1B**•1092, 1732, 1733, 1789

Local Sales Offices & Reps

AZ	Phoenix, Shefler/Kahn	602-257-9015
AR	Little Rock, Erickson Sls., Inc.	501-562-2159
CA	Huntington Bch., Oak Switch Sys.	714-963-0577
CA	Irvine, Oak Switch Sys. Inc.	714-786-8028
CA	Palo Alto, Oak Switch Sys. Inc.	415-493-0960
CA	San Jose, Oak Switch Sys. Inc.	408-729-1200
CA	Saratoga, Oak Switch Sys. Inc.	408-741-0372
CO	Denver, I.W. Strong Assoc.	303-292-6900
FL	Altamonte Springs, Oak Switch Sys.	305-831-5411
GA	Marietta, Oak Switch Sys. Inc.	404-953-9279
IL	Crystal Lake, Oak Switch Sys. Inc.	815-459-5000
IN	Speedway, Oak Switch Sys. Inc.	317-241-4424
LA	Chalmette, Erickson Sls., Inc.	504-271-1976
MA	Framingham, Oak Switch Sys. Inc.	617-256-1414
MA	Hudson, Oak Switch Sys. Inc.	617-562-3328
MI	Southfield, R.E.P. Assocs.	313-352-0110
MI	St. Joseph, R.E.P. Assocs.	616-983-7702
MN	Minnetonka, Gibb Elctrns. Sls.	612-935-4600
MO	Florissant, Oak Switch Sys.	314-355-8732
NJ	Haddonfield, Gray Assoc.	609-429-5300
NJ	Mountainside, Henry G. Richter	201-233-4615
NM	Albuquerque, Shefler/Kahn	505-296-0749
NY	Fayetteville, Henry G. Richter	315-637-6713
NC	Raleigh, Oak Switch Sys.	919-876-7591
OH	Eastlake, Oak Switch Sys. Inc.	216-946-0970
OK	Oklahoma City, Erickson Sls., Inc.	405-682-2947
OR	Beaverton, Oak Switch Sys.	503-642-4675
TX	Austin, Erickson Sls., Inc.	512-244-3068
TX	Dallas, Erickson Sls., Inc.	214-739-5833
TX	Houston, Erickson Sls., Inc.	713-980-9606
UT	Salt Lake City, I.W. Strong Assoc.	801-363-1014

Local Distributors

AL	Huntsville, Marshall Elctrns.	205-881-9235
AZ	Tempe, Marshall Elctrns.	602-968-6181
AZ	Tempe, Fisher-Brownell	602-967-1464
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Canoga Park, Marshall Elctrns.	213-999-5001
CA	Inglewood, Newark Elctrns.	213-671-7066
CA	Irvine, Marshall Elctrns.	714-556-6400
CA	Mountain View, I/O Sls. Inc.	415-968-1080
CA	San Diego, Marshall Elctrns.	619-578-9600
CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Sunnyvale, Marshall Elctrns.	408-732-1100
CO	Denver, CSID	303-292-9594
CO	Denver, Newark Elctrns.	303-757-3351
CO	Denver, Marshall Elctrns.	303-427-1818
CT	Hamden, Impact Elctrns.	203-281-1331
CT	Wallingford, Marshall Elctrns.	203-265-7338
FL	Ft. Lauderdale, Component Distr.	305-971-4950
FL	Orlando, Marshall Elctrns.	305-841-1878
GA	Norcross, Marshall Elctrns.	404-923-5750
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Crystal Lake, Sub-Sem, Inc.	815-459-4139
IL	Palatine, Ohm/Elctrns.	312-359-5500
IL	Rosemont, Advent Elctrns.	312-297-6200
IL	Schaumburg, Marshall Elctrns.	312-490-0155
IN	Indianapolis, Graham Elctrns.	317-634-8202
MD	Baltimore, C.E.I. Distr.	301-744-7711
MD	Beltsville, Newark Elctrns.	301-937-5085
MD	Gaithersburg, Marshall Elctrns.	301-840-9450
MA	Burlington, Marshall Elctrns.	617-272-8200
MA	Canton, Impact Sls.	617-821-1500
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MI	Livonia, Marshall Elctrns.	313-525-5850
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	Minneapolis, Northern Elec. Supp.	612-944-1167
MN	Plymouth, Marshall Elctrns.	612-559-2211
MO	St. Louis, Olive Elctrns.	314-426-4500
NJ	Fairfield, Marshall Elctrns.	201-882-0320
NJ	Mt. Laurel, Marshall Elctrns.	609-234-9100
NJ	Springfield, Newark Elctrns.	201-376-9500
NJ	Springfield, Route Elctrns.	201-379-7710
NM	Albuquerque, Walker Radio	505-247-2288
NY	Endwell, Marshall Elctrns.	607-754-1570
NY	Hauppauge, Marshall Elctrns.	516-273-2424
NY	Hauppauge, Fairmont Elec.	516-231-3313
NY	Jamaica, Calson Co.	212-525-5900
NY	Rochester, Marshall Elctrns.	716-235-7620
NY	Rochester, Modutex Corp.	716-647-9700
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Centerville, IPD	513-435-2086
OH	Dayton, Marshall Elctrns.	513-236-8088
OH	Solon, Marshall Elctrns.	216-248-1788
OH	Wickliffe, Gateway Megatech	216-944-8565
OR	Portland, Radar Elec.	503-232-3404
PA	Pittsburgh, Newark Elctrns.	412-787-7740
TX	Austin, Marshall Elctrns.	512-458-5654
TX	Dallas, Marshall Elctrns.	214-233-5200
TX	El Paso, Ideal Indl. Elect.	915-779-6647
TX	Houston, Marshall Elctrns.	713-789-6600
TX	Richardson, Fisher-Brownell	214-235-3177
UT	Salt Lake City, Newark Elctrns.	801-484-8611
WA	Bellevue, Marshall Elctrns.	206-747-9100
WA	Seattle, Radar Elec.	206-282-2511
WA	Spokane, Radar Elec.	509-747-3053

OAKTRON INDS., 1000 30th St., Monroe, WI 53566, Tel: 608-328-5560; Empl.: 250 ....**3**•1045

Local Sales Offices & Reps

AZ	Phoenix, S. Fisher Assoc.	602-247-7865
CA	Mill Valley, Roy Colen Sls., Inc.	415-383-8700
CA	Newhall, Lessing Assoc.	213-348-6662
CO	Arvada, C B Elctrn. Mktg.	303-422-0561
FL	Tampa, SRT Marketing	813-884-4805
GA	Atlanta, Millar Elect.	404-261-6160
IL	Elmhurst, E.S.I.	312-941-0710
IN	Mulberry, Maish Sls.	317-296-2322
MA	Lexington, Six States Sls.	617-376-2044
MN	Minneapolis, Kodo Assoc.	612-881-1255
MO	Kansas City, Nevco	816-421-1751
MO	St. Louis, Nevco	314-843-7406
NY	Rochester, J. Brown Elect. Sls.	716-266-2728
NY	Whitestone, J. Brown Elect. Sls.	212-767-1977
NC	Raleigh, Millar Elect.	919-787-9564
OH	Akron, Shamrock Elect.	216-645-0363
OH	Dayton, Shamrock Elect.	513-298-1227
TX	Richardson, Campion Sls.	214-238-8145
VA	Great Falls, Kendall & Assoc.	703-759-3128
WA	Seattle, Vector/RMC	206-322-4343
EXP	IL, Chicago, Magnus Elect.	312-679-6070

OAL ASSOCS., P.O. Box J, Escondido, CA 92025, Tel: 619-743-7143; Empl.: 10; *Sls. Mgr.:* Mark Lohkemper

Local Sales Offices & Reps

CA	Costa Mesa, Pat Dooley Co.	714-548-2232
IL	Palatine, Jos. Clark Co.	312-358-5095
NY	Great Neck, W&A Holland	516-487-8877

OAR CORP., A CompuDyne Co., 10447 Roselle St., San Diego, CA 92121, Tel: 619-453-4013, Telex: 697852; *Sls. Mgr.:* Michael A. Duke

OAS INC., See Optimum Applied Systems

OCEAN RESCH. EQUIP., INC., Box 709, Falmouth, MA 02541, Tel: 617-548-5800, Telex: 94-0859; Empl.: 125; *Sls. Mgr.:* J. Angell

OCLI PHOTOELCTRNS. DIV., See Applied Solar Energy

ODELL, M. P., CO., 1620 Chesapeake Dr., Hoffman Estates, IL 60195, Tel: 312-991-2828, 800-633-5526; *Sls. Mgr.:* Maria McClurkin ....**3**•1927

OECO CORP., 712 S.E. Hawthorne Blvd., Portland, OR 97214, Tel: 503-238-2440, Telex: 36-0350; FSC No.: 95266; Empl.: 575; *Sls. Mgr.:* Bob Bunker

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Box 59, Ogallala, NE 69153, Tel: 308-284-4093; Empl.: 37; *Sls. Mgr.:* H. L. Harrington

OHIO SEMITRONICS, INC., 1205 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-9561, TWX: 810-482-1630; FSC No.: 12066; Empl.: 46; *Sls. Mgr.:* G. Clagett .... **1B**•1854-1867; **3**•1278-1283

Local Sales Offices & Reps

AL	Huntsville, Guest Assocs.	205-534-2487
CA	Arcadia, Van Gott & Assocs.	818-445-9728
CA	Hayward, FLW, Inc.	415-487-2222
CO	Boulder, Meas. Consits.	303-449-7506
CT	North Haven, Pat Jenks Assocs.	203-239-6201
FL	Orlando, Datarep	305-843-5224
GA	Stone Mountain, Zelco Assocs.	404-498-2181
IL	Columbia, R. L. Weisheimer & Assocs.	618-281-4148
IL	Park Ridge, Elctrn. Instr. Assocs.	312-298-2290
MA	Woburn, Pat Jenks Assocs.	617-938-0488
MN	Minneapolis, Mark Co.	612-920-6280
NJ	Springfield, E. R. Mertz, Inc.	201-232-4643
NY	Latham, L-Tron Corp.	518-785-5032
NC	Charlotte, Zelco Assocs.	704-523-2961
OH	Dayton, Mohawk Intronics	513-434-8873
PA	Carnegie, Flow Media	412-923-1619
PA	King of Prussia, FLW, PA, Inc.	215-337-4343
TX	Houston, Scientific Sls. Co.	713-460-9170
TX	Richardson, Scientific Sls. Co.	214-231-6541
UT	Salt Lake City, Meas. Consits.	801-364-3174
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400

Distributor

OHIOSWITCH, INC., 6534 Singletree Dr., Columbus, OH 43229, Tel: 614-885-0319 ....**1B**•1742

OHMITE MFG. CO., 3601 W. Howard St., Skokie, IL 60076, Tel: 312-675-2600, Telex: 72-4433, TWX: 910-223-0805 ....**1A**•1910-1917, 2050, 2051

Local Sales Offices & Reps

AL	Huntsville, Cartwright & Bean	205-830-1540
AK	Anchorage, H. J. Lang Assoc.	907-279-5741
AZ	Phoenix, Stitzer-Dodd Inc.	602-944-2237
CA	Los Angeles, Wiley Co.	213-666-1611
CA	Palo Alto, Ohmite Mfg. Co.	415-494-6954
CA	San Diego, Wiley Co.	619-571-2881
CO	Denver, Lindberg Co.	303-758-9033
CT	North Haven, Coakley, Boyd & Abbett	203-239-6217
FL	Ft. Lauderdale, Cartwright & Bean	305-735-4900
FL	Orlando, Cartwright & Bean	305-422-4531
GA	Atlanta, Cartwright & Bean	404-233-2939
LA	Kenner, Cartwright & Bean	504-466-0020
MA	Needham Hgts., Coakley, Boyd & Abbett	617-444-5470
MI	Grosse Pointe Park, Greiner Assoc.	313-499-0188
MN	Bloomington, PWC Inc.	612-831-5999
MS	Jackson, Cartwright & Bean	601-981-1170
MO	Gladstone, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	River Edge, Ohmite Mfg. Co.	201-488-3690
NJ	Willingboro, Ohmite Mfg. Co.	609-871-1691
NY	Rochester, Electra Sls. Corp.	716-461-5252
NY	Syracuse, Electra Sls. Corp.	315-463-1248
NC	Charlotte, Polytech Svcs.	704-372-4161
OH	Chardon, Ohmite Mfg. Co.	216-286-7454
OH	Dayton, Ohmite Mfg. Co.	513-277-6543
OK	Oklahoma City, Erickson Sls.	405-682-2947
OR	Tigaird, Electronic Comp Sales	503-245-2342
PA	Monroeville, Ohmite Mfg. Co.	412-373-2695
TN	Knoxville, Cartwright & Bean	615-693-7450
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Austin, Erickson Sls.	512-445-2952
TX	Dallas, Erickson Sls.	214-739-5833
TX	Houston, Erickson Sls.	713-980-9606
UT	Salt Lake City, Lindberg Co.	801-467-1794
WA	Mercer Island, Electronic Comp Sales	206-232-9301

Local Distributors

AZ	Phoenix, Dalis Elctrn. Supp.	602-258-8151
CA	El Monte, Kimball & Stark	213-444-2594
CA	Hollywood, Yale Radio Elec.	213-465-3186
CA	Mountain View, Abacus Elctrns. Co.	415-961-1500
FL	Tampa, Leader Elctrn. Distr.	813-870-3315
FL	West Palm Beach, Nurmi Elec. Supp.	305-684-0320
GA	Atlanta, Specialty Distr. Co.	404-873-2521
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Peoria, Klaus Radio	309-691-4840
IN	East Chicago, Acro Elctrns. Corp.	219-397-8681
KS	Wichita, Radio Supp. Co.	316-267-5213
MA	Hingham, Sager Electrical Supp.	617-749-6700
MI	Grand Rapids, S-F Elctrn. Supp.	616-459-0216
MO	Kansas City, Walters Radio Supp.	816-531-7015
NJ	Camden, General Radio Supp.	609-964-8560
NY	Hempstead, Electronic Equip.	516-538-5510
NY	Richmond Hill, Anchor Elctrn. Distr.	212-846-2420
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rome, Rome Elctrns.	315-337-5400
OH	Cleveland, Specialized Comp. Sls.	216-464-0405
OH	Dayton, Stotts-Friedman Co.	513-224-111
PA	Drexel Hill, Kass Elctrns. Distr.	215-449-2300
PA	Pittsburgh, CAM/RPC Elctrns.	412-782-3770
PA	Reading, Barbey Elctrns.	215-376-6110
VA	Charlottesville, Virginia Radio Supp.	804-296-4180
WI	Milwaukee, Marsh Elctrns.	414-475-6000

ohmtek INC.

OHMTEK, INC., 2160 Liberty Dr., Niagara Falls, NY 14304, Tel: 716-283-4025, TWX: 710-524-1653; FSC No.: 57489; Empl.: 115; *Sls. Mgr.:* John Burger ....**1A**•1919-1921

Local Sales Offices & Reps

CA	Santa Clara, I² Inc.	408-988-3400
CA	Woodland Hills, Interstate Mktg. Assoc.	213-883-7606
CO	Aurora, High Tech. Assocs.	303-695-1990
FL	Hollywood, Askland Elctrn. Comps.	305-987-1074
KS	Overland Pk., Advanced Techn. Sls.	913-642-6675
MA	Shrewsbury, Compatible Comps.	617-842-2022
MN	Mendota Hgts., G-II Sales	612-454-3086
NJ	Englewood, Harold Gray Assocs.	201-894-0894
NM	Albuquerque, Power Entprs.	505-298-1918
NY	Rochester, Fritz Dasson	716-338-1699
OH	Cincinnati, John F. Kilfoil Co.	513-791-6150
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TX	Lewisville, Jim Hughes Co.	214-221-1536

OK INDUSTRIES, INC., 3455 Conner St., Bronx, NY 10475, Tel: 212-994-6600, Telex: 12-5091; Empl.: 100; *Sls. Mgr.:* David Leventhal

OKONITE, Box 340, Ramsey, NJ 07446, Tel: 201-825-0300, TWX: 710-988-1017; Empl.: 1900; *Sls. Mgr.:* A. C. Coppola

OLIVER ADVANCED ENGRG., 676 W. Wilson Ave., Glendale, CA 91203, Tel: 818-240-0080, Telex: 194773; Empl.: 28; *Sls. Mgr.:* Dane Hutchins; *Dist. Mgr.:* Dane Hutchins

OLYMPIC WIRE & CABLE, 1 Madison Rd., Fairfield, NJ 07006, Tel: 201-227-7996, Telex: 75-2217; Empl.: 18; *Sls. Mgr.:* Robert T. Mello; *Dist. Mgr.:* Robert T. Mello

OMEGA ENGINEERING, INC.

OMEGA ENGRG., Box 4047, Stamford, CT 06907, Tel: 203-359-1660, Telex: 99-6404; Empl.: 400; *Sls. Mgr.:* George Vermilyea ..... **1B**•1735, 1818, 1819, 1868, 1869; **2**•2135; **3**•1013, 1089, 1137, 1168, 1284, 1346, 1347, 1386

OMNETICS, P.O. Box 2577, Syracuse, NY 13220, Tel: 315-699-5262, TWX: 710-545-0235; FSC No.: 52516; Empl.: 85; *Sls. Mgr.:* Dennis G. Conard; *Dist. Mgr.:* Dennis G. Conard

OMNIBYTE CORP., 245 W. Roosevelt Rd., Bldg. 1-5, W. Chicago, IL 60185, Tel: 312-231-6880; Empl.: 30; *Sls. Mgr.:* Susan Cochran

Local Sales Offices & Reps

AZ	Scottsdale, Frontier Technology	602-998-4438
CA	Santa Clara, Applied Micro Tech.	408-730-1289
CA	Woodland Hills, Applied Micro Tech.	213-888-2027
FL	Melbourne, Reynolds & Assoc.	305-259-7000
L	Park Ridge, Ad Tech Inc.	312-692-7320
MA	Belmont, E.S.M.	617-489-4414
MI	Southfield, Infinity, Inc.	313-557-7230
MN	Minneapolis, Jen-Ray Systems	612-831-5060
NJ	Boonton, Winter Assoc.	201-334-3434
NY	Caledonia, E. F. Sls.	716-538-4754
PA	Philadelphia, Systems Plus	215-677-2985
TX	Houston, Dyna Marketing	713-460-0314
EXP	IL, Chicago, Computer Overseas Corp.	312-332-3272

OMNI SPECTRA, 21 Continental Blvd., Merrimack, NH 03054, Tel: 603-424-4111, Telex: 953053, TWX: 710-366-0674; FSC No.: QUIP; Empl.: 750; *Sls. Mgr.:* Ernest J. Devita; *Dist. Mgr.:* Terri Hastings

OMNI SPECTRA, INC., Microwave Connector Div., 140 Fourth Ave., Waltham, MA 02154, Tel: 617-890-4750

OMNI SPECTRA, INC., Microwave Subsystems Div., 2626 So. Hardy Dr., Tempe, AZ 85282, Tel: 602-966-1471, TWX: 910-950-1296; *Sls. Mgr.:* Carl Seburn; *Dist. Mgr.:* Carl Seburn

OMNITEC DATA INC., 2405 S. 20th St., Phoenix, AZ 85034, Tel: 602-258-8244, 800-528-8423, TWX: 910-951-4247; *Sls. Mgr.:* Dan J. Mitchell; *Dist. Mgr.:* Dan J. Mitchell

OMNITEK, INC., P.O. Box 102, 820 Pennsylvania Blvd., Feasterville, PA 19047, Tel: 215-355-4443, TWX: 510-667-1730; FSC No.: 54316; *Sls. Mgr.:* Frank Shandelman

OMNI-WAVE ELECTRONICS CORP., P.O. Box 660, Gloucester, MA 01930, Tel: 617-281-2800

OMRON ELCTRNS., INC., Control Comps. Div., One E. Commerce Dr., Schaumburg, IL 60195, Tel: 312-843-7900, TWX: 910-291-2494; Empl.: 209; *Sls. Mgr.:* D. Nelson

ONSET COMPUTER CORP., 199 Main St., P.O. Box 1016, N. Falmouth, MA 02556, Tel: 617-563-2267, Telex: 469915; Empl.: 6; *Sls. Mgr.:* Elaine Boyd

ONTEL CORP., 250 Crossways Park Dr., Woodbury, NY 11797, Tel: 516-364-2121, Telex: 961-382; Empl.: 430; *Sls. Mgr.:* Ed Heinze

OPAMP LABS, INC., 1033 N. Sycamore Ave., Los Angeles, CA 90038, Tel: 213-934-3566; FSC No.: 24699; Empl.: 18 ....**3**•1046

OPTEK, Crown Semi, 345 Industrial Blvd., McKinney, TX 75069, Tel: 214-542-9461, TWX: 910-860-5625; Empl.: 320; *Sls. Mgr.:* James Trautwein; *Dist. Mgr.:* Dave Kimbrough .... **1B**•1232

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Verein Corp.	602-861-1141
CA	Escondido, Uni Rep	714-746-5131
CA	Santa Clara, Criterion	408-988-6300
CA	Thousand Oaks, Sc Cubed	805-496-7307
CA	Tustin, Sc Cubed	714-731-9206
CO	Wheatridge, Waugaman Assocs.	303-423-1020
CT	Madison, Conti-Younger Assocs.	203-245-1136
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Longhorn, APM Assocs.	305-869-6831
FL	Tampa, APM Assocs.	813-886-2457
GA	Norcross, Montgomery Mktg.	404-447-6124
ID	Rathdrum, Vantage Corp.	208-772-7235
IL	Rolling Meadows, KMA Sales	312-398-5300
IN	Indianapolis, J & W Sales	317-842-3740
MA	Burlington, Conti-Younger Assocs.	617-273-1582
MI	Grosse Pointe Pk., Greiner Assocs.	313-499-0188
MN	Eden Praire, Elctrn. Innovators	612-941-0830
NH	Melvin Village, Conti-Younger Assocs.	603-544-7278
NY	Clark Mills, KLM/Garner	315-853-6126
NY	Manhasset, Win-Cor Elec.	516-627-9474
NY	Pittsford, KLM/Garner	716-381-8350
NY	Syracuse, KLM/Garner	315-458-6214
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Cincinnati, Makin & Assocs.	513-871-2424
OH	Columbus, Makin & Assocs.	614-459-2423
OH	Ravenna, Makin & Assocs.	216-297-9748
OR	Silverton, Vantage Corp.	206-455-3460
TX	Austin, Kruvand Assocs.	512-458-9204
TX	Dallas, Kruvand Assocs.	214-691-4592
TX	Houston, Kruvand Assocs.	713-780-9710
UT	Salt Lake City, Waugaman Assocs.	801-254-0570
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MA	Burlington, Tritek Inc.	617-272-4550
NJ	Paramus, Design Elctrns.	201-845-6224
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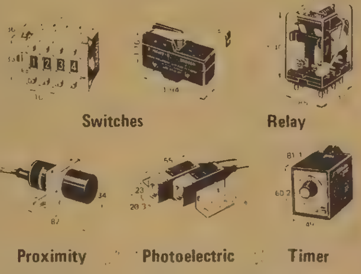

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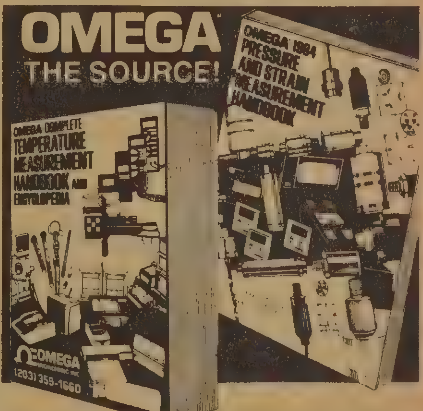
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OH	North Royalton, Great Lakes Controls Corp.	216-582-0020
OK	Tulsa, Quality Comps.	918-664-8812
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CO	Englewood, Computech Mkt.	303-773-398
CT	Bloomfield, Zaslow Sls.	203-242-778
FL	Tampa, J-R Controls	813-961-947
IL	Lisle, W-G Controls	312-963-595
MD	Silver Spring, L. G. White & Co.	301-434-155
MI	Grosse Pointe Park, Greiner Assoc.	313-499-018
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TX	Dallas, Glidden Electro Equip.	214-341-061
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CA	Riverside, Elctrn. Supply	714-683-730
CA	San Diego, Deco Elctrns.	619-693-159
CA	San Jose, Cypress Elctrns.	408-945-840
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CA	Van Nuys, Pacific Switch Controls	213-873-480
CT	Shelton, Century Elec. Supply	203-736-26
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L	Lakeland, A A Elec.	800-237-8274
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J	Medford, Jack McCoy Inc.	609-953-0770
Y	Great Neck, F. Tylinski Co.	516-466-9070
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H	Dayton, Electro-Com	513-898-5140
C	Irmo, Heritage Sls. Assoc.	803-781-8259
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NJ	Marlboro, Cook & Weil	201-536-3964
NM	Albuquerque, Vic Myers Assocs.	505-884-6878
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Latham, L-Tron Corp.	518-785-5032
NY	New York, Cook & Weil	212-246-6599
PA	Radnor, Roberts Engrg.	215-688-6525
TN	Nashville, Lee Assocs.-Mid South, Inc.	205-533-5896
TX	Arlington, John T. Houston Assocs., Inc.	817-265-2931
UT	Salt Lake City, Trembly Assocs.	801-486-5292
UT	Salt Lake City, Vic Myers Assocs.	801-581-1760
VT	Bennington, Applied Measurements	802-442-2222
VA	Arlington, Gans & Pugh Assocs.	703-527-3262

PACIFIC MAGNETICS CORP., 2602 Transportation Ave., Ste. F, National City, CA 92050, Tel: 619-474-8216; *Sls. Mgr.:* Mary Hill

PACIFIC MEAS., INC., 488 Tasman Drive, Sunnyvale, CA 94086, Tel: 408-734-5780, TWX: 910-339-9273; Empl.: 100; *Sls. Mgr.:* Ed Mendel

PACIFIC MICROCOMPUTERS, INC., 119 Aberdeen, Cardiff, CA 92007, Tel: 619-436-8649; Empl.: 27; *Sls. Mgr.:* Sherrell Harper

PACIFIC MICRO SYS., INC., 160 Gate 5 Rd., Sausalito, CA 94965, Tel: 415-331-2525; Empl.: 12; *Sls. Mgr.:* Donald Shipley; *Dist. Mgr.:* Donald Shipley

PACIFIC
POWER SOURCE CORP.

PACIFIC POWER SOURCE CORP., 15122 Bolsa Chica St., Huntington Bch., CA 92649, Tel: 714-898-2691, 800-854-2433; Empl.: 49; *Sls. Mgr.:* A. F. Hatlestad .... **3**•1897-1901

Local Sales Offices & Reps

KS	Overland Park, Ramsey Assocs.	913-649-6996
MA	Burlington, Intersell, Inc.	617-273-3844
MN	Minneapolis, Loren Green Assocs.	612-571-6666
MO	Maryland Heights, Ramsey Assocs.	314-878-5042
NY	Dewitt, D. B. Assocs. Inc.	315-446-0220
NY	Wantagh, Bytec Reps.	516-781-7400
VA	Springfield, Tech Reps. Inc.	703-569-6868
WA	Bellevue, Al Smith	206-746-6770
WA	Vancouver, Al Smith	206-892-9912

Local Distributors

EXP	Los Angeles, CA, Trans World Trade	213-476-8406

PACIFIC RESISTOR CO., 18300 Oxnard St., Tarzana, CA 91356, Tel: 213-345-7811 .... **1A**•1922, 1923

Local Sales Offices & Reps

CA	San Jose, Silcon Valley	408-286-7510
MN	St. Paul	612-642-2828

PACIFIC SCIENTIFIC CO., 4301 Kishwaukee, Rockford, IL 61105, Tel: 815-966-3600, Telex: 257-315; Empl.: 400

Distributor

PACIFIC SWITCH CONTROLS, INC., 16116 Leadwell St., Van Nuys, CA 91406, Tel: 213-873-4802 .... **1B**•1742

PACIFIC TIMER INC., 21739 N.E. 18th Way, Redmond, WA 98052, Tel: 206-881-1785; *Sls. Mgr.:* Karen A. Pettyjohn

PACIFIC TRANSDUCER, 2301 Federal, Los Angeles, CA 90064, Tel: 213-478-1134; Empl.: 23

PACTEC DIV., LaFrance Corp., Enterprise & Executive Avenues, Philadelphia, PA 19153, Tel: 215-365-8400, Telex: 83-1732; *Dist. Mgr.:* Edward Fitzpatrick .... **2**•1002, 1042, 1043

Local Sales Offices & Reps

AL	Huntsville, Hollingsworth & Still	800-241-5712
AZ	Phoenix, Gramer & Co.	602-995-9455
CA	Fallbrook, Martronix	619-728-7678
CA	Santa Clara, Warren Assoc.	408-988-7762
CO	Denver, High Plains Mktg.	303-751-7150
CT	Middletown, Gerber Sls.	203-347-3000
FL	Ft. Lauderdale, Hollingsworth & Still	305-748-8964
GA	Norcross, Hollingsworth & Still	404-447-1700
IL	Arlington, Brainard-Wilson Mktg.	312-437-2700
IN	Carmel, Brainard-Wilson Mktg.	317-844-2800
MA	Newton, Gerber Sls.	617-969-2620
MI	Detroit, Burcaw Co.	313-533-7700
MN	St. Louis Park, Lestronix	612-926-8466
MO	Grandview, Harris Hanson Co.	816-763-6200
MO	St. Louis, Harris Hanson Co.	314-432-3611
NJ	Broomall, L. D. Lowery, Inc.	215-528-5170
NJ	Woodcliff Lake, Joe Freid & Assoc.	201-391-8091
NY	Great Neck, F & F Metro	516-482-4080
NY	Mendon, Tech-Mark	716-624-3840
OH	Richfield, Bear Mktg.	216-659-3131
OR	Portland, James J. Backer Co.	503-297-8744
PA	Broomall, L.D. Lowery, Inc.	215-528-5170
TX	Dallas, MGR Elctrn.	214-238-5246
UT	Salt Lake City, High Plains Mktg.	801-968-9456
WA	Seattle, James J. Backer Co.	206-285-1300
WI	Colgate, Rep 1 & Assocs.	414-628-4016

Local Distributors

AL	Decatur, Forbes Distrs.	205-353-4762
AZ	Phoenix, R. V. Weatherford	602-272-7144

Add Dept. EM to address to tell them you saw it in EEM.

AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Phoenix, Lion Elctrns.	602-869-9611
AZ	Tucson, Elliot Elctrns.	602-884-7394
CA	Anaheim, R. V. Weatherford	714-634-9600
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Cucamonga, Abletronics	714-987-7606
CA	Gardena, California Switch & Signal	714-522-8600
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Monterey, Zackit (Monterey)	408-375-3144
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Palo Alto, R. V. Weatherford	415-493-5373
CA	Pomona, R. V. Weatherford	714-623-1261
CA	Sacramento, Zackit/Sacramento	916-446-3131
CA	San Diego, R. V. Weatherford	619-278-7400
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Rafael, Electronics Plus	415-457-0456
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Valleyo, Zackit (Valleyo)	707-644-6676
CO	Denver, Intergrated Elctrns.	303-292-6121
CO	Denver, Gateway Elctrns.	303-458-5444
CO	Denver, R. V. Weatherford	303-428-6900
CO	Greeley, Greely Walker	303-353-3241
CT	Middletown, Midstate Elctrns.	203-347-5638
CT	New Haven, Hatry Elctrns.	203-787-5921
CT	New London, Jan Elctrns.	203-442-4386
CT	Stratford, Utronics	203-378-4201
DE	Wilmington, Wholesale Elctrns.	302-656-9988
FL	Longwood, MRP Micro Elctrns.	305-331-8787
FL	Miami, Electronic Equip. Co.	305-871-3500
FL	Orlando, EMSCO	305-849-6362
FL	West Palm Beach, Nurmi Elctrns.	305-686-8553
GA	Atlanta, Ack Radio	404-351-6340
IL	Arlington Hgts., Martec Assocs.	312-437-2700
IL	Berwyn, BB & W Inc.	312-242-1533
IL	Champagne, Klaus Radio	217-356-1896
IL	Chicago, R. W. Elctrns.	312-248-2480
IL	Chicago, Electronic Distrs.	312-283-4800
IL	Elk Grove, Martec Assocs.	312-956-8090
IL	Mt. Prospect, Tri State Elctrns.	312-255-0600
IL	Niles, Joseph Elctrns.	312-297-4200
IL	Rosemont, Advent Elctrns.	312-297-6200
IN	Bloomington, Stansifer Radio Co.	812-336-6339
IN	Gary, Calumet Elctrns.	317-887-4961
IN	Indianapolis, Electronic Service Parts	317-632-8586
IN	Jasper, Elex Mart	812-882-3615
IA	Cedar Rapids, Iowa Radio Supply	319-393-5410
KS	Salina, Electronics, Inc.	913-827-7377
KY	Bowling Green, Randolph, Hale & Meredith	502-781-1460
KY	Louisville, Peerless Elctrns.	502-637-7674
MD	Aberdeen, Harco Elctrns.	301-838-7990
MD	Baltimore, Almo Elctrns.	301-247-5955
MD	Beltsville, P.S.I.	301-937-4960
MD	Hyattsville, Mark Elctrns.	301-559-7700
MD	Rockville, Capitol Radio	301-881-2270
MD	Rockville, Heath Kit Elctrns.	301-881-5420
MD	Towson, Baynesville Elctrns.	301-823-0082
MA	Hingham, Sager Elec. Supp.	617-749-6700
MI	Augusta, Great Lakes Elctrns.	616-731-4156
MI	Berrien Springs, Data Comms.	616-471-2119
MI	Detroit, Radio Supp. & Engrg.	313-TE1-3174
MI	Grand Rapids, S. F. Elctrns.	616-459-0216
MI	Lansing, Fulton Radio	517-394-5020
MI	Livonia, RS Elctrns.	313-525-1155
MN	Edina, Northern Elctrns.	612-944-1167
MO	Kansas City, Burstein & Assocs.	816-BA1-4100
MO	St. Louis, Gateway Elctrns.	314-427-6116
NE	Lincoln, Scott Elctrns.	402-466-8221
NJ	Milford, Sintec/Aries	201-996-4093
NJ	Pine Brook, Parts Masters	201-227-7797
NM	Albuquerque, Walker Radio Co.	505-247-2288
NY	Buffalo, Summit Distr.	716-887-2800
NY	Freeport, KRP Elctrns.	516-623-3346
NY	New York, Advance Elctrns.	212-687-2224
NY	Rochester, Summit Distr.	716-334-8110
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Rockville Centre, Midway Indl. Elctrns.	212-895-2443
NY	Rockville Centre, Midway Indl.	516-764-2400
NY	Troy, Trojan Elctrn. Supp.	518-274-4481
NC	Burlington, Womack Elctrns.	919-227-7486
NC	Charlotte, Dixie Elctrns.	704-377-5413
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Columbus, Hughes-Peters	614-294-5351
OH	Solon, Hart Elctrns.	216-248-8855
OK	Oklahoma City, Electronic Supp.	405-232-5215
OK	Tulsa, Radio Inc.	918-587-9123
OR	Beaverton, Norvac Elctrns.	503-644-1025
OR	Portland, Radar Elec.	206-233-3691
PA	Allentown, A.A. Peter, Inc.	215-434-5237
PA	Coatesville, County Supply	215-384-4585
PA	Enola, Almo Elctrns.	717-732-3681
PA	Marcus Hook, Linwood Wholesalers	215-485-0777
PA	Philadelphia, Almo Elctrns.	215-698-4000
PA	Willow Grove, Resco Elctrns.	215-659-4575
PA	York, Rosen Elctrns.	717-843-3875
RI	Pawtucket, Jabbour Elctrns.	401-728-4600
SC	Columbia, Dixie Elctrns.	803-779-5332
TN	Chattanooga, Techni-Tronics	615-875-5449
TN	Clarksville, Randolph, Hale & Matthews	615-647-2325
TN	Columbus, Randolph & Williams	615-388-7566
TN	Gray, Dixie Elctrns.	615-477-3838
TN	Memphis, Bluff City	901-345-9500
TN	Nashville, Randolph & Rice	615-255-5602
TN	Tullahoma, Randolph, Rice & Williams	615-455-4531
TX	Austin, Galtronics	512-452-9311
TX	Dallas, R. V. Weatherford	214-243-1571
TX	Dallas, Solid State Elctrns.	214-438-5700
TX	Houston, Ace Elctrns.	713-688-8114
TX	Houston, R. V. Weatherford	713-688-7406
TX	Houston, Gateway Elctrns.	713-978-6575
TX	San Antonio, Altex Elctrns.	512-828-0503
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Arlington, Arlington Elctrns.	703-524-2415
VA	Charlottesville, Virginia Radio	804-296-4184
VA	Falls Church, Crossroads Elctrns.	703-931-0600
VA	Richmond, ITR (Instr. Tech. Reps.)	804-275-1431
WA	Seattle, Zephyr Elctrn. Sls.	206-241-1980
WA	Seattle, Radar Elec.	206-282-2511
WA	Seattle, R. V. Weatherford	206-575-0922
WI	Madison, Satterfield Elctrns.	608-257-4801
WI	Milwaukee, E-M Instruments	414-272-7799
WI	Milwaukee, Marsh Elctrns.	414-475-6000

PAINE INSTRS., 2401 S. Bayview St., Seattle, WA 98144, Tel: 800-426-0366, TWX: 910-444-2164; FSC No.: 13624; Empl.: 69; *Sls. Mgr.:* R. E. Helmick .... **1B**•1870

PAK-TRONIC, See Tracor Paktronics

PALADIN, 3543 Old Conejo Rd., Newbury Park, CA 91320, Tel: 805-499-0318, Telex: 910-494-2799; Empl.: 9; *Sls. Mgr.:* Ronald Vogel

PALL TRINITY MICRO, Rte. 281, Cortland, NY 13045, Tel: 607-753-6041, Telex: 93-7295, TWX: 510-252-0791; Empl.: 500; *Sls. Mgr.:* R. H. Simkins; *Dist. Mgr.:* R. H. Hauslein

PALL ULTRAFINE FILTRATION CORP., 30 Sea Cliff Ave., Glen Cove, NY 11542, Tel: 516-759-1900, Telex: 64-9491, TWX: 510-223-0606; Empl.: 3500

Local Distributors

CA	Fremont, Mensco	408-739-8690
CO	Englewood, Ross Equip.	303-740-9400
CT	Hamden, Pont Tech. Sls.	203-281-0005
FL	Cocoa Beach, Sys. Comps. Corp.	305-783-1002
MI	Kalamazoo, Flowtech Corp.	616-375-1290
MI	Livonia, Flowtech Corp.	313-471-5660
MO	Maryland Heights, Process & Chemical Equip.	314-878-6161
NY	Cortland, Prosco Prods., Inc.	607-753-8231
RI	Cranston, Chisholm	800-556-6436
TX	Houston, AWC Texas, Inc.	713-486-5800
TX	Odessa, Engineered Equip.	915-367-1821

PALOMAR ENGRS., Box 455, Escondido, CA 92025, Tel: 619-747-3343; Empl.: 9

PAMOTOR
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PAMOTOR, 770 Airport Blvd., Burlingame, CA 94010, Tel: 415-347-1203, TWX: 910-374-2353; Empl.: 35; *Sls. Mgr.:* F. L. Nelson; *Dist. Mgr.:* F. L. Nelson .... **2**•1840-1850

Local Sales Offices & Reps

AL	Huntsville, Conley & Assocs.	205-882-0316
AZ	Tempe, Foley, Tallent & Lee	602-438-1564
AR	Little Rock, J.Y. Schoonmaker	501-375-2168
CA	Burlingame, W. J. Purdy	415-347-7701
CA	Costa Mesa, Berman-Gravley	714-549-2122
CO	Denver, W. J. Purdy	303-777-1411
CT	Hartford, Sturgeon	203-249-7800
FL	Boca Raton, Conley & Assocs.	305-395-6108
FL	Oviedo, Conley & Assocs.	305-365-3283
FL	Tampa, Conley & Assocs.	813-885-7658
GA	Atlanta, Conley & Assocs.	404-447-6992
IL	Elmhurst, Hill-Gray	312-832-4101
IN	Indianapolis, Sukup & Cox	317-253-5501
IA	Marion, MSB Assocs.	319-377-6261
KS	Shawnee Mission, MSB Assocs.	913-432-2131
MD	Lisbon, S. K. MacDonald	301-924-5880
MA	Needam, Sturgeon	617-444-6603
MI	Ferndale, Hilltronics	313-398-5556
MN	Edina, Mel Foster Tech. Sls.	612-941-9790
MO	St. Charles, MSB Assocs.	314-946-5577
NJ	Englewood, Harold Gray	201-894-0894
NM	Albuquerque, W. J. Purdy	505-266-7959
NY	Syracuse, Paston-Hunter	315-437-2843
NC	Raleigh, Conley & Assocs.	919-876-9862
OH	Beachwood, Electronic Salesmasters	216-831-9555
OK	Tulsa, J.Y. Schoonmaker	918-446-0373
OR	Beaverton, William J. Purdy	503-641-9373
PA	Philadelphia, S. K. MacDonald	215-545-1205
TX	Austin, J. Y. Schoonmaker	512-480-9257
TX	Dallas, J. Y. Schoonmaker	214-349-1650
TX	Houston, J.Y. Schoonmaker	713-738-2427
UT	Salt Lake City, W. J. Purdy	801-486-8557
WA	Redmond, William J. Purdy	206-882-3144

Local Distributors

AL	Birmingham, Forbes Distributing	205-251-4104
AL	Birmingham, JLS Indl. Elctrns.	205-322-2486
AL	Huntsville, Pioneer/Huntsville	205-837-9300
AZ	Phoenix, Electronic Parts	602-277-7281
AZ	Phoenix, Wyle/Distribution	602-249-2232
AZ	Tempe, Waltronic Sls.	602-967-1020
AZ	Tucson, Inland Elctrn. Supp.	602-294-2628
AR	Little Rock, Carlton-Bates Co.	501-562-9100
CA	Buena Park, RPS Elctrns.	213-744-0355
CA	El Segundo, Wyle/Distribution	213-322-8100
CA	Fresno, J. C. Arbuckle	209-264-6554
CA	Hayward, Allied Elctrns.	415-487-5250
CA	Inglewood, Newark	213-678-0441
CA	Irvine, Ratel Elctrns.	714-549-8611
CA	Irvine, Wyle/Distribution	714-641-1600
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Sacramento, Sacramento Elctrns.	916-441-4821
CA	Sacramento, Dunlap Elctrns.	916-444-8070
CA	San Diego, Wyle/Distribution	619-565-9171
CA	San Jose, Quement Elctrns.	408-998-5900
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	Santa Clara, Waltronic Sls.	408-727-1200
CA	Santa Clara, Wyle/Distribution Grp.	408-727-2500
CA	Van Nuys, Nesco	213-781-0505
CO	Colorado Springs, Centennial Elctrns.	303-633-4666
CO	Denver, Ragon Elctrns.	303-744-3601
CO	Denver, Fistell Elctrns. Supp.	303-244-4691
CO	Denver, CW Elctrn. Sls. Co.	303-832-1111
CO	Denver, Newark	303-757-3351
CO	Lakewood, Acacia Sls.	303-232-2882
CO	Thornton, Wyle/Distribution	303-457-9953
CT	New Haven, Hatry Elctrns.	203-787-5921
CT	Norwalk, Bond Radio Elctrns.	203-348-2663
CT	Wallingford, Sager Elect. Supp. Co.	203-265-460
FL	Altamonte, Pioneer/Orlando	305-834-909
FL	Jacksonville, Southeast Elctrns.	904-356-3007
FL	Miami, ESL Elctrn. Distrs.	305-633-697
FL	Miami, Electronic Equip.	305-871-350
FL	Tampa, Leader Elctrn. Distrs.	813-870-331
FL	West Palm Beach, Dolphin Elctrn. Supp.	305-659-716
HI	Honolulu, Honolulu Elctrns.	808-949-556
IL	Addison, L Comp/Chicago	312-628-140
IL	Champaign, Klaus Radio	217-356-189
IL	Chicago, Newark/Chicago	312-638-441
IL	Elgin, Allied Elctrns.	312-697-820
IL	Rockford, Midwest Assocs.	815-962-803
IN	E. Chicago, Acro Distrs.	219-397-868
IN	Ft. Wayne, Graham Elctrns.	219-423-342
IN	Indianapolis, Genesis Elctrns.	317-637-557
IN	Indianapolis, Graham Elctrns.	317-634-820
IN	Michigan City, Tri-State Elec. Supp.	219-872-555
IA	Cedar Rapids, Iowa Radio Supp.	319-393-451
KY	Lexington, Radio Elctrn. Equip.	606-255-666
KY	Louisville, Peerless Elctrn. Equip.	502-637-767
LA	Lafayette, Ralph's Elctrns.	318-234-450
LA	New Orleans, Southern Radio Supp.	504-524-234
LA	New Orleans, William B. Allen Co.	504-525-822
LA	Shreveport, Industral Elctrn. Supp.	318-222-945
MD	Baltimore, Resco/Baltimore	301-823-007
MD	Gaithersburg, Pioneer/Wash.	301-948-071
MA	Hingham, Sager Elec. Supp.	617-749-670
MA	Lynn, Land Elctrn. Supp.	617-592-222
MA	Needham, Cronin Electrns.	617-449-500
MA	No. Wilbraham, Industrial Comps.	413-596-385
MA	Waltham, Sterling Elctrns.	617-894-620
MI	Ann Arbor, Wedemeyer Elctrn. Supp.	313-665-861
MI	Battle Creek, Great Lakes Elctrns.	616-731-415
MI	Flint, Shand Elctrns.	313-743-894
MI	Livonia, RS Elctrns.	313-525-115
MI	Oak Park, Newark	313-967-060
MN	Minneapolis, Electrn Center	612-371-520
MN	Minneapolis, Newark	612-331-635
MN	St. Paul, Gopher Elctrns. Co.	612-483-332

MS	Jackson, Ellington Elctrns. Supp.	601-355-0561
MO	Kansas City, L Comp/Kansas City	816-221-2400
MO	Maryland Hgts., L Comp/St. Louis	314-291-6200
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
MO	St. Louis, Van-Sickle Radio Elctrns.	314-621-5000
NE	Lincoln, Scott Elctrn. Supp.	402-466-8221
NJ	Clifton, J-Mar	201-772-6400
NJ	Cranford, Garden State Indl. Elect.	201-272-6400
NJ	Springfield, Newark	201-376-9500
NM	Albuquerque, Elctrn. Parts Co.	505-293-6161
NM	Albuquerque, Walker Radio	505-247-2288
NY	Albany, E. E. Taylor	518-438-7811
NY	Buffalo, Genessee Radio & Parts	716-873-9661
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Hauppauge, Fairmont Elctrn. Sls.	516-231-3313
NY	Millbrook, Villarreal Elctrns.	914-677-3447
NY	Rochester, Summit Distrs.	716-334-8110
NC	Raleigh, Southeastern Elctrns.	919-828-2311
OH	Akron, Sun Radio Co.	216-434-2171
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Columbus, Hughes-Peters	614-294-5351
OH	Solon, Repco	216-248-8900
OK	Oklahoma City, Elctrn. Supp.	405-232-5215
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Hillsboro, Wyle/Distribution	503-640-6000
OR	Portland, United Radio Supp.	503-233-7151
OR	Portland, Radar Elec. Co.	503-232-3404
PA	Altoona, Allegheny Elctrns.	814-946-0871
PA	Erie, Rem Elctrns.	814-453-5626
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Philadelphia, Almo Elctrns.	215-698-4000
PA	Pittsburgh, CAM/RPC Ind'l Elctrns.	412-782-3770
RI	Pawtucket, Major/Edwards Elctrns.	401-725-7400
SC	Charleston, Wholesale Ind'l. Elctrns.	803-722-2634
SC	Columbia, Dixie Elctrns.	803-779-5332
TN	Kingsport, Radio Elec. Supp.	615-247-8111
TN	Knoxville, Indl. Elctrns.	615-573-7135
TN	Memphis, Bluff City Dist.	901-345-9500
TN	Nashville, Randolph & Rice	615-255-5601
TX	Austin, Wholesale Elctrns. Supp.	512-478-9568
TX	Austin, Harrison Equip.	512-458-3555
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Corpus Christi, Wicks Radio Equip.	512-883-4481
TX	Dallas, Wholesale Elctrns. Supp.	214-824-3001
TX	El Paso, Midland Specialty Co.	915-533-9555
TX	El Paso, Ideal Ind'l Elctrn. Supp.	915-779-6647
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Houston, Altair Co.	713-462-3029
TX	San Antonio, Sherman Elctrns.	512-224-1001
TX	Stafford, Harrison Equip.	713-879-2600
UT	Salt Lake City, Newark	801-486-1048
UT	Salt Lake City, Kimball Elctrns.	801-328-2075
VA	Norfolk, Avec Elctrns.	804-627-3502
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Wyle/Distribution	206-453-8300
WA	Seattle, Radar Elec.	206-282-2511
WV	Beckley, Halley Elctrns.	304-253-2561
WV	Charleston, McJunkin Corp.	304-348-4906
WI	Mequon, Taylor Elec.	414-241-4321
WI	Milwaukee, Indl. Elctrn. Corp. of WI	414-276-1212
PR	San Turce, Elctrn. Centre	809-724-3823

PAMRAN, 1101 Cedar Creek, Racine, WI 53402, Tel: 414-639-9076; Empl.: 28; *Sls. Mgr.:* R. C. Pfeil

PANAMETRICS, 221 Cresent St., Waltham, MA 02254, Tel: 617-899-2740, Telex: 6817337, 951006; Empl.: 200; *Sls. Mgr.:* Bob Mel

Local Sales Offices & Reps

CA	Oxnard, Quality Testing Consultants	805-985-1144
L	Bensenville, Sonoscan	312-766-7088
MA	Westboro, N.E. N.D.T. Sls. Co.	617-366-9800
MI	Chelsea, Michigan Nondestructive Gage Co.	313-475-2979
NJ	Swartswood, E.M.C.O.	201-362-9306
TX	Houston, General Svcs.	713-931-1201
WA	Poulsbo, Engineering Technlg.	206-779-5550

PANASONIC, IND'L. ELCTRN. COMPS., Panasonic, Elctrn. Comps. Div., Box 1503, Secaucus, NJ 07094, Tel: 201-348-7000, Telex: 701 992-8920; Empl.: 25 ....**3**•1414-1419

Local Sales Offices & Reps

AL	Huntsville, Rep, Inc.	205-881-9270
AZ	Phoenix, Stitzer-Dodd	602-944-2237
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CA	San Diego, Tauber & Assoc.	619-274-7242
CA	Van Nuys, K & R Sls.	213-781-0522
CO	Denver, Component Sls.	303-759-1666
CT	Madison, Conti-Younger Assoc.	203-245-1136
FL	Ft. Lauderdale, Reynolds & Assoc.	305-581-6611
FL	Melbourne, Reynolds & Assoc.	305-259-7000
FL	St. Petersburg, Reynolds & Assoc.	813-360-1484
GA	Tucker, Rep, Inc.	404-938-4358
IL	Palatine, Techn. Sls.	312-991-6600
IN	Indianapolis, Mktg. Engrs.	317-872-5665
KS	Olathe, Rush & West	913-764-2700
MD	Ellicott City, Mktg. Techn.	301-465-5944
MA	Burlington, Conti-Younger Assoc.	617-273-1582
MI	Birmingham, Favco Assoc.	313-644-0173
MN	Eden Prairie, Electro Mark	612-944-5850
MO	Ballwin, Rush & West	314-394-7271
NH	Melvin Village, Conti-Younger Assoc.	603-544-7378
NJ	Mount Laurel, Comtek	609-235-8505
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	N. Syracuse, Advanced Comp. Corp.	315-699-2671
NC	Raleigh, REP. Inc.	919-851-3007
OH	Cleveland, Del Steffen & Assoc.	216-461-8333
OH	Dayton, Del Steffen & Assoc.	513-293-3145
OH	Lexington, Del Steffen & Assoc.	419-884-2313
OR	Tigard, Elec. Sources	503-684-0040
PA	Pittsburgh, Del Steffen & Assoc.	412-276-7366
TN	Jefferson City, Rep Inc.	615-475-9012
TX	Austin, Dunbar Assoc.	
TX	Dallas, Dunbar Assocs.	214-239-7151
UT	Salt Lake City, Comp. Sls.	801-268-8440
VA	Lynchburg, Marketing Techn.	804-384-6459
WA	Bellevue, Elctrn. Sources	206-451-3500

Local Distributors

AL	Huntsville, Resistacap	205-883-4270
CA	Burlingame, Rose Elect. Distr. Co.	415-348-2740
CA	San Diego, Tauber Elctrns.	619-274-7242
CA	San Jose, Cypress Elctrns.	800-538-5112
CA	Van Nuys, NESCO	213-781-0505
IL	Chicago, Power Pak	312-286-5566
MA	Canton, Impact Sls. Co.	617-821-1500
MI	Brighton, AP Sls.	313-229-6550
NJ	Plainfield, Mars Elctrns.	201-757-4332
NY	Commack, Brentronics	516-499-5155
TX	Dallas, Computer Comp. Corp.	214-239-0271

PANAVISE PRODS., 2850 E. 29th St., Long Beach, CA 90806, Tel: 213-569-8108, Telex: 18-2135; Empl.: 29; *Sls. Mgr.:* Michael Steffen; *Dist. Mgr.:* Michael Steffen

PANDUIT CORP., 17301 Ridgeland Ave., Tinley Park, IL 60477-0981, Tel: 312-532-1800, Telex: 25-4560; Empl.: 1200 ....**2**•1532-1534, 2136-2139

Local Sales Offices & Reps

AL	Birmingham, Frank Parker & Assoc.	205-853-3152
AZ	Phoenix, Panduit Corp.	602-252-4515
AR	Little Rock, Byron Carson Co.	501-568-6798
CA	Los Altos, Ewing-Foley	415-941-4525
CA	San Diego, Tak Sls.	619-287-6141
CA	Santa Ana, Panduit Corp.	714-546-5700
CO	Denver, I. W. Strong & Assocs.	303-292-6900
FL	Lakeland, Panduit Corp.	813-665-5850
GA	Atlanta, Panduit Corp.	404-256-5940
HI	Honolulu, Agencies Co./Pacific	808-847-6581
IN	Fort Wayne, Panduit Corp.	219-424-4082
IN	Indianapolis, Panduit Corp.	317-251-8332
IA	Des Moines, Panduit Corp.	515-280-8343
KS	Kansas City, Panduit Corp.	913-764-7170
KY	Louisville, A. L. Pickens Co.	502-491-4215
LA	New Orleans, Panduit Corp.	504-581-7181
MD	Landover, Agency Group, Inc.	301-773-9292
MI	Fraser, Panduit Corp.	313-791-1700
MI	Grand Rapids, Panduit Corp.	616-942-0420
MN	Minneapolis, Electric Comp. Sls.	612-933-2594
MO	St. Louis, Panduit Corp.	314-894-7800
NH	Salem, Sales Eng. Co.	603-893-5521
NJ	Leonia, Panduit Corp.	201-461-7790
NY	Buffalo, Panduit Corp.	716-632-5182
NY	Rochester, Panduit Corp.	716-244-9480
NY	Syracuse, Panduit Corp.	315-476-6161
NC	Winston-Salem, L. G. White Southern	919-725-3612
OH	Cincinnati, Panduit Corp.	513-874-0660
OH	Cleveland, Panduit Corp.	216-835-2050
OH	Columbus, Panduit Corp.	614-262-6052
OK	Tulsa, Panduit Corp.	918-745-1420
OR	Portland, Panduit Corp.	503-248-1971
PA	Carnegie, Myles F. Smith & Assoc.	412-276-5363
PA	Glenside, Kunz, Powell & Assoc.	215-224-2434
TN	Knoxville, Panduit Corp.	615-588-2476
TN	Memphis, Byron Carson Co.	901-345-5187
TX	Dallas, Panduit Corp.	214-620-7713
TX	Houston, Panduit Corp.	713-580-0100
UT	Salt Lake City, I. W. Strong & Assocs.	801-942-6998
VA	Richmond, L. G. White Southern	804-740-7093
WA	Bellevue, Panduit Corp.	206-454-7267
WV	Dunbar, Myles F. Smith & Assoc.	304-768-9910
WI	Appleton, H. Mercer Co.	414-739-6223
WI	Brookfield, H. Mercer Co.	414-786-6431

PANEL COMPONENTS CORP., P.O. Box 6626M, Santa Rosa, CA 95406, Tel: 707-523-0600, Telex: 176-747; Empl.: 18 ....**1A**•1606-1610; **1B**•1282, 1283; **2**•1536-1539, 2140, 2141

Local Sales Offices & Reps

AL	Huntsville, DHR Mktg. Inc.	205-533-5165
CA	Santa Clara, Ross Mktg. Assoc.	408-988-8111
CO	Littleton, Omega Ltd.	303-798-7040
GA	Atlanta, DHR Mktg., Inc.	404-451-9848
IL	Northbrook, Raines & Assocs.	312-498-0890
IA	Marion, M-S-B Assocs., Inc.	319-377-6261
KS	Shawnee Mission, M-S-B Assocs., Inc.	913-432-2131
MA	Lexington, Zieco	617-861-8300
MN	St. Paul, Arkco Sls.	612-777-7454
MO	St. Charles, M-S-B Assocs., Inc.	314-946-5577
NM	Albuquerque, Burt Dieruf Assocs.	505-299-0989
NY	Great Neck, Tylinski Assocs.	516-466-9070
NY	Rochester, Lloyd Hart Assocs.	716-244-3253
NC	Raleigh, DHR Mktg., Inc.	919-876-5450
OH	Chesterland, K-T Depco	216-729-3588
OR	Portland, Earl & Brown Co.	503-245-2283
PA	Doylestown, T.O.E. Sls.	215-348-2212
PA	Pittsburgh, K-T Depco	412-487-8777
SC	Greenville, DHR Mktg. Inc.	803-235-3594
TN	Knoxville, DHR Mktg. Inc.	615-584-5286
TX	Lewisville, Jim Hughes Co.	214-221-1536
TX	Stafford, Jim Hughes Co.	713-343-0673
WA	Seattle, Earl & Brown Co.	206-284-1121

PANEL CONTROLS, 1000 Mt. Elliott Ave., Detroit, MI 48207, Tel: 313-568-2400; Empl.: 24

PANELGRAPHIC CORP., 10 Henderson Dr., W. Caldwell, NJ 07006, Tel: 201-227-1500, TWX: 710-734-4367; FSC No.: 52657; Empl.: 100

PAN-MAGNETICS INTL., INC., 455-A Carson Plaza Dr., Carson, CA 90746, Tel: 213-532-1790, Telex: 664-759; *Sls. Mgr.:* W. Dull ....**1A**•2215-2221

Local Sales Offices & Reps

AZ	Scottsdale, E.D.P. & Assocs.	602-991-6119
CT	Marlborough, Precision Sls.	203-295-0580
IN	South Bend, Schillinger Assoc.	219-282-4570
KS	Overland Park, Electri-Rep	913-649-2168
MD	Towson, Electronic Comp. Mktg.	301-321-8611
MA	Newton, Precision Sls.	617-969-0594
MN	Minneapolis, DeBeck-Hays Assocs.	612-835-3610
MO	St. Louis, Electri-Rep	314-878-0583
OR	Tigard, Electronic Sources	503-684-0040
WA	Bellevue, Electronic Sources	206-643-0400

PANNIER CORP., Graphics Div., John Fitch Industrial Park, Warminster, PA 18974, Tel: 215-672-3600; Empl.: 45; *Sls. Mgr.:* Barry Stefaniw

PAPST MECHATRONIC CORP., Aquidneck Indl. Pk., Newport, RI 02840, Tel: 401-849-5930, Telex: 952092; *Sls. Mgr.:* Emanuel V. Lauria

PARABAM, INC., 3017 E. Las Hermanas St., Rancho Dominguez, CA 90221, Tel: 213-537-1771; Empl.: 85

PARAGON ELECT., 606 Parkway Blvd., Two Rivers, WI 54241, Tel: 414-793-1161, Telex: 26-3450; Empl.: 1000; *Sls. Mgr.:* Don Karman

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TRANSFORMER SPECIALISTS

PARALINE TRANSFORMER CORP., 511 South Palm Ave., Alhambra, CA 91803, Tel: 213-281-0222; FSC No.: 59465; Empl.: 34 ....**1A**•2223-2225

PARAMOUNT TUBE, INC., 1430 Progress Rd., Ft. Wayne, IN 46808, Tel: 219-484-4111; Empl.: 46; *Sls. Mgr.:* D. F. Weimer

PARKER SEAL GRP., P.O. Box 11751, Lexington, KY 40512, Tel: 606-269-2351; Empl.: 2,200; *Sls. Mgr.:* Frand Chesnik

PARLEX CORP., 145 Milk St., Methuen, MA 01844, Tel: 617-685-4341, TWX: 710-342-1538; Empl.: 450; *Sls. Mgr.:* J. Pollack Kutchin

PARSONS MFG., 1055 O'Brien Dr., Menlo Park, CA 94025, Tel: 415-324-4726, TWX: 910-373-2106; Empl.: 85; *Sls. Mgr.:* C. E. Plummer

Local Sales Offices & Reps

CO	Boulder, Scientific Devices	303-449-9466
FL	Melbourne, Reynolds & Assocs.	305-259-7000
GA	Doraville, South Pack, Inc.	404-452-0773
IL	Elmhurst, Cougar Package Designers	312-833-0346
OH	Cleveland, Donray Co.	216-449-6450
PA	Philadelphia, Thermo-Pak Co.	215-742-0447
TX	Fort Worth, Dyna Rep	817-451-1392

PASO SOUND PRODS., 14 First St, Pelham, NY 10803, Tel: 914-738-4800, Telex: 646783 Paso Pelm; Empl.: 50

PASS & SEYMOUR, INC., P.O. Box 4822, Syracuse, NY 13221, Tel: 315-468-6211; *Sls. Mgr.:* Jack Wells

PATHCOM, INC., Pace Two-Way Radio Prods., 24105 S. Frampton Ave., Harbor City, CA 90710, Tel: 213-325-1290; Empl.: 600

PATTON-MACGUYER INC., 17 Virginia Ave., Providence, RI 02905, Tel: 401-941-6000; FSC No.: 77147; Empl.: 55; *Sls. Mgr.:* J. Allen

PAYNE ENGRG., Box 70, Scott Depot, WV 25560, Tel: 304-757-7353, Telex: 88-5452; Empl.: 30; *Sls. Mgr.:* Matthew J. Gilberto; *Dist. Mgr.:* Diane Nelson

PCA ELCTRNS., 16799 Schoenborn St., Sepulveda, CA 91343, Tel: 818-892-0761, Telex: 67-4681, TWX: 910-496-1525; FSC No.: 97722; Empl.: 45; *Sls. Mgr.:* Janice Fowler .... **1A**•1558-1564

Local Sales Offices & Reps

AZ	Phoenix, Toward Engrg. Assocs.	602-955-3193
CA	San Diego, Littlefield & Smith Assoc.	619-455-0055
CA	Santa Clara, Fahrner-Miller Assocs.	408-727-9800
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-584-8110
IL	Westchester, W. G. Brouillette & Assocs.	312-345-6500
MA	Framingham, KSA of New England	617-879-3835
MN	Minneapolis, Bill Deming and Assocs.	612-888-5000
NJ	Wayne, Howard Kagan Assocs.	201-694-1115
OH	Cleveland, Weschler Elec. Corp.	216-238-2550
OR	Portland, Elctrn. Comp. Sls.	503-245-2342
TX	Dallas, Blackburn Assocs.	214-692-8885
TX	Houston, Blackburn Assocs.	713-463-1354
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301
WA	Seattle, Elctrn. Comp. Sls.	206-232-9301

PCB PIEZOTRONICS, 3425 Walden Ave., Depew, NY 14043-2495, Tel: 716-684-0001, TWX: 710-263-1371; Empl.: 110; *Sls. Mgr.:* Roy Maines

PCK TECHNLG. DIV./KOLLMORGEN CORP., 322 South Service Rd., Melville, NY 11747, Tel: 516-454-4400, Telex: 6852163; Empl.: 200; *Sls. Mgr.:* J. F. Dennis-Browne

PCM-PAC CYBER-METRIC, 6800 Sierra Ct., Dublin, CA 94568, Tel: 415-829-8700, TWX: 910-389-6890; Empl.: 19; *Sls. Mgr.:* T. J. Netoff

PC TRANSFORMER CORP., 64 D Nancy St., West Babylon, NY 11704, Tel: 516-491-3300; FSC No.: 62281; Empl.: 6; *Sls. Mgr.:* Stanley L. Goldstein .... **1A**•2226-2229

PEARSON ELCTRNS., 1860 Embarcadero Rd., Palo Alto, CA 94303, Tel: 415-494-6444, Telex: 171-412; FSC No.: 05280; Empl.: 18; *Sls. Mgr.:* Patricia L. Pearson .... **1A**•2230

PECA, INC., 4957 Pearson Ave., Philadelphia, PA 19114, Tel: 215-824-1550; Empl.: 15; *Sls. Mgr.:* Jean Douglass

PENFIELD, INC., West & W. Main Sts., Plantsville, CT 06479, Tel: 203-621-9141; Empl.: 25

PENN AIRBORNE PRODS., Industrial Hwy., Southampton, PA 18966, Tel: 215-355-3400, Telex: 834759; FSC No.: 25805; Empl.: 25; *Sls. Mgr.:* W. Williams

PENN ENGRG. & MFG., P.O. Box 1000, Danboro, PA 18916, Tel: 215-766-8853; FSC No.: 46384; Empl.: 370; *Sls. Mgr.:* John E. O'Brien

PENN FIBRE & SPEC., 4343 "G" St., P.O. Box 4890A, Philadelphia, PA 19124, Tel: 215-288-7366; Empl.: 66; *Sls. Mgr.:* L. C. Jones

PENN KEYSTONE CORP., Unimax Switch Corp., Ives Rd., P.O. Box 152, Wallingford, CT 06492, Tel: 203-269-8701, Telex: 96-3485, TWX: 710-476-1397; FSC No.: 03034; *Sls. Mgr.:* Jack Fitzgerald

PENN RESCH. CORP. (PRC), 2652 South Main St., P.O. Box 3357, Kennesaw, GA 30144, Tel: 404-429-9061, Telex: 753010; *Sls. Mgr.:* Wallace Hundley

PENN TRANSFORMER CO., Box 1321, Rte. 144N, Wingate, PA 16880, Tel: 814-355-1521, Telex: EASY LINK 706473

Local Sales Offices & Reps

MN	Minneapolis, Intl. Sls. Co.	612-831-8423
OR	Portland, Intertech Sls.	503-775-7885
PA	Glenside, Koebert Assocs. Inc.	215-887-2301
UT	Salt Lake City, Aspen Sls., Inc.	801-467-2401

PENNTUBE PLASTICS, Madison Ave. & Holly St., Clifton Heights, PA 19018, Tel: 215-622-2300, Telex: 845-212; Empl.: 145

PENN VIDEO INC., 929 Sweitzer Ave., Akron, OH 44311, Tel: 216-762-4840, Telex: 98-6327 PVI-AKR; *Sls. Mgr.:* Sandra Donaldson

PENNWALT CORP., Three Pkwy., Philadelphia, PA 19102, Tel: 215-587-7000, TWX: 215-569-9748

PENRIL, 5520 Randolph Rd., Rockville, MD 20852, Tel: 301-984-8225, TWX: 710-828-0522; Empl.: 250; *Sls. Mgr.:* Dave L. Johnson

PERFECT GEAR & INSTR., 55 S. Denton Ave., New Hyde Park, NY 11040, Tel: 516-328-3300, TWX: 510-223-0642; Empl.: 210

PERFECTION MICA CO., see Magnetic Shield Div.

PERFORMANCE CONTROLS INC., 333 Byberry Rd., Hatboro, PA 19040, Tel: 215-675-6500; Empl.: 22; *Sls. Mgr.:* M. Edward Wokulich

PERIPHERALS, 3001 Red Hill, Bldg. 6, Ste. 107, Costa Mesa, CA 92626, Tel: 714-540-4925; *Sls. Mgr.:* Jone Ford; *Dist. Mgr.:* Jone Ford

PERITEK CORP., 5550 Redwood Rd., Oakland, CA 94619, Tel: 415-531-6500, TWX: 910-366-2029; *Sls. Mgr.:* John Brogan

PERKIN ELMER

PERKIN-ELMER CORP., Elctrn. Prods. Dept., Main Ave., Norwalk, CT 06856, Tel: 203-762-4786, TWX: 710-468-3213; Empl.: 70 .... **1A**•2231

Local Sales Offices & Reps

CA	Encino, C.D.H. Assocs.	213-707-1970

PERMAG, 400 Karin La., Hicksville, NY 11801, Tel: 516-822-3311, TWX: 710-581-5264; Empl.: 50

PERMAGILE-SALMON LTD., Insulcast Div., 101 Commercial St., Plainview, NY 11803, Tel: 516-349-1100, Telex: 221720 PERM UR; *Sls. Mgr.:* A. Zack Zarcadoolas; *Dist. Mgr.:* Edward R. Salmon

Local Distributors

FL	Boca Raton, Olson Assocs.	305-368-1845
IL	Algonquin, Adhesive Sys., Inc.	312-658-4583
OH	Dayton, Electro Supply	513-299-5020

PERMALUSTER, INC., 1844 N. Keystone St., Burbank, CA 91504, Tel: 818-849-4543; Empl.: 9; *Sls. Mgr.:* J. Ross

PERMANENT MAGNET, 4437 Bragdon St., Indianapolis, IN 46226, Tel: 317-547-1336; Empl.: 85; *Sls. Mgr.:* Jack Amigh

PERMA POWER ELCTRNS., 5615 W. Howard Ave., Chicago, IL 60648, Tel: 312-647-9414; Empl.: 85-100; *Sls. Mgr.:* Michael Shatz .... **1B**•1284; **2**•1862, 1863

Local Sales Offices & Reps

AR	El Dorado, D. Bellew Sls.	214-373-4590
CA	San Francisco, Techn. Sls.	415-467-1434
CA	Sun Valley, Tegni-Rep	213-768-4223
CO	Denver, Stan Sliz & Assoc.	303-666-4760
CT	West Hartford, Smith Co.	203-523-0512
IN	Indianapolis, Green-Wissler	317-291-2232
MI	Plymouth, J. Malcolm Flora	313-453-4296
MN	St. Paul, Skor	612-426-1160
MO	Jefferson City, C. A. Vignola	314-636-3121
NJ	Marlton, Fahy Mktg.	609-983-2366
NY	Phelps, L. S. M. Assocs.	315-548-4891
NY	Plainview, Landau & Mack	516-293-3310
NC	Greensboro, Adams & Assocs.	919-272-6838
OH	Whitehall, Mandabach-Lehner	614-235-0265
TX	Dallas, Berthold Sls.	214-328-0067
WA	Seattle, Northmar Inc.	206-524-5170
EXP	N.Y., Plainview, Morhan Export.	516-293-5582

PERRY AMPLIFIER, 138 Fuller St., Brookline, MA 02146, Tel: 617-734-0844; Empl.: 18; *Sls. Mgr.:* N. Geskos

PERSONAL MICRO COMPUTERS, 475 Ellis St., Mountain View, CA 94043, Tel: 415-962-0224, TWX: 910-379-5022

PERTEC PERIPHERALS CORP., P.O. Box 2198, Chatsworth, CA 91311, Tel: 818-882-0030, TWX: 910-494-2093; Empl.: 650

PERVEL INDS., INC., Bemis, P.O. Box 61, Community Ave., Plainfield, CT 06374, Tel: 203-564-2741, Telex: 966450; Empl.: 350; *Sls. Mgr.:* Stan Furman

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Local Sales Offices & Reps

CA	Cerritos, Specialized Plastic Svcs.	213-402-6225
CA	Los Gatos, Specialized Plastic Svcs.	408-866-5786
CO	Castle Rock, Romulus Elctrns. Ltd.	303-688-5127
FL	Clearwater, Brennan Assocs., Inc.	813-446-5006
IL	Chicago, Brock and Cushman, Inc.	312-622-4110
MI	Grand Rapids, R. P. Urban & Assoc.	616-245-0511
MN	St. Paul, Bonament Heyda Co., Inc.	612-484-8531
WA	Mercer Island, Cirkits Co.	206-236-2380

PFC, See Southern Elctrns. Co. Inc.

PHALO CORP., Transitron Elctrn. Corp., 530 Boston Tpke., Shrewsbury, MA 01545, Tel: 617-845-5000, Telex: 92-0416, TWX: 710-392-1383; Empl.: 450

PHAOSTRON INSTRUMENT & ELECTRONIC CO., 151 Pasadena Ave., South Pasadena, CA 91030, Tel: 213-255-1471

PHELPS DODGE CABLE & WIRE, Box 2100, Greenwich, CT 06836, Tel: 203-625-3200, TWX: 710-560-0006; Empl.: 750; *Sls. Mgr.:* T. P. Reilly

PHELPS DODGE INTL., 2121 Ponce de Leon Blvd. Ste. 850, Coral Gables, FL 33134, Tel: 212-775-1395 800-221-3333

PHELPS DODGE MAGNET WIRE, P.O. Box 600 Ft. Wayne, IN 46801, Tel: 219-456-4444, TWX: 810 332-1501; *Sls. Mgr.:* G. H. Guyer; *Dist. Mgr.:* W. H Deininger

PHILADELPHIA INSULATED WIRE CO. INC., 33 New Albany Rd., Moorestown, NJ 08057, Tel: 609 235-6700, TWX: 710-897-0187; Empl.: 110; *Sls. Mgr.* Fred Newman

PHILAMON, INC., 33 Dubon Ct., Farmingdale, N 11735, Tel: 516-249-2700, TWX: 510-224-6512; FS No.: 95267; Empl.: 27; *Sls. Mgr.:* B.F. Grib

PHILIPS AUDIO VIDEO SYS. CORP., See AK Acoustics

PHILIPS ECG, See Sylvania Electronic Compo nents

PHILIPS ECG, INC., 3101 Pleasant Valley Blvd Altoona, PA 16603, Tel: 814-943-1126

PHILIPS ELMET, 1560 Lisbon Rd., Lewiston, M 04240, Tel: 207-784-3591, TWX: 710-223-067 Empl.: 250

PHILIPS TELEVISION SYS., INC., P.O. Box 61 900 Corporate Dr., Mahway, NJ 07430, Tel: 201-52 1550, Telex: 37-62558; *Sls. Mgr.:* Warren Anderso Dir. of Mktg.

PHILIPS TEST & MEASURING INSTRS., 8 McKee Dr., Mahwah, NJ 07430, Tel: 201-529-380 Empl.: 70; *Sls. Mgr.:* Bob Hynes

PHILMORE MFG., 40 Inip Dr., Inwood, NY 11696, T 516-239-6161; Empl.: 22

PHI TECHNOLOGIES, INC., 4605 North Stiles, Oklahoma City, OK 73105, Tel: 405-521-9000, TWX: 901-831-3286; Empl.: 60; *Sls. Mgr.:* Gary Zebrowski .... 3•1090

PHOENIX CONTACT, 1900 Greenwood St., Harrisburg, PA 17104, Tel: 717-232-0500, TWX: 510-650-4913; *Sls. Mgr.:* Howard C. Minnick, Jr.; *Dist. Mgr.:* Mark F. Gilliford .... 2•1540-1542

Local Sales Offices & Reps

AZ	Scottsdale, Mahaffey & Assocs. Inc.	602-991-9790
CA	Fremont, Vontek	415-651-7966
CA	Pasadena, Luscombe Engrg. Co.	213-684-2000
CA	San Diego, Luscombe Engrg. Co.	619-295-4300
CO	Denver, Spectrum Sls.	303-696-1601
CT	Bloomfield, Zaslow Sls. Co.	203-242-7781
FL	Tampa, J-R Controls	813-961-9478
GA	Atlanta, Holman-Lobsinger Co.	404-256-9120
L	Mt. Prospect, Magnuson Assocs./Magnuson Elctrns.	312-956-0700
KS	Merriam, Mid-West Tech. Sls.	913-236-8557
MD	Baltimore, McCourt Co., Inc.	301-747-0044
MI	Canton, R. W. Barrick & Assocs.	313-453-0591
MN	Minneapolis, Grissinger-Johnson Sls. Inc.	612-544-5451
NJ	Rockaway, R.O.I. Sls. Co.	201-627-8879
NY	North Syracuse, Lachut Electrical Sls.	315-422-2575
NC	Charlotte, Mec-Tric Control Co.	704-376-8555
OH	Medina, J. C. Hofstetter Co.	216-241-4880
PA	Carnegie, Brown-Yates Electrical Equip. Co.	412-279-1101
PA	Willow Grove, Jacobson-Rodger Assocs.	215-657-4300
TX	Dallas, Lynn Elliott Co., Inc.	214-239-8533
TX	Houston, Lynn Elliott Co., Inc.	713-499-1571
VA	Richmond, McCourt Co., Inc.	804-741-3253
WA	Bellevue, Comtec	206-453-1188

Local Distributors

AZ	Phoenix, Sterling Elctrns.	602-268-2121
CA	Concord, Control Room Prods.	415-671-7796
CA	Duarte, Nelson West Coast, Inc.	213-303-1526
CA	Gardenia, Cal Switch	213-770-2330
CA	Riverside, Elctrn. Supply Co.	714-787-9220
CT	Wallingford, Sager Electrical	203-265-4600
FL	Lakeland, A-A Elec.	813-665-6941
GA	Atlanta, A-C Equip.	404-451-2747
L	Lombard, MacGregor & Co., Inc.	312-629-5752
LA	Baton Rouge, Ralph's Indl. Elctrns.	504-344-3761
LA	Lafayette, Ralph's Indl. Elctrns.	318-234-4507
LA	New Orleans, Long Elec. Supp.	504-524-8383
MD	Baltimore, A.I.C.	301-747-0044
MA	Hingham, Sager Electrical	617-749-6700
MI	Flint, Roth Elec. Supply Co.	313-234-8661
MI	Roseville, Madison Elec.	313-778-7640
MO	St. Charles, Lectronix Inc.	314-946-6424
NJ	East Rutherford, A-A Elec.	201-777-5477
NJ	Pennsauken, Resco Elctrns.	609-662-4000
NY	Orchard Park, Park Elec.	716-662-7070
NY	Rochester, Rochester Radio	716-454-7800
NY	Syracuse, Salmon Motor Repair Svc.	315-454-9278
NC	Charlotte, Dixie Elctrns.	704-377-5413
OH	Cincinnati, Schuster Elec. Co.	513-489-1400
OH	Twinsburg, Schuster Elec. Co.	216-425-8134
OR	Portland, United Radio Supp.	503-233-7151
PA	Bradford, B-B Elec. Supp. Co.	814-368-4173
PA	Pittsburgh, Grant Industrial Controls	412-787-9770
PA	Reading, R.A.M. Motors and Controls	215-376-7102
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Sterling Elctrns.	713-627-9800
TX	Houston, Timers & Controls, Inc.	713-894-0714
TX	Port Arthur, All-Phase Elec.	409-983-3315
WI	Cedarburg, A-A Elec.	414-377-8000

PHOENIX DATA, 3384 W. Osborn Rd., Phoenix, AZ 85017, Tel: 602-278-8528, TWX: 910-951-1364; Empl.: 55; *Sls. Mgr.:* Srini Iyer

PHOENIX MICROSYSTEMS, P.O. Box 4206, Huntsville, AL 35802, Tel: 205-881-2173, Telex: 752592; Empl.: 28; *Sls. Mgr.:* Mel Mayo

PHOENIX WIRE, INC., 100 Teflon Ave., S. Hero, VT 05486, Tel: 802-372-4561; Empl.: 25

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PHOTO CHEM. PRODS. CAL., 18031 Susana Rd., Compton, CA 90224, Tel: 213-603-0400; FSC No.: 16339; Empl.: 65

PHOTOCIRCUITS CORP., Multi-Wire Div., 491 Amherst St., Nashua, NH 03060, Tel: 609-889-0083

PHOTOCIRCUITS GLEN COVE, DIV., KOLLMORGEN CORP., 31 Sea Cliff Ave., Glen Cove, NY 11542, Tel: 516-448-1000, TWX: 516-671-3155; Empl.: 850

PHOTOCIRCUITS RIVERHEAD DIV., KOLLMORGEN CORP., See Additive Products Div., Kollmorgen Corp.

PHOTODYNE INC·

PHOTODYNE, 1175 Tourmaline Dr., Newbury Park, CA 91320, Tel: 818-889-8770, Telex: 18-1159; FSC No.: 59912; Empl.: 35; *Sls. Mgr.:* Eamon Murphy; *Dist. Mgr.:* Eamon Murphy .... 1B•1118, 1119

Local Sales Offices & Reps

AL	Huntsville, JMS	205-533-5450
CA	Burlingame, BHL Assocs.	415-342-7850
CA	San Luis Obispo, Johnson Assocs.	213-670-4794
IL	Rosemont, Synmark Sls. Co.	312-825-3455
IN	Ossian, Science Sls.	219-622-7383
MA	Sudbury, Poulin Assocs.	617-443-7333
MN	Minneapolis, All Phase Agency	612-835-4940
NJ	Pennsauken, Scientific Reps.	609-662-5222
NM	Albuquerque, Grady Moore Assocs.	505-262-1416
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NC	Fayetteville, Zim-Tek	919-485-2222
OH	Risingsun, Mecom Inc.	419-457-3231
TX	Dallas, Southwestern Engrg. & Equip. Co.	214-340-1741
TX	Houston, Southwestern Engrg. & Equip. Co.	713-820-2500
VA	Fairfax, Scientific Assocs.	703-385-0600
WA	Walla Walla, Northwest Tech. Co.	509-529-2051

PHOTON TECHNLG., 14125 Capri Dr. #4, Los Gatos, CA 95030, Tel: 408-866-0566, Telex: 17-1618 refer: Photon; Empl.: 12; *Sls. Mgr.:* John M. Fleischer

PHOTO RESCH., 3000 N. Hollywood Way, Burbank, CA 91505, Tel: 213-843-6100, Telex: 69-1427; FSC No.: 92434; Empl.: 68; *Sls. Mgr.:* M. L. Woolsey

PHOTRONIC LABS., Secor Rd., Brookfield Ctr., CT 06805, Tel: 203-775-0465; Empl.: 55; *Sls. Mgr.:* Deno Macricostas

PHO-TRONICS, 8701 W. Bradley Rd., Milwaukee, WI 53224, Tel: 414-355-6704, TWX: 910-262-3099; Empl.: 85; *Sls. Mgr.:* John R. Henry

PIC DESIGN, P.O. Box 1004, Middlebury, CT 06762, Tel: 203-758-8272, TWX: 710-477-5234; Empl.: 150; *Sls. Mgr.:* J. Baldwin

PICO CRIMPING TOOLS, 9832 Jersey Ave., Santa Fe Springs, CA 90670, Tel: 213-723-2150; Empl.: 12

PICO ELCTRNS., 453 North MacQuesten Pkwy., Mt. Vernon, NY 10552, Tel: 914-699-5514, 800-431-1064; FSC No.: 31669; *Sls. Mgr.:* Joe Sweeney .... 1A•1271-1275, 2233-2255

Local Sales Offices & Reps

AZ	Scottsdale, Piper Sls. Co.	602-946-4437
CA	Santa Clara, Fisher Assocs.	408-733-7350
CO	Arvada, Piper Sls. Co.	303-420-4646
WA	Seattle, W. Spaulding Co.	206-282-9173

PICONICS, Cummings Rd., Tyngsboro, MA 01879, Tel: 617-649-7501, TWX: 710-347-6663; FSC No.: 26618; Empl.: 48; *Sls. Mgr.:* I. Kadesh .... 1A•1277, 1611, 1680

Local Sales Offices & Reps

AZ	Scottsdale, Semper-Fi Sls.	602-991-4601
CA	N. Hollywood, Jewett Co.	213-789-8103
CA	Palo Alto, J/M Assocs.	415-857-1260
CO	Parker, Mikro Sls. Co.	303-841-4131
FL	Lighthouse Point, R. C. Simon	305-941-2757
IL	Chicago, Shaumberg Phoenix Co.	312-980-7060
MA	Natick, Wayland Engrg. Sls. Co.	617-655-6080
MN	Minneapolis, Peterson, Snater & Assocs.	612-884-3483
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NY	Huntington, Regulus Indl. Sls. Co.	516-673-6252
NY	Rochester, J. G. Welch Assocs.	716-244-1100
OH	Cincinnati, G&H Sls. Co.	513-272-0580
PA	Glenside, R. F. Koebert & Assocs.	215-887-2310
TX	Ft. Worth, El-Tec Sales	817-268-2896
VA	Gladys, Ralley Entprs.	804-283-5656

PIEZO CRYSTAL, 100 "K" St., Box 619, Carlisle, PA 17013, Tel: 717-249-2151, TWX: 510-650-2280; Empl.: 250; *Sls. Mgr.:* Roy Burkholder

PIEZO ELEC. PRODS., INC., 212 Durham Ave., CN-15, Metuchen, NJ 08840, Tel: 201-548-2800, TWX: 710-998-0592; Empl.: 125; *Sls. Mgr.:* Jack Gray .... 1B•1820, 1821, 1871

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
CA	Mountain View, IFM, Inc.	415-961-2828
FL	Melbourne, Beacon Elctrns.	305-724-8010
GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Lisle, W-G Controls	312-963-5954
IN	Ft. Wayne, Given Corp.	219-432-5585
MD	Ellicott City, Mktg. Techn.	301-465-5944
MA	Lexington, Hathaway Elctrns. Inc.	617-861-7010
MN	Minneapolis, Elctrn. Innovators	612-941-0830
NJ	Middlesex, Cornell Assocs.	201-469-1303
NY	Rochester, Canavan-Scanlon Assocs.	716-424-1830
NY	Syracuse, Canavan-Scanlon Assocs.	315-437-1271
NC	Raleigh, Beacon Elctrns.	919-787-0330
OH	Dayton, Berberich Assocs.	513-433-0342
PA	Harleysville, Thomas Jackson Assocs.	215-643-5560
TX	El Paso, El Paso Elctrn. Comps.	915-593-8481
TX	Houston, Aid Elctrns.	713-937-3373
TX	Irving, Aid Elctrns.	214-259-4761

PIEZO TECHNOLOGY INC., 2525 Shader Rd., Orlando, FL 32804, Tel: 305-298-2000, TWX: 810-850-4136; FSC No.: 25120; Empl.: 610; *Sls. Mgr.:* Dave Stewart .... 1A•1308, 1404-1409

Local Sales Offices & Reps

AZ	Scottsdale, Faser Tech. Sls.	602-948-4404
CA	Los Altos, Cain-White & Co.	415-948-6533
CA	Van Nuys, R.L. Assocs.	213-782-7826
CT	Milford, Bengal Assocs.	203-878-3946
DC	Washington, M. Lader Co.	202-296-2497
FL	Maitland, D. J. Ellis & Assocs.	305-645-1101
IN	South Bend, Schillinger & Assocs.	219-282-4570
KS	Overland Park, Barnes Mid-West Sls.	913-341-9317
MA	Randolph, Bengal Assocs.	617-961-4120
MN	Chanhassen, Barnes Sls. Assocs.	612-934-2907
NJ	Haddonfield, Mesa Tech. Assocs.	609-429-9531
NY	Buffalo, Quality Comps.	716-837-5430
NY	Great Neck, Phase 4, Inc.	516-482-1790
TX	Richardson, Vector Sls. Co.	214-234-4291

PIHER INTL., 565 W. Golf Rd., Arlington Hgts., IL 60005, Tel: 312-640-8300, 800-323-6693, Telex: 254190, TWX: 710-393-6784; Empl.: 100; *Sls. Mgr.:* Gus Stoltz; *Dist. Mgr.:* Wm. Pragit

PINLITES, See Refac Elctrns.

PIONEER COMPS., 2352 E. 66th St., Brooklyn, NY 11234, Tel: 212-444-3880; Empl.: 3; *Sls. Mgr.:* Michael R. Verter; *Dist. Mgr.:* Michael R. Verter

PIONEER MAGNETICS, 1745 Berkeley St., Santa Monica, CA 90404, Tel: 213-829-6751, Telex: 182-093, TWX: 910-343-6249; FSC No.: 08676; Empl.: 450; *Sls. Mgr.:* A. Hagiwara .... 3•1666, 1667

Local Sales Offices & Reps

CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Santa Monica, Pioneer Magnetics, Inc.	213-829-6751

CO	Commerce City, Williams Assocs.	303-289-5647
FL	Deerfield Beach, Pen-Tech Assocs.	305-421-4989
KS	Olanthe, Rush & West Assocs.	913-754-2700
MA	Waltham, Daner-Hayes	617-894-7290
MN	Eagan, Pioneer Magnetics	612-452-7747
OH	Westlake, KRW Sales	216-871-7521
PA	Cheltenham, Stein Instrm.	215-379-1990
TX	Dallas, Remtek	214-387-2855
WA	Vashon, RTS, Inc.	206-285-1363

PIRELLI CABLE CORP., Special Cable Div., P.O. Box 50, Wallingford, CT 06492, Tel: 203-265-5533, 800-243-3959, TWX: 710-476-0764; Empl.: 110; *Sls. Mgr.:* Art Fabritiis

PIRELLI CIMCO, 800 Rahway Ave., Union, NJ 07083, Tel: 201-687-8444, Telex: 138918, TWX: 6874009; Empl.: 80; *Sls. Mgr.:* John N. Vanderbeek

PITTMAN CORP., 343 Godshall Dr., Harleysville, PA 19438, Tel: 215-256-6601, TWX: 510-661-8696; FSC No.: 98938; Empl.: 135 ....**1B•**1170, 1171

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Commerce City, Williams-Assocs.	303-289-5647
FL	Bradenton, Tropi-Tec, Inc.	813-748-2868
FL	Plantation, Tropi-Tec	305-581-0101
GA	Atlanta, Electro-Rep Assocs.	404-320-1134
IL	Mount Prospect, K-W Assocs.	312-253-6680
IN	Fort Wayne, Neal Engrg.	219-436-2300
IN	Indianapolis, Neal Engrg.	317-849-4201
MA	Ashland, M. L. Assocs.	617-485-6190
NJ	Summit, R.A. Potter	201-277-0220
NM	Albuquerque, Williams-Assocs.	505-255-1638
NY	Buffalo, Application Spec.	716-834-3377
NY	Rochester, Application Spec.	716-586-6226
NY	Syracuse, Application Spec.	315-437-2813
NC	Charlotte, Electro-Rep Assocs.	704-527-2530
OH	Cleveland, Servo-Mark	216-871-2353
OK	Tulsa, Blair Engrg.	918-747-3100
TX	Austin, Blair Engrg.	512-458-3107
TX	Dallas, Blair Engrg.	214-241-5655
TX	Houston, Blair Engrg.	713-776-0011
UT	Salt Lake City, Williams-Assocs.	801-485-6511
WA	Redmond, Halbar Assocs.	206-882-0990
WA	Vancouver, Halbar Assocs.	206-696-0170
PR	Hato Rey, Tropi-Tec	809-759-7303

PLAINVIEW ELCTRNS., 28 Cain Dr., Plainview, NY 11803, Tel: 516-249-6677, Telex: 125043; Empl.: 6; *Sls. Mgr.:* B. Erde

PLANT SPECIALTIES, INC., PO Box 1097, Carrollton, TX 75006, Tel: 214-245-9673; *Sls. Mgr.:* J. E. Bryer

PLASMAGRAPHICS CORP., 141 Mount Bethel Rd., P.O. Box 4903, Warren, NJ 07060, Tel: 201-757-5000, Telex: 83-3456-0, TWX: 710-997-9529; *Dist. Mgr.:* Ronald Pignatello

PLASMA-THERM, INC., Rt. 73, Kresson, NJ 08053, Tel: 609-767-6120, Telex: 837220; *Sls. Mgr.:* John D. Raffl

Local Sales Offices & Reps

AZ	Phoenix, Plasma-Therm	602-962-4522
CA	San Jose, Plasma-Therm	408-945-9000
CA	San Jose, PT Analytical	408-943-0777
IL	Hinsdale, Plasma-Therm	312-789-2636
MA	Wakefield, Plasma-Therm	617-246-4800
MA	Woburn, Plasma Sys.	617-933-9170
NJ	Kresson, Plasma-Therm Sys.	609-767-6120
PA	Whitehall, Plasma-Therm	215-776-0330

PLASTIC CAPACITORS, INC., 2623 N. Pulaski Rd., Chicago, IL 60639, Tel: 312-489-2229, TWX: 910-221-1354; FSC No.: 99120; Empl.: 105; *Sls. Mgr.:* F. J. Pavey

PLASTIC FORMING CO., INC., 5 Lunar Dr., P.O. Box N, Woodbridge, CT 06525, Tel: 203-397-1338, Telex: 963437; Empl.: 37; *Sls. Mgr.:* John C. Womer

PLASTIGLIDE MFG., 2701 W. El Segundo Blvd., Hawthorne, CA 90250, Tel: 213-777-8108; Empl.: 425; *Dist. Mgr.:* J. Shulman

PLASTOID CORPORATION, 45 Gingerbread Castle Rd., Hamburg, NJ 07419, Tel: 201-827-7141

PLASTRONICS INC., 3111 Gardenbrook, Dallas, TX 75234, Tel: 214-243-0611, TWX: 910-860-5542; Empl.: 47

PLATO PRODS., 2120 E. Allen Ave., Glendora, CA 91740, Tel: 800-423-4510, Telex: 673-488; FSC No.: 32399; Empl.: 75; *Sls. Mgr.:* Walter Schaub

Local Distributors

AZ	Phoenix, Scottsdale Tool & Supply	602-273-7376
CA	El Segundo, Wassco	213-640-1060
CA	Sunnyvale, COM-KYL	408-734-9660
CO	Arvada, Western Tool	303-422-3413
CO	Denver, Grenfell Supp.	303-893-3111
FL	Orlando, Deanco	305-851-2480
GA	Marietta, Deanco	404-429-0126
IL	Chicago, E M F	312-889-8323
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
KS	Overland Park, Burke Sls	913-492-1880
MD	Gaithersburg, Deanco	301-948-5444
MA	Boston, Hub Material	617-542-7531
MA	Burlington, Contact East	617-272-5051
MN	St. Paul, R.G. Ragon	612-488-0201
NM	Albuquerque, Intl. Elctrns	505-265-6456
NC	Raleigh, Deanco	919-851-2065
OR	Portland, Murphy Indl Supp.	503-620-8680
TX	Dallas, Roy E. Davis	214-688-0652
TX	El Paso, Intl Elctrns	915-778-9761
UT	Salt Lake City, Techn. Devices	801-972-5935
VA	Virginia Beach, Deanco	804-499-3322

PLESSEY CERAMIC DIV., 8th & Harrison Sts., Frenchtown, NJ 08825, Tel: 201-996-2121, TWX: 510-235-3399; Empl.: 198; *Sls. Mgr.:* William Blackford

PLESSEY ELECTRO-PRODUCTS, 3860 Centinela Ave., Los Angeles, CA 90066, Tel: 213-390-3585, TWX: 910-343-6483; Empl.: 60; *Sls. Mgr.:* Joan Marie Hill

PLESSEY MICROSYSTEMS, Plessey Trading Corp., 1641 Kaiser Ave., Irvine, CA 92714, Tel: 714-540-9931/9932, TWX: 910-595-1930; *Sls. Mgr.:* Garry T. Tomlins

PLESSEY MICROSYSTEMS, 451 Hungerford Dr., Rockville, MD 20850, Tel: 301-279-2892, TWX: 710-828-9815; *Sls. Mgr.:* Garry Tomlins; *Dist. Mgr.:* Randy Williams

PLESSEY SEMICONDUCTORS, 1641 Kaiser Ave., Irvine, CA 92714, Tel: 714-540-9979, TWX: 910-595-1930; FSC No.: 52648; Empl.: 75; *Sls. Mgr.:* Jerry Surloff

PLUMER PRECISION OPTICS, 601 Montgomery Ave., Pennsburg, PA 18073, Tel: 215-679-6272; Empl.: 160; *Sls. Mgr.:* Ray Boulay

PMI MOTORS, KOLLMORGEN CORP., 5 Aerial Way, Syosset, NY 11791, Tel: 516-938-8000, TWX: 510-221-1875; Empl.: 230; *Sls. Mgr.:* F. Sarstedt; *Dist. Mgr.:* R. Malton

Local Sales Offices & Reps

AR	El Dorado, Indl. Controls Assocs.	501-862-2051
CA	San Jose, Motion Control	408-997-0544
CA	San Marino, Motion Control	213-796-0189
CO	Denver, Control Agency	303-936-6641
FL	Altamonte Springs, A. Lovisek	305-788-6606
IL	Bartlett, T. Meyer	312-830-3374
IN	Elkhart, Shaum Mfg.	219-264-0771
IN	Spencer, Shaum Mfg. Inc.	317-842-2255
IA	Marion, Design Solutions, Inc.	319-377-1129
KS	Shawnee Mission, Design Solutions, Inc.	913-432-3109
KS	Wichita, Design Solutions, Inc.	316-529-0114
LA	Baton Rouge, Industrial Controls Assocs.	800-643-1109
MA	Beverly, Electro Kinetics	617-922-4007
MA	Wellesley, Electro Kinetics	617-235-9415
MI	Ann Arbor, Pyramid Integrated Control Sys.	313-996-4162
MI	Belding, Shaum Mfg. Inc.	616-897-5385
MN	Newport, Applied Motion Technlg.	612-459-0600
MO	St. Louis, Design Solutions, Inc.	314-961-7170
NY	Cazenovia, D & O Engrg.	315-655-8602
NY	Syosset, B. Lewis	516-938-8000
NY	Syosset, Motion Control Sls.	516-921-5656
NY	Youngstown, D & O Engrg.	716-745-3915
NC	Greensboro, Engrg. & Mktg. Corp. of Virginia	919-275-1309
NC	Plymouth, Engrg. & Mktg. Corp. of Virginia	919-793-4461
OH	Chagrin Falls, Exonic Sys.	216-247-4788
PA	Pittsburgh, Exonic Systems	412-784-8400
TX	Fort Worth, Industrial Controls Assocs.	800-643-1109
TX	Spring, Industrial Controls Assocs.	800-643-1109
UT	Salt Lake City, Control Agency	801-328-4305
VA	Roanoke, Engrg. & Mktg. Corp. of Va	703-986-1410
WA	Renton, Drive Motor Control Sys. Co.	206-226-9294
WI	Racine, T. Beyer	414-632-6100

Distributor

POCO SALES, 8925 Fullbright St., Chatsworth, CA 91311, Tel: 818-700-8727 .... pgs. 642, 680, 685, 687

POLARAD ELCTRNS., INC., 5 Delaware Dr., Lake Success, NY 11042, Tel: 516-328-1100, TWX: 510-223-0414; FSC No.: 82199; Empl.: 175; *Sls. Mgr.:* Ron Ramirez

POLAROID CORP., 784 Memorial Dr., Cambridge, MA 02139, Tel: 617-577-2024, Telex: 921482, TWX: 710-320-0610; *Sls. Mgr.:* Sal La Rocca

POLYCORE ELCTRNS., 1107 Tourmaline Dr., Newbury Pk., CA 91320, Tel: 213-991-1061, Telex: 910-336-1547; Empl.: 30; *Sls. Mgr.:* S.K. Leong

POLYMER CORP., P.O. Box 422, Reading, PA 19603, Tel: 215-320-6600, Telex: 836-440, TWX: 510-651-5396; Empl.: 1000; *Sls. Mgr.:* R. S. Spangler

POLYPHASE INSTR., 175 Commerce Dr., Ft. Washington, PA 19034, Tel: 215-643-6950, Telex: 84-6327; FSC No.: 98330; Empl.: 175; *Sls. Mgr.:* R.H. Simmons

POLYPHASER CORPORATION, P.O. Box 1237, Gardnerville, NV 89410, Tel: 702-782-2511, Telex: 215406 TBYT UR: PolyPhaser .... **1B•**1285

Local Sales Offices & Reps

CA	North Hollywood, Crown Elctrns.	818-877-3550
CO	Aurora, Electro-Tek Sls.	303-343-8937
GA	Marietta, Consumer Mktg.	404-424-9097
HI	Honolulu, Manon Engrg.	808-833-9545
IL	Elk Grove Village, IRO Co.	312-593-0644
MI	Rochester, Webster Assocs.	313-375-0420
MN	Stillwater, Ned Gordon & Assocs.	612-430-1572
MO	Liberty, LectroReps	816-781-2522
NV	Gardnerville, PolyPhaser Corp.	702-782-2511
NM	Albuquerque, Electro-Tek Sls., Inc.	505-883-4871
NC	Pineville, Consumer Mktg.	704-527-4045
OH	Toledo, Webster Assocs.	419-535-0708
OK	Tulsa, Horizon Engrg. Sls. Co.	918-252-7222
OR	Portland, Manon Engrg.	503-245-7553
PA	Venetia, Webster Assocs.	412-941-8848
RI	Lincoln, Adams-McGregor	401-726-1300
TX	Houston, Horizon Engrg. Sls. Co.	713-495-1018
TX	Rockwall, Horizon Engrg. Sls. Co.	214-226-4712
TX	Rowlett, Horizon Engrg.	214-475-1179
UT	Salt Lake City, Electro-Tek Sls.	801-973-8435
WA	Kirkland, Manon Engrg.	206-827-7449
WY	Sheridan, Electro-Tek Sls., Inc.	307-672-9368

Local Distributors

CO	Aurora, Electro-Tek Sls.	303-343-893
IL	Elk Grove Village, IRO-Co.	312-593-064
KS	Dodge City, Teletron	316-225-373
NV	Gardnerville, PolyPhaser Corp.	702-782-251
NC	Greensboro, West Antenna	919-621-247
TX	Rockwall, Horizon Engrg. Sls. Co.	214-226-471
TX	Rowlett, Horizon Engrg. Sls.	214-475-117

POLY-SCIENTIFIC, 1213 N. Main St., Blacksburg, V 24060, Tel: 703-552-3014, TWX: 710-875-3694 Empl.: 625

POLYTRON DEVICES, Box 398 - River St. Sta. Paterson, NJ 07544, Tel: 201-345-5885; Empl.: 10

Add Dept. EM to address to tell them you saw it in EEM.

POMFRET RESEARCH OPTICS, 817 Long Ridge Rd., Stamford, CT06902, Tel: 203-322-6386; Empl.: 5

POMONA ELECTRONICS, See ITT Pomona

POP FASTENERS DIV., 510 River Rd., Shelton, CT 06484, Tel: 203-735-9341, Telex: 963465, TWX: 710-451-3734; Empl.: 375; *Sls. Mgr.:* James Lynch

PORTESCAP TRANSICOIL, Trooper Rd., P.O. Box 99, Worcester, PA 19490-9990, Tel: 215-277-1300, TWX: 510-660-0132; FSC No.: 82686; Empl.: 220; *Sls. Mgr.:* P. Schoenacker ....**1B**•1172, 1185

Local Sales Offices & Reps

CA	Huntington Beach, Portescap Transicoil	714-963-3069
MA	Medfield, Portescap Transicoil	617-359-2336
MA	Plymouth, Portescap Transicoil	216-224-6533
NJ	Kinnelon, Avionics Engrg. Sls.	201-838-8105
OR	Beaverton, Portescap Transicoil	503-645-7523
PA	Andalusia, Portescap Transicoil	215-245-5366
PA	Media, Homersmith, Inc.	215-543-2434
TX	Richardson, Portescap Transicoil	214-690-9000
EXP	PA, Worcester, Portescap Transicoil	215-277-1300

PORTESCAP U.S., 1547 Trooper Rd., P.O. Box 666, Worcester, PA 19490, Tel: 215-277-0433, Telex: 846367; *Sls. Mgr.:* George Beauchemin ....**1B**•1172, 1873

Local Sales Offices & Reps

CA	Pomona	714-622-4185
MA	Medfield	617-359-2336
NJ	Ft. Lee	201-461-8803
OR	Beaverton	503-645-7523
TX	Richardson	214-690-9000

POSITRONIC INDS., 423 North Campbell, Springfield, MO 65806, Tel: 417-866-2322, Telex: 436445; FSC No.: 28198; Empl.: 196; *Sls. Mgr.:* J.E. Myers; *Dist. Mgr.:* Linda Haley

POTTER & BRUMFIELD, P.O. Box 322, Princeton, IN 47671, Tel: 812-386-1000, Telex: 27-8451, TWX: 810-350-2343; Empl.: 3000; *Sls. Mgr.:* Don Morrow; *Dist. Mgr.:* Gordon Collins

POTTER CO., P.O. Box 337, North Hwy. 51, Wesson, MS 39191, Tel: 601-643-2215, TWX: 510-981-4072; FSC No.: 601-643-5126; Empl.: 300 ....**1A**•1612

Local Sales Offices & Reps

CA	Los Angeles, Potter Co.	818-704-1151
CA	San Jose, Potter Co.	408-297-6222
FL	Orlando, Potter Co.	305-831-2782
L	Chicago, Potter Co.	312-364-0424
MA	Boston, Potter Co.	617-449-1242
MN	Minneapolis, Potter Co.	612-933-7712
NY	Mineola, Colucci Sls.	516-746-0397
OH	Dayton, Allen Nace Co.	513-836-0931
PA	Philadelphia, Potter Co.	215-525-4752
TX	Austin, Potter Co.	512-451-5721

Local Distributors

AZ	Phoenix, Kachina Elctrn. Distrs.	602-269-6201
AZ	Tucson, Kachina Elctrn. Distrs.	602-792-2223
CA	Cerritos, El-Com, Inc.	714-739-5656
CA	San Diego, El-Com, Inc.	619-578-0900
CA	San Francisco, KEA Elctrn. Distributing	415-481-5588
CA	Santa Clara, Western Electromotive	408-727-7411
CT	New Haven, Cronin Elctrns.	203-265-3134
CT	Orange, Milgray Elctrns.	203-795-0711
FL	Orlando, Intertec Comps.	305-834-7777
FL	Winter Park, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
L	Chicago, Advent Elctrns.	312-297-6200
N	Indianapolis, Advent Elctrns.	317-872-4910
A	Cedar Rapids, Advent Elctrns.	319-363-0221
KS	Kansas City, Milgray Elctrns.	913-236-8800
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Boston, Cronin Elctrns.	617-449-5000
MA	Burlington, Milgray Elctrns.	617-272-6800
MI	Detroit, Advent Elctrns.	313-477-1650
NJ	Marlton, Milgray Elctrns.	609-983-5010
NY	Freeport, Milgray Elctrns.	516-546-6000
NY	North Syracuse, ANDCO	315-699-2660
OH	Cleveland, Milgray Elctrns.	216-447-1520
OR	Portland, Radar Electric	503-232-3404
PA	Philadelphia, Century Elctrn. Comps.	215-631-5400
WA	Seattle, Radar Electric	206-282-2511
WA	Spokane, Radar Electric	509-747-3053

POTTER INSTR., 10 Main St., Gonic, NH 03867, Tel: 603-332-1991, Telex: 94-4483; FSC No.: 11-1563382; Empl.: 20; *Sls. Mgr.:* S. Alexander

POULIN ASSOCIATES, INC., 302 North Rd., Sudbury, MA 01776, Tel: 617-443-7333; *Sls. Mgr.:* Scott Spalding

POWERBOX, INC., 1860 Broadway, New York, NY 10023, Tel: 212-586-1992; *Sls. Mgr.:* Len Elmlund

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Subsidiary of Vanguard Electronics Co., Inc.

POWER COMPS. CO., Vanguard Elctrns. Co., 1480 W. 178th St., Gardena, CA 90248, Tel: 213-323-8120, TWX: 910-346-7067; *Sls. Mgr.:* Ken Finley ....**3**•1668, 1669

Local Sales Offices & Reps

AZ	Tempe, Sys. Sls. of AZ.	602-829-9338
CA	Canoga Park, Chandler Assoc.	213-340-6103
CA	San Diego, T.D.I.	619-286-5107
CA	San Jose, Silicon Valley Sls.	408-286-7510
CO	Denver, W. H. Howard	303-426-3499
IL	Franklin Park, Dekotech, Inc.	312-455-5100
IN	Fort Wayne, Tx Sls. Indiana	219-489-4447
MD	Columbia; Raleigh, Robert Elect. Sls.	301-995-1900
MA	Medfield; Concord, Nortech Engr. Sls.	617-359-6063
MI	Jackson, Norwood Scroggs Co.	517-878-0434
MN	Minneapolis, Bill Deming & Assoc.	612-888-5000
NY	Commack, RC Engr. Sls.	516-543-3325
OH	Akron, Arkay	216-836-8497

POWER CONTROL, 122 Gamma Dr., Pittsburgh, PA 15238, Tel: 412-782-3120; Empl.: 75

POWER CONTROLS, P.O. Box 5860, San Antonio, TX 78201, Tel: 512-734-7155, Telex: 767222; Empl.: 90; *Sls. Mgr.:* Robert A. McAlister

POWER CONVERSION PRODS., 42 East St., Box 380, Crystal Lake, IL 60014, Tel: 815-459-9100, TWX: 910-634-3356; FSC No.: 31751; Empl.: 130; *Sls. Mgr.:* C. Seyer

POWERCUBE CORP., Sub. Unitrode Corp., 8 Suburban Pk. Dr., Billerica, MA 01821, Tel: 617-667-9500, TWX: 710-347-6792; FSC No.: 31557; Empl.: 140; *Sls. Mgr.:* James A. Ward

POWER DESIGNS, INC., 1700 Shames Dr., Westbury, NY 11590, Tel: 516-333-6200, TWX: 510-222-6561; Empl.: 100; *Sls. Mgr.:* Lillian Kelly ....**3**•1672-1679

Local Sales Offices & Reps

CA	North Hollywood, O'Halloran Assocs.	818-877-0173
CA	Palo Alto, O'Halloran Assocs.	415-326-1493
CA	San Diego, O'Halloran Assocs.	619-224-2824
CT	South Windsor, Addelco Corp.	203-644-1233
FL	Melbourne, Reynolds & Assocs.	305-259-7000
IL	Elk Grove Village, Loren Green & Assocs.	312-593-0282
IN	Indianapolis, Loren Green & Assocs.	317-293-9827
MD	Gaithersburg, Powell Pendergraph	301-921-4200
MA	Needham, Addelco Corp.	617-444-4754
MN	Minneapolis, Loren Green & Assocs.	612-781-1611
NY	Port Chester, Radiation Elctrns.	914-937-2300
PA	Willow Grove, Powell-Pendergraph	215-657-0330
VA	Richmond, Powell-Pendergraph	703-264-2341
WA	Bellevue, Topp Engrg. Sls. Corp.	206-747-5400

POWER DYNAMICS, 177 Valley, S. Orange, NJ 07079, Tel: 201-762-6886, Telex: 666 173, TWX: 136567 (PDI); FSC No.: 60046; *Sls. Mgr.:* James Papianni; *Dist. Mgr.:* Lyle Scott ....**1B**•1286, 1287, 1740; **2**•1544-1546, 1782, 1783

Local Sales Offices & Reps

CA	Laguna Niguel, David Budge & Assoc.	714-831-7720
CA	Mountain View, Bart Budge Assocs.	415-961-0940
CT	Vernon, GM Assoc.	203-646-4443
FL	Coral Springs, E.P.M. Corp.	305-755-5387
GA	Lawrenceville, BTF, Inc.	404-963-9495
IL	Crystal Lake, E. S. Healy & Assocs.	815-459-4386
KY	Louisville, KW Elctrn. Sls.	502-451-1860
MA	Framingham, GM Assoc.	617-872-4871
MI	Ypsilanti, Tamco Inc.	313-572-1950
MN	Minneapolis, R. K. Sls.	612-786-5713
NH	Exeter, GM Assoc.	603-778-7472
NJ	Englewood Cliffs, Ed Glass Assoc.	201-592-0200
NC	Raleigh, BTF, Inc.	919-782-3493
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Heights, KW Elctrn. Sls.	216-491-9177
OH	Worthington, KW Elctrn. Sls.	614-888-0483
OR	Tigard, Electronic Comp. Sls.	503-245-2342
PA	Allison Park, KW Elctrn. Sls.	412-487-4300
PA	Prospect Park, Elf Sls.	215-534-3340
TX	Dallas, Rem-Air Comps.	214-234-1069
UT	Salt Lake City, Aspen Sls.	801-467-2401
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301

Local Distributors

CA	Burlingame, Rose Elctrns.	415-348-2740
CA	Inglewood, Force Elctrns.	213-670-8570
CA	San Jose, Force Elctrns.	408-943-1324
FL	Ft. Lauderdale, KSM Elctrns.	305-971-5900
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
IL	Crystal Lake, Sub-Sem	312-782-3954
MN	St. Paul, Munsee Elctrns.	612-228-0267
NC	Raleigh, Century Elctrns.	919-755-0537
PA	Norristown, Century Elctrns.	215-631-5400
TN	Memphis, Electrotec	901-362-1350
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Stafford, Southwest Elctrns.	713-491-4900
WA	Redmond, Murphy Elctrns.	206-881-1234

POWER ELCTRNS., 96 Milton Rd., Rochester, NH 03867, Tel: 603-332-3334; Empl.: 125; *Sls. Mgr.:* Robert S. Karstedt

POWER FUNCTIONS ENGRG., 3831 Cavalier Dr., Garland, TX 75042, Tel: 214-278-0996; Empl.: 9

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POWER GENERAL, 152 Will Dr., Canton, MA 02021, Tel: 617-828-6216, TWX: 710-348-0200; Empl.: 200; *Sls. Mgr.:* Steve Dutton; *Dist. Mgr.:* John H. Gallagher ....**3**•1680-1691

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
AZ	Scottsdale, TC Electrn. Sls.	602-994-5153
CA	Milpitas, Sales One	408-945-1250
CA	Orange, XBX Sls.	714-998-8200
CA	Redwood City, Sales One	415-367-1188
CO	Englewood, Grimes Mktg.	303-799-6063
CT	Avon, Power Mark	203-678-0123
FL	Melbourne, EMS	305-724-1027
FL	Plantation, EMS	305-587-7146
FL	Sarasota, EMS	813-924-7415
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Palatine, T-Squared Assoc.	312-991-2144
IA	Cedar Rapids, Palatine Eng. & Sls.	319-365-8071
KS	Mission, Palatine Eng. & Sls.	913-831-0555
MA	Canton, Power General	617-828-6216
MI	Birmingham, Favco	313-644-0173
MI	Grand Rapids, Favco	616-459-4425
MN	Minneapolis, Comtek Sls.	612-888-7011
MO	Hazelwood, Palatine Eng. & Sls.	314-839-0800
NJ	Perth Amboy, AstroRep	201-826-8050
NY	Babylon, AstroRep Inc.	516-422-2500
NY	Babylon, AstroRep Inc.	201-624-4408
NY	DeRuyter, Net Sls.	315-662-7996
NY	Fairport, Net Sls.	716-467-4538
NY	Troy, Net Sls.	518-274-4758
NC	Winston Salem, Murcota	919-722-9445
OH	Columbus, McFadden Sls.	614-459-1280
OR	Lake Oswego, Huntley Assoc.	503-636-7558
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, Mech-Tron Mktg.	214-343-3786
TX	Houston, Mech-Tron Mktg.	713-462-1432
VA	Fairfax, Beacon North	800-572-0405
VA	Falls Church, Beakon North Inc.	703-591-1300
WA	Everett, Huntley Assoc.	206-353-1833

Local Distributors

Intl	Belgium, Gent, Belgium Computer Prods.	
Intl	France, Orsay, Microel	907.08.24
Intl	W. Germany, Muenchen, Fey Elektronik Bauelemente	(089) 184041

POWER GROUP INTERNATIONAL, 1137 Cliff Rd., Burnsville, MN 55337, Tel: 612-890-1360; FSC No.: 25441; Empl.: 500; *Sls. Mgr.:* Hortense M. Rowe ....**3**•1420, 1421

POWER INSTRS., INC., 7352 N. Lawndale Ave., Skokie, IL 60076, Tel: 312-676-2300, TWX: 910-223-0835; Empl.: 45; *Sls. Mgr.:* Tony Ruggiero

POWER INTEGRITY CORP., 1840 Pembroke Rd., P.O. Box 9682, Greensboro, NC 27408, Tel: 919-379-9773; *Sls. Mgr.:* James T. Fesmire

POWER LABS, INC., 5 Towle Ave., Dover, NH 03820, Tel: 603-742-4613; Empl.: 9

POWERMARK, 3855 Ruffin Rd., San Diego, CA 92123, Tel: 619-565-8363; Empl.: 75; *Sls. Mgr.:* Ron Baietto ....**3**•1904-1906

Local Sales Offices & Reps

AL	Birmingham, Sesco	205-988-8304
AK	Anchorage, John P. Bagoy & Assocs.	907-274-8531

AZ	Phoenix, Bob Anderson Co.	602-266-2070
CA	Milpitas, Lee/Allan Assocs.	408-946-8300
CO	Denver, Cleveland Entprs. of Colo.	303-751-3252
FL	St. Petersburg, Sesco	813-576-6991
GA	Atlanta, Sesco	404-458-6423
HI	Honolulu, Ind'l. Elctrns.	808-533-6095
ID	Boise, Underwood-Hanify Assocs.	208-343-5600
IL	Elk Grove Village, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Loren Green Assocs.	317-293-9827
KS	Shawnee, Atech	913-268-9644
LA	Baton Rouge, Sesco	504-928-4951
LA	Metairie, Sesco	504-456-2684
MD	Bethesda, Powell-Pendergraph	301-656-4535
MA	Wellesley, Power Conversion Sys.	617-235-7884
MI	Mt. Clemens, O'Hara Assocs.	313-791-7140
MN	Minneapolis, Loren Green Assoc.	
MO	St. Louis, Atech	314-428-7447
NH	Londonderry, Power Conversion Sys.	603-434-2371
NJ	Ridgewood, Ballou, Inc.	201-444-6990
NY	Clarence, Trott Elctrns.	716-634-8500
NY	Pittsford, Trott Elctrns.	716-586-8251
NC	Cary, Sesco	919-467-7482
NC	Charlotte, Sesco	704-535-4920
OH	Cleveland, Jim Finnegan & Co.	215-238-5905
OK	Tulsa, Sesco	918-622-3868
PA	Brunnerville, J. E. Cuesta & Co.	717-626-2020
PA	Valley Forge, J. E. Cuesta & Co.	215-265-5800
TX	Austin, Sesco	512-892-2490
TX	Dallas, Sesco	214-231-9364
TX	Houston, Sesco	713-999-3510
UT	Salt Lake City, Cleveland Entprs. of Colo	801-355-8424
VA	Richmond, Powell-Pendergraph	804-270-1400
WA	Bellevue, Underwood-Hanify Assocs.	206-451-8223
WA	Vancouver, Underwood-Hanify Assocs.	503-641-4463

POWER/MATE CO., 514 S. River St., Hackensack, NJ 07601, Tel: 201-440-3100, TWX: 710-990-5023: Empl.: 650; *Sls. Mgr.:* J. R. Hoeffler; *Dist. Mgr.:* G. Vardakas

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Local Sales Offices & Reps

AZ	Scottsdale, Thorson Desert States	602-998-2444
CA	Los Angeles, A-F Sls. Engrg.	213-681-5631
CA	Pasadena, A-F Sls. Engrg.	213-681-5631
CA	San Diego, A-F Sls. Engrg.	619-274-2225
CA	San Jose, Richards Assocs.	408-297-3010
CO	Denver, Quorum 3	303-696-8480
FL	Casselberry, Elctrn. Mktg.	305-339-7070
GA	Marietta, ELW Southeast	404-424-1731
IL	Itasca, L-Tec	312-773-2900
IN	Ft. Wayne, J&B Engrg.	219-483-2813
IN	Indianapolis, J&B Engrg.	317-894-8697
IA	Cedar Rapids, Lorenz Sls.	319-377-4666
KS	Overland Park, ATS	913-642-6675
MA	Brockton, Forsberg	617-522-6300
MI	Southfield, L. H. Dickelman	313-353-8210
MN	Minneapolis, Components Grp. Corp.	612-374-1250
MO	St. Louis, ATS	314-227-4448
NE	Lincoln, Lorenz Sls.	402-475-4660
NM	Albuquerque, Thorson Desert States	505-293-8555
NY	Great Neck, Trionic Assocs.	516-466-2300
NY	Pittsford, C. W. Beach	716-586-3200
NY	Syracuse, C. W. Beach	315-446-9587
OH	Columbus, Tom Mulligan Co.	614-457-2242
OK	Tulsa, Advance Tech. Sls.	918-664-0482
OR	Beaverton, W3	503-641-5790
PA	Philadelphia, Eastern Comp. Sls.	215-825-8610
PA	Stewartstown, Eastern Comp. Sls.	800-223-3850
TX	Austin, Advance Tech. Sls.	512-459-1351
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
UT	Sandy, Quorum 3	801-943-9227
VA	Manasas, Eastern Comp. Sls.	703-368-3936
WA	Seattle, W3	206-285-2667
WI	Milwaukee, L-Tec	414-774-1000

Local Distributors

AZ	Phoenix, Arrow Elctrns.	602-968-4800
AZ	Phoenix, Aero Space Southwest	602-861-1785
AZ	Phoenix, PLS Assocs.	602-246-6614
CA	Chatsworth, Diplomat Elctrns.	818-341-4411
CA	Chatsworth, Arrow Elctrns.	213-701-1133
CA	Costa Mesa, FLW	818-989-5237
CA	Los Angeles, Hanex, Inc.	213-556-3807
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Jose, Compumech Elctrns.	408-289-9171
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CO	Denver, Arrow Elctrns.	303-696-1111
CO	Denver, PLS Assocs.	303-773-1218
CO	Englewood, Diplomat Elctrns.	303-799-8300
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	Wallingford, Sterling Elctrns.	203-265-9535
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Miami, Elctrn. Equip. Co.	305-871-3500
FL	Palm Bay, Arrow Elctrns.	305-725-1480
GA	Norcross, Diplomat Elctrns.	404-449-4133
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Arlington Heights, C. W. Elctrns.	312-489-9810
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Northbrook, Classic Comps.	312-272-9650
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KS	Edwardville, C. Tennant & Sons	913-441-1801
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Timonium, Zebra Elctrns.	301-252-6576
MA	Canton, Impact Sales	617-821-1500
MA	Woburn, Arrow Elctrns.	617-933-6770
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Battle Creek, Great Lakes Elctrns.	616-731-4156
MI	Livonia, Reptron	313-525-2700
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, Aero Space Computer	612-884-4725
MO	St. Charles, Finnigan Elctrns.	314-946-6201
MO	St. Louis, Arrow Elctrns.	314-567-6888
NE	Omaha, Scott Elctrns.	402-734-6750
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NJ	Saddle Brook, Arrow Elctrns.	201-797-5800
NJ	Totawa, Diplomat Elctrns.	201-785-1830
NM	Albuquerque, Sterling Elctrns.	505-854-1900
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Mamaroneck, Logicomp Elctrns.	914-698-9332
NY	Melville, Diplomat Elctrns.	516-454-6400
NY	Rochester, Zeller Elctrns.	716-254-8840
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, CAM/RPC Elctrns.	716-865-2080
NC	Raleigh, Southeastern Elctrns.	919-828-2311
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cincinnati, Applied Data Mgt.	513-579-8108
OH	Cleveland, CAM/RPC Elctrns.	216-461-4700
OH	Columbus, Reptron	614-436-6675
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Sterling Elctrns.	918-663-2410
PA	Lancaster, CAM/RPC Elctrns.	717-392-8141
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Pittsburgh, Alder Tronics	412-821-5565
PA	Pittsburgh, CAM/RPC Elctrns.	412-782-3770
PA	Wayne, Peak Elctrns.	215-293-9000
RI	Warwick, Major Edwards Elctrns.	401-781-3000
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Dallas, Solid State Elctrns.	214-438-5700
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Houston, Sterling Elctrns.	713-627-9800
TX	Houston, Solid State Elctrns.	713-772-8483
TX	Stafford, Arrow Elctrns.	713-491-4100
UT	Salt Lake City, Diplomat Elctrns.	801-486-4135
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellevue, Integrated Elctrns.	206-455-2727
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Seattle, Radar Electric	206-282-2511
WI	Oak Creek, Arrow Elctrns.	414-764-6600
EXP	CA, Los Angeles, Hanex, Inc.	213-556-3807

POWER PAC INC.

POWER PAC, 32 Meadow St., S. Norwalk, CT 06856, Tel: 203-866-4484; FSC No.: 53998; Empl.: 175; *Sls. Mgr.:* Abe Partner ... 3•1696-1700

Local Sales Offices & Reps

AL	Huntsville, BCI	205-539-4411
CA	Los Altos, AARD Engr.	415-948-5740
CA	Westlake Village, Jayess Co.	213-991-0632
CT	Hamden, Digital Sls. Assoc.	203-248-3641
GA	Chamblee, BCI	403-455-040
IL	Des Plaines, Synmark Sls. Co.	312-296-018
MD	Seabrook, W. A. Brown-Equip. Co.	301-577-610
MA	Waltham, Digital Sls. Assoc.	617-899-430
MI	Dearborn Hgts., Electro Sls. Assoc.	313-474-732
MN	Minneapolis, R.J. Inc.	612-866-3661
NJ	E. Hanover, Emtec	201-428-060
NJ	Princeton, Murtronics	609-394-373
NJ	Teaneck, SGL Sls.	201-837-235
NY	Cazenovia, S.T. Woolard	315-655-814
NY	Melville, Emtec	516-752-163
NC	Raleigh, BCI	919-781-942
OH	Cleveland, Electro Sls. Assoc.	216-261-544
OH	Dayton, Electro Sls. Assoc.	513-426-555
PA	Harrisburg, Beil & Whitaker	717-564-690
TX	Houston, Scientific Sls.	713-666-531
TX	Richardson, Scientific Sls.	214-231-654

Local Distributors

CT	Hamden, Digital Sls. Assoc.	203-248-364
MA	Waltham, Digital Sls. Assoc.	617-899-430

POWER-PAK, INC., 6232 N. Pulaski Rd., Chicago, I 60646, Tel: 312-286-5566, TWX: 910-221-5928; *Sls* *Mgr.:* Robert Villari

POWER PRODUCTS DIV., COMPUTER PRODS. INC., See Power Products Group

COMPUTER PRODUCTS™
POWER CONVERSION

POWER PRODUCTS DIV., Computer Products, Inc., 2801 Gateway Dr., Pompano Beach, FL 33060, Tel: 305-974-2442, TWX: 510-956-3098; FSC No.: 62125; Empl.: 700 .... 3•1438, 1701-1725

POWER-SCIENCE, 7667 Vickers St., San Diego, CA 92111, Tel: 619-292-4322; Empl.: 6; *Sls. Mgr.:* E. Cooper

POWER SONIC
RECHARGEABLE BATTERIES

POWER-SONIC, Box 5242, 3106 Spring St., Redwood City, CA 94063, Tel: 415-364-5001, Telex: 348400; Empl.: 30; *Sls. Mgr.:* B. A. Ender; *Dist. Mgr.:* B. A. Ender .... 3•1422

Local Sales Offices & Reps

CA	Irvine, English/Damco	714-837-3801
FL	Tampa, SRT Mktg.	813-884-4805
IL	River Forest, Pete Collins	312-366-7076
MA	Natick, Steve Dworkin	617-653-7188
MS	Jackson, Welch & Doby	601-932-5534
NY	Wantagh, Dony Tech. Sls.	516-826-5550
NC	Raleigh, DHR Mktg.	919-876-5450
PA	Media, W. Reeves Assocs.	215-566-6709
SC	Greenville, DHR Mktg.	803-235-3594
TX	Dallas, Power Connection	214-357-8207

Local Distributors

CA	Chatsworth, Mil-Comm Distr.	213-998-3111
CA	Fountain Valley, Components Center	714-979-0433
CA	Mountain View, Cornett Electronics	415-969-5420
CA	Santa Clara, Components Center	408-988-3751
CO	Denver, Hensley Battery	303-455-3643
CT	Westport, Secres Distr.	203-226-7371
FL	Miami, ESL Elctrn. Distr.	305-633-6973
FL	Tampa, Leader Elctrns.	813-870-3315
GA	Atlanta, Allied Elctrns.	404-237-3366
GA	Atlanta, Security Wherehouse	404-955-1006
IL	Chicago, Allied Elctrns.	312-697-8200
IL	Villa Park, Melvin Elctrns.	312-378-7741
LA	Lafayette, Ralph's Elctrns.	318-234-4507
MA	Sharon, Adcour	617-784-3996
MI	Detroit, Alarm Supp.	313-425-2500
MO	St. Louis, Olive Elctrns.	314-426-4500
NM	Albuquerque, Detatron, Inc.	505-344-2381
NY	Ridgewood, J.A. McDermott Corp.	212-456-3606
OK	Tulsa, Radio, Inc.	918-587-9123
PA	Pittsburgh, Triangle Elctrns.	412-441-9659
TX	Austin, Harrison Indl. Elctrns.	512-458-3555
TX	Ft. Worth, Allied Elctrns.	817-265-9341
TX	Houston, Harrison Equip.	713-652-4700
TX	San Antonio, Sherman Elctrns.	512-224-1001
VA	Richmond, Sterling Elctrns.	804-226-2190

POWER SYSTEMS, 12 Tobey Rd., Bloomfield, CT 06002, Tel: 203-243-0357, TWX: 710-425-8778; FSC No.: 50463; Empl.: 375; *Sls. Mgr.:* Leon Gedacht .... 3•1726, 1727

Local Sales Offices & Reps

AZ	Phoenix, Tech Sls./Powerhouse	602-246-1614
CA	San Jose, Powerhouse	408-748-1555
CA	Santa Ana, Powerhouse	714-549-9599
MA	Tyngsboro, Comptech	617-649-3030

POWER SYSTEMS & CONTROLS, INC., 3206 Lanvale Ave., Richmond, VA 23230, Tel: 804-355-2803; Empl.: 40

POWER SYS. GRP., Rantec Div., Emerson Elec., 9401 Oso Ave., Chatsworth, CA 91311, Tel: 818-885-8223, TWX: 910-493-1247; FSC No.: 04971; Empl.: 265; *Sls. Mgr.:* Daniel L. Esau

POWERTEC, INC.

POWERTEC, INC., 20550 Nordhoff St., Chatsworth, CA 91311, Tel: 818-882-0004, TWX: 910-494-2092; Empl.: 349 .... 3•1728-1745

POWERTECH, INC., 0-02 Fairlawn Ave., Fairlawn, NJ 07410, Tel: 201-791-5050, Telex: 130389; FSC No.: 32953; Empl.: 49

Local Sales Offices & Reps

CA	Tarzana, Power Comp. Sls.	213-881-9111

Power Technology Inc.

POWER TECHNOLOGY, INC., P.O. Box 9769, Little Rock, AR 72219, Tel: 501-568-1995, TWX: 910-722-7313; Empl.: 40; *Sls. Mgr.:* Thomas H. Burgess .... 3•1746

Local Sales Offices & Reps

IN	Ossian, Science Sales, Inc.	219-622-7383
PA	Glenside, Koebert Assoc., Inc.	215-887-2310

POWERTREND, INC., 3139-G Los Feliz Dr., Thousand Oaks, CA 91362, Tel: 805-496-2945; *Sls. Mgr.:* R. Jones

POWER TEN, INC., 486 Mercury Dr., Sunnyvale, CA 94086, Tel: 408-738-5959, Telex: 172588 SNLO; FSC No.: 61987; *Sls. Mgr.:* Vince Mutascio

POWERTRON, See Industrial Test Equipment Co., Inc.

POWERTRON, Contraves Goerz Corp., 3821 Barranger Dr., Charlotte, NC 28210, Tel: 704-525-8962, Telex: 572-444; *Sls. Mgr.:* Sam LoBue

POWR-UPS CORP., 50 Orville Drive, Bohemia, NY 11716, Tel: 516-567-9620; Empl.: 6; *Sls. Mgr.:* Steve Summer .... 1B•1173

Local Sales Offices & Reps

CA	Fullerton, ESCO	714-879-7260
CA	San Diego, Total Elctrns. Int'l.	619-224-3291
MA	Southborough, Motion Engrg.	617-485-2144
NY	Cazenovia, D & O Engrg.	315-655-8602
OH	Dover, AJ Assocs.	216-343-2224
VA	Roanoke, Engrg. & Mktg. Corp. of Va.	703-986-1410

PPC PRODS., 7516 Central Industrial Dr., Riviera Beach, FL 33404, Tel: 305-848-9606, TWX: 510-952-7611; FSC No.: 33178; Empl.: 50; *Sls. Mgr.:* Nick Ernick

PPD, INC., Hwy. 70W, Resco Ct., P.O. Box 31347, Raleigh, NC 27612, Tel: 919-781-3955; *Sls. Mgr.:* Wm. Bagliani .... 1A•1173-1179

PPM, INC., 23945 Mercantile Rd., Cleveland, OH 44122, Tel: 216-292-6006; Empl.: 20; *Sls. Mgr.:* A. L. Bletcher .... 3•1285

Local Sales Offices & Reps

AZ	Phoenix, J. Smith & Assocs.	602-267-0981
CO	Denver, J. Smith & Assocs.	303-597-5343
MI	Ferndale, Tiby Co.	313-547-3550
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NC	Charlotte, Binco	704-366-5092
OH	Cleveland, Tiby Co.	216-371-5335
OH	Dayton, Tiby Co.	513-277-3822

PRACTICAL AUTOMATION, Trap Falls Rd., Shelton, CT 06484, Tel: 203-929-5381, Telex: 6813310; Empl.: 150; *Sls. Mgr.:* R. M. Banzaca

PRACTICAL TECHNOLOGY, 12 Village Ctr., Box 449, Carmel Valley, CA 93924, Tel: 408-659-3128; FSC No.: 59089; Empl.: 7; *Sls. Mgr.:* Keith Rosburg

PRAGMATIC DESIGNS, INC., 950 Benicia Ave., Sunnyvale, CA 94086, Tel: 408-736-8670, Telex: 17-1627, TWX: Nanet D Suvl; FSC No.: 94-2543110; Empl.: 45

PRD ELCTRNS., DIV. OF HARRIS CORP., see Harris Corp., PRD Electronics Div.

PRECICONTACT, INC., Ultra Precision, 1150 Wheeler Way, Langhorne, PA 19047, Tel: 215-757-1202, Telex: 83-4253; FSC No.: FSCM 60197; *Sls. Mgr.:* Edward W. Swirsky; *Dist. Mgr.:* John Dirado .... 2•1547, 1892

Local Sales Offices & Reps

AZ	Litchfield Park, G. B. Elctrns.	602-935-3984
CA	Mountain View, Gene C. Woempner Co.	415-964-5454
CA	Orange, Elctrn. Tech. Assoc.	714-998-2901
CO	Englewood, White Sls. Co.	403-694-9555
FL	Orlando, Over & Over	305-857-4057
GA	Norcross, Over & Over	404-449-6205
IL	Rolling Meadows, Heartland Tech. Mktg.	312-577-9222
IN	Indianapolis, Hoster & Sieloff Assoc.	317-842-3700
MD	Gaithersburg, Mechtronics Sls.	301-340-2130
MA	S. Dartmouth, Kentronics	617-999-2188
MA	Wakefield, Kentronics	617-246-0245
MO	Ravtown, Cadon Tech. Sls.	816-356-7685
MO	St. Louis, Cadon Tech Sls. Co.	314-645-8670
NJ	Mountain Lakes, Components for Elctrns.	201-334-2921
NY	Albion, Sys. Hardware Rep.	716-589-4908
NY	Corbettsville, SHR, Inc.	717-967-2607
NY	East Northport, Comps. For Elctrns.	516-266-5020
NY	Kew Gardens, Ayer Business Sys.	212-621-9002
NC	Charlotte, Over & Over	704-527-3070
NC	Raleigh, Over & Over	919-872-2262
OH	Cincinnati, Makin Assoc.	513-871-2424
OR	Portland, Elctrn. Mktg. Grp.	503-289-5320
PA	Hatboro, Jacobsen Assocs.	215-674-2937
PA	Lebanon, Jacobsen Assocs.	717-273-9746
PA	Pittsburgh, Kneip Sls.	412-824-1600; 823-0169
TN	Antioch, Over & Over	615-834-0140
TX	Austin, OM Sls.	512-452-1838
TX	Houston, OM Sls.	713-789-4426
TX	Richardson, OM Sls.	214-690-6746
UT	Salt Lake City, Charles Fields & Assocs.	801-277-4859
WA	Redmond, Elctrn. Mktg. Grp.	206-882-0962
WI	Milwaukee, Heartland Tech. Mktg.	414-931-0606

Local Distributors

AZ	Litchfield Park, GB Elctrns.	602-935-3984
CA	Chatsworth, I.E.C./Jaco	800-423-5731
CA	Fremont, Term. Sls.	415-656-7722
CA	Orange, Elctrn. Connexions Corp.	714-998-2901
CA	San Diego, Park West	619-277-8433
CA	San Jose, Cypress Elctrns.	408-945-8400
CO	Denver, CSID, Inc.	303-292-9594
CT	Norwalk, Park Distrs.	203-853-2010
CT	Wallingford, Cronin Elctrns.	203-265-3134
FL	Clearwater, Elctrn. Precepts of Florida	813-530-9781
FL	Lake Park, Park South	305-863-7275
FL	Pompano Beach, Components South	305-971-0350
IL	Palatine, OHM Elctrns.	312-359-5500
MA	Needham, Cronin Elctrns.	617-449-5000
MA	Westwood, Emtel Elctrns.	617-326-6522
MA	Wilmington, Aved Elctrns.	617-657-8310
NJ	Bellmawr, Mid-Atlantic Elctrns.	609-931-5303
NJ	Berlin, GCI Corp.	609-768-6767
NJ	Englewood, T.E.D./Powell	201-894-0800
NJ	Springfield, Route Elctrns.	201-379-7710
NM	Albuquerque, Connecting Comps. Div. T.M.A. Inc.	505-345-8921
NY	Bohemia, Norelcom Elctrns. Corp.	516-567-8866
NY	Brooklyn, Beryl Elctrns.	212-383-2208
NY	Brooklyn, Connector Resources	212-383-2208
NY	East Syracuse, Future Elctrns.	315-463-6633
NY	Hauppauge, Jaco Elctrns.	516-273-5500
OH	Mansfield, Rush Elctrns.	419-756-2311
OR	Beaverton, Component Resources	503-641-8488
PA	Wayne, Peak Elctrns.	215-293-9000
PA	York, E.C.I.	717-843-8971
TX	Allen, Prime Distrbg. Co.	214-231-0170
TX	Grand Prairie, Dial Supp.	214-647-2371
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, Jaco Elctrns.	214-235-9575
TX	Stafford, Southwest Elctrns.	713-491-4900
WA	Bellevue, I.E.C./Jaco	206-455-2727
WA	Seattle, Pacific Elctrns.	206-575-1050

PRECISION COMPONENTS, INC., 1110 W. National Ave., Addison, IL 60101, Tel: 312-543-6400; *Sls. Mgr.:* B. A. Gravens .... 3•1747

PRECISION ELCTRN. COMPS. LTD., 19 Hafis Rd., Toronto, Ont., Canada M6M 2V6, Tel: 416-249-7103, Telex: 06-969671 .... 1A•2052

PRECISION ELCTRNS., 9101 King Ave., Franklin Park, IL 60131, Tel: 312-678-5350; Empl.: 25

PRECISION EXTRUSIONS, INC., Box 120, Bensenville, IL 60106, Tel: 312-766-0340; *Sls. Mgr.*: Jim Achen

PRECISION FILTERS, INC.

PRECISION FILTERS, 240 Cherry St., Ithaca, NY 14850, Tel: 607-277-3550, Telex: 646846; FSC No.: 66-II-F & 66-II-I; Empl.: 49; *Sls. Mgr.*: Tom Rockwell ....1A•1613-1617; 3•1016-1020, 1286

Local Sales Offices & Reps

AZ	Tempe, Cleveland Entprs.	602-820-1127
CA	La Crescenta, Beckrep	213-957-1111
CO	Denver, Cleveland Entprs.	303-751-3252
FL	Osprey, Dick Ridgewell Co.	813-966-4401
IL	Park Ridge, Electronic Instr.	312-298-2290
IN	Indianapolis, Electronic Instr.	317-257-7231
MD	Fulton, Gans & Pugh Assocs.	301-953-3724
MN	Eden Prairie, Electronic Instr. Conslts.	612-937-9701
NM	Albuquerque, Cleveland Entprs.	505-265-7893
OH	Cleveland, Comtel Instr.	216-442-8080
OH	Dayton, Comtel Instr.	513-298-7573
OH	Hilliard, Comtel Instr.	614-876-8305
OR	Portland, Topp Engrg. Sls.	503-244-7265
PA	Pittsburgh, Comtel Instr.	412-922-5720
UT	Salt Lake City, Cleveland Entprs.	801-355-8424
VA	Arlington, Gans & Pugh Assocs.	703-527-3262
WA	Bellevue, Topp Engrg. Sls.	206-747-5400

PRECISION LAMP, INC., 480 Aaron Dr., Cotati, CA 94928, Tel: 707-792-0333, Telex: 348498; Empl.: 25

PRECISION LEVEL VIAL CO., Warren Industries Inc., 1800-D Mearns Rd., Warminster, PA 18974, Tel: 215-675-2355; *Sls. Mgr.*: Michael Joyce; *Dist. Mgr.*: Michael Joyce

PRECISION MECHANISMS, 44 Brooklyn Ave., Westbury, NY 11590, Tel: 516-ED3-5955; FSC No.: 08127; Empl.: 26; *Sls. Mgr.*: Leon N. Canick

PRECISION METAL PRODS. CO., Centennial Indl. Pk., Peabody, MA 01960, Tel: 617-532-5500, TWX: 710-347-0123; FSC No.: 86577; Empl.: 54; *Sls. Mgr.*: Robert H. Degnan

PRECISION MICRO IMAGES, Box 1330, Altamonte Springs, FL 32701, Tel: 305-830-7244, Telex: 56-4303; *Sls. Mgr.*: Williams S. Hodges

PRECISION MOLDED PRODUCTS, INC., 582 Meyer Lane, Redondo Beach, CA 90278, Tel: 213-372-7373

PRECISION MONOLITHICS, 1500 Space Dr., Santa Clara, CA 95050, Tel: 408-727-9222, TWX: 910-338-0218; FSC No.: 06665; Empl.: 700; *Sls. Mgr.*: Steve Pass; *Dist. Mgr.*: Mike Dennison

PRECISION RESISTIVE PRODS., INC., P.O. Box 189, Highway 61 South, Mediapolis, IA 52637, Tel: 319-394-9131; Empl.: 90; *Sls. Mgr.*: Oscar Cline; *Dist. Mgr.*: Oscar Cline ....1A•1925

Local Sales Offices & Reps

CA	Los Altos, Frauman Assoc.	415-941-0660
CA	San Diego, KCE	619-278-7640
CO	Denver, Williams Assocs.	303-373-4730
CT	Milford, Cuming Assocs.	203-878-3946
FL	Cocoa Beach, Reynolds & Assocs.	305-784-4700
IL	Chicago, Ellinger Sls.	312-763-1570
IN	Greenwood, Valentine Assocs.	317-888-2200
MA	Waltham, Jesco, Inc.	617-893-0094
MI	Warren, DEM Elctrns. Sls.	313-575-9444
MN	Minneapolis, Intl. Sls.	617-831-8423
MO	St. Charles, Chesco	314-946-6677
NJ	Paramus, Design Elctrns.	201-845-6224
NY	Syracuse, Electra Sls. Corp.	315-463-1248
TX	Richardson, Campion Sls. Co.	214-238-8145
WA	Seattle, Arneson Assoc.	206-762-7664

PRECISION RESISTOR CO., INC., 109 U.S. Hwy. 22, Hillside, NJ 07205, Tel: 201-926-3036, Telex: 13-6479-413; FSC No.: 48615; Empl.: 45; *Sls. Mgr.*: R. L. Wright ....1A•1926, 1927

PRECISION TECH. SEWING, 921 E. Charleston Rd., Palo Alto, CA 94303, Tel: 415-856-2128

PRECISION TIMER, 13 Westbrook Ind'l. Pk., Westbrook, CT 06498, Tel: 203-399-6253; Empl.: 25; *Sls. Mgr.*: A. Hockert

PRECISION TUBE, Church Rd. & Wissahickon, N. Wales, PA 19454, Tel: 215-699-5801, Telex: 84-6439; FSC No.: 82413; Empl.: 240; *Sls. Mgr.*: William J. McNeil

Local Sales Offices & Reps

CA	Mountain View, Walter Assoc.	415-965-4131
CA	Santa Ana, RMS Assocs.	714-556-4155
CO	Golden, J. R. Hurlbut Co.	303-279-7796
FL	Melbourne, Hanson Assocs.	305-727-7474
IN	Indianapolis, Sukup & Cox	317-253-1215
IA	Cedar Rapids, Snider Sls. Co.	319-362-4410
MA	Burlington, Tri Tek	617-272-4550
MO	St. Charles, Buse Sls. Co.	314-946-6430
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NY	Huntington, CDB Enterprises	516-692-5200
TX	Garland, Carey McMahill & Zerbe	214-681-1414
UT	Salt Lake City, J. R. Hurlbut Co.	801-973-4443
VA	Fairfax, Schibley Assocs.	703-591-3008
WA	Redwood City, Woodworth Co.	

PREFERRED ELCTRNS., INC., Main Line Dr, P.O. Box 954, Westfield, MA 01086, Tel: 413-568-2301, Telex: 955-339; Empl.: 250; *Sls. Mgr.*: Merton I. Rosenberg

PREMAX PRODS. DIV., Highland & College Aves., Niagara Falls, NY 14305, Tel: 716-285-9186, Telex: 91-531; FSC No.: 74183; Empl.: 350

PREMIER METAL

PREMIER METAL PRODS. CO., 381 Canal Pl., Bronx, NY 10451, Tel: 212-993-9200; Empl.: 75 ....2•1044, 1045

Local Sales Offices & Reps

AZ	Phoenix, PLS Assocs.	602-246-6477
CA	City of Industry, Premier Metal	818-336-4534
CA	Garden Grove, West Elctrn. Sls. Co.	714-898-0120
CO	Englewood, PLS Assocs.	303-773-1218
CT	East Haven, Eagle Assocs.	203-467-6742
FL	Lake Worth, Adams & Assocs.	305-588-7630
GA	Marietta, Adams & Assocs.	404-973-0853
IL	Elmhurst, Utronix Sls.	312-834-1100
KS	Overland Park, Delltron Co.	913-649-2078
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Needham, Eagle Assocs.	617-444-3446
MI	Brighton, Electronic Sources	313-227-3598
MN	Minneapolis, J.E.M. Anderson Co.	612-823-6459
MO	St. Louis, Delltron Co.	314-869-4779
NM	Albuquerque, PLS Assocs.	505-255-2330
NY	Mt. Vernon, Sonkin Assocs.	914-668-9809
NY	New Hyde Park, Harris & Aldrich Sls.	516-488-2622
NY	Syracuse, Lewis-Dunnigan Co.	315-446-5522
NC	Greenboro, Adams & Assocs.	919-272-6838
OH	Akron, ImTech Inc.	216-666-1185
PA	Bensalem, Eastern Instrmn.	215-245-6660
TN	Knoxville, Adams & Assocs.	615-577-4241
TX	Arlington, W. Pat Fralia Co. Inc.	817-640-9101
TX	Houston, W. Pat Fralia Co. Inc.	713-772-1572
UT	Salt Lake City, PLS Assocs.	801-466-8729
EXP	FL, Miami, Emec, Inc.	305-871-3124

Local Distributors

AL	Huntsville, Mock Elctrns.	205-539-2401
AL	Opelika, Southern Elctrns.	205-745-5298
AZ	Phoenix, Dalis Elctrns.	602-275-2885
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	San Jose, Quement Elctrns.	408-998-5900
CT	Middletown, Midstate Elctrns.	203-347-5638
CT	Wallingford, Sager Electrical Supp.	203-265-4600
FL	Dania, Summit Elctrns.	305-920-6253
FL	Miami, Electronic Equip. Co.	305-871-3500
IL	Elk Grove Village, GBL/Gould Elctrns.	312-593-3220
IN	Fort Wayne, Graham Elctrns.	219-423-3422
LA	Baton Rouge, Menard Elctrns.	504-355-0323
MD	Baltimore, ASI Elctrns.	301-265-5100
MD	Baltimore, Resco	301-823-0070
MD	Bethesda, Empire Elctrns.	301-656-3300
MA	Hingham, Sager Electrical Supp.	617-749-6700
MA	Newton, Greene-Shaw Co.	617-969-8900
MI	Ann Arbor, Purchase Radio Supp.	313-668-8696
MO	Kansas City, Walters Radio Supp.	816-531-7015
NJ	Cranford, Garden State Indl. Elec.	201-272-6400
NJ	Green Brook, Green Brook Elctrn.	201-968-3500
NJ	Hanover, State Elctrns. PTS	201-887-2550
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Albany, E. E. Taylor Co.	518-438-7811
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Hauppauge, Broadline Elec. Dist.	516-231-4100
NY	Hempstead, Davis Elctrn. Corp.	516-483-9200
NY	LIC, H. L. Dalis Inc.	212-361-1100
NY	Lynbrook, Peerless Radio Dist. Corp.	212-523-3456
NY	New York, Martin Audio/Video Corp.	212-541-5900
NY	New York, Argil Elec. LTD	212-691-8111
NY	Port Chester, Wise Comps.	914-939-8600
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rochester, Simcona Elctrn. Corp.	716-328-3230
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rockville Centre, Midway Industrial	516-764-2400
NY	Yonkers, Yonkers Elec. Supp.	914-969-6044
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Warren, Rem Elctrns.	814-453-5626
PA	Allentown, Federated Elctrns.	215-437-4481
PA	Braddock, Leff Elctrns.	412-271-7100
PA	Horsham, Toner Cable Equip.	215-675-2053
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Reading, Barbey Elctrns.	215-376-6116
PA	West Chester, West Chester Elec. Supp.	215-696-7500
RI	Warwick, Edwards Elctrns.	401-732-3200
SC	Charleston, Wholesale Indl. Elec.	803-722-2634
TN	Clarksville, Randolph Hale & Matthews	615-647-2325
TN	Cookeville, Randolph & Parks	615-526-6184
TN	Nashville, Randolph & Rice	615-255-5601
TN	Tullahoma, Randolph Rice & Williams	615-455-4531
TX	Farmers Branch, Summers Elec. Co.	214-748-6533
TX	Ft. Worth, Swieco Inc.	817-335-6521
TX	Houston, Lenert Co.	713-225-1465
VA	Arlington, Arlington Elctrns.	703-524-2412
WA	Seattle, Radar Elec. Co.	206-282-2511

PREMIER MICROWAVE, 35 New Broad St., Port Chester, NY 10573, Tel: 914-939-8900, TWX: 710-569-1609; FSC No.: 15870; Empl.: 60 ....1A•1775

Local Sales Offices & Reps

CA	Los Angeles, R.F. Assocs.	213-478-1586
CA	Mountain View, Mark V. Assocs.	415-964-6275
FL	Orlando, BC Elctrns. Sls.	305-894-6071
GA	Smyrna, BC Elctrn. Sls.	404-436-5169
IL	Chicago, L.G.S. Elctrns. Sls.	312-456-9616
MD	Catonsville, Callas Elctrns. Dist.	301-744-7711
MA	Natick, Gerald Rosen	617-879-5505
MO	St. Louis, Boweng Tech. Rep.	314-429-7327
NY	Huntington, C.D.B. Entprs.	516-692-5220
OH	Dayton, BEK Assocs.	513-278-1343
EXP	CA, N. Hollywood, Air Frame Mfg. & Supp.	213-765-2600

PREM MAGNETICS, 3521 N. Chapel Hill Rd., McHenry, IL 60050, Tel: 815-385-2700, TWX: 910-642-3763; Empl.: 300; *Sls. Mgr.*: D. Hertel;D. Brooke (Tech.) ....1A•2257-2259

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clark Co.	602-968-9037
CA	Vista, Sado Sls.	714-941-2654
CT	Bristol, Texell Co.	203-583-0703
IL	McHenry, Mesa, Inc.	815-344-2820
IA	Hiawatha, Gassner & Clark Co.	319-393-5763
NJ	Springfield, F. F. Sylvester Assoc.	201-376-3324
OR	Portland, Components West	503-643-5588
PA	W. Conshohocken, Eastern Comps. Sls. Corp.	215-825-8610
WA	Renton, Components West	206-271-5252

PRES-AIR-TROL CORP., 895 Mamaroneck Ave., Mamaroneck, NY 10543, Tel: 914-698-2026, 800-431-2625 (exc NY); Empl.: 6 ....1B•1741

PRESIDIO COMPS., INC., 7185 Construction Ct., San Diego, CA 92121, Tel: 619-578-9390, TWX: 910-335-1254 ....1A•1181

Local Sales Offices & Reps

AZ	Phoenix, Eltron	602-266-2164
CA	La Mirada, Select Elctrns.	714-739-8891

CA	San Jose, Meade Assocs.	408-446-1991
CA	Santa Clara, Meade Advantage	408-748-1991
FL	Orlando, Micro Mktg.	305-788-0886
L	Palantine, R-Tek	312-991-4404
N	Fort Wayne, R-Tek	219-432-8783
MA	Shrewsbury, Compatible Comps.	617-842-2022
MA	W. Boylston, Compatible Comps.	617-835-3614
MN	Minneapolis, Peterson Sls. & Assoc.	612-944-0030
NY	Chappaqua, Micrel	914-238-4961
NY	Fair Haven, Feikert Assocs.	315-652-5577
PA	Colmar, E & L Assocs.	215-822-2510
TX	Dallas, Merino Sls.	214-233-6002
TX	El Paso, EPEC, Inc.	915-593-8481
WA	Bellevue, MARS	206-747-3292

Local Distributors

TX	Richardson, Central States Comps.	214-644-2070

PRESS-ON PRODS., 39 Factory Rd., Addison, IL 60101, Tel: 312-628-2255; Empl.: 40; *Sls. Mgr.:* T. Cummins

PRESSURE CONTROLS, INC., 681 Main St., Belleville, NJ 07109, Tel: 201-751-5002; Empl.: 15; *Sls. Mgr.:* P. Emmarco

PRESSURE SYS., 15 Research Dr., Hampton, VA 23666, Tel: 804-865-1243, Telex: 901406; Empl.: 30; *Sls. Mgr.:* John Whytsell

Local Sales Offices & Reps

AL	Birmingham, Hile Controls-Alabama	205-879-2990
AZ	Tempe, Trembly Assocs.	602-967-2058
CA	Long Beach, Saber Entprs.	213-595-5646
CA	Mountain View, Saber Entprs.	415-968-0427
CA	San Diego, Saber Entprs.	619-271-1523
CO	Lakewood, Trembly Assocs.	303-233-9544
CT	Hamden, Applied Measurements	203-288-5288
L	Chicago, Comtel-Midwest	312-539-4838
N	Indianapolis, RDP Corp.	317-788-4296
N	Indianapolis, Comtel-Midwest	317-253-1681
A	Cedar Rapids, Comtel-Midwest	319-377-9434
KS	Mission, Comtel-Midwest	913-722-1030
ME	Waterville, Applied Measurements (Kentrol)	207-873-7741
MA	Acton, Applied Measurements	617-263-2766
MI	Charlotte, RDP Corp.	517-543-6212
MN	Wayzata, Comtel-Midwest	612-476-1551
MO	St. Louis, Comtel-Midwest	314-991-5363
NJ	Garwood, E. R. Mertz & Assocs.	201-232-4643
NM	Albuquerque, Trembly Assocs.	505-266-8616
NC	Charlotte, Zelco Assocs.	704-523-2961
OH	Cleveland, RDP Corp.	216-659-3138
OH	Dayton, RDP Corp.	513-253-6175
PA	Jenkintown, PDC Corp.	215-887-9610
PA	Pittsburgh, RDP Corp.	412-487-2217
TN	Knoxville, Hile Controls of TN	615-584-0208
TX	Houston T. D. Stringer Assocs.	713-469-9209
UT	Salt Lake City, Trembly Assocs.	801-486-5292
VT	Bennington, Applied Measurements	802-442-2222
VA	Richmond, Hile Controls of VA	804-796-3001
WI	New Berlin, Comtel-Midwest	414-544-6042

PRESTOLITE WIRE DIV., 3529 24th St., Port Huron, MI 48060, Tel: 313-987-6300

PRESTON SCIENTIFIC, 805 E. Cerritos Ave., Anaheim, CA 92805, Tel: 714-776-6400, Telex: 655-321; Empl.: 61; *Sls. Mgr.:* Charles J. McGuire ....3•1169

Local Sales Offices & Reps

AL	Huntsville, Mo-Co	205-881-5968
AZ	Scottsdale, Williams Assocs.	602-947-4297
CA	La Crescenta, Beckrep	213-957-1111
CA	Santa Clara, PBC Assocs.	408-727-7244
CO	Denver, Williams Assocs.	303-289-5647
CT	Avon, Power Mark	203-678-0123
FL	Orlando, Truex Assocs.	305-859-2160
L	Arlington Heights, Coombs Assocs.	312-439-9810
N	Ft. Wayne, Coombs Assocs.	219-747-7661
KS	Shawnee Mission, Techn. Sls. Assocs.	913-888-3330
MD	Greenbelt, Riffe Assocs.	301-474-8600
MA	Falmouth, RJC Assocs.	617-540-8832
MN	St. Paul, Vikeland Sls.	612-645-4647
MO	Ferguson, Techn. Sls. Assocs.	314-725-5361
NJ	Ridgewood, Hansen/Hughes	201-652-7055
NM	Albuquerque, Williams Assocs.	505-255-1638
NC	Winston-Salem, Radco	919-722-9671
OH	Dayton, Hocker Assocs.	513-298-8638
OH	N. Olmsted, Hocker Assocs.	216-734-4433
OR	Portland, Sci. Dvcs.	503-292-6934
PA	Cheltenham, Stein Instrmn.	215-379-1990
TX	Richardson, Lear Assocs.	214-231-5388
TX	Spring, Lear Assocs.	713-370-7449
UT	Salt Lake City, Williams Assocs.	801-485-6511
WA	Bellevue, Sci. Dvcs.	206-747-5169
WI	Milwaukee, Coombs Assocs.	414-351-6123

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PRIMELINE-SOLTEC DISTBN., Soltec Corp., P.O. Box 818, Sun Valley, CA 91353-0818, Tel: 800-525-5554, 818-764-5400, Telex: 67-4188 Soltec LSA; *Dist. Mgr.:* Byron G. McIntire ....3•1387

Local Sales Offices & Reps

AZ	Temple, J. F. Hurlbut	602-968-5962
CA	Mill Valley, Roy Colen Sls.	415-383-8700
CA	Sun Valley, Soltec Distbn.	818-764-5400
CO	Golden, J. F. Hurlbut	303-279-7796
FL	Orlando, Cartwright & Bean Inc.	305-422-4531
IL	Park Ridge, Bob Burns & Assocs.	312-823-9360
MN	Minneapolis, Kodo Assocs.	612-881-1255
NJ	Englewood, Baum & Epstein	201-569-7600
NJ	Medford, Champion Elctr. Sls. Co.	609-983-0932
NC	Raleigh, Rick Burns	919-876-2224
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
PA	Pittsburgh, Marlow Assocs.	412-367-8886
TX	Irving, Kite Elctrn. Sls. Co.	214-438-9336
UT	Salt Lake City, J. F. Hurlbut	801-973-4443
WA	Redmond, CMS, Inc.	206-885-0278

Local Distributors

AZ	Phoenix, MeterMaster	602-243-4111
CA	Los Angeles, MeterMaster	213-685-4340
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Santa Clara, E.I.L. Instrs.	408-727-0396
CO	Denver, E.I.L. Instrs.	303-534-4160
CT	Middletown, E.I.L. Instrs.	203-346-6646
FL	Palm Bay, E.I.L. Instrs.	305-725-8300
IL	Bridgeview, E.I.L. Instrs.	312-430-2292
IL	Niles, Joseph Elctrns.	312-297-4200
IN	Indianapolis, E.I.L. Instrs.	317-545-1373
KY	Louisville, E.I.L. Instrs.	502-454-3420
MD	Sparks, E.I.L. Instrs.	301-771-4800
MA	Braintree, Burton Forrester Assoc.	617-848-7234
MA	Burlington, E.I.L. Instrs.	617-272-9450
MA	N. Billerica, AST Servo	617-667-8541
NJ	Pennsauken, E.I.L. Instrs.	609-488-0474
NY	Hauppauge, E.I.L. Instrs.	516-231-6333
NY	Rochester, E.I.L. Instrs.	716-424-5750
NY	Rochester, E.I.C. Elctrns.	716-544-4392
OH	Cleveland, MeterMaster	216-651-4100
OH	Dayton, E.I.L. Instrs.	513-435-2134
PA	Philadelphia, Sunshine Sci. Instr.	215-673-5600
TN	Oak Ridge, R & H Sci.	615-482-1315
TX	Dallas, MeterMaster	214-271-5671
TX	Houston, E.I.L. Instrs.	713-271-3100
WA	Seattle, E.I.L. Instrs.	206-762-0880

PRIME POWER

PRIME POWER, INC., Prime Technology Co., Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092; *Sls. Mgr.:* J. L. Jamieson ....3•1671

Local Sales Offices & Reps

CA	Buena Park, Chuck Cooper Co.	714-739-8526
CT	Washington, Tri-Com Assocs.	2-3-563-2241
GA	Stone Mountain, DTM, Inc.	404-962-2530
MA	Waltham, Betronic Assocs.	617-894-8400
NJ	Fort Lee, FJK Assocs., Inc.	201-592-1002

PRIME TECHNOLOGY, See General Resistance, Inc., Transducers and Systems Inc. and Prime Power, Inc.

PRIMO, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan, Tel: 0422-43-3121, Telex: 2822-326; Empl.: 350; *Sls. Mgr.:* S. Shirota

PRINCETON CASE CO., INC., 667 Lehigh Ave., Union, NJ 07083, Tel: 201-687-1750; Empl.: 60; *Sls. Mgr.:* S. E. Parker

PRINCETON ELCTRN. PRODS., Box 101, North Brunswick, NJ 08902, Tel: 201-297-4448, TWX: 710-380-3832; Empl.: 70; *Sls. Mgr.:* R. Shermister; *Dist. Mgr.:* R. Shermister

PRINCO INSTRS., INC., 1020 Industrial Hwy., Southampton, PA 18966, Tel: 215-355-1500; FSC No.: 48620; Empl.: 66; *Sls. Mgr.:* S. A. Clayton

PROBE MASTER, INC., 4898 Ronson Ct., San Diego, CA 92111, Tel: 619-560-9676, 800-854-1519, 800-772-1519; *Sls. Mgr.:* Dick Press ....3•1287

PROBE-RITE, INC., 2725 Lafayette St., Santa Clara, CA 95050, Tel: 408-727-0100, TWX: 910-338-0260; *Sls. Mgr.:* Marilyn Bailey

PROCESS ANALYZERS, INC., 3 Headley Pl., Fallsington Ind'l Pk, Fallsington, PA 19054, Tel: 609-921-7330, TWX: 510-685-9254

PRODUCTS FOR RESCH., 88 Holten St., Danvers, MA 01923, Tel: 617-774-3250, Telex: 940-287; Empl.: 22; *Sls. Mgr.:* Harry Martin

PTS
FREQUENCY SYNTHESIZERS

PROGRAMMED TEST SOURCES, Beaver Brook Rd., Littleton, MA 01460, Tel: 617-486-3008; Empl.: 20 ....3•1288

Local Sales Offices & Reps

CA	La Crescenta, Beckrep, Inc.	213-957-1111

PROJECTS UNLTD., 3680 Wyse Rd., Dayton, OH 45414, Tel: 513-890-1918, TWX: 810-450-2523; Empl.: 75; *Sls. Mgr.:* Greg Kimpton

PRO-LOG, 2411 Garden Rd., Monterey, CA 93940, Tel: 408-372-4593, TWX: 910-360-7082; Empl.: 200

PROTEON, INC., 4 Tech Circle, Natick, MA 01760, Tel: 617-655-3340, Telex: PROTEON; Empl.: 50; *Sls. Mgr.:* Barney Strobel

PROTO STAMPING CORP., 850 Charter St., Redwood City, CA 94063, Tel: 415-365-0498, Telex: 709241; *Sls. Mgr.:* David Duncan

PROTO SYSTEMS OF ATLANTA, 11510 N. Fulton Industrial Blvd., Alpharetta, GA 30201, Tel: 404-475-1330, Telex: 469432; *Sls. Mgr.:* John Gregory

PT PROTOTEK INC

PROTOTEK, INC., 25 Standen Dr., Hamilton, OH 45015, Tel: 513-874-5094; FSC No.: 60813 ....2•1893

Local Sales Offices & Reps

EXP	CT, Litchfield, Intrade, Inc.	800-243-5252

PROTOTYPE TRANSFORMER CORP., 545 N. Arlington Ave, East Orange, NJ 07017, Tel: 201-672-2400; Empl.: 50-75

PSG INDS., 1225 Tunnel Road, Perkasie, PA 18944, Tel: 215-257-3621, Telex: 827361; FSC No.: 18509; Empl.: 150; *Sls. Mgr.:* John Feldermann, Jr.

PTK CORPORATION, 1173 Los Olivos Ave., Los Osos, CA 93402, Tel: 805-528-5858, TWX: 910-351-5802; FSC No.: 60132; Empl.: 114; *Sls. Mgr.:* Wayne Hamari

PTL ELCTRNS., 10211 Vinemont St., Dallas, TX 75218, Tel: 214-327-3180; Empl.: 10

PTS ELECTRONICS INC., Box 272, Bloomington, IN 47401, Tel: 812-824-9331; Empl.: 525; *Sls. Mgr.:* R. W. King; *Dist. Mgr.:* J. Hamilton

PTX-PENTRONIX INC., 1737 Cicotte, Lincoln Park, MI 48146, Tel: 313-388-3100, Telex: 23-0398; Empl.: 21; *Sls. Mgr.:* J. Schultz

PULNIX AMERICA, INC., 453F Ravendale Dr., Mountain View, CA 94043, Tel: 415-964-0955, Telex: 172541 PULNIX AMERICA; *Sls. Mgr.:* Toshi Hori

PULSAR PRODUCTS DIV., 2700 Merced St., San Leandro, CA 94577, Tel: 415-577-7236, TWX: 910-366-7033; Empl.: 24

PULSE ENGRG. INC., A Varian Sub., P.O. Box 12235, San Diego, CA 92112, Tel: 619-268-2400, TWX: 910-335-1527; Empl.: 1200; *Sls. Mgr.:* Leonard M. Luner

Local Sales Offices & Reps

CA	Irvine	714-250-0551
CA	Los Angeles	818-704-1151

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CA	San Jose	408-297-6222
FL	Orlando	305-831-2782
IL	Chicago	312-364-0424
MA	Boston	617-449-1242
MN	Minneapolis	612-933-7712
PA	Philadelphia	215-525-4752
TX	Austin	512-451-5721

PULSE INSTRS. CO., 1536 W. 25th St., San Pedro, CA 90732, Tel: 213-548-1327; Empl.: 12; *Sls. Mgr.:* Ron Perry

PYLE INDS., INC., 501 Center St., P.O. Box 620, Huntington, IN 46750, Tel: 219-356-1200; Empl.: 175; *Sls. Mgr.:* Frank Pyle, Jr.; *Dist. Mgr.:* Mark Pyle

PYLE-NATIONAL CO., 1334 N. Kostner Ave., Chicago, IL 60651, Tel: 312-342-6300

PYLON CO., 452 John Dietsch Blvd., Attleboro Falls, MA 02763, Tel: 617-699-7646, TWX: 948095; Empl.: 200; *Sls. Mgr.:* Andy Fontaine

PYROCOM CO., 924 N. 143rd St., Seattle, WA 98133, Tel: 206-365-3535

PYROFERRIC INTL., INC., 200 Madison St., Toledo, IL 62468, Tel: 217-849-3300, TWX: 910-663-0616; Empl.: 50; *Sls. Mgr.:* John A. Roberts

PYROFILM RESISTOR CO., See KDI Pyrofilm

Q-MATIC CORP., 3194-D Airport Loop Dr., Costa Mesa, CA 92626, Tel: 714-545-8233, Telex: 67-8389

Q-S PRODUCTS CO., INC., 3605 S.W. Snoqualmie St., Seattle, WA 98126, Tel: 206-937-5505

Q-SYSTEMS, PO Box 35879, Tucson, AZ 85740, Tel: 602-293-4923, TWX: 910-952-1185; Empl.: 7; *Sls. Mgr.:* M. Lloyd

Q-TECH CORP., 2201 Carmelina Ave., Los Angeles, CA 90064, Tel: 213-820-4921, Telex: 69-6140; FSC No.: 51774; Empl.: 65; *Sls. Mgr.:* H. Phillips .... 1A•1410, 1411

Local Sales Offices & Reps

CA	Cupertino, Dura Elctrn. Sls.	408-255-2084
CA	Northridge, Tauber-Dreyer	213-993-0048
FL	Melbourne, Reynolds & Assocs.	305-259-7000
GA	Acworth, Reynolds & Assocs.	404-451-9558
MA	Malden, J-K Assocs.	617-321-2922
NJ	Paramus, Eltech Sls.	201-967-1309
NY	Kings Park, Eltech Sls.	201-967-1309
NC	Winston Salem, Reynolds & Assocs.	919-725-6196
TX	Houston, TCI Elctrns.	713-774-5019

QUADRA SALES CORP., 14825 NE 40th, Suite 340, Redmond, WA 98052, Tel: 206-833-3550

QSI

QUALIDYNE SYS., 2256 Main St., Chula Vista, CA 92011, Tel: 619-429-7440, Telex: 622-43860; FSC No.: 619-429-1011; *Sls. Mgr.:* James J. Louden .... 3•1748-1750

Local Sales Offices & Reps

AZ	Phoenix, Thor Engrg.	602-437-1463
CA	Chatsworth, Raltech, Inc.	818-700-0933
CA	San Diego, Power Assocs.	619-275-0641
CA	Santa Clara, Gagner-Toomey Assocs.	408-244-2200
CO	Denver, Grimes Mktg.	303-740-6063
CT	Guilford, O.E.M. Mktg. & Sls.	203-453-5424
FL	Ft. Lauderdale, Beacon Elctrns.	305-491-1054
MN	Burnsville, Electromec Sales	612-894-8200
NH	Salem, O.E.M. Mktg. & Sls.	603-893-0009
NY	Glen Cove, F&F Assoc.	516-671-8900
TX	Dallas, Jim D. Gray & Assocs.	214-341-7190
UT	Ogden, Grimes Mktg.	801-546-4029

QUALITY THERMISTOR, 2147 Centurion Pl., Boise, ID 83705, Tel: 208-377-3373; FSC No.: 56866; Empl.: 12; *Sls. Mgr.:* John Mahoney

Local Sales Offices & Reps

AZ	Scottsdale, ARCOM Sls.	602-947-5745
CA	San Jose, Silicon Vally Sls.	408-984-6354
CA	Temple City, HMC Incorporated	213-285-0485
CO	Wheat Ridge, C-Tech	303-431-7025
FL	Casselberry, Elctrn. Mktg. Corp.	305-339-7070
IL	Arlington Heights, C. L. Greenslade Sls.	312-253-9620
IN	Ft. Wayne, John F. Kilfoil Co.	219-424-7719
MA	Needham, Hatch Assocs.	617-444-3310
MO	St. Louis, Forristal-Young Sls.	816-358-6771
NJ	Plainfield, Glassman Assocs.	201-561-3866
NY	Glen Cove, Glassman Assocs.	516-676-1039
OH	Cincinnati, John F. Kilfoil Co.	513-791-6150

QUAM-NICHOLS CO., 234 E. Marquette Rd., Chicago, IL 60637, Tel: 312-488-5800, Telex: 701676; Empl.: 200; *Sls. Mgr.:* William G. Little; *Dist. Mgr.:* Greg Johns .... 3•1048, 1049

QUANTRONIX, 225 Engineers Rd., Smithtown, NY 11787, Tel: 516-273-6900, Telex: 967-782; Empl.: 175; *Sls. Mgr.:* R. J. Bruno; *Dist. Mgr.:* R. J. Bruno

QUANTUM, Barnes Indl. Pk., Wallingford, CT 06492, Tel: 203-265-2811, Telex: 953-543; Empl.: 200; *Sls. Mgr.:* D. Felt

QUANTUM DATA, INC., 455 E. Kehoe, Carol Stream, IL 60188, Tel: 312-668-3301, Telex: 206725; Empl.: 35 .... 3•1289

QUARTIC SYSTEMS, INC., 3575 South West Temple #4, Salt Lake City, UT 84115, Tel: 801-268-9264; *Sls. Mgr.:* Jim Elwell

QUARTZITE PROCESSING, INC., 6 Holyoke St., Malden, MA 02148, Tel: 617-322-1380; Empl.: 11; *Sls. Mgr.:* P. S. Yanofsky

QUAY CORP., 22 Meridian Rd., P.O. Box 783, Eatontown, NJ 07724, Tel: 201-542-7340; *Sls. Mgr.:* George Hill

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OH	Columbus, K.W. Elec. Sls.	614-888-0483
OH	Dayton, K W Elctrn. Sls.	513-890-2150
OH	Shaker Hts., K.W. Elec. Sls.	216-496-9177
OR	Portland, Eltech	503-238-0805
PA	Allison Park, K.W. Elec. Sls.	412-487-4300
TN	Memphis, D. Bellew Sls.	901-452-1468
TN	Oak Ridge, Alpha Mktg.	615-482-1660
TX	Austin, Barry Sls.	512-836-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255
VA	Reston, Colrud Corp	804-353-6320
WA	Bellevue, Eltech	206-643-4330

Local Distributors

AL	Huntsville, Comp. Dist.	205-883-7501
AZ	Phoenix, Tri-Tek	602-995-9352
AZ	Phoenix, Dalis	602-275-2885
AZ	Tucson, Inland Elec. Supp.	602-889-5301
AR	Little Rock, Southern Elec.	501-372-4196
AR	Little Rock, Carlton-Bates	501-562-9100
CA	Buena Park, Control Des.	714-521-5040
CA	Burlingame, Rose Elec.	415-348-2740
CA	Fremont, Term. Sls.	415-656-7722
CA	Gardena, Calif. Switch & Signal	213-538-9830
CA	Los Angeles, Elec. Switches	213-660-1310
CA	San Carlos, Control Des.	415-592-4808
CA	San Diego, Lectro Comp.	714-578-4290
CA	San Jose, Con. Parts	408-263-9521
CA	Santa Monica, Master Distr.	213-452-1229
CO	Denver, CSID	303-292-9594
CO	Englewood, Indl. Elctrns.	303-694-9444
CT	Stratford, Utronic	203-378-4201
FL	Ft. Lauderdale, Comp. Dist.	305-971-4950
GA	Atlanta, Elctrl. Control Prod.	404-455-1216
GA	Stone Mountain, Control Des.	404-979-3500
IL	Addison, Lectro Comps.	312-543-1680
IL	Arlington Heights, Lo Dan Elctrns.	312-398-5311
IL	Oak Park, Newark Elctrns.	312-524-1800
IL	Rockford, Mid-West Assoc.	815-962-8036
IN	Ft. Wayne, Graham Elec.	219-423-3422
IN	Indianapolis, Control Des.	317-788-4559
IA	Cedar Rapids, Deeco	319-365-7551
KY	Louisville, CED/E & H Elec. Supp. Co.	502-587-0991
LA	Lafayette, Ralph's Indl. Elec.	318-234-4507
LA	New Orleans, Wm. B. Allen Supp.	800-535-9593
LA	Shreveport, Indl. Elctrn. Supp.	318-222-9459
MD	Beltsville, Treeko Sls.	301-937-8260
MA	Burlington, QPL Elec. Dist.	617-229-2424
MA	Middleboro, The Stockroom	617-947-4262
MI	Southfield, Michigan Lectrols	313-353-1350
MN	Minneapolis, Aero-Space Computer Supp.	612-884-4725
MN	Minneapolis, Newark Elec.	612-331-6350
MN	Minneapolis, Control Des.	612-721-1628
MO	St. Louis, Olive Indl.	314-426-4500
MO	St. Louis, Control Des.	314-426-3150
NE	Lincoln, Scott Elctrn.	402-466-8221
NJ	Fairlawn, Relay Specialties	201-797-3313
NJ	Jersey City, Cuny & Gerber	201-653-0222
NY	Buffalo, Summit	716-884-3450
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Mt. Vernon, QAR Indl. Elec. Sls.	914-699-2224
NY	Rochester, R. Baker Elctrns.	716-586-9164
NC	Charlotte, Control Des.	704-588-4410
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Southeastern Radio	919-828-2311
OH	Akron, Akron Elctrn.	216-762-8818
OH	Cincinnati, URI Elctrns.	513-761-4030
OH	Columbus, Elctrns. Mktg. Co.	614-299-4161
OH	Dayton, ESCO	513-226-1133
OH	Wickliffe, Gateway Megatech	216-944-8565
OK	Tulsa, Radio	918-587-9123
OR	Eugene, Vitus Elec. Supp.	503-484-6333
OR	Portland, Radar	503-232-3404
PA	Malvern, Control Des.	215-296-0150
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Phila. Elec.	215-568-7400
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Memphis, Brownell Electro	901-795-8487
TX	Dallas, Control Des.	214-358-1441
TX	Dallas, Dallas Meter-Tech.	214-349-6044
TX	Houston, Angie Elctrns.	713-659-8386
TX	Longview, Summers Elec.	214-757-6021
UT	Salt Lake City, Stuart Elctrns. Supp.	801-466-8603
WA	Seattle, Pacific Elctrns.	206-575-1050
WA	Seattle, Radar Elec.	206-282-2511
WV	Redmond, Murphy Elctrns.	206-881-1234
WI	New Berlin, Control Des.	414-784-1015
WI	West Allis, Marsh Elctrns.	414-475-6000

REACTEL, INC.

REACTEL, INC., 687-D Lofstrand La., Rockville, MD 20850, Tel: 301-279-5535; FSC No.: 60458; Empl.: 20; *Sls. Mgr.:* D. E. Claycomb

Local Sales Offices & Reps

CA	North Hollywood, Crown Elctrns.	213-877-3550
CA	Sunnyvale, ESCO Assocs.	408-745-1410
FL	Largo, Electro Craft	813-530-4749
MA	Wakefield, Nerem	617-245-4426
VA	Fairfax, Beacon North	703-591-1300

REAL TIME SYS., 152 S. MacQuesten Pkwy., Mt. Vernon, NY 10550, Tel: 914-667-0425; *Sls. Mgr.:* A. Citrin

REBLING PLASTICS CO., 150 Franklin Drive, Warrington Ind. Park, Warrington, PA 18976

RECORDER SYS. DIV., See Gulton Inds., Inc., Graphic Instrs. Div.

RECOTON CORP., 46-23 Crane St., Long Island City, NY 11101, Tel: 212-392-6442, Telex: 236047 RCTN; Empl.: 150; *Sls. Mgr.:* George Calvi

REDINGTON COUNTERS, 130 Addison Rd., Windsor, CT 06095, Tel: 203-688-6205, Telex: 64-3390 REDCO WSOR; *Sls. Mgr.:* Alan Schoenhut

REED SWITCH DEV. CO. INC., PO Box 1464, Kerrville, TX 78028, Tel: 512-896-4444; Empl.: 1

RE-EL CIRCUITS, INC., See RCI/Data

REEVE ELCTRNS., 444 N. Orleans, Chicago, IL 60610, Tel: 312-670-0150; Empl.: 25; *Sls. Mgr.:* George Elliott

REEVES-HOFFMAN
Division, Dynamics Corporation of America

REEVES-HOFFMAN DIV., 400 W. North St., Carlisle, PA 17013, Tel: 717-243-5929, TWX: 510-650-3510; Empl.: 291; *Sls. Mgr.:* Edward J. Sweeney .... **1A**•1413-1417; **2**•1795-1797

Local Sales Offices & Reps

AZ	Phoenix, Chaparral Elctrns.	602-252-0897
CA	Culver City, Westaironics	213-641-4123
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CO	Boulder, R.G. Entprs.	303-447-9211
FL	Fern Park, EIR Inc.	305-830-9600
GA	Kennesaw, BWS Marketing	404-974-5107
D	Boise, N. R. Schultz Co.	208-377-8686
L	Chicago, ESCO Assocs.	312-763-0800
KS	DeSoto, Midtec Assocs.	913-441-6565
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MA	Wakefield, H. Jappe	617-245-9359
MN	Minneapolis, Intl. Elctrns.	612-571-0000
MO	Florissant, Midtec Assocs.	314-837-5200
NY	Huntington, Compar New York Inc.	516-423-5660
NC	Winston-Salem, Murcota	919-722-9445
OH	Cincinnati, Tri-State Mktg.	513-761-7993
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Hatboro, Electro Rep Engrg.	215-674-4421
TX	Irving, Kite Elctrns. Sls.	214-438-9336
WA	Bellevue, N. R. Schultz Co.	206-454-0300

REFAC ELCTRNS. CORP., P.O. Box 809, Winsted, CT 06098, Tel: 203-379-2731, TWX: 710-449-6464; FSC No.: 28564; Empl.: 80; *Sls. Mgr.:* Chuck Altschul .... **1B**•1094

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Luscombe Engrg.	602-949-9333
CA	Campbell, Luscombe Engrg.	408-370-2020
CA	Pasadena, Luscombe Engrg.	818-684-2000
CA	San Diego, Luscombe Engrg.	619-295-4300
CO	Boulder, Luscombe Engrg.	303-772-3342
CT	Kensington, Norman Stachelek Co.	203-828-6161
FL	Clearwater, Delmac Sls.	813-447-5192
FL	Orlando, Delmac Sls.	305-898-4688
FL	Palm Bay, Delmac Sls.	605-724-8377
FL	Tamarac, Delmac Sls.	305-726-1330
GA	Norcross, Montgomery Mktg.	404-447-6124
L	Mt. Prospect, Interep	312-577-8899
MD	Baltimore, Burgin-Kreh Assocs.	301-265-8500
MA	Canton, New England Elctrn. Sls.	617-828-4835
MI	Madison Heights, Pine Sls.	313-539-0350
MN	Spring Lake Park, Holmgren Assocs.	612-786-7641
MO	Gladstone, Delltron Co.	816-436-6445
MO	St. Louis, Delltron Co.	314-869-4779
NJ	Englewood, Sprung/Nussbaum	201-569-5666
NY	E. Syracuse, Nycom Co.	315-437-8343
NY	Williamsville, Nycom Co.	716-633-9395
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Dayton, J. C. Hoffstetter Co.	513-296-1010
OH	Medina, J. C. Hoffstetter Co.	216-241-4880
OK	Tulsa, Ion Assocs.	918-664-0186
OR	Beaverton, Luscombe Engrg.	503-636-6664
PA	Pittsburgh, J. C. Hoffstetter Co.	412-356-2305
PA	Southampton, Campbell Assocs.	215-322-6630
TX	Austin, Ion Assocs.	512-346-7160
TX	Grand Prairie, Ion Assocs.	214-647-8225
TX	Houston, Ion Assocs.	713-977-4354
VA	Lynchburg, Burgin-Kreh Assocs.	804-239-2626
WI	Milwaukee, Interep	414-774-1100

REGDON CORP., 3713 Grand Blvd., Brookfield, IL 60513, Tel: 312-485-5152, TWX: 910-691-2214; FSC No.: 27190; Empl.: 65 .... **1B**•1497

Local Sales Offices & Reps

AL	Decatur, Tenn Tech	205-350-0630
CA	Los Altos, J. W. Wilhoit	415-961-3660
CA	Valencia, DJM Elctrns.	213-362-4309
CT	Woodbury, Mark-Rep Assocs.	203-263-3047
FL	Fern Park, EIR, Inc.	305-830-9600
GA	Clarkston, Tenn Tech	404-292-5368
L	Downers Grove, Richmar Elect. Corp.	312-968-0118
N	Indianapolis, Richmar Elctrns.	317-846-6383
MN	Edina, T.H. Hanson & Co.	612-893-9960
MN	Edina, Wendell Lee & Assoc.	612-831-5056
NH	Atkinson, Mark-Rep Assocs.	603-362-4526
NJ	Livingston, Varrelman-Gorman Co.	201-992-2505
NY	Ilion, NHA	315-894-9943
NY	Pittsford, NHA	716-586-9002
NC	Raleigh, Tenn Tech	919-266-3610
OH	New Lebanon, J. N. Bailey	513-687-1325
PA	Abington, Indl. Mktg. Specialists Co.	215-659-0444
TX	Austin, K & H Sales	512-258-8841
TX	Plano, K & H Sales	214-423-6520
WI	Milwaukee, Richmar Elctrns.	414-781-1730

Local Distributors

CA	Burlingame, Logan Elctrn. Supp.	415-697-6481
MA	Lynn, Land Elctrns.	617-592-2220
NJ	Fairlawn, Relay Specialties	201-797-3313

REGENT CONTROLS, 39 Fanny St., P.O. Box 767, Shelton, CT 06484-0767, Tel: 203-736-2924; *Sls. Mgr.:* Wendell E. Carroll

REHLANDER ASSOCS., 363 Rantoul St., Beverly, MA 01915, Tel: 617-922-5961; *Sls. Mgr.:* Michael Rehlander

REICH ASSOCS., P.O. Box 73, Plano, TX 75074, Tel: 214-424-7904, Telex: 794783, TWX: 910-989-1691; FSC No.: 55916; Empl.: 10

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Electronics for Test and Communication

RE INSTRUMENTS CORP., 31029 Center Ridge Rd., Westlake, OH 44145, Tel: 216-871-7617, TWX: 810-427-9257; Empl.: 15; *Sls. Mgr.:* B. A. Gravens .... **3**•1291

Local Sales Offices & Reps

CA	Los Gatos, Pacific Coast Mktg.	408-395-7021

REI SLS., 19525 Business Centre Dr., Northridge, CA 91324, Tel: 617-938-0900; Empl.: 5; *Sls. Mgr.:* T. P. Fitzgerald

RELATIONAL MEMORY SYS., 1650 Berry Essa Rd., Ste. B, San Jose, CA 95133-1082, Tel: 408-729-3011, TWX: 910-379-0014

R. E. LAW INSTRU. INC., 7735 W. 112th Pl., Palos Hills, IL 60465, Tel: 312-974-4000; FSC No.: 6685-6695; *Sls. Mgr.:* Harry Booth; *Dist. Mgr.:* R. Gene Law

RELAY SERVICE CO., 1310 N. Pulaski Rd., Chicago, IL 60651, Tel: 312-AL2-2700; Empl.: 30; *Sls. Mgr.:* Chas. H. Badger

Local Sales Offices & Reps

CA	Danville, Stuart Assoc.	415-837-8197
CA	Vista, Sado Sls.	619-941-2654
CT	Bethany, Reps. Corp.	203-393-0024
IL	Woodridge, Trend-Tronics	312-985-0626
MD	Fulton, Samuel A. Jeffries	301-792-7452
MA	Wellesley, Reps. Corp.	617-237-6476
OH	Cincinnati, John O. Olsen	513-574-7711
OH	Cleveland, John O. Olsen	216-662-3454
OR	Tigard, Elctrn. Comp. Sls.	503-245-2342
PA	Narbreth, Samuel A. Jeffries	215-664-8500
PA	Pittsburgh, John O. Olsen	412-279-2550
TX	Dallas, Elctrn. Prod. Reps.	817-467-0377
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301

RELAY SPECIALTIES, 1300 Plaza Rd., Fair Lawn, NJ 07410, Tel: 201-797-3313, 800-526-5376, Telex: 642751; Empl.: 48; *Sls. Mgr.:* S. R. Gershberg

Local Sales Offices & Reps

CA	Cypress, The Rep House	213-596-4922
IN	Noblesville, Newton & Assocs.	317-845-4087
MD	Baltimore, Com Tech Assocs.	301-583-1993
TX	Dallas, Art Brawner & Assocs.	214-824-4013

RELCO PRODS., 5594 E. Jefferson Ave., Denver, CO 80237, Tel: 303-756-1143; FSC No.: 14454; Empl.: 7

RELIABILITY INC., 16400 Park Row, P.O. Box 218370, Houston, TX 77218, Tel: 713-492-0550, TWX: 910-881-1739; FSC No.: 54098; Empl.: 350; *Sls. Mgr.:* J. Marcussen .... **3**•1752-1755

Local Sales Offices & Reps

AZ	Phoenix, PLS Assocs.	602-246-6477
CA	Carson, Amasco	213-516-8561
CA	Sunnyvale, Amasco	408-733-8690
CO	Englewood, PLS Assocs.	303-773-1218
CT	Hamden, Digital Sls. Assocs.	203-248-3641
FL	Orlando, Gra-Mar	305-894-3351
IL	Elk Grove, Loren Green & Assocs.	312-593-0282
IN	Ft. Wayne, Jim Finnegan & Co.	219-747-9525
IA	Davenport, Ensco-Rep	319-386-6600
KS	Overland Park, Ensco	913-381-7557
KS	Wichita, Ensco-Rep	316-683-1070
MD	Wheaton, Brim Berg Sls.	301-946-2670
MA	Waltham, Digital Sls. Assocs.	617-899-4300
MO	St. Louis, Ensco-Rep	314-567-3935
NM	Albuquerque, PLS & Assocs.	505-345-5501
NY	Mt. Vernon, Sonkin Assocs.	914-668-9809
NC	Raleigh, Barker & Assocs.	919-876-0282
OH	Cinncinatti, Jim Finnegan & Co.	513-931-1686
OH	Cleveland, Jim Finnegan & Co.	216-238-5905
OH	Mansfield, Jim Finnegan & Co.	419-526-3564
OH	Maumee, Jim Finnegan & Co.	419-893-1052
OK	Tulsa, Advanced Techn. Sls.	918-664-0482
OR	Beaverton, General Elctrns.	503-641-5288
PA	Glenside, Koebert Assocs.	215-887-2310
PA	Pittsburg, Jim Finneagan & Co.	412-561-4687
TX	Austin, Advance Techn. Sls.	512-459-1351
TX	Dallas, Advance Techn. Sls.	214-361-8584
TX	Houston, Advance Techn. Sls.	713-440-8066
UT	Salt Lake City, PLS Assocs.	801-466-8729
WA	Tukwila, General Elctrns.	206-575-4030

Local Distributors

AZ	Phoenix, Weatherford	602-272-7144
CA	Anaheim, Weatherford	714-634-9600
CA	Glendale, Weatherford	213-849-3451
CA	Pomona, Weatherford	713-623-1261
CA	San Diego, Weatherford	619-695-1700
CA	Santa Barbara, Weatherford	805-965-8551
CA	Sunnyvale, Weatherford	408-738-8694
CO	Denver, Weatherford	303-428-6900
CO	Englewood, PLS Assocs.	303-773-1218
CT	Wallingford, Sager Elctrl. Supp.	203-265-4600
IL	Elk Grove, Dot-Tronics	312-593-0282
MD	Baltimore, Whitney Distrs.	301-944-8080
MA	Hingham, Sager Elctrl. Supp.	617-749-6700
MA	Middleboro, Stockroom	617-947-4262
MO	Maryland Heights, Ensco	314-423-3935
NY	Mt. Vernon, Kintronics	800-431-1658
OH	Dayton, Koehlke Comps.	513-435-5435
TX	Austin, S. W. Elctrns.	512-837-8977
TX	Dallas, Weatherford	214-931-7333
TX	Houston, Weatherford	713-688-7406
TX	Richardson, Southwest Elctrn. Supp.	214-234-3050
TX	Stafford, Southwest Elctrn. Supp.	713-491-4900
WA	Seattle, Weatherford	206-575-1340

RELMS, See Relational Memory Systems, Inc.

REMEE PRODS. CORP., 41 Bridge St., Florida, NY 10921, Tel: 914-651-4451, Telex: 64-6715; *Sls. Mgr.:* Joseph R. Fichtl; *Dist. Mgr.:* Joseph R. Fichtl

REMEX, Ex-Cell-O Corp., 1733 Alton St., Irvine, CA 92714, Tel: 714-957-0039, Telex: 681-333, TWX: 910-595-1715; *Sls. Mgr.:* Rich McGowan; *Dist. Mgr.:* Don Schulze

RENBRANDT, INC., 6 Parmelee St., Boston, MA 02118, Tel: 617-445-8910; FSC No.: 99934; Empl.: 25; *Sls. Mgr.:* M. Rogers

RENCO
Division of Electro-Craft Corporation
Industrial Automation Group

RENCO, 26 Coromar Dr., Goleta, CA 93017-3094, Tel: 805-968-1525, TWX: 910-334-1180; FSC No.: 34479; Empl.: 110; *Sls. Mgr.:* Don Risk .... **1B**•1874, 1875; **3**•1139

Local Sales Offices & Reps

CA	Garden Grove, Advanced Digital Group, Inc.	714-897-0319
CA	San Jose, Renco/Electrocraft	408-554-0234
CA	Westlake Village, Electro-Craft Corp.	818-889-3631
CO	Englewood, Integrated Motion Sys., Inc.	303-762-1817
CO	Englewood, Renco Corp.	303-762-1754
CT	Vernon, Renco/Electrocraft	203-871-8053
GA	Atlanta, Renco Corp.	404-971-2669
GA	Marietta, Renco/Electrocraft	404-971-2669
IL	Palatine, Renco/Electrocraft	312-991-4570
MI	Troy, Renco/Electrocraft	313-528-2940

MN	Hopkins, Electro-Craft Corp.	612-931-2700
NH	Salem, Electro-Craft Corp.	603-893-5552
NJ	Cherry Hill, Electro-Craft Corp.	609-662-0555
NJ	Monmouth Junction, Renco Corp	201-329-6233
NY	Ballston Lake, Ross Equip. Co., Inc.	518-877-5533
NY	Buffalo, Ross Equip. Co., Inc.	716-634-0990
NY	Elmira, Ross Equip. Co., Inc.	607-734-4175
NY	Rochester, Ross Equip Co.	716-271-5660
NY	Syracuse, Ross Equip. Co., Inc.	315-463-6691
OH	Cincinnati, Renco/Electrocraft	513-474-4171
WA	Bellevue, Sweo Engrg.	206-644-2725

RENCO ELCTRNS., 60 Jefryn Blvd. E., Deer Park, NY 11729, Tel: 516-586-5566, Telex: RCA 220883; Empl.: 70; *Sls. Mgr.:* Ed Rensing ....**1A**•1278-1280, 2260, 2261

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For sales and sales service information about RENCO products, please call (516) 586-5566. For engineering assistance please dial our toll-free number (800) 645-5828.

REPCO, 2421 N. Orange Blossom Trail, Box 7065, Orlando, FL 32854, Tel: 305-843-8484, Telex: 56-6536 ....**3**•1065

Local Sales Offices & Reps

CT	Niantic, Northeast Reg. Sls. Off.	203-739-6877
TX	Lewisville, Southwest Reg. Sls. Off.	214-434-1139
WA	Seattle, Western Reg. Sls. Off.	206-542-6500

REPRODUCTION TECHNOLOGIES INC., Dept. EM, P.O. Box 815, Bristol, IN 46507-0518, Tel: 219-848-5233; Empl.: 8 ....**3**•1050, 1051

All sales are factory direct.

REPUBLIC ELCTRNS. CORP., 176 E. 7th St., Paterson, NJ 07524, Tel: 201-279-0300, TWX: 710-988-5908; FSC No.: 93958; Empl.: 125; *Sls. Mgr.:* W. Eisenberger ....**1A**•1182

Local Sales Offices & Reps

CA	Los Angeles, Corcoran Assocs.	213-823-2425
CA	Sunnyvale, W. W. Posey Co.	408-746-0771
CO	Commerce City, Williams Assocs.	303-289-5647
FL	Sunrise, Arnold Milrot & Assoc.	305-748-6446
IL	Chicago, Ropek, Cahill & Vogt	312-631-0070
IN	Ft. Wayne, Given Corp.	219-432-5585
IA	Cedar Rapids, Ard Sales Co.	319-393-6392
MD	Ellicott City, Nelson Elecs.	301-747-7887
MA	Lowell, Underwood Sls. Corp.	617-256-8191
MN	Edina, Grayden & Flemmer	612-941-1120
MO	Grandview, R. R. Burton & Assocs.	816-763-5385
MO	Maryland Hgts., R. R. Burton & Assocs.	314-434-1678
NJ	Hasbrouck Hgts., Comp-Tech Sls.	201-288-7400
NY	Liverpool, Precision Sls.	315-451-3480
NY	New Hyde Park, Comp-Tech Sls.	516-593-2628
NY	Pittsford, Precision Sls.	716-381-2820
NY	Pleasant Valley, Precision Sls.	914-635-3233
NC	Charlotte, Jake Rudisill Assocs.	704-377-6901
OH	Columbus, Tom Mulligan & Assocs.	614-457-2242
OK	Tulsa, Hugh J. Daly Co.	918-627-4159
PA	Lancaster, Electro Rep.	717-299-5877
TX	Houston, Rainwater Reps.	713-376-0442
WA	Seattle, Blum & Assocs.	206-777-6656

Local Distributors

CA	San Fernando, Petell Elctrns.	213-365-9841
IL	Skokie, Kellner Elctrns.	312-677-1120
NJ	Perth Amboy, Metuchen Capacitors	201-442-0500
NY	Hauppauge, Semi Cap Elctrns.	516-582-4400

REPUBLIC ELECTRONICS, INC., 575 Broad Hollow Rd., Melville, NY 11747, Tel: 516-249-1414, Telex: 96-1460; FSC No.: 95750; Empl.: 100; *Sls. Mgr.:* J. Anderson

REPUBLIC PACKAGING CORP., 9160 S. Green St., Chicago, IL 60620, Tel: 312-233-6530, Telex: 25-4621; *Sls. Mgr.:* Hal Grossman; *Dist. Mgr.:* Herb Fasth

RESDEL ENGRG., 300 E. Live Oak Ave., Arcadia, CA 91006, Tel: 213-684-2600, TWX: 910-582-3219; Empl.: 190

RESEARCH, INC., Box 24064, Minneapolis, MN 55424, Tel: 612-941-3300, Telex: 29-0502; Empl.: 250; *Sls. Mgr.:* Brian Callahan

RESEARCH PRODS., 1015 E Washington Ave., Madison, WI 53701, Tel: 608-257-8801, TWX: 910-286-2781

RESISTANCE TECHNOLOGY INC., 1260 Red Fox Rd., St. Paul, MN 55112, Tel: 612-636-9770; *Sls. Mgr.:* Roger H. Falde; *Dist. Mgr.:* Roger H. Falde

RESISTORS, INC., 5226 W. 26th St., Chicago, IL 60650, Tel: 312-652-7555; Empl.: 50 ....**1A**•1937

Local Sales Offices & Reps

CT	Plantsville, Parnetics Co.	203-628-9343
FL	Melbourne, Jerry Williams, Inc.	305-259-7700
IL	Arlington Hgts., Resistance Specialists	312-259-6571
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
MI	Lathrup Village, R.C. Nordstrom & Co.	313-559-7373
NY	New York City, Symon Assocs.	212-757-3638
OH	Wickliffe, W.J. Brauer & Assocs.	216-943-0601
WI	Milwaukee, Honkamp Sls. Co.	414-463-2530

RES-NET, 110 Route 10, Whippany, NJ 07981, Tel: 201-887-2260, out of state 800-526-0704; FSC No.: 55 877; Empl.: 42; *Sls. Mgr.:* Henry Brandi ....**1A**•1938

Local Sales Offices & Reps

CA	Irvine, Angle Assocs.	714-833-0692
CA	Palo Alto, Mollard Mktg.	415-961-0456
MA	Waltham, Dynasel Assocs.	617-890-6777
NJ	Florham Park, Harry Thaw Sls.	201-992-2711
TX	Houston, Rep Master	713-692-8204

REVERE CORP. OF AMER., 845 N. Colony Rd., Wallingford, CT 06492, Tel: 203-269-7701, Telex: 96-3482, TWX: 710-476-3197; Empl.: 389; *Sls. Mgr.:* J. McGurkin

REXNORD CHEMICAL PRODS. INC., 6120 E. 58th Ave., Commerce City, CO 80022, Tel: 303-289-5651, Telex: 45-0331; *Sls. Mgr.:* Michael P. Manegold

Local Sales Offices & Reps

CA	Glendora, Rexnord Chem. Prods.	818-963-1109
IL	Northfield, Special Elec.	312-446-5113
MI	Roseville, Special Elec. Co.	800-558-0604
MN	Excelsior, JPM Assocs.	612-474-3408
MO	St. Louis, Special Elec. Co.	314-962-1150
OH	Cleveland, Special Elec. Co.	216-441-5244
RI	Lincoln, Special Elec. Co.	401-727-1136
WI	Milwaukee, Special Elec.	414-383-6370

RFD, INC., 5024 Nassau St., Tampa, FL 33607, Tel: 813-872-1502, TWX: 810-876-9146; *Sls. Mgr.:* Thomas W. Facer

RFI CORPORATION, 100 E. Pine Aire Dr., Bay Shore, NY 11706, Tel: 516-231-6400, TWX: 510-227-6233; FSC No.: 13619; Empl.: 250 ....**1A**•1618

Local Sales Offices & Reps

AL	Huntsville, Murcota Corp.	205-539-8476
AZ	Scottsdale, Williams-Assocs.	602-947-4297
CA	Monterey Park, M.W. Riedel Co.	213-283-7694
CA	Mountain View, Peninsula Tech. Sls.	415-965-3636
CO	Denver, Williams-Assocs.	303-373-4730
FL	St. Petersburg, Tech-Rep Assocs.	813-577-2779
IL	North Riverside, J. Popp Sls.	312-447-6124
IN	Ft. Wayne, Denton Mktg., Inc.	219-627-5515
IA	Davenport, Ensco-Rep	319-386-6600
KS	Overland Park, Ensco-Rep	913-381-7557
MD	Rockville, Mechtronics Sls.	301-340-2130
MO	St. Louis, Ensco-Rep	314-423-3935
NH	Hudson, EMC Sls. Inc.	603-880-3671
NJ	Cherry Hill, H.J. White Co.	609-428-4544
NM	Albuquerque, Williams-Assocs.	505-255-1638
NY	Great Neck, Trionic Assocs.	516-466-2300
NC	Winston-Salem, Murcota Corp.	919-722-9445
PA	McKean, Ecco Elctrn. Sls.	814-476-1376
TX	Garland, McBride Sci. Sls.	214-494-5000
WA	Seattle, Granville Gillette Assocs.	206-284-3344

RFL INDS., A Dowty Grp. Co./Comms. Div., Powerville Rd., Boonton, NJ 07005, Tel: 201-334-3100, TWX: 710-987-8352; FSC No.: 49673; Empl.: 300

RFL INDS., A Dowty Grp. Co./Instr. Div., Powerville Rd., Boonton, NJ 07005, Tel: 201-334-3100, TWX: 710-987-8352; FSC No.: 49673; Empl.: 300

RFL INDS., Thermocontrol Div., W. Prospect St., Box 250, Brandon, VT 05733, Tel: 802-247-6811, TWX: 710-987-8352; Empl.: 350; *Sls. Mgr.:* Bob Berman; *Dist. Mgr.:* Bob Berman

RF MONOLITHICS, INC., 4441 Sigma Rd., Dallas, TX 75234, Tel: 214-233-2903, TWX: 910-860-5474; Empl.: 90; *Sls. Mgr.:* William Spurgeon

RHG ELECTRONICS LAB., INC., 161 E. Industry Ct., Deer Park, NY 11729, Tel: 516-242-1100, TWX: 510-227-6083; Empl.: 150; *Sls. Mgr.:* Martin D. Markson

RHOMBUS INDS., 15801 Chemical Ln., Huntington Bch., CA 92649-1595, Tel: 714-898-0960, TWX: 910-596-1826; Empl.: 60

Local Sales Offices & Reps

CA	Irvine, J. V. Earley & Assocs.	714-833-1806
CA	Redwood City, James S. Heaton Co.	415-367-9000
CO	Parker, A-5 Co.	303-841-3651
TX	Irving, Space Elctrns.	214-251-3636

RICHARD-LEE CO., Box 724, New Providence, NJ 07974, Tel: 201-276-0710; Empl.: 8

RICHARDS, ARKLAY S., CO., INC., 72 Winchester St., Newton Highlands, MA 02161, Tel: 617-527-1512; *Sls. Mgr.:* L. K. Richards

RICHCO PLASTIC CO., 5825 N. Tripp Ave., Chicago, IL 60646, Tel: 312-539-4060, TWX: 910-221-1938; Empl.: 400; *Sls. Mgr.:* Craig Richardson; *Dist. Mgr.:* Mike Dornik

RIDGE TOOL CO., Sub. Emerson Elec. Co., 400 Clark St., Elyria, OH 44036, Tel: 216-323-5581, Telex: 0243420

RIFA INC., Greenwich Office Park 3, P.O. Box 3110, Greenwich, CT 06836-3110, Tel: 203-625-7300, TWX: 710-579-2970 ANCONERICS-GRC ....**3**•1756, 1757

RIL ELCTRNS., INC., 125 Titus Ave., P.O. Box H, Warrington, PA 18976, Tel: 215-EL5-1361; Empl.: 25

RIPLEY, 46 Nooks Hill Rd., Cromwell, CT 06416, Tel: 203-635-2200, TWX: 710-428-9567; Empl.: 100; *Sls. Mgr.:* R. S. Clark

RISK, GEORGE, INDS., GRI Plaza, Kimball, NE 69145, Tel: 308-235-4645, TWX: 910-620-9040; FSC No.: 24229; Empl.: 100; *Sls. Mgr.:* J. Fisher; *Dist. Mgr.:* J. Fisher ....**1B**•1792

Local Sales Offices & Reps

AZ	Tempe, Cleveland Entprs. of Ariz.	602-820-1127
CA	Anaheim, Galaxie Sales Int'l.	714-752-1580
CA	Escondido, Cirolia Elctrn. Sls.	619-743-3015
CA	San Carlos, Kafco	415-591-6758
FL	Tamarac, SRT Marketing	305-920-2222
GA	Atlanta, Young & Lawrence	404-255-5450
IL	Wheaton, Chadra-Schilke & Assoc.	312-653-8126
MD	Baltimore, Stemler Assocs.	301-944-8262
MA	Milton, Naton Assocs.	617-698-0670
MN	St. Paul, Countryman Assocs.	612-645-9151
MO	Maryland Heights, Kebco	314-576-4111

Local Distributors

AZ	Phoenix, TRI Tek, Inc.	602-995-9352
CA	Hawthorne, Jade Computers	213-973-7707
CA	Los Angeles, Electric Switches	213-660-1310
CA	Santa Ana, Advanced Computer Prods.	714-558-8813

RLC ELCTRNS., INC., 83 Radio Cir., Mt. Kisco, NY 10549, Tel: 914-241-1334, TWX: 710-571-2103; FSC No.: 12598; *Sls. Mgr.:* Philip H. Wright

RMF PRODS., INC., 1275 Paramount Pkwy., P.O. Box 520, Batavia, IL 60510, Tel: 312-879-0020; Empl.: 11; *Sls. Mgr.:* R. Frieders ....**2**•1785

RMS ELECTRONICS INC., 50 Antin Pl., Bronx, NY 10462, Tel: 212-892-6700; Empl.: 100; *Dist. Mgr.:* Seymour Goldberg

Local Sales Offices & Reps

CA	Santa Ana, RMS Electronics Inc. Western	714-662-1041

RMS TECHN., 706 Industry Dr., Hampton, VA 23661, Tel: 804-838-2458; Empl.: 7

ROANWELL, 180 Varick St., New York, NY 10014, Tel: 212-989-1090, TWX: 710-581-6555; FSC No.: 82872; Empl.: 200; *Sls. Mgr.:* A. W. Mazzeo; *Dist. Mgr.:* A. W. Mazzeo

Local Sales Offices & Reps

CA	N. Hollywood, Jewett Co.	818-789-8103

RO ASSOCIATES

RO ASSOCS., 246 Caspian Dr., Box 61419, Sunnyvale, CA 94086, Tel: 408-744-1450, TWX: 910-339-9304; Empl.: 90; *Sls. Mgr.:* R. D. Okada
3•1758

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns.	205-881-5031
AZ	Phoenix, Sigma	602-241-1334
AR	Little Rock, Beacon Elctrns.	501-224-5449
CA	Los Angeles, Amasco	213-516-8561
CA	San Francisco, Amasco	408-733-8690
CO	Denver, F.G. Mktg.	303-795-9176
DC	Washington, Gans & Pugh	703-527-3262
FL	Melbourne, Beacon Elctrns.	305-724-8010
GA	Atlanta, Beacon Elctrns.	404-256-9640
HI	Honolulu, Aloha Assoc.	808-941-1574
L	Chicago, John Kennaugh & Assoc.	312-980-2570
N	Indianapolis, SAI Mktg.	317-241-9276
KS	Shawnee Mission, Midtec	913-441-6565
MD	Baltimore, Gans & Pugh	703-527-3262
MA	Boston, Intersell	617-273-3844
MI	Detroit, SAI Mktg.	313-227-1786
MN	Minneapolis, R-J Inc.	612-866-3661
MO	St. Louis, Midtec	314-837-5200
NM	Albuquerque, Sigma	602-241-1334
NY	Mt Vernon, Sonkin Assoc.	914-668-9809
NY	Utica, B. D. Hummel Co.	315-736-7821
NC	Raleigh, Beacon Elctrns.	919-787-9330
OH	Cleveland, SAI Mktg.	216-751-3633
OH	Columbus, SAI Mktg.	614-454-8942
OH	Dayton, SAI Mktg.	513-435-3181
OK	Tulsa, Cunningham Components Corps.	918-492-0390
PA	Philadelphia, Gans & Pugh	703-527-3262
TX	Dallas, Cunningham Comps. Corp.	214-233-4303
TX	Houston, Cunningham Comps. Corp.	713-461-4197
WA	Seattle, Huntley Assocs.	206-353-1833

ROBBINS & MEYERS, INC., Motor & Control Sys. Div., Rte. 4, Bob McCormick Rd., Gallipolis, OH 45631, Tel: 614-446-9868, Telex: 205-427
1B•1175

ROBERT BOSCH CORP., See Bosch, Robert, Corp.

ROBINSON-HALPERN, One Apollo Rd., P.O. Box 248, Plymouth Meeting, PA 19462-0248, Tel: 215-825-9200, TWX: 510-660-8637; Empl.: 65; *Sls. Mgr.:* J. Lanza

ROBINSON-NUGENT, INC., 800 East 8th St., New Albany, IN 47150, Tel: 812-945-0211, TWX: 810-540-4082; Empl.: 567; *Sls. Mgr.:* Hap Taylor
2•1552-1555

Local Sales Offices & Reps

AL	Huntsville, Electronic Mktg.	205-837-7363
AZ	Phoenix, Stitzer Dodd	602-944-2237
CA	El Monte, Cook Ent.	213-686-2120
CA	San Diego, Cook Entprs.	619-584-0936
CA	Santa Clara, Logan Sls.	408-496-0660
CO	Denver, W. J. Purdy	303-777-1411
FL	Boca Raton, Conley Assoc.	305-395-6108
FL	Oviedo, Conley Assoc.	305-365-3283
FL	Tampa, Conley Assoc.	813-885-7658
GA	Atlanta, Elctrn. Mktg.	404-448-1215
IL	Park Ridge, Metcom	312-696-1490
IN	Indianapolis, Mktg. Engrs.	317-872-5665
IA	Cedar Rapids, PMR Corp.	319-362-9177
KS	Overland Park, PMR Corp.	913-381-0004
KS	Wichita, PMR Corp.	316-684-4141
MA	Lexington, John E. Boeing Co.	617-862-2500
MN	Minneapolis, Professional Sls. for Ind.	612-944-8545
MS	Jackson, Welch and Doby	601-932-5534
MO	Maryland Heights, PMR Corp.	314-569-1220
NM	Albuquerque, W. J. Purdy	505-266-7959
NY	Manhasset, Win-Cor	516-627-9474
NY	Rochester, Canavan-Scanlon	716-424-1830
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Raleigh, Elect. Mktg.	919-847-8800
OH	Beachwood, Electronic Salesmasters	216-831-9555
OR	Silverton, Vantage Corp.	503-873-5090
PA	Broomall, L. D. Lowery	215-356-5300
SC	Greenville, Elect. Mktg.	803-233-4637
TX	Austin, Space Elctrns.	512-451-3173
TX	Houston, Space	713-266-9245
TX	Irving, Space	214-251-3636
UT	Salt Lake City, William J. Purdy Co.	801-486-8557
VA	Charlottesville, L. D. Lowery	804-973-6672
WA	Seattle, Vantage Corp.	206-455-3460
WI	West Allis, Metcom Assocs.	414-476-1300

Local Distributors

AL	Huntsville, Schweber Elctrns.	205-882-2200
AL	Huntsville, RM Elctrns. Co.	205-852-1550
AZ	Phoenix, Schweber Elctrns.	602-997-4874
AZ	Phoenix, Cetec	602-272-7951
AZ	Tempe, Bell Inds.	602-267-7774
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Buena Park, RPS Elctrns.	714-521-5230
CA	Canoga Park, Schweber Elctrns.	213-999-4702
CA	Chatsworth, Diplomat Elctrns.	314-700-8700
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Fullerton, Pyramid Elctrns.	714-773-0781
CA	Irvine, Schweber Elctrns.	714-556-3880
CA	Irvine, Cetec Elctrns.	714-250-4141
CA	Manhattan Beach, Prime Electro	213-379-3642
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Sacramento, Schweber Elctrns.	916-929-9732
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, Sigma Elctrn.	619-565-2000
CA	San Diego, Cetec	619-278-5020
CA	San Jose, Anthem Elctrns.	408-946-8000
CA	San Jose, Cetec	408-263-7373
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santa Clara, Schweber Elctrns.	408-748-4700
CA	South Gate, Cetec	213-773-6521
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CA	Sunnyvale, Acacia Sls.	408-745-7200
CO	Denver, Ragon Elctrn. Parts	303-744-3601
CO	Englewood, Diplomat Elctrns.	303-799-8300
CO	Lakewood, Acacia Sls.	303-232-2882
CT	Danbury, Diplomat Elctrns.	203-797-9674
CT	Danbury, Schweber Elctrns.	203-792-3500
CT	Hamden, ALmo Elctrns.	203-288-6556
FL	Altamonte Springs, Schweber Elctrns.	305-331-7555
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Hollywood, Schweber Elctrns.	305-927-0511
FL	Orlando, Hammond Elec.	305-849-6060
GA	Norcross, Diplomat Elctrns.	404-449-4133
GA	Norcross, Schweber Elctrns.	404-449-9170
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Chicago, Nep Elctrns.	312-625-8400
IL	Elk Grove Village, Schweber Elctrns.	312-364-3750
IL	Lombard, RM Elctrns.	312-932-5150
IL	Northbrook, Classic Comps.	312-272-9650
IN	Evansville, Hutch & Son	812-425-7201
IN	Ft. Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, RM Elctrns. Co.	317-247-9701
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Schweber Elctrns.	319-373-1417
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
KS	Overland Park, Schweber Elctrns.	913-492-2922
KY	Louisville, P. I. Burks	502-589-3960
MD	Baltimore, Resco	301-823-0070
MD	Beltsville, Resco/Washington	301-937-9100
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Gaithersburg, Schweber Elctrns.	301-840-5900
MA	Bedford, Schweber Elctrns.	617-275-5100
MA	Canton, Almo Elctrns.	617-821-1450
MA	Westboro, Future Elctrns.	617-366-2400
MA	Woburn, Diplomat Elctrns.	617-366-2400
MI	Grand Rapids, R-M Michigan	616-531-9300
MI	Livonia, Schweber Elctrns.	313-525-8100
MI	Walled Lake, Ambur Elctrns.	313-669-3710
MN	Fridley, Voyager Elctrns.	612-571-7766
MN	Minneapolis, Schweber Elctrns.	612-941-5280
MO	Earth City, Schweber Elctrns.	314-739-0526
MO	Kansas City, LComp	816-221-2400
MO	Maryland Heights, LComp	314-291-6200
NE	Lincoln, Scott Elec.	402-466-8221
NE	Omaha, Scott Elctrns.	402-734-6750
NH	Hudson, C & H Elctrns.	603-882-1133
NH	Manchester, Schweber Elctrns.	603-625-2250
NJ	Fairfield, Schweber Elctrns.	201-227-7880
NJ	Totowa, Diplomat	201-785-1830
NM	Albuquerque, Bell Inds.	505-292-2700
NY	Bohemia, Car-Lac	516-567-4200
NY	Buffalo, Summit Dist.	716-887-2800
NY	Farmingdale, Harrison Elec.	516-293-7990
NY	Liverpool, Diplomat Elctrns.	315-652-5000
NY	Lynbrook, Peerless Radio Corp.	516-593-2121
NY	Melville, Diplomat Elctrns.	516-454-6400
NY	Mt. Vernon, QAR Elect.	914-699-2224
NY	Rochester, Schweber Elctrns.	716-424-2222
NY	Rochester, CAM/RPC Indl. Electrns.	716-865-2080
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Westbury, Schweber Elctrns.	516-334-7474
NC	Greensboro, Hammond Elec.	919-275-6391
NC	Raleigh, Schweber Elctrns.	919-876-0000
OH	Beachwood, Schweber Elctrns.	216-464-2970
OH	Cleveland, CAM/RPC Indl. Electrns.	216-461-4700
OH	Dayton, Stotts Friedman	513-298-5555
OH	Dayton, Schweber Elctrns.	513-439-1800
OH	Maumee, R S Elctrns.	419-893-0721
OK	Tulsa, Schweber Elctrns.	918-622-8000
OK	Tulsa, Connec-Tek	918-664-8812
OR	Beaverton, Acacia Sls.	503-646-3377
OR	Portland, Radar Elec.	503-232-3404
OR	Wilsonville, Zepher Inds.	503-682-2929
PA	Horsham, Schweber Elctrns.	215-441-0600
PA	Lancaster, CAM/RPC Indl. Electronics	717-392-8141
PA	McKean, Advacom	814-476-7774
PA	Philadelphia, Almo	215-698-4000
PA	Pittsburgh, CAM/PRC Indl. Elctrns.	412-782-3770
PA	Pittsburgh, Schweber Elctrns.	412-782-1600
SC	Columbia, Dixie Elctrn.	803-779-5332
SC	Greenville, Hammond Elec.	803-233-4121
TX	Addison, Connec-Tek	214-239-7552
TX	Austin, Schweber Elctrns.	512-458-8253
TX	Austin, Connec-Tek	512-835-0220
TX	Austin, Southwest	512-837-8971
TX	Dallas, RM Elctrns. Co.	214-263-8361
TX	Dallas, Schweber Elctrns.	214-661-5010
TX	Ft. Worth, Allied	817-336-5401
TX	Houston, Schweber Elctrns.	713-784-3600
TX	Houston, Powerline Prods.	713-578-3222
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, Fisher Brownell	214-235-3177
TX	Stafford, Southwest Elctrns.	713-491-4900
TX	Sugar Land, Connec/Tek	713-491-2255
UT	Salt Lake City, Bell Inds.	801-972-6969
UT	Salt Lake City, Diplomat-Alta	801-486-4134
VA	Charlottesville, Virginia Radio	804-296-4184
WA	Kent, Pyramid Elctrns.	206-872-5800
WA	Seattle, Zepher Elctrns.	206-241-1980
WA	Seattle, Radar Elec.	206-282-2511
WI	Brookfield, Schweber Elctrns.	414-784-9020
WI	New Berlin, RM Elctrns. Co.	414-784-4420
WI	New Berlin, Classic Comps. Supply	414-786-5300
WI	New Berlin, NEP Elctrns.	414-785-9100

ROBISON ELECTRONICS, INC.

ROBISON ELCTRNS., P.O. Box Y, San Luis Obispo, CA 93406, Tel: 805-544-8000; FSC No.: 19080; Empl.: 45 **2**•1870, 1887

ROCHESTER INSTR. SYS., 255 N. Union St., Rochester, NY 14605, Tel: 716-263-7700, Telex: 978457; Empl.: 330

ROCKBESTOS CO., P.O. Box 1102, New Haven, CT 06504, Tel: 203-772-2250

ROCKLAND INSULATED WIRE & CABLE, 87 Broadway, Haverstraw, NY 10927, Tel: 914-429-3103; FSC No.: 12111

ROCKLAND SYS. CORP., See Wavetek Rockland Inc.

ROCKWELL FILTER PRODS., 2990 Airway Ave., Costa Mesa, CA 92626, Tel: 714-540-7640, Telex: 685532; Empl.: 100; *Sls. Mgr.:* Lee Cornett

ROCKWELL INT'L., 4311 Jamboree Rd., Newport Beach, CA 92660, Tel: 800-854-8099, TWX: 910-591-1654; FSC No.: 34576; Empl.: 1995; *Sls. Mgr.:* K. MacDonald; *Dist. Mgr.:* K. Foster

ROCKWELL INTL., Commercial Elctrns. Opers., 1200 N. Alma Rd., Richardson, TX 75081, Tel: 214-996-5000, Telex: 73-307, 73-2490, TWX: 910-867-4709; Empl.: 15,000

RODALE ELCTRNS. CORP., 603 Chestnut St., Garden City, NY 11530, Tel: 516-222-0050, TWX: 510-222-0274; *Sls. Mgr.:* John B. Clement

RODELCO ELCTRNS. CORP., 356A Comac Rd., Deer Park, NY 11729, Tel: 516-643-5110; Empl.: 28

ROD-L ELECTRONICS, INC.

ROD-L ELECTRONICS, INC., 1098 Hamilton Ct., Menlo Park, CA 94025, Tel: 415-322-0711, TWX: 296210 .... 3•1292-1295

Local Sales Offices & Reps

AL	Huntsville, Sci. Svcs. SE	205-536-1969
AZ	Phoenix, Venturesearch	602-894-5216
CA	Carson, Amasco	213-516-8561
CA	Sunnyvale, Amasco	408-733-8690
CO	Conifer, Energy Equip. Sls.	303-674-8111
FL	Orlando, Sci. Dvcs. SE	305-841-8180
IL	Elk Grove, Loren Green Assocs.	312-593-0282
IN	Indianapolis, Loren Green Assocs.	317-293-9827
MD	Baltimore, Sci. Reps.	301-321-1411
MA	Reading, Scheinfein Assocs.	617-944-2304
MN	Minneapolis, Instrmn. Svcs. Inc.	612-544-8916
MO	Florissant, Web Elctrns.	314-921-5720
MO	Kansas City, Paloma Sls. Co.	816-358-7272
NJ	Fairfield, Addem Sls.	201-882-0993
NJ	Pennsauken, Sci. Reps.	609-662-5222
NY	De Witt, DB Assocs.	315-446-0220
NC	Winston-Salem, Sci. Dvcs.	919-765-5776
OH	Centerville, Micro Sls.	513-433-8171
OK	Tulsa, Spectra Sls.	919-633-7188
OR	Portland, Control Tek Sls. Limited	503-641-8180
TX	El Paso, Venturesearch	915-594-4094
TX	Houston, Spectra Sls.	713-747-2798
TX	Richardson, Spectra Sls.	214-234-3600
VA	Fairfax, Sci. Reps.	703-385-0600
WA	Spokane, Control Tek Sls. Ltd.	509-922-2971

ROEAN INDUSTRIES, INC., 12970 Branford, Ste. C, Pacoima, CA 91331, Tel: 818-767-7047, Telex: 758630 TGMC FTW; Empl.: 8

ROEDERSTEIN ELCTRNS., INC., P.O. Box 5588, Statesville, NC 28677, Tel: 704-872-8101

ROGAN, 3455 Woodhead Dr., Northbrook, IL 60062, Tel: 312-498-2300, TWX: 910-686-0008; Empl.: 100; *Sls. Mgr.:* D. Pelletier; *Dist. Mgr.:* D. Pelletier .... 2•1786

Local Sales Offices & Reps

AZ	Phoenix, O'Donnell Southwest	602-944-9542
CA	San Diego, O'Donnell Assocs.	619-578-1645
CA	San Jose, O'Donnell Assocs.	408-263-6500
CA	Torrance, O'Donnell Assocs.	213-539-9664
CO	Arvada, Challange Sls.	303-427-3149
IN	Fort Wayne, Aktron Corp.	219-747-3650
IA	Cedar Rapids, Dytronix	319-377-8275
MA	Westwood, Apex Assocs.	617-326-5042
MN	Minneapolis, R. W. Marshall	612-929-0457
MO	Bridgeton, Dytronix	314-731-5799
MO	Independence, Dytronix	816-373-6600
NJ	Pitman, Colrud Co.	609-589-5866
NY	Mount Vernon, Sonkin Assocs.	914-668-9809
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Portland, SD-R2 Prods. & Sls.	503-295-6779
PA	Pittsburgh, J. C. Hofstetter Co.	412-327-1410
TX	Dallas, W. Reese Assocs.	214-638-6575
TX	Houston, W. Reese Assocs.	713-621-3134
WA	Bellevue, SD-R2 Sls.	206-747-2483

Local Distributors

AL	Huntsville, Component Distrs.	205-883-7501
AR	Little Rock, Component Distrs.	501-227-6278
CA	Sunnyvale, Cazco Sls.	408-745-7221
CA	Torrance, Cazco Sls.	213-328-9710
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
IL	Northbrook, Classic Comps.	312-272-9650
IL	Rosemont, Advent Elctrns.	312-297-6200
IA	Cedar Rapids, Advent Elctrns.	319-363-0221
MA	Newton, Greene-Shaw Co.	617-969-8900
MI	Livonia, RS Elctrns.	313-525-1155
NJ	Bellmawr, Mid-Atlantic Elctrns.	609-931-5303
NJ	East Hanover, State Elctrns.	201-887-2550
NC	Raleigh, Component Distrs.	919-781-0177
OH	Medina, Electro-Supply	216-241-4880
TX	Austin, SW Elctrns.	512-837-8971
TX	Richardson, SW Elctrns.	214-234-3050
TX	Stafford, SW Elctrns.	713-494-6021
Can	Pointe Claire, Quebec, Future Elctrns.	514-694-7710

ROGERS CORP., Box 700, Chandler, AZ 85224, Tel: 602-963-4584, TWX: 910-950-1961; Empl.: 400; *Sls. Mgr.:* Paul Anderson

ROGERS CORP., One Technology Dr., Rogers, CT 06263, Tel: 203-774-9605, TWX: 710-448-0047; Empl.: 2500; *Sls. Mgr.:* Paul L. Anderson .... 2•1894

Local Sales Offices & Reps

AL	Huntsville, G. S. Jordan	205-881-7971
AZ	Scottsdale, H.R. Crowder	602-991-8908
AZ	Tempe, M. F. Iosue	602-839-5478
CA	Corona, R. A. Forester	714-734-5881
CA	Granada Hills, W. E. Pollock	213-368-0703
CA	Mission Viejo, A. C. Young	714-859-8028
CA	Palo Alto, R. A. Greenman	408-947-7797
CA	Poway, A.W. Riel	619-487-1065
CA	Redwood City, K. R. Sinisgalli	408-947-7797
CA	San Clemente, W. A. J. Waters	714-496-7305
CA	San Jose, R.H. Jackson	408-947-7797
CA	San Jose, W. J. Stolp	408-947-7797
CA	Van Nuys, D. Bergheimer	213-988-7138
CA	Westminster, D. Bergheimer	714-775-0179
CA	Woodland Hills, A. W. Riel	213-347-7435
CO	Littleton, G. B. Lange	303-795-3600
CT	Bristol, J. F. Witkewicz	203-583-4341
CT	Brooklyn, A. J. Boulia	203-774-0729
CT	Jewett City, G. R. Jessel	203-376-0276
CT	Norwich, G.R. Jessel	203-376-0276
FL	Melbourne Beach, P. R. Pratt	305-725-6105
GA	Roswell, J. N. Anderson	404-992-4307
IL	Chicago, R. E. Albright	312-798-5800
IL	Edwardsville, W. T. Davison	618-288-7786
IL	Hazel Crest, J. R. Menees	312-798-5800
KY	Prospect, G. A. Keibler	502-228-5792
MI	Garden City, L. J. Bradley	313-422-7150
MI	Rochester, Kent & Assocs.	313-651-1890
MN	Minneapolis, E. J. Sandor	612-330-3663
MN	Minneapolis, H. R. Crowder	612-574-7440
MN	Northfield, W. P. Kelly	507-663-1050
NH	Londonderry, W. J. Coyne	603-434-5358
NJ	Pitman, R. M. Neidig	609-582-1666
NJ	Springfield, S. D. Wellen	201-944-7777
NY	Endwell, T. H. Johnston	914-471-4707
NY	Rochester, R. C. Bangs	716-454-6520
NC	Cary, D. C. Reed	919-836-0415
OH	Shaker Hgts., E. R. Perme	216-283-5486
OH	Xenia, J. L. Forte	513-426-8993
PA	Downingtown, T. G. Sleasman	215-873-0180
PA	Hermitage, H. A. Harriman	412-983-3742
SC	Rock Hill, E. E. Wild	803-366-2952
TX	Carrollton, K. W. Norvell	214-446-1095
TX	Round Rock, B.D. Duke	512-244-3074
VA	Lynchburg, L.J. Rodrigue	804-384-9517
VA	Roanoke, J. L. Settles	703-774-8478
WA	Seattle, L. B. Keen	206-575-4175

R-OHM (EASTERN OPER.), 2303 W. Meadowview Rd. #3, Kingston Bldg., Greensboro, NC 27407, Tel: 919-855-0217

ROLM CORP., 1 River Oaks Pl., San Jose, CA 95134, Tel: 408-988-2900, TWX: 910-338-0247; FSC No.: 14345; Empl.: 6240; *Sls. Mgr.:* Dave Pidwell (MSC); R. Nugent (CBX); *Dist. Mgr.:* Ken Batorski (CBX)

ROLYN OPTICS CO., 738 Arrowgrand Cir., Covina, CA 91722-2199, Tel: 818-915-5707/5717, Telex: 67-0380

ROHM CORP., 8 Whatney, Irvine, CA 92714, Tel: 714-855-2131, TWX: 910-595-1721; Empl.: 100; *Sls. Mgr.:* Mike Hammel

ROME CABLE CORP., P.O. Box 71, Rome, NY 13440, Tel: 315-337-3000

RONOR SYSTEMS, 145 N. Plains Ind. Pk. Rd., Wallingford, CT 06492, Tel: 203-265-2110; Empl.: 12

RONTRON ENGINEERING, 25 Rose St., Branford, CT 06405, Tel: 203-488-5020

ROSE

ROSE ENCLOSURES SYS., INC., 12140 Parklawn Dr., Rockville, MD 20852, Tel: 301-984-1783, Telex: 908-107 Resi Rove; *Sls. Mgr.:* Richard Ramsey .... 2•1046

ROSEMONT-NASHVILLE, INC., See Chromalox Instrs. & Controls

ROSS ENGRG. CORP., 559 Westchester Dr., Campbell, CA 95008, Tel: 408-377-4621, TWX: 910-590-8033; FSC No.: 23598; Empl.: 45; *Sls. Mgr.:* Hugh C. Ross .... 1B•1472

Local Sales Offices & Reps

CA	Mountain View, Energy Devices	415-969-0330

ROSTONE CORP., P.O. Box 7497, Lafayette, IN 47903, Tel: 317-474-2421, TWX: 810-342-1887; Empl.: 600

ROTEK INSTR. CORP., 390 Main St., Waltham, MA 02254, Tel: 617-899-4611; *Sls. Mgr.:* Eliot Warner

Local Sales Offices & Reps

AL	Huntsville, Kemp Instrs.	205-837-4304
CA	Calabasas, Max Shovlowsky	805-498-6547
CA	Cupertino, Patterson Control Sys.	408-973-1050
CT	Mount Carmel, Sci. Dev.	203-248-9361
FL	Palm Harbor, Teqspec	813-785-2276
IL	La Grange, PVA Co.	312-579-9300
KS	Wichita, Aero Hill Sls.	316-682-2052
MA	Waltham, Sci. Dev.	617-890-2252
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NJ	Parlin, JMR Sls.	201-727-5335
NY	Rochester, Sci. Dev.	716-334-2445
NC	Winston-Salem, Radco	919-722-9671
PA	Philadelphia, Techn. Instr. Sls.	215-836-2222
PA	Pittsburgh, Meas. Instr. East	412-459-8090
TX	Dallas, True Techn.	214-691-7870
VA	McLean, Sci. Dev. DC	703-893-6513
WA	Seattle, Eicher Richards	206-523-7888

ROTRON, INC., See EG & G Rotron

ROWE INDUSTRIES, INC., 6225 Benore Rd., P.O. Box 6877, Toledo, OH 43612, Tel: 419-729-9761, TWX: 810-442-1734; FSC No.: 82878; Empl.: 85; *Sls. Mgr.:* D. L. Mang; *Dist. Mgr.:* D. L. Mang .... 2•1556-1558, 2143

Local Sales Offices & Reps

AZ	Chandler, Blackhart Assocs.	602-831-2566
CA	San Jose, V. C. Robinson	415-969-4831
CT	Wethersfield, Underwood Sls.	203-563-3046
FL	Fern Park, EIR, Inc.	305-830-9600
KS	Leawood, Thunderbird	913-642-7220
KS	Wichita, Thunderbird	316-684-3941
MD	Baltimore, R. A. Wafer Assocs.	301-744-1133
MA	Burlington, Don C. Richard	617-272-1595
MA	Lowell, Underwood Sls.	617-256-8191
MI	Holland, Com-Tek Sls.	616-399-5719
MN	Hopkins, KITS Co.	612-933-1888
MO	Maryland, Thunderbird	314-567-6488
NJ	Haddonfield, Mills-Brown Assocs.	609-429-1005
NJ	Middletown, Astrorep	201-826-8050
NJ	Perth Amboy, Astrorep	201-826-8050
NM	Albuquerque, Ron-tek	505-299-4124
NY	Babylon, Astrorep	516-422-2500
NY	Farmingdale, Astrorep	201-624-4408
NC	Charlotte, Dula Assocs.	704-334-7090
NC	Winston-Salem, Dula Assocs.	919-768-7166
OH	Beachwood, RC Assocs.	216-292-4954
OH	Cuyahoga Falls, Lee Tronics	216-928-8584
TX	Richardson, Thunderbird	214-690-0763

RTE AEROVOX INC., P.O. Box B-970, 740 Belleville Ave., New Bedford, MA 02741, Tel: 617-994-9661, TWX: 710-344-6985; FSC No.: 4K459; Empl.: 700; *Sls. Mgr.:* Jack Chmura; *Dist. Mgr.:* Matthew Simon .... 1A•1619-1621

RTE DELTEC CORP., 2727 Kurtz St., San Diego, CA 92110, Tel: 619-291-4211, TWX: 910-335-1246; FSC No.: 52297; Empl.: 200; *Sls. Mgr.:* John J. Waterman .... 3•1907

Local Sales Offices & Reps

AL	Huntsville, FM Assocs., Ltd.	205-882-0689
AK	Soldotna, Air Tek	907-262-5937
AZ	Scottsdale, Barnhill Assocs.	602-947-7841
CA	Los Altos, Jay Stone & Assocs.	415-948-4563
CO	Englewood, Barnhill Assocs.	303-779-3600
CT	Avon, Power Mark	203-678-0123
FL	Jupiter, FM Assocs., Ltd.	305-746-2996
FL	Orlando, FM Assocs., Ltd.	305-851-5710
GA	Atlanta, FM Assocs., Ltd.	404-451-2293
HI	Honolulu, EMC	808-836-1138
IL	Chicago, PoweReP, Inc.	312-641-3321
IN	Indianapolis, Tech Sls. & Mktg.	317-849-6612
IA	W. Des Moines, Data Power Technlg. Corp.	515-255-6113
KS	Lenexa, Engineered Equip. Co.	913-492-9221
LA	Baton Rouge, Barnhill Assocs.	504-924-6826
MN	Golden Valley, JR Assocs.	612-546-4110
MO	St. Louis, Applied Power Sys.	314-383-5858
NE	Omaha, Data Power Technlg. Corp.	402-592-7860
NJ	Lodi, SDM Reps.	201-368-0125
NJ	Pennsauken, Scientific Reps.	609-662-5222
NM	Albuquerque, Barnhill Assocs.	505-299-7658
NY	Rochester, SDM Reps.	716-247-8770
NC	Ramseur, FM Assocs., Ltd.	919-824-2196
OH	Cleveland, Instrumentation Sys.	216-845-8800
OH	Dayton, Instrumentation Sys.	513-294-2838
PA	Pittsburgh, Instrumentation Sys.	412-243-1111
TX	Austin, Barnhill Assocs.	512-451-0217
TX	Houston, Barnhill Assocs.	713-688-9971

TX	Richardson, Barnhill Assocs.	214-231-2573
UT	Murray, Barnhill Assocs.	801-262-3000
VA	McLean, Creative Mktg. Assocs., Ltd.	703-442-9100
WA	Seattle, F/M Sales Co.	206-628-9620
WI	Milwaukee, PoweReP	414-272-4684
EXP	CA, San Diego, RTE Deltec Corp.	619-291-4211

Local Distributors

AL	Huntsville, RTS Distributing	205-882-0689
AZ	Scottsdale, Beta Distrs.	602-947-7841
CO	Englewood, Beta Distrs.	303-779-4494
CT	Ridgefield, Data Set Cable Co.	203-438-9684
FL	Fort Lauderdale, Nabra Entprs.	305-584-9105
FL	Jupiter, RTS Distributing	305-746-2996
FL	Orlando, RTS Distributing	305-851-5710
GA	Atlanta, RTS Distributing	404-451-2293
HI	Honolulu, EMC Assocs.	808-836-1138
LA	Baton Rouge, Beta Distrs.	504-924-6826
NV	Las Vegas, Data Set Cable Co.	702-382-6777
NJ	Lodi, SSI Distribution	201-368-1025
NM	Albuquerque, Beta Distrs.	505-299-7658
NY	Rochester, SSI Distribution	716-247-8770
NC	Ramseur, RTS Distributing	919-824-2196
TX	Austin, Beta Distrs.	512-452-0199
TX	Houston, Beta Distrs.	713-688-9971
TX	Richardson, Beta Distrs.	214-231-2573
UT	Murray, Beta Distrs.	801-262-3000

RTE POWER/MATE, See Power/Mate Co.

RTRON CORP., 7324 Lawndale, Skokie, IL 60076, Tel: 312-679-7180, TWX: 910-223-0810; FSC No.: 19130; *Sls. Mgr.:* R. McLean

Local Sales Offices & Reps

AZ	Tucson, J.J. Riley & Assocs.	602-888-4627
CA	Redondo Beach, J.J. Riley & Assocs.	213-374-3468
CT	Washington, Tri-Com	205-563-2241
MA	Burlington, Tri-Com	617-272-8163
MI	Detroit, R.P. Urban & Assoc.	313-535-2355
MI	Grand Rapids, R.P. Urban & Assoc.	616-245-0511
MN	Brooklyn Center, Northwest Savespro	612-566-0196
NJ	Plainfield, S. Glassman Assoc.	201-561-3866
NY	Glen Cove, S. Glassman Assoc.	516-676-1039
OH	Cincinnati, J. Olsen Co.	513-451-5995
OH	Cleveland, J. Olsen Co.	216-662-3454
OR	Aloha, Elctrnc. Comp. Sls.	503-245-2342
PA	Jenkintown, Arnold Assoc.	215-PI 2-0600
PA	Pittsburgh, J. Olsen Co.	412-279-2550
WA	Mercer Island, Elctrn. Comp. Sls.	206-232-9301

RTS SYSTEMS, INC., Compact Video, Inc., 1100 W. Chestnut St., Burbank, CA 91506, Tel: 818-843-7022, Telex: 194855, TWX: 910-498-4987; Empl.: 40; *Sls. Mgr.:* Bob Tourkow ....3•1066

Local Sales Offices & Reps

AL	Birmingham, Sonics Assocs.	205-942-9631
AL	Birmingham, Gray Comms. Conslt.	205-942-2824
AL	Cropwell, Broadcast Sys.	205-525-5467
AL	Huntsville, Central Dynamics Corp.	205-837-5180
AL	Mobile, Gray Comms. Conslt.	205-343-0662
AK	Anchorage, N V S Sys.	907-349-3523
AZ	Cottonwood, R I A Corp.	602-634-8065
AZ	Phoenix, Siboney Communications Inc. (SCI)	602-252-5992
AZ	Tucson, SCI	602-881-5432
CA	Berkeley, Curtis M. Karplus, Esq.	415-642-1942
CA	Burbank, H N E Inc.	213-508-7543
CA	Burbank, Tri Tronics	213-843-2170
CA	City of Industry, SCI	213-965-2281
CA	El Monte, Cetec Vega	213-442-0782
CA	Encino, Everything Audio	213-995-4175
CA	Glendale, Paramount Sound Sys. Corp.	213-956-3222
CA	Inglewood, Audio Visual Hdqtrs. Corp.	213-419-4040
CA	Lawndale, Omega Video	213-679-9021
CA	Long Beach, K T Elctrns.	213-424-0979
CA	Los Angeles, Acromedia Corp.	213-410-4141
CA	Los Angeles, Tourkow & Co.	213-664-8884
CA	Los Angeles, Shoreline Ltd.	213-851-1236
CA	Los Angeles, Hollywood Sound Sys.	213-466-2416
CA	Los Angeles, Skaggs Video Los Angeles	213-556-2133
CA	N. Hollywood, Audio Svcs. Corp.	213-980-9891
CA	N. Hollywood, Doc Siegel Audio	213-877-2300
CA	N. Hollywood, Best Audio	213-763-2378
CA	N. Hollywood, Theatre Vision	213-769-0928
CA	Newbury Park, Westlake Audio	213-655-0303
CA	Nipomo, Broadcast Sys.	805-929-4476
CA	Pasadena, Audio Engrg. Assocs.	213-798-9127
CA	San Diego, Skaggs Video San Diego	619-578-9640
CA	San Diego, SCI	714-578-7777
CA	San Diego, Pacific Recorders & Eng. Corp.	619-453-3255
CA	San Diego, Centro Corp.	619-560-1578
CA	San Francisco, Sound Genesis	415-285-8900
CA	Santa Clara, Video Comms. Corp.	408-988-2968
CA	Sun Valley, Burns Audio	213-768-1701
CA	Sunnyvale, Video Media	408-733-6500
CA	Walnut, Video Comms. Corp.	714-594-2442
CO	Denver, Film/Video Equip. Svc.	303-778-8616
CO	Denver, R I A Corp.	303-320-5521
CO	Englewood, Skaggs Video Denver	303-740-9031
CT	Shelton, Anton Bauer	203-929-1100
FL	Gainesville, Gray Comms. Conslt.	904-376-2435
FL	Miami, Hubbard Comms.	305-594-0744
FL	Miami, Midwest Corp.	305-592-5355
FL	Miami, Gray Comms. Conslt.	305-591-3637
FL	Orlando, Gray Comms. Conslt.	305-896-7414
FL	St. Petersburg, Hubbard Comms.	813-577-7759
FL	Tampa, SCI	813-985-4687
FL	Tampa, Gray Comms. Conslt.	813-885-1411
GA	Albany, Gray Comms. Conslt.	912-883-2121
GA	Doraville/Atlanta, Gray Comms. Conslt.	404-455-3121
GA	Norcross, SCI	404-441-3300
GA	Norcross/Atlanta, Tech. Video Sys.	404-447-6621
GA	Union City/Atlanta, Allied Broadcast Equip.	404-964-1464
IL	Chicago, Allied Broadcast Equip.	312-794-0224
IL	Elk Grove Vlg., Swiderski Elctrns.	312-364-1900
IL	Harvey, Bridgewater Custom Sound	312-596-0309
IL	Morton Grove, Roscor Corp.	312-539-7700
IL	Quincy, Harris Corp.	217-222-8200
IN	Evansville, Kavco	812-476-6327
IN	Indianapolis, Kavco	317-251-0800
IN	Indianapolis, R C A Corp.	317-273-3547
IN	Indianapolis, Midwest Corp.	317-251-5750
IN	Richmond, Allied Broadcast Equip.	317-962-8596
IA	Davenport, Video Midwest	319-322-1525
IA	Des Moines, Video Midwest	515-244-1447
KY	Edgewood, Midwest Corp.	800-543-1584
KY	Lexington, Midwest Corp.	606-277-4994
KY	Louisville, Midwest Corp.	502-491-2888
LA	Harahan/New Orleans, Gray Comms. Conslt.	504-733-7265
MD	Bethesda, Professional Prods.	301-657-2141
MD	Lanham, Midwest Corp.	301-577-4903
MD	Rockville, Peirce Phelps Inc.	301-984-7979
MA	Boston, Professional Recording & Sound	617-254-2110
MA	Framingham, Landy Assocs.	617-877-9570
MA	Needham Hgts., Capron Lighting & Sound Co.	617-444-8850
MA	Newton, Lake Sys. Corp.	617-244-6881
MI	Ann Arbor, Hy James Audio Professionals	313-994-0934
MI	Oak Park, Midwest Corp.	313-399-6361
MI	Troy/Detroit, Midwest Corp.	313-689-9730
MN	Burnsville, Emmons Assocs.	612-890-8920
MN	Minneapolis, Video Midwest	612-831-2248
MN	Minneapolis, Todd Comms.	612-941-0556
MS	Bay St. Louis, Harris Corp. S. Central Reg.	601-255-3337
MO	Chesterfield, Television Engrg. Corp.	314-532-4700
MO	El Dorado Springs, Broadcast Sys.	417-876-6254
MO	St. Louis, Antech Labs	314-997-5666
NE	Omaha, Todd Comms.	402-341-7600
NV	Las Vegas, Western Media Entprs.	702-873-2014
NV	Las Vegas, Acromedia Corp. Las Vegas	702-362-7552
NJ	Atlantic City, Telemeasurements	609-345-2670
NJ	Cherry Hill, Landy Assocs.	609-424-4660
NJ	Clifton, Telemeasurements	201-473-8822
NJ	Mahwah, Philips Television Sys.	201-529-1550
NJ	Mountain Lakes, Turner Engrg.	201-263-0023
NJ	Northvale, A F Assocs.	201-767-1000
NM	Albuquerque, SCI	505-884-6858
NM	Los Lunas, Dyma Engrg.	505-865-6700
NY	New York, Martin Audio/Video Corp.	212-541-5900
NY	New York, Westec Audio Video	212-586-1662
NY	New York, Tech. Video Sys.	212-580-3104
NY	New York, M P C S Video Inds.	212-586-3690
NY	New York, Adcom Comms.	212-265-1760
NY	New York, Camera Mart	212-757-6977
NC	Charlotte, Reliable Music	704-375-8662
NC	Charlotte, Midwest Corp.	704-399-6336
NC	RTP, Broadcast Sys.	919-851-1956
NC	Raleigh, Southeastern Sight & Sound	919-828-2311
NC	Winston-Salem, Tech. Video Sys.	919-748-0916
OH	Cleveland, Midwest Corp.	216-447-9745
OH	Columbus, Midwest Corp.	614-476-2800
OH	Columbus, Kavco	614-274-0180
OH	Dayton, Kavco	513-898-2003
OH	Dayton, Midwest Corp.	513-275-3339
OH	N. Royalton, Kavco	216-237-1950
OH	Parma Hgts., Reddish Sound	216-885-1222
OK	Claremore, R I A Corp.	918-341-9066
OK	Tulsa, M Z B & Assocs.	918-743-2661
OR	Portland, Baldwin Mktg. Co.	503-234-1359
PA	Allentown, Daveland Co.	215-439-8701
PA	Carnegie, Alpha Video & Elctrns.	412-923-2070
PA	Gibsonia, Midwest Corp.	412-443-6720
PA	King of Prussia, Maris Equip. Corp.	215-275-9300
PA	Philadelphia, Peirce Phelps Inc.	215-879-7205
PA	Philadelphia, Lerro Elctrl. Corp.	215-223-8200
PA	Pittsburgh, R P C Elctrns.	412-782-3770
TN	Knoxville, Gray Comms. Conslt.	615-523-3107
TN	Nashville, Gray Comms. Conslt.	615-883-9175
TN	Nashville, Consolidated Media Sys.	615-244-3933
TX	Amarillo, Magnetic Media Corp.	806-358-2468
TX	Arlington, Midcom	817-640-4573
TX	Austin, SCI	512-454-7194
TX	Austin, M Z B & Assocs.	512-837-7240
TX	Austin, Magnetic Media Corp.	512-451-0138
TX	Austin, Broadcast Sys.	512-836-6014
TX	Corpus Christi, SCI	512-883-6688
TX	Dallas, Video Sys.	214-349-0951
TX	Dallas, Magnetic Media Corp.	214-931-0404
TX	Dallas, M Z B & Assocs.	214-233-5535
TX	El Paso, SCI	915-598-8538
TX	Houston, L D Systems	713-695-9400
TX	Houston, M Z B & Assocs.	713-448-0881
TX	Houston, SCI	713-686-9685
TX	Houston, Magnetic Media Corp.	713-771-9125
TX	Houston, Video Sys.	713-686-9651
TX	Irving, SCI	214-258-8470
TX	Lubbock, Video Sys.	806-792-2325
TX	Madison, SCI	615-865-1980
TX	Plano, Allied Broadcast Equip.	214-423-8667
TX	Plano, Broadcast Sys.	214-867-8775
TX	San Antonio, Video Sys.	512-824-2311
UT	Salt Lake City, R I A Corp.	801-486-8822
UT	Salt Lake City, Skaggs Video Sls.	801-539-1420
UT	Salt Lake City, Skaggs Telecom Svc.	801-539-1420
VA	Richmond, Professional Prods.	804-794-2585
VA	Virginia Beach, Midwest Corp.	804-464-6256
VA	Woodbridge, Broadcast Sys.	703-494-4998
WA	Federal Way, Allied Broadcast Equip.	206-927-4337
WV	Charleston, Midwest Corp. Corporate H/Q	304-343-8874
WV	Nitro/Charleston, Midwest Corp.	304-722-2921
WI	Madison, Full Compass Sys.	608-271-1100

RUSH/HOUSTON, INC., 600 Kealrick, Ste C-40, Houston, TX 77060, Tel: 713-682-5151; *Sls. Mgr.:* Fred Murphy

RUSSELL INDS., 3000 Lawson Blvd., Oceanside, NY 11572, Tel: 516-536-5000; Empl.: 20; *Sls. Mgr.:* H. Russell

RUTHERFORD RESCH. PRODS., Box 249, Rutherford, NJ 07070, Tel: 201-933-2091; Empl.: 4; *Sls. Mgr.:* Dr. A. Blanck; *Dist. Mgr.:* Dr. A. Blanck

RYAN INTL. CORP., 4800 Evanswood Dr., Columbus, OH 43229, Tel: 614-885-3303; Empl.: 26 ....3•1219

RYE INDS., INC., 125 Spencer Pl., P.O. Box M, Mamaroneck, NY 10543, Tel: 914-698-0080; Empl.: 50

SABRE COMMS. CORP., 117 Main St., Soiux City, IA 51102, Tel: 712-258-6690; FSC No.: 60348; *Sls. Mgr.:* Bailey Aalfs; *Dist. Mgr.:* Richard Krone

Local Sales Offices & Reps

FL	Coral Springs, SECOM Sys.	305-753-6777
GA	Chamblee, SECOM Sys.	404-455-0672
NC	Kings Mountain, SECOM Sys.	704-739-9297
TN	Bloomington Springs, SECOM Sys.	615-653-4363

Local Distributors

FL	Coral Springs, SECOM Sys.	305-753-6777
GA	Chamblee, SECOM Sys.	404-455-0672
NC	Kings Mountain, SECOM Sys.	704-739-9297
TN	Bloomington Springs, SECOM Sys.	615-653-4363

SABRITEC, 16631 Noyes Ave., Irvine, CA 92714, Tel: 714-549-7350, Telex: 678401; *Sls. Mgr.:* M. J. Bennett

SAFEWAY PRODUCTS, 440 Middlefield St., Middletown, CT 06457, Tel: 203-346-6601, TWX: 710-428-7225; Empl.: 241

SAFT AMERICA INC., Box 1886, Valdosta, GA 31601, Tel: 912-247-2331, Telex: 547620, TWX: 810-786-5866

SAFT AMERICA INC., Advanced Battery Sys. Div., 107 Beaver Ct., Cockeysville, MD 21030, Tel: 301-666-3200

SAFT AMERICA INC., Elctrn. Sys. Div., 2414 W. 14th St., Tempe, AZ 85281, Tel: 602-894-6864

SAFT

SAFT AMERICA INC., Power Sources Div., 711 Industrial Blvd., Valdosta, GA 31601, Tel: 912-247-2331, Telex: 547-620; Empl.: 1300; *Sls. Mgr.:* R. Bartmes ....3•1398, 1424-1429

Local Sales Offices & Reps

CA	Chatsworth	818-998-0626
CO	Denver	303-740-7781
FL	Orlando	305-282-2245
IL	Chicago	312-991-6396
MA	Quincy	617-773-7980
MN	Minneapolis	612-770-0082
NC	Winston-Salem	919-765-6690
OH	Columbus	216-861-1877
PA	Philadelphia	215-831-9520
TX	Dallas	214-436-0757
VT	Rutland	802-773-8748

Local Distributors

AL	Montgomery, Aviall	205-284-3001
AK	Anchorage, Standard Aero Ltd.	907-349-9655
AK	Anchorage, Aviall	907-248-4624
AK	Anchorage, Van Dusen Aircraft Supp.	907-561-1644
AZ	Phoenix, Aviall	602-275-4434
AZ	Phoenix, Van Dusen Aircraft Supp.	602-275-4493
AZ	Phoenix, Standard Aero Ltd.	602-273-7451
AR	Little Rock, Aviall	501-376-0379
CA	Burbank, Aero Quality Sls.	818-841-6163
CA	El Cajon, Aviall	619-448-2885
CA	Fresno, Van Dusen Aircraft Supp.	209-292-2222
CA	Long Beach, Standard Aero Ltd.	213-421-8431
CA	S. San Francisco, Van Dusen Aircraft Supp.	415-589-3133
CA	San Jose, Standard Aero Ltd.	408-926-2505
CA	San Leandro, Aviall	415-638-8736
CA	Van Nuys, Van Dusen Aircraft Supp.	818-988-7308
CA	Van Nuys, Aviall	818-997-0242
CO	Broomfield, Aviall	303-457-2461
CO	Denver, Van Dusen Aircraft Supp.	303-393-0813
FL	Hollywood, Aviall	305-925-8330
FL	Miami, Aero Quality Sls.	305-592-5055
FL	Miami Springs, Van Dusen Aircraft Supp.	305-885-3481
FL	Orlando, Aviall	305-277-2191
GA	Atlanta, Van Dusen Aircraft Supp.	404-766-8334
GA	College Park, Aviall	404-997-3935
HI	Honolulu, Van Dusen Aircraft Supp.	808-833-0061
HI	Honolulu, Standard Aero Ltd.	808-833-2447
ID	Boise, Van Dusen Aircraft Supp.	208-384-0030
IL	Elk Grove Village, Van Dusen Aircraft Supp.	312-437-5230
IL	Wheeling, Aviall	312-541-7040
KS	Kansas City, Van Dusen Aircraft Supp.	913-321-4200
KS	Overland Park, Aviall	913-341-2999
KS	Wichita, Van Dusen Aircraft Supp.	316-943-2418
LA	Lafayette, Aviall	318-233-8930
LA	Lafayette, Standard Aero Ltd.	318-269-1111
LA	New Orleans, Van Dusen Aircraft Supp.	504-246-3166
MA	East Boston, Van Dusen Aircraft Supp.	617-567-3000
MA	Stow, Aviall	617-897-3400
MI	Pontiac, Van Dusen Aircraft Supp.	313-666-2240
MI	Romulus, Aviall	313-946-9110
MI	St. Clair Shores, Aero Quality Sls.	313-772-7810
MN	Edina, Van Dusen Aircraft Supp.	612-835-6988
MN	Minneapolis, Standard Aero Ltd.	612-835-9250
MN	Minneapolis, Aviall	612-884-4441
MS	Southaven, Van Dusen Aircraft Supp.	601-393-5500
MO	Chesterfield, Aviall	314-532-3458
MO	Kansas City, Standard Aero Ltd.	816-842-3903
MO	St. Louis, Van Dusen Aircraft Supp.	314-731-1700
MT	Billings, Van Dusen Aircraft Supp.	406-245-2309
NE	Lincoln, Van Dusen Aircraft Supp.	402-474-3512
NV	Las Vegas, Van Dusen Aircraft Supp.	702-739-9322
NJ	Lyndhurst, Aero Quality Sls.	201-288-5510
NJ	Teterboro, Van Dusen Aircraft Supp.	201-288-1500
NY	Bohemia, Aviall	516-567-2002
OH	Cincinnati, Aviall	513-871-6623
OH	Cleveland, Van Dusen Aircraft Supp.	216-473-6711
OH	Vandalia, Van Dusen Aircraft Supp.	513-898-4672
OK	Bethany, Aviall	405-787-4630
OK	Oklahoma City, Van Dusen Aircraft Supp.	405-682-4496
OK	Tulsa, Aviall	918-838-3316
OR	Fairview, Aviall	503-667-5068
PA	New Cumberland, Van Dusen Aircraft Supp.	717-774-3511
PA	Philadelphia, Aviall	215-677-9700
PA	Pittsburgh, Aviall	412-664-4440
TN	Mt. Juliet, Van Dusen Aircraft Supp.	615-754-7700; 800-251-5775
TN	Nashville, Aviall	615-833-7431
TX	Addison, Aviall	214-458-0525
TX	Dallas, Van Dusen Aircraft Supp.	214-352-2611
TX	Dallas, Aviall	214-688-0811
TX	Dallas, Standard Aero Ltd.	214-931-7480
TX	Dallas, Aero Quality Sls.	214-350-8881
TX	Ft. Worth, Aviall	817-626-3795
TX	Houston, Aviall	713-645-3376
TX	Houston, Aero Quality Sls.	713-943-3906
TX	Houston, Van Dusen Aircraft Supp.	713-643-8566
TX	Midland, Van Dusen Aircraft Supp.	915-563-0907
TX	San Antonio, Aviall	512-340-3938
UT	Salt Lake City, Aviall	801-355-2717
UT	Salt Lake City, Van Dusen Aircraft Supp.	801-532-5194
VA	Richmond, Van Dusen Aircraft Supp.	804-222-7287
WA	Bellevue, Standard Aero Ltd.	206-643-4220
WA	Seattle, Standard Aero Ltd.	206-762-0550
WA	Seattle, Aviall	206-763-1350
WA	Seattle, Van Dusen Aircraft Supp.	206-763-1544

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SAGE LABORATORIES, INC., 3 Huron Dr., Natick, MA 01778, Tel: 617-653-0844, TWX: 710-346-0390; FSC No.: 07180; *Sls. Mgr.:* Tony Cieri

SAI TECHNLG. CO., Science Applications Inc., 4060 Sorrento Valley Blvd., San Diego, CA 92121, Tel: 619-452-9150, TWX: 756769; FSC No.: 54779; Empl.: 300

SAMARIUS, INC., 300 Seymour Ave., P.O. Box 377, Derby, CT 06418, Tel: 203-735-7405, TWX: 710-451-2495; FSC No.: 18065; Empl.: 90 ....**1A**•2053

SAMTEC, 810 Progress Blvd., P.O. Box 1147, New Albany, IN 47150, Tel: 812-944-6733, TWX: 810-540-4095; FSC No.: 55322; Empl.: 50; *Sls. Mgr.:* B. Shine; *Dist. Mgr.:* C. Roll

S & EI MFG., Box 832, Northridge, CA 91324, Tel: 818-349-4111, TWX: 910-493-1252; FSC No.: 24152; Empl.: 85

Local Sales Offices & Reps

CA	Sacramento, John Wayner	916-689-1281
CA	San Diego, Qualtronics	619-560-8955
FL	Ft. Lauderdale, Electro Comp. Assocs.	305-491-4141
IL	Chicago, Ropek-Cahill	312-631-0070
KS	Parker, S. W. Wollard Co.	913-898-6552
MA	Boston, TEC Sys.	617-834-4663
MO	St. Louis, Abrams & Assocs.	314-569-0047
NJ	Cherry Hill, Danco Corp.	609-627-2218
OH	Dayton, Berberich & Assocs.	513-433-0342

SANDERS ASSOCS., Flexprint Prods. Div., Grenier Fld., Manchester, NH 03103, Tel: 603-669-4615, TWX: 710-220-9999; FSC No.: 4L 277; Empl.: 500; *Sls. Mgr.:* Martin S. Schwartz

Local Sales Offices & Reps

AL	Huntsville, BJR	205-881-3569
AZ	Tempe, Spectrum Assoc. S.W.	602-966-1788
CA	Downey, Trimarco	213-861-8244
CA	Downey, Trimarco	213-861-8244
CA	Los Altos, El Repco	415-941-4990
CA	San Jose, Cero	408-298-1918
FL	Cocoa Bch., JEPCO	305-783-3037
IL	Downers Grove, Momak Sls.	312-963-6400
MD	Baltimore, R. A. Wafer Assoc.	301-744-1133
MD	Glen Burnie, New Era Sls.	301-768-6666
MA	Burlington, Microwave Mktg. Spec.	617-272-7530
MN	New Brighton, TWC	612-636-1770
NH	Amherst, Callahan & Tremblay	603-883-9000
NJ	Wayne, GT Assocs.	201-694-6040
NY	Great Neck, Phase 4	516-482-1790
PA	Hatboro, Jacobsen Assoc.	215-674-2937
TX	Austin, Kruvand Assoc.	512-441-6777
TX	Dallas, Kruvand Assoc.	214-691-4592

S H
S & H INDUSTRIES, INC.

S & H INDS., 119 Glen Cove Dr., Glen Head, NY 11545, Tel: 516-671-5600; Empl.: 50; *Sls. Mgr.:* R. Smith ....3•1767, 1908, 1928

SAN DIEGO INSTR. LAB, See SANLAB

SAN FERNANDO ELEC. MFG., See SFE Techn.

SANFORD-MILLER CORP., 8 John St., Lynbrook, NY 11563, Tel: 516-593-2025, Outside NY 800-645-5900; Empl.: 10

SANGAMO CAPACITOR DIV., Box 128, Pickens, SC 29671, Tel: 803-878-6311, Telex: 57-0441, TWX: 810-397-2496; FSC No.: 00853; *Sls. Mgr.:* J. Kolkowski; *Dist. Mgr.:* J. Kolkowski

SANKEN ELEC. CO., 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan, Tel: 03-986-6151, Telex: 272-2323; Empl.: 2,500; *Sls. Mgr.:* K. Imaizumi; *Dist. Mgr.:* S. Muramoto

SANKEN ELEC. U.S.A. CORP., 3848 Carson St., Ste. 105, Torrance, CA 90503, Tel: 213-540-2209, Telex: 181839; Empl.: 5; *Sls. Mgr.:* Mr. Tack Kunimi; *Dist. Mgr.:* Mr. Tack Kunimi

SAN-O INDUSTRIAL CORP., 85 Orville Dr., Bohemia, NY 11716, Tel: 516-567-5556, TWX: 510-228-7701; Empl.: 50; *Sls. Mgr.:* M. Castellano

SANTA BARBARA RESCH. CTR., 75 Coromar Dr., Goleta, CA 93117, Tel: 805-968-3511, Telex: 910-334-1885, TWX: Hacsbar; Empl.: 2025; *Sls. Mgr.:* D.K. Smith

SANTA FE TEXTILES, 3151 W. Adams St., Santa Ana, CA 92704, Tel: 714-751-7733; FSC No.: 31415; Empl.: 20; *Sls. Mgr.:* J. Tressen; *Dist. Mgr.:* J. Abbey

SANYO ELEC. INC., 200 Riser Rd., Little Ferry, NJ 07643, Tel: 201-641-2333, Telex: 134-394; Empl.: 500; *Sls. Mgr.:* H. Matsuoka ....3•1430

Local Sales Offices & Reps

CA	Compton	213-537-5830
IL	Schiller Park	312-671-3261
NJ	Little Ferry	201-641-2333

SANYO SEMICONDUCTOR CORP., 7 Pearl Ct., Allendale, NJ 07401, Tel: 201-825-8080, Telex: 135138 SANYOSEMI ALNJ; Empl.: 16; *Sls. Mgr.:* Koichi Takahashi; *Dist. Mgr.:* Aki Goto

SAPHIKON, 51 Powers St., Milford, NH 03055, Tel: 603-673-5831, Telex: 95-3067; Empl.: 45; *Sls. Mgr.:* K. G. Lonie

..SaRonix....

SARONIX, 4010 Transport at San Antonio, Palo Alto, CA 94303, Tel: 415-856-6900, Telex: 348465; FSC No.: 61441; Empl.: 24; *Sls. Mgr.:* Michael N. Blewett; *Dist. Mgr.:* Michael N. Blewett ....**1A**•1418, 1419

Local Sales Offices & Reps

AZ	Tempe, Elec Com	602-967-8644
CA	Culver City, Bestronics Inc.	213-870-9191
CA	Fallbrook, Matronix/Chilcote	619-728-7678
CA	Irvine, Bestronics Inc.	714-261-7233
CA	Southern California, Bestronics Inc.	213-704-5616
CA	Woodland Hills, Bestronics Inc.	213-704-5616
CO	Denver, Lindberg Co.	303-758-9033
FL	Orlando, Delmac Sls.	305-898-4688
GA	Marietta, Rick Burns Assoc.	404-951-1181
IL	Elk Grove Vlg., John G. Twist Co.	312-593-0200
IN	South Bend, Schillinger Assoc. Inc.	219-291-6258
KS	Overland Park, EPI Inc.	314-962-1411
MA	Andover, Richard Purinton	617-475-7055
MN	Bloomington, John G. Twist Co.	612-835-2120
MO	St. Louis, EPI Inc.	314-962-1411
NJ	Cherry Hill, Trinkle Sls.	609-795-4200
NJ	Englewood, Harold Gray Assocs.	201-894-0894
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Cazenovia, S. T. Woolard Co.	315-655-8145
NC	Raleigh, Rick Burns Assoc.	919-876-2224
OH	Dayton, J. C. Hofstetter	513-296-1010
OH	Medina, J. C. Hofstetter	216-241-4880
TX	Austin, Logic 1 Sls.	512-459-1297
TX	Houston, Logic 1 Sls.	713-462-0641
TX	Richardson, Logic 1 Sls.	214-234-3375
UT	Salt Lake City, Lindberg Co.	801-969-2400
WA	Bellevue, Hood Engrg.	206-953-9375
WI	Brookfield, John G. Twist Co.	414-782-2670
WI	Milwaukee, The John G. Twist Co.	414-782-2670
EXP	CA, Palo Alto, SaRonix	415-856-6900

Local Distributors

AZ	Tempe, Anthem Elctrns.	602-244-0900
CA	Chatsworth, Anthem Elctrns.	213-700-1000
CA	Costa Mesa, Deco Elctrns.	714-754-1322
CA	Manhattan Beach, Prime Electro Prods.	213-379-3642
CA	San Diego, Deco Elctrns.	619-693-1595
CA	San Diego, Anthem Elctrns.	619-279-5200
CA	San Jose, Anthem Elctrns.	408-946-8000
CA	Tustin, Anthem Elctrns.	714-730-8000
CO	Englewood, Anthem Elctrns.	303-790-4500
IN	Indianapolis, MAR Elctrns. Inc.	317-875-4510
MA	Andover, R² Elctrns.	617-475-3777
OR	Lake Oswego, Anthem Elctrns.	503-684-2661
TX	Addison, Active Comp. Technlg.	214-980-1888
TX	Austin, Active Comp. Technlg.	512-452-5254
TX	Houston, Active Comp. Technlg.	713-496-4000
UT	Salt lake City, Anthem Elctrns.	801-973-8555
WA	Redmond, Anthem Elctrns.	206-881-0850
Intl	England, Kent, Electrautom Ltd.	0622 673131
Intl	France, St. Quentin En Yvelines, A S A P	604 7878
Intl	Germany, Munich, LSI-Electronic Vertriebs	089 310-7272
Intl	Switzerland, Duebendorf-Zuerich, Compona	01 821-3737

SAVOY ELCTRNS., P.O. Box 5727, Ft. Lauderdale, FL 33310, Tel: 305-563-1333, 800-327-1282, TWX: 510-955-9766; FSC No.: 59-1672492; Empl.: 60; *Sls. Mgr.:* Lorayne Beardsley

SAWTEK INC., P.O. Box 18000, Orlando, FL 32860, Tel: 305-886-8860, Telex: 514083; TWX: 810-862-0835; FSC No.: 58068; Empl.: 140 ....**1A**•1420, 1565, 1622, 1623

Local Sales Offices & Reps

AL	Huntsville, L&D Inc.	205-837-1469
AZ	Scottsdale, Faser Tech. Sls.	602-948-4404
CA	Los Altos, Cain-White & Co.	415-948-6533
CA	Van Nuys, R-L Assocs.	213-782-7826
FL	Maitland, D. J. Ellis & Assoc.	305-645-1101
GA	Atlanta, L & D	404-455-3483
IL	Palatine, R. Tek	991-222-1830
IN	Fort Wayne, R-Tek	219-432-8783
KS	Overland Park, Barnes-Midwest Sls.	913-341-9317
MD	Burtonsville, Eastern Instrmn. Corp.	301-384-8500
MN	Chanhassen, Barnes Sls. Assocs.	612-934-2907
NH	Amherst, Callahan & Tremblay Inc.	603-883-9000
NJ	East Windsor, Micro-Lambda	609-443-3113
NY	Buffalo, Quality Comps.	716-837-5430
NY	Great Neck, Phase 4 Technical Rep., Inc.	516-482-1790
NY	Manlius, Quality Comps.	315-682-8885
NC	Greensboro, L & D	919-292-3201
NC	Raleigh, L & D	919-876-5301
OH	Fairfield, Selectron Sls. Assocs.	513-829-2251
TX	Richardson, Vector Sls.	214-234-4291

SAWYER INDS., 5649 Peck Rd., Arcadia, CA 91006, Tel: 213-442-5981, TWX: 910-587-3534; FSC No.: 18098; Empl.: 167

SAXTON PRODS., 215 N. Rte. 303, Congers, NY 10920, Tel: 914-268-6848, 800-431-2774, Telex: 13-1538; FSC No.: 16164; Empl.: 130; *Sls. Mgr.:* Bill Cullen; *Dist. Mgr.:* Steve Shelley ....**2**•2144-2149

Local Sales Offices & Reps

CA	Cerritos, Saxton Prod.	213-926-5596
CA	Livermore, Reptronixx	415-443-5343
CA	Pleasanton, Electro Des.	415-846-9257
CA	San Jose, Reptronixx	408-995-6433
CA	Santee, Southwestern Mktg.	619-562-2422
CO	Denver, J & B Sls.	303-698-2211
CT	Guilford, Phil Orzell Assocs.	203-453-6488
GA	Atlanta, Atlanta Cable Sls.	404-448-6311
GA	Marietta, Consumer Mktg.	404-424-9097
IN	Angola, Waid Assocs.	219-833-3523
MA	Milford, Jonel Sales Assocs.	617-478-4650
MA	Sharon, Adcour	617-784-8123
MN	Burnsville, Strong & Assocs.	612-890-3168
MS	Jackson, Welch & Dolby	601-932-5524
NJ	Livingston, Accurate Wire & Cable	201-533-0103
NY	Mohegan Lake, Travano & De Palma Assocs.	914-245-5269; 914-968-1084
OR	McMinnville, Electro Des.	503-472-0481
PA	Collegeville, Steve Linton	215-489-9473
TX	Austin, TPC	512-443-1577
TX	Dallas, TPC	214-357-8207
VA	Arlington, Howard Golen Paul & Assocs.	703-525-5898

Local Distributors

CA	Downey, David Levy Co.	213-869-2539
CA	Montebello, Atlas Wire & Cable	213-723-2401
CA	San Jose, Sundown Sls.	408-995-6433
CT	Manchester, Inventory Mgt. Svs.	203-649-4415
CT	Meriden, New England Insulated Wire	203-204-8927
MS	Hattiesburg, Wright Elctrn.	601-545-2545
NY	Brooklyn, Ceco Comm.	212-646-1617
NC	Greenville, Pair Elctrns.	919-756-8007
PA	Broomall, Omni Cable	215-544-7766
SC	Columbia, Hesco	803-254-4575
VA	Arlington, Arlington Elctrn.	703-524-2412
VA	Leesburg, Elctrn. Wire & Cable	703-777-3551

SCANBE DIV., 3445 Fletcher Ave., El Monte, CA 91731, Tel: 213-579-2300, TWX: 910-587-3437; Empl.: 125

SCANNING DEVICES, 108 Elm St., Waltham, MA 02154, Tel: 617-891-8991; Empl.: 25; *Sls. Mgr.:* Louis Goldenberg

SCHAEVITZ ENGRG., U.S. 130, Union Ave., Pennsauken, NJ 08110, Tel: 609-662-8000, TWX: 710-892-0714; FSC No.: 93190; Empl.: 325; *Sls. Mgr.:* F. R. Pisaro

Local Sales Offices & Reps

AZ	Scottsdale, Dave Menegay Assoc.	602-994-9519
CA	Long Beach, Saber Entprs.	213-595-5646
CA	San Carlos, Elctrn. Engrg.	415-593-2189
CA	San Diego, Saber Entprs.	714-271-1523
CO	Boulder, Meas. Conslts. of CO	303-449-7506
CT	Tolland, R.G. Assoc.	203-875-4201
FL	Orlando, MicroSpec, Inc.	305-299-6508
GA	Lawrenceville, MicroSpec	404-979-3444
IL	Deerfield, Torkelson Assoc.	312-945-8700
IL	Lombard, Patrick & Douglas	312-971-1800
IN	Indianapolis, Torkelson Assoc.	317-244-7867
KS	Mission, Vertec Assoc.	913-677-3200
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MI	Farmington Hills, Anderson Elctrns.	313-553-7600
MN	Minneapolis, Trask Engrg.	612-537-2434
MO	Manchester, Vertec Assocs.	314-394-6242
NJ	Cherry Hill, Ana Lectro, Inc.	609-424-2883
NM	Albuquerque, Odyssey 1	505-265-6645
NY	Latham, L-Tron Corp.	518-785-5032
NY	Rockaway Park, Metropolitan Sls.	212-634-3100
OH	Columbus, R. D. Cloon Assoc.	614-459-2890
PA	Pittsburgh, Wainwright Tech. Sls.	412-487-5055
SC	Rock Hill, MicroSpec	803-366-3015
TX	Dallas, Measurement Sys. & Sls.	214-243-5782
UT	Salt Lake City, Meas. Conslts. of UT	801-364-3174
WA	Seattle, Brett Assocs.	206-935-8054
WI	Brookfield, Torkelson Assoc.	414-784-7736
WI	Glendale, Stapleman Corp.	414-352-5777

SCHAFFNER EMC INC., Component Div., 825 Lehigh Ave., Union, NJ 07083, Tel: 201-851-0644, Telex: 685-3444; FSC No.: 201-467-1330; *Sls. Mgr.:* Thomas Pate

Local Sales Offices & Reps

AL	Brownsboro, JHU Assoc. Inc.	205-536-7455
AZ	Tuscon, Clemick & Assoc. Inc.	602-749-4003
CA	Burlingame, Jack Logan & Assoc.	415-348-8822
CA	Costa Mesa, Berman Gravley Co., Inc.	714-549-2122
CA	Fallbrook, Martronix	619-728-7678
CO	Westminster, D/Z Assoc. Inc.	303-429-9369
CT	No. Haven, Kitchen & Kutchin Inc.	203-239-0212
FL	Orlando, OEM Mktg. Corp.	305-293-7117
GA	Atlanta, JHU Assoc. Inc.	404-634-1000
MA	Burlington, Kitchen & Kutchin Inc.	617-229-2660
NJ	Teaneck, R T Reid Assoc. Inc.	201-692-0200
OH	Cleveland, Jim Finnegan & Co., Inc.	216-238-5905
OR	Portland, Harry Levinson Co.	503-245-1902
TN	Talbot, JHU Assoc. Inc.	615-581-4141
TX	Richardson, Lone Star Technlg. Inc.	214-238-2709
UT	Salt Lake City, D/Z Assoc. Inc.	801-486-4233
WA	Seattle, Harry Levinson Co.	206-382-1300

SCHAFFNER EMC INC., Instr. Div., 825 Lehigh Avenue, Union, NJ 07083, Tel: 201-851-0644, Telex: 685-3444

Local Sales Offices & Reps

CA	Fullerton, GRU Assoc.	714-738-0903
CO	Boulder, Herb Bass Assoc.	303-530-7509
IL	Elk Grove Village, Loren F. Green Assoc./Cen.	312-593-0282
IN	Indianapolis, Loren F. Green Assoc. of Indiana	317-293-9827
MI	Northville, Micro Sls. Corp.	315-459-1670
MN	Minneapolis, Loren F. Green Assoc. of Minnesota	612-571-6666
OH	Centerville, Micro Sls. Corp.	513-433-8171
OH	N. Olmstead, Micro Sls. Corp.	216-734-3080
OR	Portland, Harry Levinson Co.	503-245-1902
WA	Seattle, Harry Levinson Co.	206-382-1300

SCHAUER MFG., 4500 Alpine Ave., Cincinnati, OH 45242, Tel: 513-791-3030, Telex: 21-4576; Empl.: 195; *Sls. Mgr.:* A. A. Groenewold; *Dist. Mgr.:* Dan Shaw

SCHNEIDER INSTR., 8115 Camargo Rd., Cincinnati, OH 45243, Tel: 513-561-6803; Empl.: 23; *Sls. Mgr.:* C. A. Schneider, Pres.

SCHONSTEDT INSTR. CO., 1775 Wiehle Ave., Reston, VA 22090, Tel: 703-471-1050, TWX: 710-833-9880; Empl.: 45

SCHOTT CORP., 1000 Parkers Lk. Rd., Wayzata, MN 55391, Tel: 612-475-1173, TWX: 910-576-2964; FSC No.: 80023; Empl.: 325; *Sls. Mgr.:* A. Schmitt

SCHOTT ELCTRNS., Hershey Dr., Ansonia, CT 06401, Tel: 203-736-2677, Telex: 170 451 8911; *Sls. Mgr.:* Don Davis

SCHOTT OPTICAL GLASS INC., York Ave., Duryea, PA 18642, Tel: 717-457-7485, TWX: 510-671-4535; FSC No.: 23-169-1403; Empl.: 600; *Sls. Mgr.:* J. Nimmerfroh

SCHRACK NORTH AMERICA CORP., 76 N. Broadway, Irvington, NY 10533, Tel: 914-591-7900, Telex: 646149; Empl.: 4; *Sls. Mgr.:* Zach Zager

Schroff®
19" Systems for Electronics Packaging

SCHROFF INC., 170 Commerce Dr., Warwick, RI 02886, Tel: 401-732-3770, Telex: 952175; *Sls. Mgr.:* Thomas Kennedy ....**2**•1053

Local Sales Offices & Reps

AL	Decatur, Tenn. Tech.	205-350-0630
AZ	Scottsdale, Luscombe Engr.	602-949-9333
CA	Campbell, Luscombe Engr.	408-370-2020
CA	Pasadena, Luscombe Engr.	213-684-2000
CA	San Diego, Luscombe Engr.	619-295-4300
FL	Pompano Beach, EMA	305-943-3732
FL	Winter Park, EMA	305-671-6800
GA	Atlanta, Tenn Tech.	404-622-5784
IL	Berkeley, Cadre Tech. Rep.	312-449-3900
MI	Troy, C. B. Jensen	313-643-0506
MN	Minneapolis, D. A. Case Assoc.	612-869-3700
NH	Salem, Sales Engr.	603-893-5521
NJ	Englewood, Sprung-Nussbaum	201-569-5666
NY	Central Sqare, Bastian Sls.	315-668-2957

NY	Fairport, Bastian Sls.	716-223-0237
NY	Port Crane, Bastian Sls. Agency Inc.	607-722-3421
NC	Raleigh, Tenn Tech.	919-266-3610
OH	Aurora, EMA	216-562-6104
OH	Centerville, EMA	513-433-2800
PA	Huntington Valley, Omega Elctrn. Sls.	215-947-4135
TX	Austin, CMZ	512-255-1663
TX	Garland, CMZ	214-681-1414
TX	Houston, CMZ	713-771-1500

SCHROFF UK LTD., Maylands Ave., Hemel Hempstead, Herts, HP2 4SG, England, Tel: 0442-40471/6, Telex: 825658; *Sls. Mgr.:* Mr. B-U Kaupisch

SCHULZ CONTROLS, INC., P.O. Box 9555, New Haven, CT 06511, Tel: 203-562-2555, 800-243-4570; Empl.: 35; *Sls. Mgr.:* Paula Calabrese; *Dist. Mgr.:* Paula Calabrese

SCHURTER, INC., 1016 Clegg Ct., Petaluma, CA 94952, Tel: 707-778-6311, Telex: 176-084; FSC No.: 61935; *Sls. Mgr.:* Bruno H. Schurter

Local Sales Offices & Reps

CA	Fullerton, Gru Assocs.	714-738-0903
CA	San Jose, Ruppert Sls. & Engrg.	408-998-8717
CO	Lakewood, Cristee-Meade Co.	303-232-0287
FL	Ft. Lauderdale, IMR, Inc.	305-741-2449
IL	Arlington Hgts., MJ Petersen & Assoc., Ltd.	312-577-8200
MN	Minnetonka, Frank Anthony Mktg.	612-934-0773
MS	Jackson, Welch & Doby.	601-932-5534
NH	Nashua, Bell Controls	603-882-6984
NJ	Ho-Ho-Kus, D. J. Fisher Co.	201-652-0090
NJ	Medford, Champion Elctrn. Sls. Co.	609-983-0932
NY	Fairport, TAC Sls, Inc.	716-425-1070
OH	Beachwood, Electronic Salesmasters	216-831-9555
OR	Portland, Dussault & Associates Inc.	503-641-8780
TX	Austin, OM Sls., Inc.	512-452-1838
TX	Dallas, OM Sls., Inc.	214-241-3876
TX	Houston, OM Sls., Inc.	713-789-4426
WA	Seattle, Dussault & Associates Inc.	206-527-5454

Local Distributors

CA	San Jose, Quail Elctrns.	408-995-0812
FL	Clearwater, Elctrn. Hardware for Industry	813-577-2998
IL	Elk Grove Village, Nu-Way Elctrn. Distrbs. Inc.	312-437-7120
MD	Rockville, FIC Corp.	800-638-6594
TX	Dallas, Fuses, Inc.	214-341-6407

SCHWEITZER, DIV., Kimberly Clark Corp., Lee, MA 01238, Tel: 413-243-1000, TWX: 413-243-2121; Empl.: 750

SCIENCE ACCESSORIES CORP., 970 Kings Hwy. W., Southport, CT 06490, Tel: 203-255-1526, Telex: 964300 SAC SPRT; *Sls. Mgr.:* H. A. Cleveland

SCIENCE/ELCTRNS., 1224-26 McCook Ave., Dayton, OH 45404, Tel: 513-228-6011, Telex: 288-004; Empl.: 25; *Sls. Mgr.:* E. E. Pohl; *Dist. Mgr.:* J. Tanksley

SCIENTECH, INC., 5649 Arapahoe Ave., Boulder, CO 80303, Tel: 303-444-1361, 800-525-0522, TWX: 910-940-0994; Empl.: 57

Local Sales Offices & Reps

CA	Hayward, Avionics Liaison	415-783-1131
CA	San Jose, Scientific Spectrum	408-289-9733
CO	Englewood, SCT Sls., Inc.	303-761-2934
GA	Atlanta, Schoonover	404-396-8877
IL	Crystal Lake, Stanmatic Sls.	815-459-1741
MD	Silver Spring, SOC Assocs.	301-439-3200
NH	Deerfield, Kronk Scientific	603-463-7866
NJ	Oakland, Non-Linear Devices	201-337-0666
WA	Seattle, Avionics Liaison	206-767-3870

SCIENTIFIC-ATLANTA, INC., P.O. Box 105600, Atlanta, GA 30348, Tel: 404-441-4000, Telex: 0542898, TWX: 810-766-4912

SCIENTIFIC-ATLANTA, INC., New Jersey Div., Randolph Park W., Rte 10, Randolph Township, NJ 07801, Tel: 201-361-3100, TWX: 710-987-7946; Empl.: 100; *Sls. Mgr.:* E. Stagnitti

SCIENTIFIC-ATLANTA, INC., See Optima Enclosures

SCIENTIFIC COLUMBUS, INC., Esterline Corp., 1900 Arlingate La., Columbus, OH 43228, Tel: 614-274-7160, Telex: 245-426; Empl.: 210; *Sls. Mgr.:* Don Yore; *Dist. Mgr.:* Don Yore ....**1B**•1876, 1877

Local Sales Offices & Reps

AL	Birmingham, Spader & Assocs.	205-879-1366
AZ	Scottsdale, Young of Ariz.	602-991-9191
CA	Glendale, R. A. Young & Co.	213-242-2171
CA	S. San Francisco, Wrathall & Krusi	415-777-0226
CO	Denver, Cliff Beabout Co.	303-831-7259
FL	Orlando, RJC Assocs.	305-894-7371
GA	Decatur, Spader & Assocs.	404-296-3024
HI	Honolulu, Berkley Engrg. & Equip. Co.	808-845-9377
IL	La Grange, PVA Co.	312-579-9300
IN	Nobelsville, C. D. Arnold Co.	317-773-5821
IA	Cedar Rapids, Harry Ferris Co.	319-377-1226
IA	Des Moines, Harry E. Ferris Co.	515-255-5008
KS	Kansas City, Power Equip. Sls. Co.	913-384-3848
LA	Baton Rouge, Mid-South Sls. Co.	504-924-0106
LA	Slidell, Mid-South Sls. Co.	504-641-7480
MA	Needham Heights, Danek Assocs.	617-444-8838
MI	Troy, George R. Peters Assocs.	313-362-1220
MN	Minneapolis, Arjay Sls.	612-854-4972
MO	St. Louis, Ken Way Co.	314-567-0051
NE	Lincoln, Harry Ferris Co.	402-464-6148
NM	Albuquerque, Bryant Co.	505-843-9450
NY	Albany, Robert F. Lamb Co.	518-869-3355
NY	Buffalo, Robert F. Lamb Co.	716-874-4900
NY	Rochester, Robert F. Lamb Co.	716-544-5580
NY	Syracuse, Robert F. Lamb Co.	315-455-2469
NC	Charlotte, Robert W. Chapman & Co.	704-525-2421
NC	Greensboro, Robert W. Chapman & Co.	919-282-0740
NC	Raleigh, Robert W. Chapman & Co.	919-782-2624
OH	Cincinnati, Annett Indl. Sls.	513-271-0030
OH	Cleveland, M. A. Blankenburg & Co.	216-251-7010
OK	Tulsa, C. B. Anderson Elec. Co.	918-836-4661
OR	Portland, McLaren Inc.	503-297-2248
PA	Dylestown, The Gee Co.	215-348-3300
PA	Philadelphia, Gee Co.	215-348-3300
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
SC	West Columbia, Robert W. Chapman & Co,	803-256-0072
TN	Murfreesboro, Robert W. Chapman & Co.	615-895-1019
TX	Amarillo, C. B. Anderson Electric Co.	806-376-6443
TX	Arlington, Ev Smith Sls. Co.	817-572-2911
TX	Houston, Ev Smith Sls. Co.	713-649-5756
UT	Salt Lake City, Instrumentation Sls.	801-277-2044
VA	Alexandria, Hildenbrand Co.	703-998-0445
VA	Richmond, Robert W. Chaman & Co.	804-744-4848
WA	Bellevue, McLaren Inc.	206-454-3400
WI	Wauwatosa, T. R. Bickler Assocs.	414-784-2600

SCIENTIFIC COMMUNICATIONS, INC., 3425 Kingsley Rd., Garland, TX 75041, Tel: 214-271-3685, TWX: 910-860-5172; *Sls. Mgr.:* Donald G. Luiken

SCIENTIFIC RADIATION CORP., 1201 San Antonio Rd., Mountain View, CA 94043, Tel: 415-965-0910, Telex: 345506; *Dist. Mgr.:* James A. Lazzara

SCIENTIFIC RESEARCH CORP., See TRAK Microwave Corp.

SCIENTIFIC TECHNLG., 1201 San Antonio Rd., Mountain View, CA 94043, Tel: CA 415-965-0910, 800-221-7060, Telex: 34-5506; Empl.: 50

SCOTT AVIATION, Figgie International Inc., 123 East Montecito Ave., Sierra Madre, CA 91024, Tel: 213-355-4281

SCREENPRINT/DOW INDUSTRIES, 271 Ballardvale St., Wilmington, MA 01887, Tel: 617-935-6395, Telex: 948227; *Sls. Mgr.:* W. F. Donovan Jr.

SEABOARD ELCTRNS., 70 Church St., New Rochelle, NY 10805, Tel: 914-235-8073, Telex: 646289; Empl.: 78; *Sls. Mgr.:* Dr. Richard Ader; *Dist. Mgr.:* Dr. R. Ader

SEACLIFF TECHNOLOGY, INC., 320 Judah Street, San Francisco, CA 94122, Tel: 415-661-4800

SEACOR, INC., 123 Woodland Ave, Westwood, NJ 07675, Tel: 201-666-5600, Telex: 135-354; Empl.: 45 ....**1A**•1183

Local Sales Offices & Reps

AZ	Scottsdale, Arcom Sales	602-947-5745
CA	Santa Ana, Seacor West	714-641-4040
IL	Skokie, Mar-Con	312-675-6450
MI	Farmington, Amtech Reps.	313-474-8300
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NY	Rochester, Sweetco	716-225-2383
NY	Utica, Sweetco Assoc.	315-797-6721
OH	Northfield, Val-Skol Sls.	216-467-1392
PA	King of Prussia, D. Freedman	215-279-5767
TN	Chattanooga, Dimark	615-892-7630
TN	Greenville, Dimark	615-639-0113
TX	Cypress, Wessco Prods.	713-469-7814
TX	Garland, Wessco Prods.	214-530-8857
PR	San Juan, David S. Ternent	809-762-2688

Local Distributors

AZ	Tempe, T.T.I	602-966-1616
CA	Burbank, TAW Elctrns.	213-846-3911
CA	Cypress, On-Line Elect.	714-826-8200
CA	Garden Grove, Natl. Cap. Supp.	800-854-2451
CA	San Diego, Sigma Elctrns.	619-565-2000
CA	Santa Clara, California Capacitor	408-980-8495
CT	Stratford, Utronics	203-378-4201
IL	Chicago, Bell Indus.	312-982-9210
MD	Beltsville, Resco/Wash.	301-937-9100
MA	Burlington, TLC	617-273-0140
MA	N. Chelmsford, Pilgrim Elect.	617-251-8746
MA	Needham, Cronin	617-449-0500
MI	Westland, Westland Elctrns.	
MN	Minneapolis, The Joel Corp.	612-545-5669
NY	Farmingdale, SAI	516-293-2710
NY	Lynbrook, Varitech Elctrns.	516-593-9300
OH	Cleveland, Roberts Elctrns.	
OK	Pryor, Combined Technology	918-825-5715
PA	Philadelphia, Jan Indl. Elec.	215-922-1321
TX	Addison, Captronics	214-980-0123
TX	Austin, Captronics	512-459-4328
TX	Ft. Worth, Allied Elect.	817-336-5401
TX	Ft. Worth, T.T.I	817-831-0441
TX	Houston, Captronics	713-776-2100

SEA DATA CORP., One Bridge St., Newton, MA 02158, Tel: 617-244-3216, Telex: 951107; Empl.: 40; *Sls. Mgr.:* W. Hill

SEALECTRO, 225 Hoyt St., Mamaroneck, NY 10543, Tel: 914-698-5600; Empl.: 1600; *Sls. Mgr.:* T. Lynn; *Dist. Mgr.:* N. Buonanno ....**2**•1561

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Phoenix, M/R Engrg.	602-956-4670
CA	Carlsbad, Addem Elctrns.	619-729-9216
CA	Manhattan Beach, Sealectro West	213-318-3326
CA	Mountain View, Sealectro West	415-965-1212
CO	Denver, Spectrum Sls.	303-696-1601
FL	Orlando, OEM Mktg.	305-299-1000
GA	Norcross, Montgomery Mktg.	404-447-6124
ID	Boise, N. R. Schultz	208-377-8686
IL	Arlington Hgts., Diethert-Angel	312-593-7600
KS	Overland Park, Advanced Tech. Sls.	913-642-6675
MD	Rockville, Mechtronics Sls.	301-340-2130
MO	Ellisville, Advanced Tech. Sls.	314-227-4448
NH	Salem, Sls. Engrg.	603-893-5521
NJ	Marlton, BGR Assocs.	609-428-2440
NY	Mt. Vernon, Friedman-Smith	914-664-4866
NY	Syracuse, I. A. Hotze Assoc.	315-479-6641
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Columbus, McFadden Sls.	614-459-1280
OR	Beaverton, N. R. Schultz	503-643-1644
TX	Dallas, Allied Comps.	214-238-0408
WA	Bellevue, N. R. Schultz	206-454-0300

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, R. V. Weatherford	602-272-7144
CA	Glendale, R. V. Weatherford	213-849-3451
CA	San Jose, Powell Elctrns.	408-943-9020
CA	Sunnyvale, R. V. Weatherford	408-738-8694
FL	Altamonte Springs, Pioneer/Fla.	305-834-9090
FL	Ft. Lauderdale, Powell Elctrns.	305-979-5000
IN	South Bend, Genesis Elctrns.	219-287-2911
IA	Cedar Rapids, Deeco	319-365-7551
KS	Wichita, Radio Supp.	316-267-5213
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Columbia, Powell Elctrns.	301-995-0410
MD	Gaithersburg, Pioneer Elctrns.	301-921-0660
MA	Burlington, Milgray Elctrns.	617-272-6800
MA	Westboro, Powell Elctrns.	617-366-6100
MN	Minneapolis, Indl. Comps.	612-831-2666
MO	Maryland Hgts., L Comp	314-291-6200
NJ	Kenilworth, Federated Purchaser	201-272-0505
NY	Bohemia, Car Lac Elctrns.	516-567-4200
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Rochester, Summit Distrs.	716-334-8110
NC	Charlotte, Pioneer Elctrns.	704-527-8188
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Solon, Repco Elctrns.	216-248-8900
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	Philadelphia, Powell Elctrns.	215-365-1900
TX	Dallas, Pioneer/Dallas	214-386-7300
TX	Dallas, R. V. Weatherford	214-931-7333
WA	Seattle, R. V. Weatherford	206-575-1340

SEALTRON, INC., 9705 Reading Road, Cincinnati, OH 45215, Tel: 513-733-8400

SEASTROM MFG. CO., INC., 701 Sonora Ave., Glendale, CA 91201, Tel: 818-245-9121, TWX: 910-497-2271; FSC No.: 86928; Empl.: 75

SEATTLE COMPUTER PRODUCTS, INC., 1114 Ind. Dr., Seattle, WA 98188, Tel: 206-575-1830, 800-426-8936; *Sls. Mgr.:* Max Gerdts

SECURITY PLASTICS INC., 14427 N.W. 60th Ave., Miami Lakes, FL 33014, Tel: 305-823-5440, Telex: 803303; Empl.: 350; *Sls. Mgr.:* J. Licht

SEIKO INSTRUMENTS

SEIKO INSTRS. U.S.A., INC., 2990 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-530-8777, TWX: 910-347-7307; *Sls. Mgr.:* John Hawkins, Lee Guio; *Dist. Mgr.:* Lee Guio, John Hawkins .... **1A•**1421; **1B•**1095; **3•**1091

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-533-2100
AZ	Scottsdale, Fred Board Assocs.	602-994-9388
CA	Los Alamitos, Santana Sls.	714-827-9100
CA	San Diego, SR Elctrns.	619-560-8330
CA	Santa Clara, Quorum Tech. Sls.	408-980-0812
CT	Madison, Forsberg Sls.	203-245-4314
FL	Clearwater, Gallagher & Assocs.	813-726-3187
FL	Plantation, Gallagher & Assocs.	305-473-2101
GA	Atlanta, Electro-Mech	404-447-6478
IA	Cedar Rapids, Coombs Assocs.	319-362-4116
KS	Overland Park, Kebco	913-541-8431
KS	Wichita, Kebco	316-733-1301
MD	Annapolis, Vince Iorio Assocs.	301-261-1716
MA	Brockton, Forsberg Sls.	617-522-6300
MI	Grosse Pointe Pk., Greiner Assoc.	313-499-0188
MN	Bloomington, Quantum Sls.	612-884-4700
MO	Maryland Hgts., Kebco	314-576-4111
NM	Albuquerque, Fred Board Assocs.	505-293-1399
NY	Kingston, R. P. Kennedy Co.	914-876-2700
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NY	Rochester, R. P. Kennedy Co.	607-271-6322
OH	Akron, Imtech	216-666-1185
OH	Dayton, Imtech	513-278-6507
OR	Tigard, Components West	503-684-1671
PA	Broomall, TCA Assocs.	215-353-2022
TN	Nashville, Electro-Mech	615-753-5841
TX	Austin, TL Mktg.	512-453-4586
TX	Dallas, TL Mktg.	214-357-1752
WA	Redmond, Components West	206-885-5880

Local Distributors

AL	Huntsville, Contact Elctrns.	205-881-9321
AZ	Phoenix, Sterling Elctrns.	602-268-2121
CA	Santa Ana, Pacesetter Elctrns. USA	714-557-7131
CA	Sunnyvale, Pacesetter Elctrns. USA	408-734-5470
CA	Walnut, A.C.I. Elctrns. Corp.	213-331-0735
CO	Denver, A.C.T.	303-422-9229
CT	Wallingford, Sterling Elctrns.	203-265-9535
LA	Metairie, Sterling Elctrns.	504-887-7610
MD	Middletown, Current Comps.	301-473-5333
MA	Waltham, Sterling Elctrns.	617-894-6200
MA	Woburn, A.C.I. Elctrns. Corp.	617-935-7230
MO	St. Louis, Ric-Tronics	314-576-9816
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NM	Albuquerque, Sterling Elctrns.	505-884-1905
NY	Plainview, A.C.I. Elctrns. Corp.	516-293-6630
OK	Tulsa, Sterling Elctrns.	918-663-2410
OR	Lake Oswego, Moore Elctrns.	503-684-3100
TX	Austin, Sterling Elctrns.	512-836-1341
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Sterling Elctrns.	713-627-9800
UT	Salt Lake City, A.C.T.	801-487-8131
VA	Richmond, Sterling Elctrns.	804-226-2190
Can	Downsview, Westburne Indl. Entprs.	416-635-2950

SEIKO INSTRUMENTS U.S.A., INC., Robotics/Automation Div., 2990 W. Lomita Blvd., Torrance, CA 90505, Tel: 213-530-8777; *Sls. Mgr.:* John Dudley

SEKAI ELCTRNS. OF AMER., INC., 14700 E. Firestone Blvd., Suite 122, La Mirada, CA 90638, Tel: 714-670-1854, Telex: 685521; FSC No.: 8V398; Empl.: 4; *Sls. Mgr.:* Larry Klementowski

SELCO PRODUCTS CO., 7580 Stage Rd., Buena Park, CA 90621, Tel: 714-521-8673, Telex: 65-5457; Empl.: 18; *Sls. Mgr.:* Bill Wilkinson; *Dist. Mgr.:* Ray McDowell

SELEC-KEY, Microdot, 302 Roma Jean Pkwy., Streamwood, IL 60103, Tel: 312-837-7970; *Sls. Mgr.:* Charles Stelzner

SEL-REX DIV., OMI Intl. Corp., 75 River Rd., Nutley, NJ 07110, Tel: 201-667-5200, Telex: 133-320, TWX: 710-989-1423; Empl.: 250; *Sls. Mgr.:* Larry Price

SEMCO, Rte. 6, No. Windham, CT 06226, Tel: 203-423-6316; *Sls. Mgr.:* Alan Giordano

SEMICOA, 333 McCormick Ave., Costa Mesa, CA 92626, Tel: 714-979-1900, Telex: 678-315, TWX: 910-595-1961; FSC No.: 34156; Empl.: 65; *Sls. Mgr.:* Mark Ellsberry

SEMICON, 10 North Ave., Burlington, MA 01803, Tel: 617-272-9015, TWX: 710-332-1919; Empl.: 550; *Sls. Mgr.:* Tom Le Blanc; *Dist. Mgr.:* L. Le Bow

SEMICONDUCTOR CIRCUITS, INC.

SEMICONDUCTOR CIRCUITS, 49 Range Rd., Windham, NH 03087, Tel: 603-893-2330, TWX: 710-366-0505; Empl.: 500; *Sls. Mgr.:* Steven Troscianecki; *Dist. Mgr.:* Marc Gauthier .... **3•**1759-1766

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Scottsdale, Sls. Engrg.	602-994-3230
CA	Milpitas, Lee/Allan Assocs.	408-946-8300
CA	San Diego, Tauber & Associates	619-274-7242
CA	Thousand Oaks, SC^3	805-496-7307
CA	Tustin, SC^3	714-731-9206
CO	Denver, Component Sls.	303-759-1666
CT	Westport, Compass Technology, Inc.	203-222-1787
FL	Ft. Meyers, Rainbow Sales, Inc.	813-332-2210
FL	Melbourne, Rainbow Sls. Inc.	305-259-6692
GA	Atlanta, Remco	404-447-6937
IL	Des Plaines, Janus	312-298-9330
IN	Fort Wayne, Wilson Technical Sales	219-424-5288
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
IA	Des Moines, The Beams Company	515-255-1148
KS	Shawnee Mission, The Beams Company	913-631-0300
MD	Baltimore, Micro Comp.	301-247-0400
MA	Woburn, Compass Technology, Inc.	617-933-3336
MI	Brighton, A.P. Associates	313-299-6550
MN	Minneapolis, Northstar Comps.	612-553-1888
MO	St. Louis, The Beams Company	314-434-8448
NJ	Livingston, Varrelman-Gorman Co.	201-992-2505
NY	Clark Mills, KLM Garner	315-853-6126
NY	North Syracuse, KLM Garner	315-458-6214
NY	Pittsford, KLM Garner	716-381-8350
NC	Raleigh, Remco	919-847-5079
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J.C. Hofstetter Co.	210-241-4880
OK	Tulsa, Southern States Mktg.	918-665-8338
PA	Hickory, J.C. Hofstetter Co.	412-356-2305
PA	King of Prussia, KSI	215-783-6400
TX	Austin, Southern States Mktg.	512-473-2741
TX	Houston, Southern States Mktg.	713-988-0991
TX	Richardson, Southern States Mktg.	214-238-7500
UT	Salt Lake City, Component Sls.	801-466-8623
WA	Maple Valley, Electronic Sls. N.W.	206-432-1002
WI	Milwaukee, Janus	414-476-9104

Local Distributors

CA	Milpitas, Power Systems Distrs.	408-946-8300
GA	Atlanta, Trans-Southern Elctrns.	404-451-4425
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3222
IN	Carmel, Altex Elctrns.	317-848-1323
MD	Baltimore, MPI	800-368-2527
MA	Wellesley Hills, Target Elctrn. Supp.	617-235-2545
MI	Brighton, A.P. Sales, Inc.	313-229-6550
NY	Rochester, Simcona Elctrns.	716-328-3230
OR	Lake Oswego, Moore Elctrns.	503-684-3100
TX	Stafford, Southwest Elctrns.	713-240-4000

SEMICONDUCTOR PACKAGING MATLS. CO. INC., 700 Waverly Avenue, Mamaroneck, NY 10543, Tel: 914-698-5353, TWX: 710-566-1103

SEMICONDUCTOR TECHNLG., INC., 3131 S.E. Jay St., Stuart, FL 33494, Tel: 305-283-4500, TWX: 510-953-7511; Empl.: 45

SEMIKRON INTL., INC., 11 Executive Dr., P.O. Box 66, Hudson, NH 03051, Tel: 603-883-8102, TWX: 710-228-1494; FSC No.: 58687; Empl.: 40; *Sls. Mgr.:* Frank Haase

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Phoenix, Trembly Assocs.	602-967-2058
CA	Downey, Trimarco	213-861-8244
CA	Redwood City, Ault Assocs.	415-367-1710
CO	Denver, Trembly Assocs.	303-233-9544
FL	Oldsmar, Boggs & Assocs.	813-855-1812
GA	Atlanta, Remco	404-447-6937
HI	Honolulu, Aloha Assocs.	808-951-1574
IL	Chicago, Ropek, Cahill & Vogt	312-631-0070
KS	Kansas City, Harris-Hanson Co.	816-763-6200
MI	Detroit, Favco	313-644-0173
MN	Eden Prairie, Bohlig & Assocs.	612-944-8404
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NV	Las Vegas, Trembly Assocs.	702-369-8700
NH	Hudson, Eva-Tec Mktg.	603-888-7478
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Albany, H.C. Johnson Agencies	518-459-1239
NY	Buffalo, H. C. Johnson Agencies	716-632-7880
NY	Rochester, H. C. Johnson Agencies	716-586-0777
NC	Raleigh, Remco	919-847-5079
OH	Dayton, Cleary Sls. Co.	513-890-8642
OH	Hamilton, B & J Entprs.	513-863-1353
OR	Portland, Doran Sls. Assocs.	503-357-3333
PA	Pittsburgh, Electrosystems Sls.	412-468-8811
TX	Kingwood, Coulomb Elctrns. & Assocs.	713-358-9595
UT	Salt Lake City, Trembly Assocs.	801-486-5292
WA	Seattle, Doran Sls. Assocs.	206-885-1885

Local Distributors

MI	Detroit, Osborne Transformer Co.	313-368-4136
NJ	Roselle, Lectron Inds.	201-245-5858
NC	Gastonia, JMT Elctrns. & Controls	704-867-4401
WA	Seattle, Pacific Elctrns.	206-575-1050

SEMTECH, 652 Mitchell Rd., Newbury Park, CA 91320, Tel: 213-628-5392, TWX: 910-336-1264; FSC No.: 14099; Empl.: 350

SENCORE, 3200 Sencore Dr., Sioux Falls, SD 57107, Tel: 605-339-0100, TWX: 910-660-0300; Empl.: 250

SENSITEK CORPORATION, 1000 Lincoln Drive, Marlton, NJ 08053, Tel: 609-983-3600, TWX: 710-897-1648; *Sls. Mgr.:* E. F. Bickel

Sensitive Research

SENSITIVE RESEARCH INSTRS., 25 Dock St., Mt. Vernon, NY 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35 .... **3•**1296-1298

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-947-4297
CO	Commerce City, Williams Assocs.	303-289-5647
DC	Washington, Whitcomb Assocs.	202-737-0763
IL	Lincolnwood, Saffro & Assocs.	312-677-9720
KS	Shawnee Mission, Comtel - Midwest	913-722-1030
MD	Baltimore, Whitcomb Assocs.	301-889-1245
MA	Lexington, Zieco	617-861-8300
MI	Southfield, Comtel Instrs. Co.	313-358-2505
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	St. Louis, Comtel - Midwest	314-991-5363
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Mount Vernon, Elctrl. Instr. Svc.	914-699-9717
OH	Cleveland, Comtel Instrs. Co.	216-442-8080
OH	Dayton, Comtel Instrs. Co.	513-298-7573
OH	Hilliard, Comtel Instrs. Co.	614-876-8305
OK	Tulsa, Data Mktg. Assocs.	918-438-4911
PA	Pittsburgh, Comtel Instrs. Co.	412-922-5720
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-780-2511
TX	San Antonio, Data Mktg. Assocs.	512-342-3031
UT	Salt Lake City, Williams Assocs.	801-532-7701
WI	Lake Mills, Saffro & Assocs.	414-648-2605

SENSOR CORP., Box 140, Scottdale, PA 15683, Tel: 412-887-4080; Empl.: 6

SENSOR ELECTRONICS, INC., 105 Fairway Terrace, Mt. Laurel, NJ 08054, Tel: 609-778-0850; *Sls. Mgr.:* J. M. Langberg; *Dist. Mgr.:* J. M. Langberg

SENSOR SCIENTIFIC, INC., 1275 Bloomfield Ave., Fairfield, NJ 07006, Tel: 201-227-7790; *Sls. Mgr.:* Bob Brinley

SENSOR SYSTEMS, INC., 8929 Fullbright Ave., Chatsworth, CA 91311, Tel: 818-341-5366, Telex: 69-1583; *Sls. Mgr.:* E. Schneider

SENSORTEK, INC., 154 Huron Ave., Clifton, NJ 07013, Tel: 201-779-5577; Empl.: 24

SENSOR TECHN., 21012 Lassen St., Chatsworth, CA 91311, Tel: 213-882-4100, TWX: 910-494-4776; Empl.: 350; *Sls. Mgr.:* Robert Bryden

SENSOTEC INC., 1200 Chesapeake Ave., Columbus, OH 43212, Tel: 614-486-7723, TWX: 810-482-1188; FSC No.: 29927; *Sls. Mgr.:* Jack Feil

SENSYM, INC., 1255 Reamwood Ave., Sunnyvale, CA 94089, Tel: 408-744-1500, Telex: 176376, TWX: 910-339-9625; *Sls. Mgr.:* Joe Fijak; *Dist. Mgr.:* Joe Fijak

SENTRY MFG., Crystal Park, Chickasha, OK 73018, Tel: 405-224-6780, 800-654-8850, TWX: 910-830-6425; Empl.: 150; *Sls. Mgr.:* R. Stephens

SEQUENTIAL INFO. SYS., 249 N. Saw Mill River Rd., Elmsford, NY 10523, Tel: 914-592-5930, TWX: 710-567-1212; Empl.: 90; *Sls. Mgr.:* Murray E. Vinarub

Local Sales Offices & Reps

AL	Jasper, Smith Lake Automation	205-221-2492
CA	Campbell, Sedillo Co.	408-374-5220
CA	Huntington Beach, Wheatcroft Engrg.	714-964-4681
HI	Honolulu, Aloha Assocs.	808-941-1574
IL	Schaumberg, Control Sys. Research	312-228-8061
MA	Bedford, Datasource	617-275-8460
MI	Detroit, Automatic Controls	313-533-8890
MN	Minneapolis, Busch Elctrns.	612-835-2044
MO	St. Louis, Prod. Automation	314-441-6600
NJ	Point Pleasant, A. Ackerman (E. Reg. Sls. Mgr.)	201-295-2737
NY	Elmira, Powertrain	607-962-3291
OH	Cincinnati, J. W. Murray	513-574-8500
OH	Cincinnati, J.W. Murray	513-574-8500
OH	Cleveland, Automatic Controls	216-631-0333
PA	King of Prussia, Freedman & Malta	215-337-9211
TX	Houston, Scientific Sls.	713-460-9170
TX	Richardson, Scientific Sls.	214-231-6541
VA	Springfield, Mid-States Mktg.	703-569-2661
WA	Seattle, Penryn Sls. & Engrg.	203-783-4334
WI	Shorewood, Werking Indl. Sls.	414-964-2225

SERIAL LAB PRODS., INC., 50 Brigham St., P.O. Box 766, Marlboro, MA 01752, Tel: 617-481-1684, Telex: 955318 Attn: SERIAL LAB; Empl.: 12; *Sls. Mgr.:* R. L. Wiedeman; *Dist. Mgr.:* D. Kreck

Local Sales Offices & Reps

CA	San Carlos, Electronic Engrg. Assocs.	415-593-2189
CT	Hamden, Digital Sls. Assocs.	203-248-3641
FL	Indian Rocks Beach, Par Assocs.	813-596-8841
GA	Atlanta, Par Assocs.	404-448-4181
IL	Chicago, Electro Tech Mktg.	312-588-4535
MD	Gaithersburg, Wright Mktg. Co. Ltd.	301-840-1928
MA	Waltham, Digital Sls. Assocs.	617-899-4300
MN	Minneapolis, Deerland Distrs.	612-331-6433
MO	Grandview, Digital Systems Sls.	816-765-3337
TX	Houston, Dalton Systems	713-556-1216
TX	Lewisville, Dalton Systems	214-221-5611
WI	Milwaukee, Deerland Distrs.	414-258-7660

SERMETEL, 155 Limerick Rd., Limerick, PA 19468, Tel: 215-948-5100, Telex: 84-6335, TWX: 710-637-1263; Empl.: 177; *Sls. Mgr.:* Luke McLaughlin

SERVO-INSTRS. CORP., See Valley Electromagnetics

SERVOMETER CORP., 501 Little Falls Rd., Cedar Grove, NJ 07009, Tel: 201-785-4630; FSC No.: 18469; Empl.: 105; *Sls. Mgr.:* D. Walker

SERVO-TEK PRODS. CO., 1086 Goffle Rd., Hawthorne, NJ 07506, Tel: 201-427-3100; Empl.: 86; *Sls. Mgr.:* J. Duffy .... 1B•1177

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Denver, Anderson Controls	303-692-0290
DC	Washington, Automation Indl. Control	301-944-8400
FL	Orlando, Seybert Sls.	305-299-6508
GA	Lawrenceville, MicroSpec	404-979-3444
IL	Hinsdale, Patton Sls.	312-325-2170
IN	Ft. Wayne, Aktron Corp.	219-747-3650
MA	Salem, Forbes Engrg. Sales	617-744-1693
MN	St. Paul, Northstar Motion & Control	612-770-5311
OH	Chagrin Falls, K. F. Nauerz Co.	216-338-8450
OH	Cincinnati, Drivex Corp.	513-474-5100
OR	Beaverton, Halbar Assoc.	503-226-0451
SC	Rock Hill, Johnson Sls.	803-366-3015
TN	Knoxville, Stephenson Controls & Sys.	615-588-7474
VA	Richmond, Automation Indl. Control	804-741-3253
WA	Redmond, Halbar Assocs.	206-882-0990

SETRA SYSTEMS, INC., 45 Nagog Park, Acton, MA 01720, Tel: 617-263-1400, Telex: 948440; FSC No.: 53367; Empl.: 65; *Sls. Mgr.:* William R. Stern

Local Sales Offices & Reps

AL	Huntsville, Burnette Techno Metrics	205-533-9073
CA	Los Altos, Qcon, Inc.	415-941-5530
CA	Los Angeles, Dynasales Co.	213-268-1175
CO	Westminster, RMS Sls.	303-429-1111
FL	Orlando, Datarep	305-843-5224
GA	Atlanta, Craft Assocs.	404-256-0420
IL	Chicago, Data Elctrns.	312-283-0300
IN	Indianapolis, Data Elctrns.	317-359-5368
LA	Metairie, Slaton & Assocs. Inc.	504-455-3855
MA	Framingham, J. M. Lancaster Co.	617-875-8893
MI	Hazel Park, Tiby Co.	313-547-3550
MN	Plymouth, Data Elctrns.	612-559-1434
MO	St. Louis, Adelphi, Inc.	314-821-1232
NJ	Cedar Grove, KLS Assocs.	201-785-4450
NY	E. Rochester, A&D Devices	716-385-2778
OH	Cleveland, Tiby Co.	216-371-5335
OH	Tulsa, Inotek Corp.	918-622-8570
OR	Portland, McLaren, Inc.	503-297-2248
PA	Cheltenham, Stein Instrumentation	215-379-1990
TX	Dallas, Inotek Corp.	214-243-7000
TX	Houston, Inotek Corp.	713-688-7000
WA	Bellevue, McLaren, Inc.	206-454-3400

SEVEN MOUNTAINS SCI. INC., P.O. Box 650, Boalsburg, PA 16827, Tel: 814-466-6559; Empl.: 4; *Sls. Mgr.:* Josephine Chesworth

SFE TECHNOLOGIES, 1501 1st St., San Fernando, CA 91341, Tel: 213-365-9411, TWX: 910-496-1535; FSC No.: 96733; Empl.: 2000; *Sls. Mgr.:* J. Lucia; *Dist. Mgr.:* J. Lucia

SGL ELECTRONICS, 300 Harvard Ave., Westville, NJ 08093, Tel: 609-456-7300, TWX: 710-944-0758; Empl.: 60; *Sls. Mgr.:* Dan Holdstein

Local Sales Offices & Reps

AZ	Phoenix, Conductors & Dielectrics, Inc.	602-263-0042
CA	S. Pasadena, Deniston/JDA	213-289-2844
CA	San Francisco, Conductors & Dielectrics, Inc.	415-494-1044
FL	St. Petersburg, K-Square	813-381-1893
IL	Hanover Park, J. R. Ripley Assocs.	312-289-5365
MA	Newton Upper Falls, Anchor Engrg. Corp.	617-964-6205
MN	Minneapolis, Charles D. Atwater Assoc.	612-925-1672
NJ	Berkeley Heights, Cambridge Allen	201-464-0203
NY	Camillus, Ontec Elctrn. Mktg. Inc.	315-672-5626
NY	New York, Cambridge Allen Assoc.	212-592-6361
NY	Rochester, Ontec Elctrn. Mktg. Inc.	716-464-8636
NY	Wappingers Falls, Ontec Elctrn. Mktg. Inc.	914-462-7188
NC	Garner, Candor Co.	919-876-4999
OH	Akron, Augnat Assocs.	216-239-1621
OR	Portland, Conductors & Dielectrics, Inc.	503-242-1456
SC	Myrtle Beach, Candor Co.	803-448-8361
TX	Dallas, Southwest Elctrn. Inds.	214-690-9881
TX	Houston, Dunkel Elctrns. Assoc.	713-729-1670
WA	Seattle, Conductors & Dielectrics, Inc.	206-282-5032

SGL HOMALITE, Div. of SGL Inds., 11 Brookside Dr., Wilmington, DE 19804, Tel: 302-652-3686, TWX: 510-666-3450; Empl.: 70; *Sls. Mgr.:* R. L. Quell

SGL INDUSTRIES, 76 Euclid Ave, Haddonfield, NJ 08033

SGL PLASTICS, Route 248, Nazareth, PA 18064, Tel: 215-759-0280; Empl.: 60; *Sls. Mgr.:* W. Tomko

SGL PRINTED CIRCUITS, 827 Black Oak Ridge Rd., Wayne, NJ 07470, Tel: 201-835-2765; Empl.: 34; *Sls. Mgr.:* R. J. Puzo

SGL WABER®

SGL WABER, 300 Harvard Ave., Westville, NJ 08093, Tel: 609-456-5400, 800-257-8384; Empl.: 170; *Sls. Mgr.:* R. C. Waldron .... 2•1864; 3•1909

Local Sales Offices & Reps

AL	Huntsville, Hollingsworth & Still	205-859-5562
CA	Burlingame, Carelli-EMA	415-342-5546
CA	Gardena, Ungar Sls. Assocs.	213-538-2811
CO	Denver, Walter Engrg.	303-777-5585
FL	Miami, Hollingsworth & Still	305-431-1631
FL	Orlando, Hollingsworth & Still	305-859-9423
FL	Winter Park, Hollingsworth & Still	305-678-2858
GA	Norcross, Hollingsworth & Still	404-447-1700
HI	Honolulu, Lee Gabor Co.	808-536-2457
IL	Northbrook, Wm. M. Linz Assocs.	312-498-9600
IN	Indianapolis, Robert Milsk Co.	317-842-3400
MD	Silver Spring, David S. Linz Co.	301-593-2477
MA	Scituate, K. J. Walsh & Assocs.	617-545-3145
MI	Southfield, Robert Milsk Co.	313-354-3310
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
MO	Blue Springs, Kathrinus-Kelly-Baumhauer	816-229-0001
MO	St. Louis, Kathrinus-Kelly-Baumhauer	314-627-2400
NM	Albuquerque, C. T. Carlberg & Assocs.	505-888-3883
NY	Rochester, Warren Kaufman & Assocs.	716-266-2728
NY	Whitestone, Jack Brown Sls.	212-769-1979
NC	Kernersville, Hollingsworth & Still	919-996-4622
OH	Beachwood, Elctrn. Salesmasters	216-831-9555
OR	Beaverton, Wm. J. Purdy Co.	503-641-9373
PA	Philadelphia, David S. Linz Co.	215-379-0734
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
TX	Dallas, Forner Sls. Co.	214-241-2166
WA	Redmond, Wm. J. Purdy Co.	206-882-3144

Local Distributors

AL	Huntsville, Mock Elctrns.	205-539-2401
AZ	Phoenix, Parts Elctrn.	602-258-6476
AZ	Tucson, Inland Elect.	602-889-5301
AR	Little Rock, Carlton Bates Co.	501-562-9100
CA	Berkeley, Al Lasher's Dealer Elect.	415-843-5915
CA	Canoga Park, Sandy's Elctrn. Supp.	213-346-8353
CA	Costa Mesa, MarVac Elctrns.	714-540-3280
CA	El Monte, Claude Michael	213-696-0141
CA	Fullerton, Orvac Elctrns.	714-871-1020
CA	Gardena, California Switch & Signal	213-770-2330
CA	Glendale, Western Elctrns.	213-246-4861
CA	Hollywood, Pacific Radio Exch.	213-462-1393
CA	Hollywood, Yale Radio	213-465-3186
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Oakland, Brill Elctrns.	415-834-5888
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Pasadena, Dow Radio	213-793-1195
CA	Riverside, Electronic Supp.	714-836-7300
CA	San Diego, Shanks & Wright	714-239-0176
CA	San Francisco, Zack Elctrns.	415-626-1444
CA	San Jose, Quement Elctrns.	408-998-5900
CA	Sunnyvale, Com-Kyl	408-734-9660
CO	Denver, Denver Wintronics	303-934-2406
CO	Denver, Elctrn. Parts	303-744-1992
CT	Stamford, Mar Le Co.	203-348-2645
CT	Waterbury, Suburban Supp.	203-757-1251
FL	Miami, Elctrn. Equip.	305-871-3500
FL	Miami, ESL Elctrn. Distrs.	305-633-6973
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Pensacola, Grice Elctrns.	904-434-2481
GA	Atlanta, Ack Radio Supp.	404-351-6340
GA	Atlanta, Specialty Distrib.	404-873-2521
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Elk Grove Village, GBL Elctrns.	312-593-3220
IL	Niles, Joseph Elctrns.	312-297-4200
IL	Northbrook, Classic Comps.	312-272-9650
IL	Palatine, Ohm Elctrns.	312-359-5500
IL	Peoria, Klaus Radio & Elctrns.	309-691-4840
IL	Rockford, Mid-West Associated	815-962-8036
IN	East Chicago, Acro Elctrns.	312-357-1269
IN	Ft. Wayne, Ft. Wayne Elctrns.	219-423-3422
IN	Indianapolis, Meunier Elect.	317-635-3511
IN	Indianapolis, Radio Distrib.	317-257-2231
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Terre Haute, Midwest Supp. Elec.	812-232-0187
KY	Lexington, Radio Elctrn. Equip.	606-255-6661
KY	Louisville, P.I. Burks Co.	502-589-3960
KY	Louisville, Peerless Elctrn. Equip.	502-637-7674
LA	Lafayette, Ralphs of Lafayette	318-234-4507
LA	Shreveport, Industrial Elect.	318-222-9459
MD	Baltimore, Radio Elctrn. Svc. Co.	301-823-0700
MD	Baltimore, ASI Elctrns.	301-265-5100
MD	Gaithersburg, Pioneer/Wash. Elect.	301-948-0710
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Lynn, Land Elec. Supp.	617-592-2220
MA	Needham, You-Do-It Elctrns.	617-449-1005
MA	Newton Upper Falls, In-Stock Prods. Co.	617-964-6200
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	W. Newton, A. W. Mayer Co.	617-965-1111
MI	Ann Arbor, Wedemeyer Elect. Supp.	313-665-8611
MI	Detroit, RS Elctrns.	313-491-1012
MN	Minneapolis, Stark Elctrns.	612-332-1325
MN	Minneapolis, Electronics Ctr.	612-371-5200
MS	Jackson, Ellington Elect. Supp.	601-355-0561
MO	Kansas City, Electronic Supp. Co.	816-921-0250

MO	Kansas City, Walters Radio Supp.	816-531-7015
MO	St. Louis, Van Sickle Radio	314-621-5000
MO	St. Louis, Olive Indl. Elect.	314-863-7800
NE	Lincoln, Scott Elec. Supp.	402-466-8221
NE	Omaha, Radio Equip.	402-341-7700
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Camden, General Radio Supp.	609-964-8560
NJ	Hanover, State Elctrn. Parts	201-887-2550
NJ	Springfield, Route Elctrns.	201-467-0166
NJ	Springfield, Federated Purchaser	201-376-8900
NM	Albuquerque, Electronic Parts	505-293-6161
NM	Albuquerque, Walker Radio Co.	505-247-2288
NY	Buffalo, Summit Distrib.	716-884-3450
NY	Farmingdale, Fordham Radio	516-752-0500
NY	Hauppauge, Broadline Elctrns.	516-420-8320
NY	Hempstead, Davis Elctrns.	516-483-9200
NY	Long Island City, H. L. Dalis, Inc.	212-361-1117
NY	New York, Argil Elctrns.	212-691-8111
NY	Portchester, Wise Comps.	203-531-4880
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Masline Elctrns.	716-546-5373
NY	Rome, Rome Elctrns.	315-337-5400
NY	Schenectady, Adirondack Elctrns.	518-842-8350
NC	Raleigh, Southeastern Radio Supp.	919-828-2311
OH	Akron, Akron Elctrn. Supp.	216-762-8818
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cincinnati, United Radio	513-662-2610
OH	Cleveland, Pioneer-Standard Elect.	216-587-3600
OH	Cleveland, Pattison Supp.	216-441-3000
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Dayton, Becker Elctrns.	513-226-1341
OH	Dayton, ESCO, Inc.	513-226-1133
OH	Dayton, Pioneer Elctrns.	513-236-9900
OH	Solon, Repco	216-248-8900
OH	Toledo, Warren Radio	419-248-3364
OK	Oklahoma City, Trice Whlsl. Elect.	405-524-4411
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, EOFF Elec.	503-222-9411
PA	Allentown, A. A. Peters	215-434-5237
PA	Huntingdon Valley, Shap Elctrns.	215-322-7150
PA	Philadelphia, Almo Elctrns.	215-698-4000
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Plymouth Meeting, Techni-Tool	215-825-4900
PA	Reading, Barbey Elctrns.	215-376-6116
RI	Providence, Wm. Dandreta & Co.	401-861-2800
SC	Charleston, Wholesale Radio Supp.	803-747-9672
TN	Chattanooga, Curle Elctrns.	615-266-4727
TN	Kingsport, Radio Elect. Supp.	615-247-8111
TN	Nashville, Electra Distrib.	615-329-3971
TN	Nashville, Randolph & Rice	615-255-5602
TX	Austin, Harrison Ind. Elctrns.	512-458-3555
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Dallas, Wallace Elctrns.	214-340-0400
TX	Dallas, KA Elect. Sls.	214-634-7870
TX	Dallas, Wholesale Elect. Supp.	214-824-3001
TX	Ft. Worth, Sweico	817-335-6521
TX	Houston, City Electronic Supp.	713-621-1060
TX	Houston, Electrotex	713-941-7016
TX	Houston, Harrison Ind. Elctrns.	713-652-4700
TX	Houston, Lenert Co.	713-225-1465
TX	San Antonio, Sherman Elect. Supp.	512-224-1001
UT	Salt Lake City, Standard Supp.	801-486-3371
VA	Arlington, Arlington Elctrn.	703-524-2412
VA	Portsmouth, Distributors	804-399-2446
VA	Richmond, Avec Elctrns.	804-359-6071
VA	Roanoke, Peoples Radio & TV Supp.	703-342-8933
WA	Seattle, Radar Elect.	206-282-2511
WI	Madison, Satterfield Elctrns.	608-257-4801
WI	Milwaukee, Marsh Elctrns.	414-475-6000

SGS-ATES SEMICONDUCTOR CORP., 240 Bear Hill Rd, Waltham, MA 02154, Tel: 617-890-6688, Telex: 923495; Empl.: 9000

SHALLCO, Box 1089, Smithfield, NC 27577, Tel: 919-934-3135, TWX: 510-939-1479; Empl.: 35; *Sls. Mgr.:* M. D. Sutton .... **1B**•1744-1747; **3**•1052, 1053

Local Sales Offices & Reps

CA	Chatsworth, WCV/RALTECH	818-700-0933
CA	Santa Clara, Fischer Assocs.	408-733-7350
IL	Northfield, Imex	312-446-8934
IA	Cedar Rapids, S & O Sls.	310-393-1845
KS	Shawnee Mission, Tech. Sls.	913-888-3330
MD	Towson, Holden Engrg. Sls.	301-823-3763
MA	Norwood, MPS Elctrn.	617-769-8700
MN	Minneapolis, R. J. Inc.	612-866-3661
MO	Ferguson, Tech. Sls.	314-725-5361
NY	Lynbrook, HLJ	516-599-2999
NY	Manhattan, Lothar Sanford Corp.	212-757-3881
NY	Pittsfield, D. Hurley Sls.	716-586-6159
OH	Englewood, Allen Nace Co.	513-836-0931

Local Distributors

FL	Jacksonville, Southeast Elctrns.	904-356-3007
MI	Grand Rapids, Audio Distrib.	616-452-1596
NY	Lynbrook, Peerless Radio	516-593-2121
OH	Cincinnati, United Radio	513-761-4030
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TN	Bristol, Broadcast Equip. & Supp.	615-878-2531
TX	Dallas, Wholesale Elctrns.	214-824-3001
Can	Montreal, Que., Braydon Electro	514-332-5650

SHALLCROSS, INC., See RCL-Shallcross

SHALLTRONIX CORP., Preston St., P.O. Box 235, Selma, NC 27576, Tel: 919-965-6346; FSC No.: 58258; *Sls. Mgr.:* Joe Deans .... **3**•1299

Local Sales Offices & Reps

TX	Arlington, Electronic Prod. Reps.	817-467-0377

SHAPE MAGNETRONICS, INC., 901 DuPage Ave., Lombard, IL 60148, Tel: 312-620-8394, TWX: 910-991-2352; *Sls. Mgr.:* J. Hilgenberg .... **3**•1910, 1911

SHAPIRO SCIENTIFIC INST., 3500 E. Coast Hwy., Corona del Mar, CA 92625, Tel: 714-675-1024; Empl.: 7

SHELLY
associates

SHELLY ASSOCIATES, INC., 2942 Dow Ave., Tustin, CA 92680, Tel: 714-544-9970, TWX: 910-595-1589; FSC No.: 00303; Empl.: 30; *Sls. Mgr.:* Chuck Feeney .... **1B**•1096

Local Sales Offices & Reps

CA	Mountain View, Leddy Assocs.	415-969-6313
CA	Redondo Beach, Vedax, Inc.	213-540-1255
CT	Madison, Eastronix, Inc.	203-421-4514
FL	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
FL	Melbourne, Reynolds & Assocs. Inc.	305-259-7000
FL	St. Petersburg, Reynolds & Assocs.	813-360-1384
GA	Acworth, Reynolds & Assocs. Inc.	404-451-9558
IL	Downers Grove, Splon Assocs. Inc.	312-963-7011
IN	Ft. Wayne, Scott Elctrns.	219-484-7865
IN	Indianapolis, Scott Elctrns. Inc.	317-897-9976
KS	Shawnee Mission, Florence and Meyer, Inc.	913-722-5210
LA	Covington, HBT Assocs. Inc.	504-892-4045
MA	Bedford, Eastronix	617-275-5775
MI	Lake Orion, C C Elctrns. Inc.	313-338-7400
MN	Edina, Splon Assocs. Inc.	612-927-6744
NJ	Boonton, TMA	201-263-2946
NY	Port Washington, TMA	516-883-2432
NC	Spring Hope, Reynolds & Assocs. Inc.	305-259-7000
OH	Cincinnati, Scott Elctrns.	513-791-2513
OH	Cleveland, Scott Elctrns. Inc.	216-473-5050
OH	Dayton, Scott Elctrns. Inc.	513-294-0539
OH	Reynoldsburg, Scott Elctrns.	614-863-1281
PA	Pittsburgh, Scott Elctrns.	412-963-6116
PA	Wynnewood, Metz-Benham Assocs.	215-896-7300
TX	Dallas, Tag Techn. Sls.	214-986-0568
TX	Irving, Tag Tech. Sls.	214-253-1310
UT	Salt Lake City, Sunbird Inds. Inc.	801-272-1303
VT	Shelburne, Eastronix, Inc.	802-985-3743

Local Distributors

CA	Anaheim, Bisco Inds. Inc.	714-635-0380
CA	San Jose, Bisco Inds. Inc.	408-946-8980
CT	Norwalk, Park Distrs. Inc.	203-853-2010
CT	Wallingford, Midstate Elctrns. Co.	203-265-9900
IL	Franklin Park, Bisco Inds. Inc.	312-451-1230
MA	Chelmsford, Pilgrim Elctrns.	617-251-8746
MA	Woburn, Elctrn. Packaging Comps.	617-935-0400
NJ	Cranford, Garden State Indl. Elctrns.	201-272-6400
NJ	East Brunswick, Brothers Elctrns.	201-238-2200
NJ	Fair Lawn, Relay Specialties	201-797-3313
NJ	Saddle Brook, Tide Elctrns.	201-794-9660
NY	Elmsford, White Plains Elctrl. Supp. Co.	914-592-9555
OH	Strongsville, Roberts Elctrns. Co., Inc.	216-238-1711
OK	Tulsa, Radio, Inc.	918-587-9123
TX	Dallas, Wilkinson Brothers Co.	214-941-9963
WI	Mequon, Lakeview Elctrns.	414-377-8250

SHIELDING TECHNOLOGY, INC., 120 Ethel Rd. West, Piscataway, NJ 08854, Tel: 201-985-8800, TWX: 710-480-6297; *Sls. Mgr.:* Mason Carter

SHINANO KENSHI CORP. (SKC), 7525 Ethel Ave., Ste. 1, N. Hollywood, CA 91605, Tel: 818-764-4266; Empl.: 5; *Sls. Mgr.:* William F. Dowis .... **1B**•1181

Local Sales Offices & Reps

CA	North Hollywood, Shinano Kenshi Corp.	818-764-4266
CA	Santa Clara, Logan Sales	408-496-0660
CO	Denver, Tech Rep Sls. Co.	303-758-7031
CT	Madison, SIR Assocs.	203-245-2242
FL	Orlando, Irby & Connolly Inc.	305-894-8471
IL	Barrington, Richard Fisk Mktg.	312-381-0653
MA	Bedford, SIR Assocs.	617-275-5550
MI	Southfield, Fred Gehrke & Assoc.	313-559-5363
MN	Eagan, J. Jorgenson & Assoc.	612-452-9541
NJ	Hatboro, PA, Electro Rep	215-674-4421
NJ	Oxford, Malin Assocs.	201-689-7398
NY	Rochester, The Robert F. Lamp Co.	716-323-1250
NC	Greenville, Ranico Representatives	615-639-7696
OK	Richardson, TX, Precision Technology Assocs.	214-234-8071
OR	Portland, Intertech Sls.	503-775-7885
TN	Greenville, Lamons Sales Co.	615-639-8711
TX	Austin, Precision Technlg. Assocs.	512-250-0201
TX	Fort Worth, Gene Moody Entprs.	817-572-1068
TX	Houston, Precision Technlg. Assocs.	713-463-6801
TX	Richardson, Precision Technlg. Assoc.	214-234-8071
WA	Seattle, Rep West	206-283-8351

Local Distributors

CA	N. Hollywood, Digilog Devices	818-764-9777

SHOGYO

SHOGYO INTL. CORP., 287 Northern Blvd., Great Neck, NY 11021, Tel: 516-466-0911, Telex: 4758024, TWX: 12218 .... **1A**•2055, 2263; **1B**•1097; **2**•1562-1564, 2150; **3**•1054, 1348, 1349

SHOKAI FAR EAST LTD., 280 North Central Ave., Hartsdale, NY 10530, Tel: 914-681-0700, Telex: 22-4219; Empl.: 362; *Sls. Mgr.:* Martin N. Rubin .... **3**•1055

SHOW 'N TELL PRODUCTS, AMG, Inc., 155 Franklin Street, Dayton, OH 45402, Tel: 513-223-8211; *Sls. Mgr.:* Jon A. Bloyd

SHUGART ASSOCS., 475 Oakmead Pkwy., Sunnyvale, CA 94086, Tel: 408-733-0100, TWX: 910-339-9355; Empl.: 3000; *Sls. Mgr.:* Gary Galusha; *Dist. Mgr.:* Gary Galusha

SHURE BROS., 222 Hartrey Ave., Evanston, IL 60204, Tel: 312-866-2200, Telex: 72-4381, TWX: 910-231-0048; *Sls. Mgr.:* R. T. Murphy, Sales Manager

SHURITE METERS, INC., 577 Grand Ave., P.O. Box 1848, New Haven, CT 06508, Tel: 203-624-1188; Empl.: 30; *Sls. Mgr.:* Joseph V. LeBlanc; *Dist. Mgr.:* Joseph V. LeBlanc

Local Sales Offices & Reps

AZ	Tempe, Gassner & Clark Co.	602-968-9037
CA	Los Angeles, Modco	213-848-2215
CA	Sunnyvale, W. W. Posey Co.	408-746-0771
CO	Denver, Nelson	303-295-1017
FL	Longboat, R. S. Cushing	813-383-1770
IL	Park Ridge, Bob Burns & Assoc.	312-823-9360
IN	Indianapolis, Sukup & Cox	317-253-5501
IA	Des Moines, The Beams Co.	515-255-1148
MI	E. Detroit, Jack M. Thorpe	313-779-6363
MN	Minneapolis, Lestronix	612-926-8466
NJ	Belleville, D. F. Tobias & Co.	201-751-8680
NY	Rochester, H. C. Johnson Agen.	716-586-0777
NC	Raleigh, B. T. Funderburk	919-782-3493
OH	Cincinnati, John O. Olsen	513-574-7711
PA	Ardmore, John Wurtz	215-649-6300
RI	Lincoln, Adams-McGregor	401-726-1300
TX	Dallas, Crockett Sls.	214-350-3377
WA	Seattle, Don Smith Sls.	206-633-3160

SIDEREAL CORP., 9600 S.W. Barnes Rd., Portland, OR 97225, Tel: 503-297-5531, Telex: 36-0640, TWX: 910-464-6139; *Sls. Mgr.:* Jim Miller & Jeff Gretz; *Dist. Mgr.:* Joy Sakata

SIECOR CORP., Box 489, Hickory, NC 28603, Tel: 704-328-2171, Telex: 800-510, TWX: 510-934-1204; Empl.: 600; *Sls. Mgr.:* J. English

SIEMENS COMPS., INC., Optoelectronics Div., 19000 Homestead Rd., Cupertino, CA 95014, Tel: 408-257-7910, Telex: 352084, TWX: 910-338-0022; FSC No.: 50579; Empl.: 1100; *Sls. Mgr.:* Gary Durgin; *Dist. Mgr.:* Merv Stamberger

SIEMENS CORP., 186 Wood Ave., S., Iselin, NJ 08830, Tel: 201-494-1000, TWX: 710-998-0588; Empl.: 800

SIEMENS CORP., Colorado Comps. Div., 800 Hoyt St., Broomfield, CO 80020, Tel: 303-469-2161, Telex: 45-4357; Empl.: 373; *Sls. Mgr.:* Bill Hacker

Sierracin/Magnedyne

SIERRACIN/MAGNEDYNE, 2258 Rutherford Rd., P.O. Box 458, Carlsbad, CA 92008, Tel: 619-438-3321, Telex: 910 322-1391; Empl.: 190 .... **1B**•1178, 1179

Local Sales Offices & Reps

AL	Huntsville, L & D Inc.	205-837-1469
CA	Campbell, Luscombe Engrg. Co.	408-370-2020
CA	Laguna Beach, Comar Co.	619-540-1219
CA	Torrance, Carl J. Aguirre	213-375-9485
CA	W. Los Angeles, Mike McNeil	213-478-6942
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
GA	Atlanta, L & D Inc.	404-455-3483
IL	Rolling Meadows, KMA Sls. Co.	312-398-5300
MD	Churchville, Atlantic Tech. Sls.	301-879-2236
MN	St. Paul, North Star Motion & Controls	612-770-5311
NJ	Paramus, Carnes Diamond Assocs.	201-967-1309
NY	Centerport, Carnes Diamond Assocs.	516-261-8100
NY	Pittsford, Controlled Motion Prods. Co.	716-381-1933
NC	Greensboro, L & D Inc.	919-292-3201
OH	Cleveland, Servo-Mark	216-871-2353
PA	King of Prussia, Rivco January	215-265-5211
TX	Dallas, Thorson Co.	214-233-5744
WI	Milwaukee, KMA Sls. Co.	414-259-1771

Sierracin/Power Systems

SIERRACIN/POWER SYSTEMS, 20500 Plummer St., Chatsworth, CA 91311, Tel: 818-998-9873, TWX: 910-494-4830; FSC No.: 58999; Empl.: 450; *Sls. Mgr.:* Nick Freyling; *Dist. Mgr.:* Nick Freyling .... **3**•1768-1770

Local Sales Offices & Reps

AZ	Tempe, Chapman Assocs.	602-894-6775
CA	San Diego, Interstate Mktg.	619-292-8117
CA	Santa Clara, Fahner-Miller	408-727-9800
CA	Woodland Hills, Interstate Mktg.	818-883-7606
CT	Guilford, Whitehead Assoc.	203-453-3762
FL	Altamonte Springs, Semtronic Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Ft. Lauderdale, Semtronics	305-730-2484
IL	Rolling Meadows, Sumer, Inc.	312-991-8500
IA	Cedar Rapids, Comstrand	319-377-1575
KS	Merriam, Midwest Tech. Sls.	913-236-8555
KS	Wichita, Midwest Tech. Sls.	316-262-7240
KY	Louisville, KW Elctrn. Sls.	502-451-1860
MA	Lynnfield, Whitehead Assoc.	617-246-5070
MI	Novi, Lektronics	313-349-3304
MN	Minneapolis, Comstrand	612-788-9234
MO	St. Charles, Midwest Tech. Sls.	314-441-1012
NJ	Ridgewood, Hansen & Hughes	201-652-7055
NY	Mendon, Tech-Mark, Inc.	716-624-3840
NC	Raleigh, J & B Sls.	919-878-8600
OH	Dayton, K. W. Elctrn. Sls.	513-890-2150
OH	Shaker Heights, K. W. Elctrn. Sls.	216-491-9177
OH	Worthington, K. W. Elctrn. Sls.	614-888-0483
OR	Beaverton, Wm. J. Purdy Co.	503-641-9373
PA	Allison Park, K. W. Elctrn. Sls.	412-487-4300
PA	Huntingdon Valley, Omega Elctrn. Sls.	215-947-4135
TN	Tullahoma, J & B Sls.	615-455-7487
VA	Alexandria, Scott Data	703-765-7901
WA	Seattle, Wm. J. Purdy Co.	206-284-8020
WI	Brookfield, Sumer, Inc.	414-784-6641

Local Distributors

AL	Huntsville, Hall-Mark	205-837-8700
AZ	Phoenix, Hall-Mark	602-243-6601
CA	Chatsworth, Priority One	818-709-5464
CA	Citrus Heights, Hall-Mark	916-722-8600
CA	Costa Mesa, FLW	714-751-7512
CA	El Segundo, Hall-Mark	213-643-9101
CA	San Diego, FLW	619-277-0993
CA	San Diego, Hall-Mark	619-268-1201
CA	Sunnyvale, Hall-Mark	408-773-9990
CA	Tustin, Hall-Mark	714-669-0681
CO	Englewood, Hall-Mark	303-694-1662
FL	Clearwater, Hall-Mark	813-530-4543
FL	Ft. Lauderdale, Hall-Mark	305-971-9280
FL	Orlando, Hall-Mark	305-855-4020
FL	Tampa, Reptron	813-855-4656
GA	Norcross, Hall-Mark	404-447-8000
IL	Arlington Hgts., Reptron Elctrns.	312-593-7070
IL	Bensenville, Hall-Mark	312-860-3800
KS	Lenexa, Hall-Mark	913-888-4747
MD	Columbia, Hall-Mark	301-988-9800
MI	Grand Rapids, Calder Elctrns.	616-949-2900
MI	Livonia, Reptron Elctrns.	313-525-2700
MN	Bloomington, Hall-Mark	612-854-3223
MO	Maryland Hgts., Hall-Mark	314-291-5350
NJ	Cherry Hill, Hall-Mark	609-424-7300
NJ	Fairfield, Hall-Mark	201-575-4415
NY	Ronkonkoma, Hall-Mark	516-737-0600
NC	Raleigh, Hall-Mark	919-872-0712
OH	Cincinnati, Hall-Mark	513-563-5980
OH	Englewood, Argent/Electra	513-836-8633
OH	Solon, Hall-Mark	216-349-4632
OH	Solon, REH Elctrns.	216-248-1636
OH	Westerville, Hall-Mark	614-891-4555
OK	Tulsa, Hall-Mark	918-665-3200
OR	Wilsonville, Zepher Ind.	503-682-2929
PA	Pittsburgh, ATI/Electra	412-821-5565
TX	Austin, Hall-Mark	512-258-8848
TX	Dallas, Hall-Mark	214-341-1147
TX	Houston, Hall-Mark	713-781-6100
WA	Seattle, Zepher Ind.	206-241-1980
WI	Oak Creek, Hall-Mark	414-761-3000

SIERRACIN/THERMAL SYS., 13920 S. Broadway, Los Angeles, CA 90061, Tel: 213-321-4350, TWX: 910-346-6774; FSC No.: 11416; Empl.: 175

SIERRA ELEC., See Pass & Seymour, Inc.

SIGMA INSTRS., 170 Pearl St., Braintree, MA 02184, Tel: 617-843-5000, Telex: 94-0645, TWX: 710-348-1161; Empl.: 1,500

SIGMA INSTRS., Intl. Instr. Div., 88 Marsh Hill Rd., Orange, CT 06477, Tel: 203-795-4711, Telex: 714-465-2897; Empl.: 150; *Dist. Mgr.:* J. Connolly

SIGMA-NETICS, INC., One Washington Ave., Fairfield, NJ 07006, Tel: 201-227-6372

SIGMA PLASTRONICS, 14531-33 Tireman Ave, Dearborn, MI 48126, Tel: 313-846-4410; Empl.: 10; *Sls. Mgr.:* S. J. Hirshfield

SIGMAPOWER, INC., 20790 Leapwood Ave., Carson, CA 90746, Tel: 213-32-Sigma; FSC No.: 55196; Empl.: 61; *Sls. Mgr.:* Bill Adams

SIGMA SYSTEMS CORP., 3163 Adams Ave., San Diego, CA 92116, Tel: 619-283-3193; Empl.: 14; *Sls. Mgr.:* T. Stewart .... **3**•1179

SIGNAL SYS. INTL., P.O. Box 198, Holmdel, NJ 07733, Tel: 201-741-1120; Empl.: 7; *Sls. Mgr.:* D. Roy

SIGNAL TRANSFORMER, 500 Bayview Ave., Inwood, NY 11696, Tel: 516-239-4510, Telex: 96-8112, TWX: 510-225-8440; FSC No.: 08779; Empl.: 280; *Sls. Mgr.:* G. Carlin .... **1A**•2267-2279

Direct sales only. Inwood, NY 516-239-4510 or 516-239-7200

SIGNATRON, 12 Hartwell Ave., Lexington, MA 02173, Tel: 617-861-1500, Telex: 955329XTLSRVC ATTN:SIGNATRON; FSC No.: 59371; Empl.: 120; *Sls. Mgr.:* Joseph T. McNamara

SIGNETICS, 811 E. Arques Ave., Sunnyvale, CA 94086, Tel: 408-739-7700, TWX: 910-339-9220; Empl.: 6000; *Sls. Mgr.:* J. Luke; *Dist. Mgr.:* J. Abram

SIGNUM SYS., 726 Santa Monica Blvd., Santa Monica, CA 90401, Tel: 213-451-5382; Empl.: 7

SILICON DETECTOR CORP., 855 Lawrence Dr., Newbury Park, CA 91320, Tel: 805-498-6737, Telex: 182229; *Sls. Mgr.:* F. W. Sullivan

Local Sales Offices & Reps

MA	Holden, Poulin Assocs.	617-829-6948
NC	Fayetteville, Zimtec	919-485-2222
OH	Cleveland, Geotronix Inc.	216-526-2535
VA	Fairfax, Beacon North	703-591-1300

SILICON GENERAL, 11651 Monarch St., Garden Grove, CA 92641, Tel: 714-892-5531, Telex: 692-411, TWX: 910-596-1804; FSC No.: 34333; Empl.: 150; *Sls. Mgr.:* Joe Castellano; *Dist. Mgr.:* Larry Baumgardner

Local Sales Offices & Reps

AL	Huntsville, R. O. Whitesell and Assoc.	205-883-5100
AZ	Phoenix, I.S.D.S.	602-971-6250
CA	Cupertino, Thresum Assoc.	408-996-9889
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CA	Santa Ana, I.S.D.S.	714-973-2162
CA	Woodland Hills, I.S.D.S.	213-883-7130
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FL	Clearwater, H.H.P	813-797-4447
FL	Ft. Lauderdale, H.H.P.	305-971-5750
FL	Maitland, H.H.P.	305-831-2474
GA	Norcross, Glen White Assoc.	404-441-1447
ID	Boise, N. R. Schultz	208-377-8686
IL	Rolling Meadows, Sumer	312-991-8500
IN	Ft. Wayne, R. O. Whitesell and Assoc.	219-432-5591
IN	Indianapolis, R. O. Whitesell and Assoc.	317-359-9283
IN	Kokomo, R. O. Whitesell and Assoc.	317-457-9127
IA	Cedar Rapids, Rep Assoc.	319-373-0152
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KY	Louisville, R. O. Whitesell and Assoc.	502-426-7696
MD	Baltimore, Conroy Sls.	301-296-2444
MI	Grand Rapids, R. O. Whitesell and Assoc.	616-942-5420
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CT	North Branford, LJM Assocs.	203-488-4244
IL	Rolling Meadows, Hill Sls. Corp.	312-259-5190
KS	Overland Park, Kebco	913-541-8431
MD	Timonium, Glen White Assocs.	301-252-6360
MA	Topsfield, RFC Assocs.	617-887-8545
MI	Farmington, Amtech Reps.	313-474-8300
MN	Bloomington, Northport Engrg.	612-854-5556
MO	St. Louis, Kebco	314-576-4111
NJ	Fairfield, T. J. Saes Inc. of N.J.	201-667-5900
TX	Dallas, J. Clay Co.	214-350-1281
VA	Lynchburg, Glen White Assocs.	804-237-6291
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FL	Clearwater, Marketiers Corp.	813-443-4302
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MN	Burnsville, Aquapoly Equip.	612-890-3939
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PA	Furlong, Avenir, Inc.	215-348-8290
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MD	Lisbon, Samuel K. Macdonald	301-924-5880
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MI	Southfield, R. C. Merchant Co.	313-354-4300
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MS	Jackson, Cartwright & Bean Co.	601-981-1170
MO	Blue Springs, Kathrinus-Kelly-Baumhauer Co.	816-229-0001
MO	St. Louis, Kathrinus-Kelly-Baumhauer & Co.	314-647-2400
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CT	E. Haven, Eagle Assocs.	203-467-6542
FL	Pompano Beach, Cole-Tek Assocs.	305-781-8110
GA	Stone Mountain, DTM, Inc.	404-962-2530
IL	Park Ridge, Bob Burns & Assoc.	312-775-1233
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
MD	Glen Burnie, Macrotech Assoc.	301-437-5588
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MN	Minneapolis, Loren Green Assoc. of Minn.	612-571-6666
MO	St. Charles, C. F. Elctrns.	314-946-8500
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FL	Ft. Lauderdale, Powell Elctrns.	305-972-4300
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IL	Des Plaines, Edmar Elctrns.	312-298-8580
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OH	Solon, Repco	216-248-8900
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TX	Houston, Altair Co.	713-462-3029
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FL	Ft Lauderdale, Hollingsworth & Still	404-447-1700
FL	Miami, Hollingsworth & Still	404-447-1700
FL	Tampa, Hollingsworth & Still	404-447-1700
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FL	Ft. Lauderdale, R. M. Intl.	305-975-7500
GA	Atlanta, Electro-Mech	404-447-6478
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IN	Columbus, John H. Weaver Co., Inc.	812-372-3625
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MO	St. Louis, Abrams & Assoc.	314-569-0447
NJ	Medford, Jack McCoy, Inc.	215-363-0350
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SOLATRON ENTERPRISES, 421 E. Beach Ave., Inglewood, CA 90302, Tel: 213-678-4981; Empl.: 20

SOLDER ABSORBING TECHNOLOGY (SAT), South End Bridge Circle, Agawam, MA 01001, Tel: 800-628-8862, TWX: 710-350-6466; Empl.: 8

SOLDER REMOVAL, 1077 E. Edna Pl., Covina, CA 91724, Tel: 213-967-3681, TWX: 910-584-1820; FSC No.: 34605

SOLID STATE, INC., 46 Farrand St., Bloomfield, NJ 07003, Tel: 201-429-8700, TWX: 710-994-4780; Empl.: 110; *Sls. Mgr.:* T. King

SOLID STATE CIRCUITS, 616 Boonville, Springfield, MO 65806, Tel: 417-869-4678, TWX: 910-775-4762; Empl.: 165; *Sls. Mgr.:* Gary Bollinger

SOLID STATE DEVICES, 14830 Valley View Ave., La Mirada, CA 90638, Tel: 213-921-9660, TWX: 910-583-4807; FSC No.: 30043; Empl.: 100; *Sls. Mgr.:* D. Peden

SOLID STATE ELCTRNS. CORP., 18646 Parthenia St., Northridge, CA 91324, Tel: 818-993-8257; FSC No.: 11911; Empl.: 15

SOLID STATE RELAYS, 213 Eisenhower Lane So., Lombard, IL 60148, Tel: 312-932-1660; *Sls. Mgr.:* D. E. Wienke

SOLID STATE SCIENTIFIC, 3900 Welsh Rd., Willow Grove, PA 19090, Tel: 215-657-8400, Telex: 476-1101, TWX: 510-661-7267; Empl.: 650; *Dist. Mgr.:* David DeLane

Local Sales Offices & Reps

AZ	Phoenix, Sanford Sls. Assoc.	602-957-3570
CA	Fallbrook, Martronix	619-728-7678
CA	Mountain View, Technlg. Sls.	415-960-0600
CA	San Jose, Solid State Sci.	408-241-7111
CA	Sherman Oaks, Solid State Sci.	213-995-6666
CA	Woodland Hills, Interstate Mktg. Assoc.	213-883-7606
CO	Englewood, Todd & Fry Assoc.	303-447-9358
CT	Guilford, Datamark	203-453-0575
FL	Coral Springs, Electrocraft	305-753-8666
FL	Largo, Electrocraft	813-530-4749
FL	Tampa, Solid State Sci.	813-935-8203
GA	Clarkston, Electramark	404-292-0369
GA	Lawrenceville, Electramark	404-963-4793
IL	Arlington Hgts., Solid State Sci.	312-255-3883
IL	Rolling Meadows, Hartland Tech. Mktg.	312-577-9222
MD	Towson, Arbotek Assoc. Inc.	301-825-0775
MA	Lexington, Nova Sales	617-861-1820
MA	Waltham, Solid State Sci.	617-891-7530
MN	Eden Prairie, Electronic Innovators	612-941-0830
MO	Blue Springs, KKB & Co.	816-229-0001
MO	St. Louis, KKB & Co.	314-647-2400
NJ	Bellmawr, TAI Corp.	609-933-2600
NY	Camillus, Ontec Inc.	315-672-5626
NY	Commack, ERA Inc.	516-543-0510
NY	Rochester, Ontec Inc.	716-464-8636
NY	Wappinger Falls, Ontec Inc.	914-462-7188
OH	Beachwood, Electronic Salesmaster	216-831-9555
OR	Beaverton, Caruso & Northcutt	503-646-4973
PA	Willow Grove, Solid State Sci.	215-657-8400
TX	Austin, EMA	513-837-0893
TX	Grapevine, EMA	817-481-7502
TX	Houston, EMA	713-498-8120
WA	Bellevue, Caruso & Northcutt	206-454-9699
WI	Milwaukee, J. M. Sales	414-546-0040
WI	Milwaukee, Heartland Technical Mktg.	414-931-0606

SOLID STATE SYSTEMS, 1990 Delk Industrial Blvd., Marietta, GA 30067, Tel: 404-952-9401; Empl.: 140; *Sls. Mgr.:* H. Ivester; *Dist. Mgr.:* J. Schloss

SOLID STATE TESTING, INC., 56 Middlesex Tpke., Burlington, MA 01803, Tel: 617-272-0972, TWX: 710-332-1620; Empl.: 150; *Sls. Mgr.:* James Roberts; *Dist. Mgr.:* James DiGiacomo

SOLITRON DEVICES, 8808 Balboa Ave., San Diego, CA 92123, Tel: 619-278-8780, TWX: 910-335-1221; Empl.: 900

SOLITRON DEVICES, INC., Semiconductor Group, 1177 Blue Heron Rd., Riviera Beach, FL 33404, Tel: 305-848-4311, Telex: 51-3435, TWX: 510-952-7610; FSC No.: 21845; Empl.: 646; *Sls. Mgr.:* John Flynn; *Dist. Mgr.:* Kevin O'Shea

SOLITRON/MICROWAVE, Box 278, Port Salerno, FL 33492, Tel: 305-287-5000, TWX: 510-953-7500; FSC No.: 95077; Empl.: 300; *Sls. Mgr.:* James J. McCann

SOLTEC
CORPORATION

SOLTEC CORP., 11684 Pendelton St., Sun Valley, CA 91352, Tel: 818-767-0044, 800-423-2344, Telex: 67-4188; Empl.: 46; *Sls. Mgr.:* Gary A. Purser ....**3**•1388, 1389

Local Sales Offices & Reps

AL	Huntsville, Saber Assocs.	800-327-0853
AZ	Scottsdale, Barnhill Assocs.	602-947-7841
CA	San Carlos, Elctrn. Engrg. Assocs.	415-593-2189
CA	San Diego, Mesa Engrg.	619-268-3500
CO	Englewood, Barnhill Assocs.	303-779-3600
DE	Wilmington, Elctrn. Mktg. Assocs.	302-652-5333
FL	Melbourne, Saber Assocs.	800-432-6288
GA	Cummings, Saber Assocs.	800-327-0853
IL	Arlington Heights, Dytec/Central	312-394-3380
KS	Mission, Vertec Assocs.	913-677-3200
LA	Baton Rouge, Barnhill Assocs.	504-924-6826
MD	Baltimore, Elctrn. Mktg. Assocs.	301-744-7700
MD	Rockville, Elctrn. Mktg. Assocs.	301-881-5300
MA	Acton, Applied Measurements	617-646-7250
MI	Madison Heights, WKM Assocs.	313-588-2300
MN	Minneapolis, Trask Engrg	612-537-2434
MO	Manchester, Vertec Assocs.	314-394-6242
NJ	Lodi, SDM Reprs.	201-368-0123
NM	Albuquerque, Barnhill Assocs.	505-299-7658
NY	Rochester, SDM Reps	716-247-8770
NC	Clayton, Saber Assocs.	800-327-0853
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OR	Beaverton, Northwest Test & Meas.	503-646-9966
PA	King of Prussia, Elctrn. Mktg. Assocs.	215-265-1600
PA	Philadelphia, Elctrn. Mktg. Assocs.	215-248-5050
PA	Pittsburgh, WKM Assocs.	412-892-2953
PA	Plymouth Meeting, Elctrn. Mktg. Assocs.	215-828-7400
SC	Columbia, Saber Assocs.	800-327-0853
TX	Austin, Barnhill Assocs.	512-451-0217

TX	Houston, Barnhill Assocs.	713-688-9971
TX	Richardson, Barnhill Assocs.	214-231-2573
UT	Murray, Barnhill Assocs.	801-262-3000
VA	Norfolk, Elctrn. Mktg. Assocs.	804-461-8133
VA	Richmond, Elctrn. Mktg. Assocs.	804-320-8801
WA	Redmond, Northwest Test & Meas.	206-881-8857

SONIC INTERNATIONAL CORP., 2515 N.E. Riverside, Portland, OR 97211, Tel: 503-665-0187, Telex: 36-0325; Empl.: 130

Sonnenschein

SONNENSCHEIN BATTERIES INC., 525 New Britain Ave., Unionville, CT 06085, Tel: 203-677-5846, Telex: 710-4238 723; *Sls. Mgr.:* Robert McCarthy .... 3•1431

Local Sales Offices & Reps

AL	Huntsville, Raycom, Inc.	205-859-2017
CA	Anaheim, Impact Elctrns.	714-533-1351
CA	Milipitas, Lee-Allan Assoc.	408-946-8300
CO	Golden, J. F. Hurlbut Co.	303-279-7796
CT	Bethel, G/M Assocs.	203-744-1426
CT	Manchester, G/M Assocs.	203-646-4443
FL	Melbourne, Raycom, Inc.	305-259-7988
IL	Park Ridge, Metcom Assocs. Corp.	312-696-1490
MA	Framingham, G/M Assocs.	617-872-4871
MI	Southfield, R. C. Merchant & Co.	313-354-4300
MI	St. Joseph, R. C. Merchant & Co.	616-983-7378
MN	St. Paul, Arkco Sls.	612-777-7454
MO	Florissant, Web Assocs/Elctrns.	314-921-5720
NH	Exeter, G/M Assocs.	603-778-7472
NJ	Linden, C. E. Kite Assocs.	201-925-1899
NY	Huntington, Registration Elec. Supp.	516-266-2808
NC	Raleigh, Raycom, Inc.	919-847-8276
OH	Chesterland, KT/Depko	216-729-3588
TX	Austin, Delta Comps.	512-458-4288
TX	Seagoville, Delta Comps.	214-287-6333
WA	Portland, Harry Levinson Co.	503-245-1902
WA	Seattle, Harry Levinson Co.	206-382-1300
WI	West Allis, Metcom Assocs. Corp.	414-476-1300

SONICOR INSTRUMENT CORP., 1365 Marconi Blvd., Copiague, NY 11726, Tel: 516-842-3344, Telex: 649494; FSC No.: 31605; *Sls. Mgr.:* Arthur Liers; *Dist. Mgr.:* Arthur Liers

SONOBOND, 200 E. Rosedale Ave., West Chester, PA 19380, Tel: 215-696-4710, Telex: 834511; Empl.: 50; *Sls. Mgr.:* John Harper

SONY CORP. OF AMERICA, Component Prods. Div., 15 Essex Road, Paramus, NJ 07652, Tel: 201-368-5000

SORENSEN CO., 676 E. Island Pond Rd., Manchester, NH 03103, Tel: 603-668-4500, Telex: 94-3459, TWX: 710-220-1339; Empl.: 850; *Sls. Mgr.:* Roy Allman

SORENSON LIGHTED CONTROLS, 75 Locust St., Hartford, CT 06114, Tel: 203-527-3092, TWX: 710-425-4093; Empl.: 100; *Sls. Mgr.:* Tom D'Allesantro .... 1B•1102, 1103

Local Sales Offices & Reps

CA	Anaheim, Galaxie Sls.	714-752-1580
CA	Mt. View, Del Bucchia & Assoc.	415-965-8045
CT	Hartford, Atlantic Switch Co.	203-527-7705
FL	Lakeland, Switch Controls	813-644-7564
IL	Wheaton, Chadra-Schilke	312-653-8126
IN	Fort Wayne, Menze Sls.	219-747-5616
MA	Canton, Comtek Assoc.	617-828-2948
MI	Birmingham, Favco	313-644-0173
MN	Edina, Monroe/Hanna	612-566-1324
MO	Clayton, Mertens Co.	314-993-6600
NJ	Marlton, Naudain Assoc.	609-596-1562
NY	Great Neck, Pacent Eng. Co.	516-482-4678
NY	Roslyn Heights, November Elctrn. Sls.	516-621-6378
NC	Raleigh, Rick Hadley	919-362-4099
TX	Dallas, Texaswitch	214-357-1768
WA	Mercer Island, Elctrn. Comp.	206-232-9301

Local Distributors

CA	Los Angeles, Electric Switches	213-660-1310
CA	Tustin, Western Switches	714-731-4333
CA	Van Nuys, Pacific Switch Controls	213-873-4802
CO	Denver, Waco Elctrns.	303-371-4370
CT	Hartford, Atlantic Switch Controls	203-527-7705
FL	Lakeland, Switch Controls	813-644-7564
GA	Augusta, Dixie Elctrns.	404-722-2055
IL	Wheaton, Conectrix	312-653-1460
MI	St. Clair Shores, Specialties Mfg.	313-771-2700
MN	Minneapolis, Carl Berquist	612-835-2322
NJ	Mt. Laurel, Jersey Switch	609-778-8190
NY	Woodside, Switches Unltd.	212-478-5000
NC	Charlotte, Dixie Elctrns.	704-377-5413
OH	Columbus, Ohio Switch	614-885-0319
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Dallas, Texaswitch	214-357-1768
EXP	NJ, Ft. Lee, Joseph Gross	201-944-3609

SOSHIN ELEC. CO., 1-18-18 Nakamagome, Ota-Ku, Tokyo, Japan, Tel: (03) 775-2111, Telex: 246-6377; Empl.: 800; *Sls. Mgr.:* N. Hiraide, Exp. & Imp. Dept. .... 1A•1184

Local Sales Offices & Reps

NY	Commack, Arco Elctrns.	516-864-7000

Local Distributors

CA	Chatsworth, Arco Elctrns.	213-882-8707
NY	Commack, Arco Elctrns.	516-864-7000

SOURIAU, INC., 25158 Avenue Stanford, Valencia, CA 91355, Tel: 805-257-4830, Telex: 4720328, TWX: 910-495-2028; Empl.: 55; *Sls. Mgr.:* Bill Vockerath/Richard Monstein .... 2•1566, 1567

Local Sales Offices & Reps

AL	Brownsboro, JHU Assocs.	205-536-7455
AZ	Scottsdale, Summit Sls.	602-998-4850
AR	Fort Smith, Electra Reps	501-452-4030
CA	Los Altos, Recht Assocs.	415-964-6321
CA	Los Angeles, Wiley Co.	213-666-1611
CA	San Diego, Wiley Co.	619-571-2881
CO	Westminster, D/Z Assocs.	303-429-9369
FL	Altamonte Springs, Gugel-Tuttle Assoc.	305-788-0845
GA	Atlanta, JHU Assocs.	404-634-1000
IL	Lisle, WG Controls	312-963-5954
IN	Indianapolis, CC Elctrns.	317-255-1508
MD	Ellicott City, Doss Elctrns.	301-465-1336
MA	Stow, Today Comp. Sls.	617-897-7500
MI	Lake Orion, CC Elctrns.	313-338-7400
MO	Raytown, Centech	816-358-8100
NJ	West Caldwell, Grimm Siegel Assoc.	201-575-9300
NY	Poughkeepsie, C.W. Floring & Assoc.	914-471-2973
NY	Scottsville, C.W. Floring & Assoc.	716-271-6865
NY	Syracuse, C.W. Floring & Assoc.	315-478-2149
NC	Greensboro, JHU Assocs.	919-852-9097
OH	Dayton, Dircksen & Assoc. (DESC only)	513-294-3657
OH	Galion, CC Elctrns.	419-468-4817
OR	Aloha, Venture Elctrns.	503-642-9090
PA	Glenside, PWC	215-576-0110
TN	Talbott, JHU Assoc.	615-581-4141
TX	Dallas, Electra Reps	214-387-3594
TX	Houston, Electra Reps	713-530-2208
UT	Salt Lake City, D/Z Assocs.	801-486-4233
WA	Bellevue, Venture Elctrns.	206-454-4594

Local Distributors

AL	Huntsville, Marshall Elctrns.	205-881-9235
AZ	Scottsdale, Contech Elctrns.	602-948-3330
AZ	Tempe, Marshall Elctrns.	602-968-6181
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Anaheim, Compucable	714-635-7330
CA	Canoga Park, Marshall Elctrns.	818-999-5001
CA	El Monte, Marshall Elctrns.	818-442-7204
CA	Fullerton, Pyramid Elctrns. Supp.	714-773-0781
CA	Irvine, Marshall Elctrns.	714-556-6400
CA	Irvine, Acacia Sls.	714-660-0834
CA	San Diego, Marshall Elctrns.	619-578-9600
CA	San Diego, Acacia Sls.	619-565-4365
CA	Santa Ana, Norstan Elctrns.	714-540-4165
CA	Santa Clara, Pyramid Elctrns. Supp.	408-727-9810
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Sunnyvale, Marshall Elctrns.	408-732-1100
CA	Van Nuys, Air Electro Supp.	818-988-4400
CO	Denver, Marshall Elctrns.	303-427-1818
CO	Lakewood, Acacia Sls.	303-232-2882
CT	East Haven, J V Elctrns.	203-469-2321
CT	Norwalk, Park Distrs.	203-853-2010
CT	Wallingford, Marshall Elctrns.	203-265-3822
FL	Casselberry, Afcom	305-699-9500
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Orlando, Marshall Elctrns.	305-841-1878
FL	Winter Park, Zebra Elctrns.	305-677-6661
GA	Norcross, Marshall Elctrns.	404-923-5750
IL	Schaumburg, Marshall Elctrns.	312-490-0155
MD	Gaithersburg, Marshall Elctrns.	301-840-9450
MD	Timonium, Zebra Elctrns.	301-252-6576
MD	White Marsh, Resco/Baltimore	301-529-0500
MA	Burlington, Marshall Elctrns.	617-272-8200
MA	Natick, Tec-con Elctrns.	617-655-9333
MI	Livonia, Marshall Elctrns.	313-525-5850
MN	Plymouth, Marshall Elctrns.	612-559-2211
MO	Kansas City, Walters Radio Supp.	816-531-7015
MO	St. Charles, Finnigan Elctrns.	314-946-6201
NJ	Fairfield, Marshall Elctrns.	201-882-0320
NJ	Maple Shade, Zebra Elctrns.	609-779-8073
NJ	Mt. Laurel, Marshall Elctrns.	609-234-9100
NM	Albuquerque, Betatron Elctrns.	505-344-2381
NM	Albuquerque, Connecting Comps.	505-345-8921
NY	Endwell, ASI	607-754-3823
NY	Endwell, Marshall Elctrns.	607-754-1570
NY	Farmingdale, Iris Elctrns.	516-420-8400
NY	Farmingdale, Resource for Elctrns.	516-420-8555
NY	Farmingdale, Midway Indl. Elctrns.	516-293-6800
NY	Hauppauge, Marshall Elctrns.	516-273-2424
NY	Port Washington, Restart Elctrns.	516-883-3500
NY	Rochester, Marshall Elctrns.	716-235-7620
OH	Cincinnati, Schuster Elec.	513-489-1400
OH	Dayton, Marshall Elctrns.	513-236-8088
OH	Solon, Marshall Elctrns.	216-248-1788
OH	Twinsburg, Schuster Elec.	216-425-8134
OK	Oklahoma City, Electro Entprs.	405-427-6591
OR	Beaverton, Acacia Sls.	503-646-3377
PA	Allentown, P.A. Peters	215-434-5237
PA	Norristown, Comp. Entprs.	215-272-7900
TX	Addison, Connec/Tek	214-239-7552
TX	Austin, Marshall Elctrns.	512-458-5654
TX	Dallas, Target Elctrns.	214-788-0761
TX	Dallas, Marshall Elctrns.	214-233-5200
TX	Grand Prairie, Dial Supp.	214-642-2371
TX	Houston, Marshall Elctrns.	713-789-6600
TX	Sugarland, Connec/Tek	713-491-2566
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
WA	Bellevue, Marshall Elctrns.	206-747-9100
WA	Seattle, Radar Elec.	206-282-2511

SOUTHCO, INC., Concordville, PA 19331, Tel: 215-459-4000, Telex: 83-1485, TWX: 710-760-1715; *Sls. Mgr.:* R. W. Dougherty

SOUTHERN COMPUTER CORP., 3720 N. Stratford Rd. N.E., Atlanta, GA 30342, Tel: 404-231-5363; *Sls. Mgr.:* Raymond F. Marley; *Dist. Mgr.:* Robert Morris

SOUTHERN ELECTRONICS, F-Dyne, 726 So. Flower St., Burbank, CA 91502, Tel: 213-845-2458, TWX: 910-498-5707; Empl.: 100; *Sls. Mgr.:* Ron Head

SOUTH SHORE METAL PRODS., 88 E Allen Blvd., Farmingdale, NY 11735, Tel: 516-249-3322; Empl.: 30; *Sls. Mgr.:* A. G. Bauer

SOUTHWEST TECH PRODS CORP., 219 W. Rhapsody, San Antonio, TX 78216, Tel: 512-344-0242; Empl.: 34

SPACE ELECTRONICS, INC., Box 2166, Meriden, CT 06450, Tel: 203-235-7755; Empl.: 16; *Sls. Mgr.:* Richard Boynton

SPACE POWER ELCTRNS., Jeffrey Lane, RD 1, Glen Gardner, NJ 08826, Tel: 201-537-2184

SP AMERICA INC., Shin-Etsu Polymer, 1754 Technology Dr., Ste. 128, San Jose, CA 95110, Tel: 408-947-0311, TWX: 910-338-2229; *Sls. Mgr.:* R. L. Bucholtz

SPARKOMATIC, Rte. 6 & 209, Milford, PA 18337, Tel: 717-296-6444, TWX: 510-260-2682; Empl.: 300; *Sls. Mgr.:* Robert Schuler

SPEC, INC., 3014 N. Hayden Rd., Ste. 115, Scottsdale, AZ 85251, Tel: 602-994-1511; *Sls. Mgr.:* James J. Edwards

SPECIALIZED ELCTRN. MAGNETIC PRODS., 272 Loudon Ridge Rd. Route 8, Loudon, NH 03301, Tel: (603) 267-6892; *Sls. Mgr.:* Grant D. Avery

SPECIALTY CONNECTOR CO., 2620 Endress Place, Greenwood, IN 46141, Tel: 317-535-5353

SPECO DIV., Components Specialties, Inc., P.O. Box 624, 1172 Rte. 109, Lindenhurst, NY 11757, Tel: 516-957-8700, 800-645-5516, Telex: 96-7754; Empl.: 33; *Sls. Mgr.:* Mel Hulkower; *Dist. Mgr.:* Stan Hulkower

SPECTRACOM, 320 N. Washington St., Rochester, NY 14625, Tel: 716-381-4827; Empl.: 12

SPECTRAGRAPHICS CORP., 10260 Sorrento Valley Rd., San Diego, CA 92121, Tel: 619-450-0611; Empl.: 100

SPECTRAL DYNAMICS DIV., Scientific-Atlanta, Box 671, San Diego, CA 92112, Tel: 619-268-7100, TWX: 910-335-2022; Empl.: 600; *Sls. Mgr.:* Robert N. Saunders

SPECTRA LUX CORP., 12840 N.E. 21 St. Pl., Bellevue, WA 98005, Tel: 206-747-0560; FSC No.: 51896; *Sls. Mgr.:* Ron Bustad

SPECTRAN CORP., Hall Rd., P.O. Box 650, Sturbridge, MA 01566, Tel: 617-347-2261; FSC No.: 6V569; Empl.: 25

SPECTRAN INSTRUMENTS, INC., Box 891, La Habra, CA 90631, Tel: 213-694-3995

SPECTRA SONICS, 3750 Airport Rd., Ogden, UT 84403, Tel: 801-392-7531; Empl.: 35

SPECTRA-STRIP, 7100 Lampson Ave., Garden Grove, CA 92642-0415, Tel: 714-892-3361, TWX: 910-596-1314; Empl.: 300; *Sls. Mgr.:* Jerry Campbell

SPECTRO EQUIPMENT, INC., 6021 Royalton Rd., N. Royalton, OH 44133, Tel: 216-237-8910; Empl.: 25

SPECTROLAB, INC., 12500 Gladstone Ave., Sylmar, CA 91342, Tel: 213-365-4611, TWX: 910-496-1488; Empl.: 250

SPECTROL ELCTRNS., 17070 East Gale Ave., City of Industry, CA 91749, Tel: 818-964-6565, TWX: 910-584-1314; Empl.: 600; *Sls. Mgr.:* R. Shackelford .... **1A**•2056-2062

Local Sales Offices & Reps

AL	Huntsville, Beacon Sls.	205-881-5031
AZ	Phoenix, Thom Luke Sls.	602-941-1901
CA	San Diego, Hadden Assoc.	619-565-9444
CA	Santa Clara, I^2	408-988-3400
CA	Ventura, Astralonics	805-653-5991
CO	Denver, Spectrum Sls.	303-696-1601
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Clearwater, Beacon Sls.	813-796-2378
FL	Ft. Lauderdale, Beacon Sls.	305-491-1054
IL	Downers Grove, Momak Sls.	312-963-6400
IA	Hiawatha, Gassner & Clark	319-393-5763
KS	Shawnee Mission, Lowell-Kangas	913-631-3515
MD	Baltimore, Component Sls.	301-484-3647
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Livonia, Luebbe Sls.	313-477-3131
MN	St. Paul, Murnco	612-484-8200
MO	St. Louis, Lowell-Kangas	314-821-4050
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NY	Commack, E.R.A.	516-543-0510
NY	Liverpool, Precision Sls.	315-451-3480
NY	Syracuse, L Mar	315-437-7779
NC	Raleigh, Beacon Sls.	919-787-0330
OH	Cincinnati, Luebbe Sls.	513-891-5770
OH	Cleveland, Luebbe Sls.	216-333-0425
OH	Columbus, Luebbe Sls.	614-431-0474
OH	Dayton, Luebbe Sls.	513-294-0426
OR	Beaverton, Barrett-Squibb & Assocs.	503-642-1661
PA	Pittsburgh, R. F. Clark	412-242-9500
TX	Dallas, Allied Comps.	214-238-0408
TX	Houston, Allied Comps.	713-988-1600
TX	Hurst, Allied Comps.	817-589-0456
WA	Redmond, Barrett-Squibb & Assocs.	206-885-6991

SPECTRON CORP., 344 New Albany Rd., Moorestown, NJ 08057, Tel: 609-234-5700, Telex: 83-1488, TWX: 710-897-1359

SPECTRONICS CORP., 956 Brush Hollow Rd., Westbury, NY 11590, Tel: 516-333-4840, TWX: 510-222-5877; *Sls. Mgr.:* Henry K. Lee; *Dist. Mgr.:* James J. Weglarz

SPECTRONICS, DIV. HONEYWELL, See Honeywell Optoelctrns.

SPECTRUM CONTROL, INC., 8061 Avonia Rd., Fairview, PA 16415, Tel: 814-474-1571

SPECTRUM CONTROL, INC., 2185 W. 8th St., Erie, PA 16505, Tel: 814-455-0966, TWX: 510-699-6871; FSC No.: 33095; Empl.: 450; *Sls. Mgr.:* R. Greer; *Dist. Mgr.:* C. Pirro .... **1A**•1625-1627; **2**•1569-1573

Local Sales Offices & Reps

CA	Sunnyvale, Spectrum Control	408-735-9015
CA	Valencia, Spectrum Control	805-257-2280
MA	Chelmsford, Spectrum Control	617-256-3565
NJ	Brielle, Spectrum Control	201-528-8420
NJ	Fairfield, Pantronics	201-575-1177
NY	New York, Landseas	212-265-8323
TX	Irving, Spectrum Control	214-251-1669
EXP	PA, Erie, Spectrum Control	814-455-0966

Local Distributors

CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, Cypress Elctrns.	213-533-6005
FL	Dania, Summit Distrs.	305-920-6253
IL	Chicago, Newark Elctrns.	312-638-4411
NJ	Perth Amboy, Metuchen Capacitors	201-442-0500
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Rochester, Summit Distrs.	716-334-8110
OH	Dayton, Aschbacher	513-252-7785
TX	Addison, Captronics	214-980-0123
TX	Austin, Captronics	512-459-4328
TX	Houston, Captronics	713-776-2100
Intl	Australia, Rifa	03-480 1211
Intl	Denmark, E.V.J. Johanssen Elektronics	01-839022
Intl	Eng., Birmingham, Steatite Insulations	021 454-6961-2
Intl	France, Gentilly, Radio Television Franchise S.A.	664.11.01
Intl	Israel, Tel-Aviv, Landseas, Ltd.	247291-4
Intl	Japan, Tokyo, Jepico	Tokyo (03) 348-0621/0622
Intl	Netherlands, Zaandam, Bodamer Intl. BV	075-351521
Intl	Norway, H.C.A. Melbye/AS	02-106050
Intl	S. Africa, Bryanston, Taltronics Pty. Ltd.	618-2014/5
Intl	Sweden, Farsta, Traco AB	08-93-0960
Intl	Switzerland, Ebmatingen, EME, Ernst Egli	01-980-11-11
Intl	W. Germany, Ettlingen, Bodamer GmbH	(07243) 79263
Intl	W. Germany, Hamburg, Bodamer GmbH	(040) 7111091
Intl	W. Germany, Munchen, Bodamer GmbH	(089) 641801

SPECTRUM TECHNOLOGY, INC., 300 Lopez Rd., Goleta, CA 93116, Tel: 805-964-7791, TWX: 910-334-1163; FSC No.: 32464; Empl.: 100; *Sls. Mgr.:* Wm. L. Bishop .... **1A**•1426, 1427

Local Sales Offices & Reps

AZ	Tempe, Sedco Sls.	602-835-6281
AZ	Tucson, Sedco Sls.	602-298-1758
CA	Culver City, Westaironics	213-641-4122
CA	San Jose, Frequency Control Assocs.	408-446-0200
CT	Milford, Todino Engrg. Sls.	203-874-6643
FL	Ft. Myers, Rainbow Sls.	813-332-2210
FL	Melbourne, Rainbow Sls.	305-727-3305
IL	Elgin, R.K. Elctrns.	312-695-8552
MA	Needham, Todino Engrg. Sls.	617-444-7925
NJ	Haddonfield, Mesa Tech. Assocs.	609-429-9531
NM	Albuquerque, I.M.E.C.	505-883-9010
NY	Huntington, Compar N.Y.	516-423-5660
OK	Tulsa, Ion Assocs.	918-664-0186
TX	Austin, Ion Assocs.	512-458-2108
TX	Grand Prairie, Ion Assocs.	817-640-8282
TX	Houston, Ion Assocs.	713-461-5311
VA	Fairfax, Schibley Assocs.	703-591-3008

Spellman
High Voltage Electronics Corporation

SPELLMAN HIGH VOLTAGE ELCTRNS. CORP., 7 Fairchild Ave., Plainview, NY 11803, Tel: 516-349-8686, TWX: 510-221-2155; Empl.: 175; *Sls. Mgr.:* James R. Usher .... **3**•1774-1776

Local Sales Offices & Reps

CA	El Cajun, Atronics	619-444-1501
CA	Woodland Hills, Atronics	213-703-7212
FL	Orlando, Gra-Mar, Inc.	305-894-3351
MA	Concord, Nortech Engrg. Sls.	617-259-0032
MA	Medfield, Nortech Engrg.	617-359-6063
MN	St. Paul, Knox Assocs.	612-488-5402
TX	Dallas, Seaton Corp.	214-380-0414
TX	Houston, Seaton Corp.	713-731-2649

SPEMCO SWITCHES, 23425 Harper, St. Clair Shores, MI 48080, Tel: 800-482-2828; Empl.: 9

A.W. SPERRY
INSTRUMENTS INC.

SPERRY, A. W., INSTRS., P.O. Box 9300, Smithtown, NY 11787, Tel: 516-231-7050, Telex: 645104; Empl.: 40; *Sls. Mgr.:* Dennis W. Carroll .... **3**•1304

Local Sales Offices & Reps

AL	Birmingham, Russell Elctrn. Assocs.	205-822-2196
CA	N. Hollywood, Don Starr Co.	213-875-2766
CA	San Francisco, Flair Electro Sls.	415-864-0444
CA	Santa Fe Springs, New West Agency	213-921-6812
CO	Denver, E. O. Sales Co.	303-778-1900
FL	Longwood, Ralph Joyner Mktg.	305-339-0181
HI	Kailua, Don Thomas Assocs.	808-262-4818
IL	Chicago, Ken Levy & Assocs., Ltd.	312-763-5000
IL	Forest Park, J. K. Neuhauser Sls. Co.	312-771-7800
IN	Indianapolis, Blind & Assocs.	317-844-1314
IA	Council Bluffs, Bob Smith Co.	712-322-1233
LA	Mandeville, Corrigan Agency	504-626-5231
MD	Kensington, Forti Assocs.	301-949-1706
MA	Northboro, W. B. Pray Sls.	617-393-3434
MI	Detroit, Burcaw Co.	313-533-7700
MN	Minneapolis, Fruen's Sales	612-546-7173
MO	Kansas City, Johnson Elec. Sls. Co.	816-421-4891
NY	Buffalo, Rudell-Merrifield Assoc.	716-634-4300
NY	Oceanside, Bittan Assocs.	516-678-6222
NY	Syracuse, Electro-Lines	315-455-5701
NC	Charlotte, W. H. Lassiter	704-523-2736
OH	Chagrin Falls, Thomas R. Eby Co.	216-543-8141
OH	Columbus, Mandabach-Lehner	614-235-0265
TX	Dallas, Kopiuitz Co.	214-484-7557
TX	Ft. Worth, Chet Wells & Co.	817-284-0261
WA	Bellevue, Topp Engrg. Sls.	206-747-5400

SPERRY UNIVAC, Mini-Computer Operations, Box C-19504, Irvine, CA 92713, Tel: 714-754-6900, TWX: 910-596-1358; Empl.: 500

SPIRICON INC., 2600 North Main, Logan, UT 84321, Tel: 801-753-3729; Empl.: 5; *Sls. Mgr.:* Carlos Roundy

SPRAGUE ELEC. CO., 481 Marshall St., No. Adams, MA 01247, Tel: 413-664-4411, Telex: 92-6415, TWX: 710-369-1360; FSC No.: 56289; Empl.: 10,500; *Dist. Mgr.:* J. J. Judge

SPRAGUE ELEC. CO., Semiconductor Div., 115 Northeast Cutoff, Worcester, MA 01606, Tel: 617-853-5000, TWX: 710-340-6304; FSC No.: 56289; Empl.: 650

SPRAGUE-GOODMAN ELCTRNS., INC., 134 Fulton Ave., Garden City Pk., NY 11040, Tel: 516-746-1385, Telex: 14-4533; FSC No.: 52769; Empl.: 100; *Sls. Mgr.:* David Taub; *Dist. Mgr.:* David Taub .... **1A**•1185

Local Sales Offices & Reps

AZ	Phoenix, Sanford Sls. Assocs.	602-957-3570
CA	Burlingame, W. J. Purdy Co.	415-347-7701
CA	Los Angeles, R.F. Assocs.	213-478-1586
CA	San Diego, R. D. Miner Inc.	619-566-9891
CO	Denver, W. J. Purdy Co.	303-777-1411
FL	Pompano Beach, Cole-Tek	305-781-8110
GA	Smyrna, Spartech	404-432-3644
IL	Chicago, B.N.I. Elctrns.	312-447-0581
IN	Ft. Wayne, Denton Mktg. Inc.	219-627-5515
IA	Marion, M.S.B. Assoc.	319-377-6261
KS	Shawnee Mission, M.S.B. Assoc.	913-432-2131
MD	Pikesville, Imagitron Sls.	301-521-2020
MA	Southboro, KSA of New England	617-485-9432
MI	Jackson, Sprague Elec. Co.	517-787-3934
MN	Chanhassen, Barnes Sls. Assoc.	612-934-2907
MO	St. Charles, M.S.B. Assoc.	314-946-5577
NJ	Wayne, Richman Salesco - Kagan	201-694-1115
NY	Commack, Richman Salesco	516-543-5532
NY	Utica, Sweetco Assoc.	315-797-6721
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
TX	Austin, Delta Comps.	512-458-4288
TX	Seagoville, Delta Comps.	214-287-6333
WA	Seattle, Sprague Elec. Co.	206-632-7761
WA	Vancouver, Sprague Elec.	206-892-0361

Local Distributors

CA	Belmont, Varitech Electronics	415-593-3300
CA	Garden Grove, National Capacitor Corp.	714-892-7749
CA	Santa Ana, Projections Unlimited	714-641-1472
IL	Skokie, Kellner Elctrns.	312-677-1120
MA	Burlington, T.L.C.	617-273-0140
MA	Needham, Cronin Elctrns.	617-449-5000
NY	Hauppauge, Prime Comps.	516-582-6258
NY	Lynbrook, Varitech Elctrns.	516-593-9300
NY	Stony Brook, Bomark Elctrns.	516-689-8999
PA	State College, ALVO Elctrns.	814-238-0505
TX	Addison, Captronics	214-980-0123
TX	Ft. Worth, PATCO Supp.	
WA	Seattle, KAM Elctrns.	206-285-5622

SPRAGUE PRODUCTS CO., 481 Marshall St., No. Adams, MA 01247, Tel: 413-664-4481, TWX: 710-369-1363; FSC No.: 56289; *Sls. Mgr.:* J. Judge; *Dist. Mgr.:* A. Bascomb, Vice President

SPRINGFIELD MOULDERS, INC., See ITT Thermotech

SPRUCE PINE MICA CO., Mtn. Laurel Dr., Spruce Pine, NC 28777, Tel: 704-765-4241; Empl.: 45; *Sls. Mgr.:* Hugh M. Wiseman

Local Sales Offices & Reps

CA	Mountain View, Straube Assocs.	415-969-6060
NC	Smithfield, Agents & Distrs.	919-934-7592

SQUARE D CO., Executive Plaza, Palatine, IL 60067, Tel: 312-397-2600, Telex: 255274; Empl.: 21100; *Sls. Mgr.:* R. A. Hegeman

SR ENGINEERING INC., 13961 Nautilus Dr., Dept. E, Garden Grove, CA 92643, Tel: 714-554-4200; FSC No.: 21441; *Sls. Mgr.:* Coleman W. Conrad

Local Sales Offices & Reps

AZ	Phoenix, Runyon Co,	602-840-6060
IA	Cedar Rapids, Howard Brown Sls. Co.	319-366-0635

SRS INDUSTRIES, INC., 903 S. Alta Vista Ave., Monrovia, CA 91016, Tel: 213-357-3287, TWX: 910-585-3486; FSC No.: 015362; *Sls. Mgr.:* John B. McCaffery

S S A C, Box 395, Liverpool, NY 13088, Tel: 315-622-1000, Telex: 646221, TWX: SSAC LIPL; FSC No.: 16-0985719; Empl.: 220; *Sls. Mgr.:* R. Shutt

STACKBIN CORP., Albion Road, Lincoln, RI 02865, Tel: 401-333-1600; Empl.: 75; *Sls. Mgr.:* J. J. Patterson

STACKPOLE (THE STACKPOLE CORP.), Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; FSC No.: 78488

STACKPOLE, CARBON DIV., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; *Sls. Mgr.:* T. M. Eynon

STACKPOLE COMPONENTS CO., 3400 Yonkers Rd., Raleigh, NC 27604, Tel: 919-828-6201, TWX: 510-928-0520, 29; *Sls. Mgr.:* Patrick J. Ryan; *Dist. Mgr.:* Tish Gibson

STACKPOLE COMPONENTS CO., Box M, Farmville, VA 23901, Tel: 804-392-4111, TWX: 510-928-0520/29; *Sls. Mgr.:* P. J. Ryan; *Dist. Mgr.:* Tish Gibson

STACKPOLE, ELECTRONIC COMPONENTS DIV., 201 Stackpole St., St. Marys, PA 15857, Tel: 814-781-1234, Telex: 914-514, TWX: 510-693-4511; *Sls. Mgr.:* D. L. Almquist

STACKPOLE, MAGNET DIV., 700 Elk Ave., Kane, PA 16735, Tel: 814-837-7000, TWX: 510-695-8360; *Sls. Mgr.:* V. D. Venigni

STACO, INC., See Staco Transpower

STACO ENERGY PRODUCTS CO.

STACO ENERGY PRODS. CO., 301 Gaddis Blvd., Dayton, OH 45403, Tel: 513-253-1191, Telex: 288-032, TWX: 810-459-1798; FSC No.: 83008; Empl.: 146; *Sls. Mgr.:* Robert Simpson .... **1A**•2280, 2281

Local Sales Offices & Reps

CA	Costa Mesa, Stacoswitch	714-549-3041
CA	Santa Clara, Thomas Assocs.	408-988-4484
CO	Denver, West, Inc.	303-692-0131
FL	Ft. Lauderdale, Hutto-Hawkins-Peregoy	305-917-5750
FL	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
GA	Atlanta, Millar Elctrn. Sls.	404-261-6160
HI	Honolulu, Elctrns. Sls. & Svc.	808-845-8207
IL	Evanston, Saffro & Assocs.	312-328-0140
IN	Indianapolis, Electronic Mktg.	317-842-4155
LA	Folsom, McKinney Sls. Co:	504-796-5861
MA	Lexington, Hathaway Elctrns.	617-861-7010
MN	St. Paul, SKOR	612-645-6461
MO	Kansas City, J. O. Schmitz	816-363-3414
NM	Albuquerque, C. T. Carlberg & Assocs.	505-265-1579
NY	Alexander, B. F. Tollefson Assocs.	716-591-1219
NY	Auburn, B. F. Tollefson Assocs.	315-253-4109
NY	Rochester, B. F. Tollefson Assocs.	716-271-4141
NY	Valley Stream, Levison Sls. Co.	516-561-9696
NC	Raleigh, Millar Elctrns.	919-787-9564
OH	Dayton, Dircksen & Assoc.	513-294-3657
OH	Dayton, Rockford Controls	513-898-5452
OH	Euclid, Rockford Controls	216-731-5250
OK	Tulsa, McKinney Sls. Co.	918-492-8882
OR	Portland, James J. Backer	503-297-3776
OR	Salem, Jas. J. Backer	503-362-0717
PA	Flourtown, Eastern Comps.	215-836-1616
PA	Stuartstown, Eastern Comps. Sls.	717-993-3288
PA	York, Eastern Comps.	717-764-3114
TX	Bellaire, McKinney Sls. Co.	713-444-3817
TX	Dallas, McKinney Sls. Co.	214-631-9450
VA	Herndon, Eastern Comps.	703-471-1025
WA	Seattle, James J. Backer	206-285-1300
WI	Lake Mills, Saffro & Assocs.	414-648-2605
EXP	FL, Hialeah, West Indes Sls. Co., Ltd.	305-888-1676
EXP	NY, New York, Allied Intl.	212-986-3222

STACOSWITCH, 1139 Baker St., Costa Mesa, CA 92626, Tel: 714-549-3041, TWX: 910-595-1507; FSC No.: 12522; Empl.: 100; *Sls. Mgr.:* D. Sugg

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg., Inc.	205-533-9281
CA	San Jose, Snyder Sls.	408-559-4444
CO	Golden, J. F. Hurlbut Co.	303-279-7796
CT	Marion, Sands Co.	203-628-4363
FL	Orlando, EMA, Inc.	305-671-6800
GA	Stone Mountain, 20th Century Mktg., Inc.	404-292-7088
IL	Oak Brook, MSL Assoc.	312-655-8977
IN	Richmond, EMA, Inc.	513-433-2800
IA	Cedar Rapids, H. R. Brown Sls.	319-366-0635
KS	Kansas City, B-C Elctrn. Sls.	913-342-1211
MD	Silversprings, Youth & Nelson	301-598-5740
MA	Woburn, Sands Co.	617-935-7495
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MO	St. Louis, B-C Elctrn. Sls.	314-731-1255
NJ	Wayne, G.T. Assocs.	201-694-6040
NY	Syracuse, Lenard Co.	315-479-9191
OH	Cleveland, C.A. Robinson Co.	216-381-9049
OH	Dayton, C.A. Robinson	513-278-7969
OR	Portland, Frank Jackson Assoc.	503-292-2638
PA	Media, W. Reeves Assocs.	215-566-6709
TN	Knoxville, 20th Century Mktg., Inc.	615-690-1618
TX	Austin, Delta Comps.	512-458-4288
TX	Dallas, Delta Comp.	214-358-4288
TX	Houston, Delta Comps.	713-664-6777
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
WA	Redmond, Frank Jackson Assoc.	206-881-7277

STACO TRANSPOWER

STACO TRANSPOWER, 301 Gaddis Blvd., Dayton, OH 45403, Tel: 513-253-1191, Telex: 288-032, TWX: 810-459-1798; FSC No.: 83008; Empl.: 100; *Sls. Mgr.:* T. D. McNulty .... **1A**•2283

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Scottsdale, Power Specialists	602-996-4100
CA	Buena Park, Chuck Cooper Co.	714-739-8526
CA	Los Altos, Frauman Assoc.	415-941-0660
CT	Natick, Benchmark Assoc.	617-899-3390
GA	Atlanta, Remco	404-447-6937
KY	Cinci, Tri-State Mktg.	513-761-7993
MA	Natick, Benchmark Assocs.	617-655-9333
MI	Southfield, Fred Gehrke & Assocs.	313-559-5363
MN	Arlington Hgts., Diethert-Angel	312-593-7600
MN	Minneapolis, Diethert Angel	612-546-6099
NJ	King of Prussia, Freeman-Malta Assoc.	215-337-9211
NJ	Mountain Lakes, Levison Sls. Co. Inc.	201-334-2921
NY	Illion, Noeth-Honsinger Assoc.	315-894-9943
NY	Pittsford, Noeth-Honsinger Assoc.	716-586-9002
NY	Valley Stream, Levison Sls.	516-561-9698
NC	Raleigh, Remco	919-847-5079
OH	Cleveland, Marlow Assocs.	216-991-6500
OH	Columbus, Marlow Assocs.	614-885-7643
PA	Pittsburgh, Marlow Assocs.	412-367-8886
UT	Salt Lake City, Aspen Sales	801-467-2401
WI	Menomonee Falls, Walter M. Braun & Assocs.	414-251-8685

STAFFALL INC., 7 Woodland St., Providence, RI 02908, Tel: 401-351-8282, TWX: 710-381-6964; Empl.: 25

STAINLESS, INC., 3rd St., N. Wales, PA 19454, Tel: 215-699-4871, TWX: 510-661-8097; Empl.: 80; *Sls. Mgr.:* Jess C. Rodriguez

STANCOR/HAMILTON STANDARD CONTROLS, 131 Godfrey St., Logansport, IN 46947, Tel: 219-722-2244, TWX: 810-295-0699; FSC No.: 80089; *Sls. Mgr.:* Hubert Daubs .... **1A**•2284-2292: **1B**•1474

Local Sales Offices & Reps

AZ	Scottsdale, Thom Luke Sls.	602-941-1901
CA	San Diego, Haddeu Assoc. Inc.	619-565-9444

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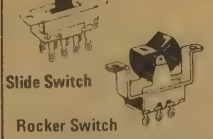

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GA	Atlanta, Beacon Elctrns.	404-256-9640
IL	Glenview, Reigel Assoc.	312-729-3824
IN	Indianapolis, Electronic Reps. Inc.	317-894-1414
IA	Cedar Rapids, Gassner & Clark	319-393-5763
KS	Shawnee Mission, Lowell Kangas & Assoc. Inc.	913-631-3515
MD	Baltimore, Component Sls.	301-484-3647
MA	Needham Heights, Newscott Co., Inc.	617-444-1923
MI	East Detroit, Jack M. Thorpe Co.	313-779-6363
MN	St. Paul, Murnco	301-833-2039
NJ	Haddonfield, Sunday O'Brien	609-429-4013
NY	Commack, Engineering Reps. Assoc.	516-543-0510
NY	Liverpool, Precision	315-451-3480
OH	Cincinnati, Luebbe Sls. Co.	513-891-5770
PA	Pittsburgh, Russell F. Clark Co.	412-242-9500
TX	Dallas, Allied Comps. Inc.	214-238-0408
WA	Bellevue, B & P Sls.	206-454-6571

STANDARD CONDENSER CORP., 1065 W. Addison St., Chicago, IL 60613, Tel: 312-327-5440

STANDARD ENERGY, Div. WBH Scientific, Inc., Rte. 32, Greenville, NY 12083, Tel: 518-966-4197, Telex: 754180 ....**3**•1777-1779

STANDARD ENGRG., 44800 Girmmer, Fremont, CA 94538, Tel: 415-657-7555, TWX: 910-381-6048; Empl.: 40

STANDARD ENVIRONMENTAL SYSTEMS, INC., 383 Minnisink Rd., Totowa, NJ 07512, Tel: 201-256-2200, TWX: 710-988-5722; Empl.: 50

STANDARD GRIGSBY, INC., 920 Rathbone Ave., Aurora, IL 60507, Tel: 312-844-4300, TWX: 910-232-3138; Empl.: 350; *Sls. Mgr.:* Ed Barry; *Dist. Mgr.:* Bob Lynch ....**1B**•1626, 1627

Local Sales Offices & Reps

AL	Huntsville, L. & D., Inc.	205-837-1469
AZ	Tempe, Piper Sls.	602-949-0048
CA	Laguna Hills, Jack Fitch & Assocs.	714-951-0196
CA	Milpitas, Maxim Elctrn. Sls.	408-946-6001
CT	East Haven, Eagle Assocs.	203-467-6542
FL	Casselberry, Southern Elctrn. Mktg.	305-695-3335
FL	Clearwater, Southern Elctrn. Mktg.	813-441-3902
FL	Ft. Lauderdale, Southern Elctrn. Mktg.	305-475-3686
GA	Dunwoody, L. & D., Inc.	404-455-3483
IN	Ft. Wayne, Wilson Tech. Sls.	219-424-5299
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
IA	Cedar Rapids, Rep Assocs.	319-373-0152
MI	Ann Arbor, R. L. Rowe & Assocs.	313-995-8711
MI	Livonia, Luebbe Sls. Co.	313-477-3131
MN	St. Paul, Murnco	612-484-8200
NJ	Mountain Lakes, Comps. For Elctrns.	201-334-2921
NM	Ithaca, L-Mar Assoc.	607-256-5712
NY	E. Syracuse, L-Mar Assoc.	315-437-7779
NY	East Northport, Comps. for Elctrncs.	516-266-5020
NY	Rochester, L-Mar Assoc.	716-323-1000
NY	W. Seneca, L-Mar Assoc.	716-675-1277
NC	Greensboro, L. & D., Inc.	919-292-3201
NC	Raleigh, L. & D., Inc.	919-876-5301
OH	Cincinnati, Luebbe Sls.	513-891-5770
OH	Cleveland, Luebbe Sls.	216-333-0424
OH	Columbus, Luebbe Sls.	614-431-0464
OH	Dayton, Luebbe Sls.	513-294-0427
OK	Broken Arrow, Design Mktg.	918-258-8656
OR	Aloha, Micro Sls.	513-642-1818
PA	Feasterville, Knowles Assocs.	215-322-7100
PA	Pittsburgh, Luebbe Sls.	412-931-0414
TN	Seymore, L. & D., Inc.	615-557-1549
TX	Conroe, Design Mktg.	713-273-2319
TX	Dallas, Design Mktg.	214-680-9767
TX	Hurst, Design Mktg.	817-268-2004
TX	Round Rock, Design Mktg.	512-255-9896
VA	Richmond, L. & D., Inc.	804-359-0125
WA	Bellevue, Micro Sls.	206-451-0568

Refer to Gordos Corporation, Bloomfield, New Jersey for Authorized Distributor information.

STANDARD GRIGSBY INC., W. Günther GMBH, Virnsberger Strasse 51, D 8500 Nürnberg 51, West Germany, Tel: 0911-65521, Telex: 622351

STANDARD LOGIC, 2215 S. Standard Ave., Santa Ana, CA 92707, Tel: 714-979-4770, TWX: 910-595-1707; Empl.: 150; *Sls. Mgr.:* B. L. Billington

STANDARD MICROSYSTEMS, 35 Marcus Blvd., Hauppauge, NY 11787, Tel: 516-273-3100, TWX: 510-227-8898; Empl.: 310; *Dist. Mgr.:* William Rotoli

STANDARD PNEUMATIC MOTOR, Box 10530, Reno, NV 89510, Tel: 702-329-6311, Telex: 354-467; FSC No.: 53623; Empl.: 125

STANDARD POWER, INC., 1400 S. Village Way, Santa Ana, CA 92705, Tel: 714-558-8512, TWX: 910-595-1760; Empl.: 221; *Sls. Mgr.:* Sydele M. Petch; *Dist. Mgr.:* Sydele M. Petch ....**3**•1780-1783

Local Sales Offices & Reps

AL	Huntsville, Electronic Mfrs. Agts.	205-830-4030
AZ	Phoenix, O'Donnell Assocs.	602-944-9542
CA	San Diego, Martronix	619-728-7678
CA	Sunnyvale, O'Donnell Assocs.	408-263-6500
CA	Torrance, Orion Sls.	213-240-3151
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Altamonte Springs, WMM Assocs.	305-831-4530
FL	Clearwater, WMM Assocs.	813-442-3913
FL	Davie, WMM Assocs.	305-432-2628
FL	Indialantic, WMM Assocs.	305-773-1157
GA	Atlanta, Electronic Mfrs. Agts.	404-329-0503
IL	Elmhurst, Utronix Sls.	312-834-1100
IN	Ft. Wayne, Needler Sls.	219-447-2123
IN	Indianapolis, Needler Sls.	317-255-8056
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
KY	Louisville, Needler Sls.	502-241-4046
MA	Needham Hgts., Sturgeon Co.	617-444-6603
MN	Bloomington, Northport Engrg.	612-854-5556
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Syracuse, T Squared Elctrns.	315-463-8592
NY	Victor, T Squared Elctrns.	716-924-9101
NC	Pineville, Electronic Mfrs. Agts.	704-541-2628
NC	Winston-Salem, Electronic Mfrs. Agts.	919-784-7304
OH	Cleveland, Marlow Assoc.	216-991-6500
OH	Columbus, Marlow Assoc.	614-885-7643
OR	Portland, Westerberg & Assocs.	503-297-1719
PA	Pittsburgh, Marlow Assoc.	412-367-8886
PA	Prospect Park, Elf Sls.	215-534-3340
TN	Donelson, Electronic Mfrs. Agts.	615-883-1414
TX	Houston, Milco Mktg.	713-946-2841
WA	Bellevue, Westerberg & Assocs.	206-453-8881

Local Distributors

AL	Huntsville, Arrow Elctrns.	205-882-2730
AL	Huntsville, R.M. Elctrns.	205-852-1550
AZ	Phoenix, Wyle Distr. Grp.	602-249-2232
AZ	Phoenix, Kachina Elect. Dist.	602-269-6201
AZ	Phoenix, R.V. Weatherford Co.	602-272-7144
CA	Anaheim, R.V. Weatherford Co.	714-634-9600
CA	Burlingame, Rose Elctrns.	415-348-2740
CA	El Segundo, Wyle Distr. Grp.	213-322-8100
CA	Glendale, R.V. Weatherford Co.	213-849-3451
CA	Irvine, Wyle Distr. Grp.	714-641-1600
CA	Los Angeles, Arrow Elctrns.	213-701-7500
CA	Pomona, R.V. Weatherford	714-623-1261
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Diego, Wyle Distr. Grp.	619-565-9171
CA	San Diego, R.V. Weatherford	619-695-1700
CA	San Francisco, Arrow Elctrns.	408-745-6600
CA	Santa Barbara, R.V. Weatherford Co.	805-965-8551
CA	Santa Clara, Wyle Distr. Grp.	408-727-2500
CA	Sunnyvale, R.V. Weatherford Co.	408-738-8694
CA	Tustin, Arrow Elctrns.	714-838-5422
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Denver, R.V. Weatherford Co.	303-428-6900
CO	Thornton, Wyle Distr. Grp.	303-457-9953
CT	Wallingford, Sager Elect.	203-265-4600
CT	Wallingford, Arrow Elctns.	203-265-7741
FL	Ft. Lauderdale, Hammond Elctrns.	305-973-7103
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Melbourne, Arrow Elctrns.	305-725-1480
FL	Orlando, Hammond Elctrns.	305-849-6060
GA	Atlanta, Hammond Elctrns.	404-524-7502
GA	Norcross, Arrow Elctrns.	404-449-8252
HI	Honolulu, Industrial Elctrns.	808-533-6095
IL	Addison, LComp-Chicago	312-628-1400
IL	Chicago, Arrow Elctrns.	312-893-9420
IL	Lombard, RM Elctrns.	312-932-5150
IN	East Chicago, Acro Elctrns.	219-397-8681
IN	Ft. Wayne, Graham Elect. Supp.	219-423-3422
IN	Indianapolis, Advent Elctrns.	317-872-4910
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, RM Elctrns.	317-247-9701
IN	Lafayette, Graham Elect. Supp.	317-423-5564
IA	Cedar Rapids, Iowa Radio Supp. Co.	319-393-4510
IA	Cedar Rapids, Arrow Elctrns.	319-395-7230
KS	Wichita, L Comp Inc.	316-265-5100
KS	Wichita, Radio Inc.	316-264-2798
LA	Marrero, AFG Elctrn. Supp.	504-368-9696
LA	New Orleans, Radio Parts	504-581-5959
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Baltimore, Resco/Baltimore	301-823-0070
MD	Beltsville, Resco	301-937-9100
MD	Beltsville, Treeko Sls.	301-937-8260
MA	Hingham, Sager Elec. Supply	617-749-6700
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Grand Rapids, R.S. Elctrns.	616-241-3483
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Kalamazoo, R.S. Elctrns.	616-381-5470
MI	Livonia, R.S. Elctrns.	313-525-1155
MI	Roseville, R.S. Elctrns.	313-779-2450
MI	Wynadotte, R.S. Elctrns.	313-282-5880
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, Northern Elctrns.	612-944-1167
MO	Kansas City, LComp-Kansas City	816-221-2400
MO	Maryland Hgts., LComp-St. Louis	314-291-6200
MO	St. Louis, Van Sickee Radio Supp.	314-621-5000
MO	St. Louis, Arrow Elctrns.	314-567-6888
NE	Lincoln, Scott Elec. Supp.	402-466-8221
NH	Manchester, Arrow Elctrns.	604-668-6968
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Farmingdale, Arrows Elctrns.	516-694-6800
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Mt. Vernon, QAR Ind'l. Sls.	914-699-2224
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, Rochester Radio Supp. Co.	716-454-7800
NY	Syracuse, Arrow Elctrns.	315-652-1000
NC	Greensboro, Hammond Elctrns.	919-275-6391
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Cincinnati, Graham Elctrn. Supp.	513-772-1661
OH	Cincinnati, Hughes-Peters	513-351-2000
OH	Cleveland, CAM/Ohio	216-461-4700
OH	Cleveland, Arrow Elctrns.	216-248-3990
OH	Columbus, Graham Elctrn. Supp.	614-895-1590
OH	Columbus, Hughes-Peters	614-294-5351
OH	Dayton, Arrow Elctrns.	513-435-5563
OH	Dayton, Esco, Inc.	513-226-1133
OH	Toledo, R.S. Elctrns.	419-893-0721
OK	Oaklahoma City, Radio Inc.	405-789-0741
OK	Tulsa, Radio Inc.	918-587-9123
OR	Lake Oswego, Rose Elctrns.	503-635-8823
OR	Portland, Wyle Distr. Grp.	503-640-6000
PA	Drexel Hill, Kass Elctrns.	215-449-2300
PA	Pittsburgh, CAM/RPC Ind'l. Elctrns.	412-782-3770
PA	Pittsburgh, Arrow Elctrns.	415-856-7000
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Knoxville, Hammond Elctrns.	615-691-3491
TN	Nashville, Graham Elctrn. Supp.	615-242-2682
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Corpus Christi, Douglas Elctrns.	512-883-5103
TX	Dallas, R.V. Weatherford	214-931-7333
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	El Paso, ERA Elctrns.	915-592-4126
TX	Houston, R.V. Weatherford Co.	713-688-7406
TX	Houston, Arrow Elctrns.	713-491-4100
UT	Salt Lake City, Wyle Distr.	801-974-9953
UT	Salt Lake City, Bell Inds.	801-972-6969
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
WA	Bellevue, Wyle Distr. Grp.	206-453-8300
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Seattle, R.V. Weatherford Co.	206-575-1340
WI	Madison, Arrow Elctrns.	608-273-4977
WI	Mequon, Taylor Elec. Co.	414-241-4321

STANDARD REFERENCE LABS, INC., Coan Pl., Metuchen, NJ 08840, Tel: 201-549-9280, TWX: 710-998-0503; FSC No.: 57114; Empl.: 5; *Sls. Mgr.:* Dennis M. Koep; *Dist. Mgr.:* Dennis M. Koep ....**3**•1305

Local Sales Offices & Reps

AZ	Scottsdale, Williams Assocs.	602-947-4297
CA	San Diego, Mesa Engrg.	619-278-8037
CA	Torrance, Cutlas Elctrns.	213-324-7360
CO	Commerce City, Williams Assocs.	303-289-5647
FL	Winter Haven, Lee Assocs., Florida	813-294-5815
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-924-3568
IA	Cedar Rapids, Marsland Assocs.	319-296-8030
MD	Wheaton, Brimberg Sls.	301-946-2670
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-878-2404
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	Binghamton, Tae-Rep	607-722-9265
NY	Rochester, Tae-Rep	716-586-8710
UT	Salt Lake City, Williams Assocs.	801-532-7701
WA	Portland, Westcon	503-283-0132
WI	New Berlin, Marsland Assoc.	414-786-6611

STANDARD WIRE & CABLE CO., 2345 Alaska Ave., El Segundo, CA 90245, Tel: 213-536-0006, Telex: 65-3423, TWX: 910-340-6758; FSC No.: 04946; Empl.: 125; *Sls. Mgr.:* J. Gaither; *Dist. Mgr.:* Jerry Gaither

STANDEX ELCTRNS., 4538 Camberwell Rd., Cincinnati, OH 45209, Tel: 513-871-3777, Telex: 212066; Empl.: 1,039; *Sls. Mgr.:* Charles C. Johnson ....**1A**•1628, 1629; **1B**•1475

STANFORD APPLIED ENGRG. INC., 3520 De La Cruz Blvd., Santa Clara, CA 95050, Tel: 408-980-1600, TWX: 910-338-0132; Empl.: 1300; *Sls. Mgr.:* Dick Hudspeth; *Dist. Mgr.:* Dick Hudspeth

Local Sales Offices & Reps

Filters/Power Devices

AL	Huntsville, K & E Assocs.	205-883-9720
AZ	Scottsdale, American Mktg.	602-948-2778
AZ	Scottsdale, F. Board Assoc.	602-994-9388
AR	Tulsa, Kemp Engrg.	918-663-4501
CA	San Diego, Vinco	619-569-6959
CA	San Diego, Stanford Applied Engrg.	619-569-6959
CA	Santa Ana, Caltronics	714-751-9162
CA	Santa Ana, Stanford Applied Engrg.	714-751-9162
CA	Santa Clara, Caltronics	408-727-7552
CO	Denver, Quorum 3: Sls. Grp.	303-696-8480
CO	Englewood, Quorum 3: Sls. Grp.	303-696-8480
FL	Osteen, Bolton Assocs.	305-321-3077
FL	Pompano Beach, Electrocraft	305-781-5778
GA	Doraville, K & E Assocs.	404-448-7025
HI	Honolulu, Adtech	808-941-0708
L	Barrington, Stanford Applied Engrg.	312-382-6960
L	Wheeling, P.G. Applied Sls.	312-459-5750
N	Indianapolis, SAI Mktg.	317-241-9276
A	Cedar Rapids, Electromec Sls.	319-362-6413
KS	Shawnee, BAKA Corp.	913-268-5065
KS	Wichita, Baka	316-262-0179
MD	Ellicot City, Arbotek Assoc.	301-461-1323
MA	Millis, Selmark Assocs.	617-376-2914
MI	Brighton, SAI Mktg.	313-227-1786
MN	Burnsville, Electromec Sls.	612-894-8200
MN	Minneapolis, Electromec Sls.	612-894-8200
NJ	Medford, Component Consits.	609-654-5300
NJ	Perth Amboy, Astrorep, Inc.	201-826-8050
NJ	Teaneck, Norest Techn. Sls.	201-833-0061
NM	Albuquerque, Power Entprs.	505-298-1918
NY	Babylon, Astrorep, Inc.	516-422-2500
NY	Melville, Stanford Applied Engrg.	516-420-8111
NY	North Syracuse, Advanced Comp. Sls.	315-699-2671
NY	Syracuse, Pitronics	315-455-7346
NC	Raleigh, K & E Assocs.	919-781-1406
OH	Dayton, SAI Mktg.	513-435-3181
OH	Shaker Heights, SAI Mktg.	216-751-3633
OH	Zanesville, SAI Mktg.	614-454-8942
OK	Tulsa, Kemp Engrg.	918-663-4501
OR	Beaverton, Huntley Assocs.	503-649-5288
N	Jonesboro, K & E Assocs.	615-753-2921
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, Mech-Tron Mktg.	214-343-3786
TX	Houston, Mech-Tron Mktg.	713-462-1432
UT	Salt Lake City, Quorum 3: Sls. Grp.	801-943-7441
WA	Everett, Huntley Assocs.	206-353-1833
WA	Kirkland, Elec. Technical Sls.	206-827-8086

Interconnections & Packaging

AL	Huntsville, K & E Assocs.	205-883-9720
AZ	Scottsdale, American Mktg.	602-948-2778
AR	Tulsa, Kemp Engrg.	918-663-4501
CA	San Diego, Vinco	619-569-6959
CA	Santa Ana, Caltronics	714-751-9162
CA	Santa Clara, Caltronics	408-727-7552
CO	Boulder, Stanford Applied Engrg.	303-530-1900
CO	Denver, Quorum 3: Sls. Grp.	303-696-8480
CT	Farmington, Stanford Applied Engrg.	203-677-6046
FL	Apopka, Bohman Assocs.	305-886-1882
GA	Doraville, K & E Assocs.	404-448-7025
HI	Honolulu, Adtech, Inc.	808-941-0708
L	Barrington, Lancastle, Ltd.	312-381-6780
L	Wheeling, P.G. Applied Sls.	312-459-5750
A	Cedar Rapids, Electromec Sls.	319-362-6413
KS	Shawnee, Baka	913-268-5065
KS	Wichita, Baka	316-262-0179
MD	Ellicott City, Marketing Tech	301-465-5944
MA	Lexington, Circuit Sls. Co.	612-861-0567
MN	Burnsville, Electromec Sls.	612-894-8200
MO	Ferguson, Baka Corp.	314-878-4224
NJ	Medford, Component Consits.	609-654-5300
NJ	Perth Amboy, Astrorep, Inc.	201-826-8050
NJ	Teaneck, Noreast Techn. Sls.	201-833-0061
NM	Albuquerque, Power Entprs.	505-298-1918
NY	Babylon, Astrorep, Inc.	516-422-2500
NY	North Syracuse, Advanced Comp. Sls.	315-699-2671
NC	Raleigh, K & E Assocs.	919-781-1406
OH	Beachwood, Electronic Salesmasters	216-831-9555
OK	Tulsa, Kemp Engrg.	918-663-4501
PA	Springhouse, Deltatronics	215-542-0250
TN	Jonesboro, K & E Assocs.	615-753-2921
TX	Austin, Mech-Tron Mktg.	512-835-0980
TX	Dallas, Mech-Tron Mktg.	214-343-3786
TX	Houston, Mech-Tron Mktg.	713-462-1432
UT	Salt Lake City, Quorum 3: Sls. Grp.	801-943-7441
WA	Tukwila, General Elctrns.	206-241-7990

Local Distributors

AL	Huntsville, RM Alabama, Inc.	205-852-1550
AL	Huntsville, Component Distrs.	205-883-7501
AZ	Phoenix, Hieland Elctrns.	602-243-7171
AZ	Phoenix, Arizona Components	602-279-9446
AZ	Tempe, Time Elctrns.	602-967-2000
AZ	Tempe, Bell Industries	602-966-7800
AR	Little Rock, Component Distrs.	501-227-6278
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Chatsworth, Integrated Elctrns.	213-988-2200
CA	Costa Mesa, Escot	714-557-3252
CA	Irvine, Ryno Elctrns.	714-557-5021
CA	Irvine, Ratel Elctrns.	714-549-8611
CA	Los Angeles, Connector Distbn. Corp.	213-670-2266
CA	San Diego, Ryno Elctrns.	619-292-6022
CA	San Jose, Ratel Elctrns.	408-946-4300
CA	Santa Clara, Escot	408-988-4991
CA	Santa Clara, Caltronics	408-727-7552
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Broomfield, Escot	303-465-2346
CO	Colorado Springs, Ratel Elctrns.	303-599-9043
CO	Englewood, Industrial Elctrns.	303-694-9444
CO	Wheatridge, Bell Industries	303-424-1985
CT	Bethel, Beilind Elctrns.	203-797-8600
FL	Ft. Lauderdale, Dielco	305-973-8700
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Ft. Lauderdale, Component Distrs.	305-971-4950
HI	Honolulu, Adtech, Inc.	808-941-0708
IL	Chicago, Bell Industries	312-982-9210
IL	Lombard, RM Illinois, Inc.	312-932-5150
IL	Mt. Prospect, Magnuson	312-956-0700
IL	Wheeling, Escot	312-459-5750
IN	Indianapolis, RM Indiana, Inc.	317-247-9701
IN	Indianapolis, Magnuson	317-247-5108
MD	Savage, Pyttronic Inds.	301-953-9650
MA	Burlington, Schaal Assocs.	617-272-7940
MA	Burlington, Heilind Elctrns.	617-272-5610
MA	Woburn, Time Elctrns.	617-935-8080
MI	Grand Rapids, RM Michigan, Inc.	616-531-9300
MN	Edina, Northern Elctric. Supply	612-944-1167
MN	St. Paul, Magnuson Elctrns.	612-227-8495
MO	St. Louis, Time Elctrns.	314-391-6444
NH	Hudson, Heilind Elctrns.	603-883-9536
NJ	Oakland, Gordon/Horne Inc.	201-337-5200
NM	Albuquerque, Bell Industries	505-292-2700
NY	Buffalo, Summit Elctrns.	716-884-3450
NY	Hauppauge, Schaal Assocs.	516-234-4600
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Rochester, Modutex Corp.	716-424-1620
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Rome, Rome Elctrns.	716-337-5400
NC	Raleigh, Component Distrs.	919-781-0262
NC	South Charlotte, Elctrn. Mktg. Corp.	704-394-6195
OH	Columbus, Elctrn. Mktg. Corp.	614-299-4161
OH	Highland Heights, Elctrn. Mktg. Corp.	216-442-3441
OK	Oklahoma City, Radio Inc.	405-789-0741
OK	Tulsa, Radio Inc.	918-587-9123
OK	Tulsa, Altair	918-252-5781
OR	Oswego, Bell Industries	503-241-4115
PA	Broomall, Time Elctrns.	215-359-1200
PA	Montgomeryville, Pyttronic Inds.	215-643-2850
PA	Pittsburgh, Pyttronic Inds.	412-276-6722
TX	Austin, Altair Co.	512-837-4490
TX	Dallas, Heilind Elctrns.	214-351-2058
TX	Dallas, RM Texas, Inc.	214-235-3100
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
UT	Midvale, Ratel Elctrns.	810-562-2600
UT	Salt Lake City, Bell Industries	801-972-6969
WA	Bellevue, Bell Industries	206-747-1515
WA	Bellevue, Integrated Elctrns.	206-455-2727
WI	New Berlin, RM Wisconsin	414-784-4420
WI	Waukesha, Bell Industries	414-784-0235

STANFORD TELECOMMUNICATIONS, INC., 2421 Mission College Blvd., Santa Clara, CA 95050, Tel: 408-748-1010, TWX: 910-339-9531; FSC No.: 61362; Empl.: 300; *Sls. Mgr.:* J. A. Kirby

STANLEY/AC INTERFACE, 2925 College Ave., Unit A 1, Costa Mesa, CA 92626, Tel: 714-979-9830, Telex: 655328; *Sls. Mgr.:* R. D. Henwood; *Dist. Mgr.:* R. D. Henwood

STANLEY-VIDMAR, Stanley Works, 11 Grammes Rd., Allentown, PA 18103, Tel: 215-797-6600; *Sls. Mgr.:* Ernie Gitlin

STANPAT PRODS., 366 Main St., Port Washington, NY 11050, Tel: 516-883-8400; Empl.: 25

STANTON MAGNETICS, INC., Terminal Dr., Plainview, NY 11803, Tel: 516-349-0200, TWX: 510-221-1845; Empl.: 300

STANTRON DIV., 6900 Beck Ave., N. Hollywood, CA 91605, Tel: 818-875-0800, TWX: 910-499-2177; FSC No.: 06514; Empl.: 125; *Sls. Mgr.:* G. A. Tessier .... **2**•1055

Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn Co.	602-257-9015
CA	Los Angeles, Landa/Minyard	213-879-0770
CA	Pleasanton, Moulthrop Sls.	415-463-0450
CO	Golden, J. F. Hurlbut Co.	303-279-7796
CT	Farmington, Ray Perron & Co.	203-673-4825
CT	Seymour, Ray Perron & Co.	203-888-4849
FL	Pompano Beach, T. G. & Assocs.	305-781-8328
FL	Tampa, T. G. & Assocs.	813-753-5632
GA	Jonesboro, Wallace Elctrn. Sls.	404-471-6297
HI	Honolulu, J.C. Elctrns.	808-841-7477
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Carmel, Berndt Assocs.	317-844-0114
KS	De Soto, Midtec Assoc.	913-441-6565
MD	Ellicott City, Sci-Rep	301-321-1411
MA	Needham, Ray Perron & Co.	617-449-6162, 800-225-4280
MI	Jackson, Norwood Scroggs	517-750-1170
MN	Minneapolis, Berndt Assocs.	612-546-2021
MO	Florissant, Midtec Assocs.	314-837-5200
NH	Dover, Ray Perron & Co.	603-742-2321
NJ	Pennsauken, Sci-Rep	609-662-5222
NJ	Wayne, G.T. Assocs.	201-694-6040
NM	Albuquerque, Shefler-Kahn Co.	505-265-7049
NY	Rochester, Gislason Sls.	716-454-4741
NC	Kernersville, Wallace Elctrn. Sls.	919-996-2742
OH	Cincinnati, J. O. Olsen Co.	513-574-7711
OH	Cleveland, J. O. Olsen Co.	216-662-3454
OK	Tulsa, Barry Sls.	918-749-7775
PA	Pittsburgh, J. O. Olsen Co.	412-279-2550
TN	Chattanooga, Wallace Elctrn. Sls.	615-870-2080
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls. Co.	713-784-5860
TX	Richardson, Barry Sls. Co.	214-234-0255
UT	Salt Lake City, J. F. Hurlbut Co.	801-973-4443
VA	Fairfax, Sci-Rep	703-385-0600
WA	Seattle, D. Smith Sls.	206-633-3160
WI	Milwaukee, Berndt Assocs.	414-545-8400

STAR MICRONICS, INC., Components Div., 70-D Ethel Rd. W., Piscataway, NJ 08854, Tel: 201-572-9512; Empl.: 120; *Sls. Mgr.:* R. Messer .... **3**•1056-1059, 1092, 1093

Local Sales Offices & Reps

AZ	Phoenix, MacDonald Assocs.	602-998-1848
CA	Fullerton, Groh Assoc.	714-738-7105
CA	Menlo Pk., G. R. McKnight Co.	408-942-0880
CA	San Diego, Groh Assoc.	714-738-7105
FL	Casselberry, Southern Elctrn. Mktg.	305-695-3334
FL	Fort Lauderdale, Southern Elctrn. Mktg.	
GA	Atlanta, Magaro & Assoc.	404-451-8826
IL	Elk Grove Village, Oasis Sls. Corp.	312-640-1850
IN	Carmel, Shamrock Sls.	317-848-5265
IA	Cedar Rapids, Elctrn. Innovators	319-362-2217
MD	Baltimore, Adcour	301-889-1211
MA	Sharon, Adcour	617-784-8123
MI	Southfield, Component Assoc.	313-557-3232
MN	Eden Prairie, Elctrn. Innovators	612-941-0830
NJ	Sparta, Instr. & Equip.	201-729-4293
NY	Queens, Metropolitan Sls.	212-634-3100
NC	Greensboro, Magaro & Assocs.	919-294-4783
OH	Bedford, A.S.A. Assocs.	216-662-6080
OR	Portland, Controltek Sls.	503-641-0877
TX	Houston, Repmaster-Houston	713-692-8204
TX	Richardson, McCoy Assocs.	214-238-1017
WA	Bellevue, Controltek	206-451-8163

WV	Spokane, Controltek	509-922-2971
WI	Brookfield, Oasis	414-783-6660
EXP	Markham, Lenbrook	416-477-7722

Local Distributors

CA	Costa Mesa, Marvac	714-540-3280
CA	Los Angeles, Elect. Switches	213-660-1301
CA	San Diego, Tauber Elctrns.	619-274-7242
CA	Santa Clara, Waltronics Sls.	408-727-1200
IL	Wheeling, Hawk Elctrns.	312-459-4040
MA	Sharon, Adcour	617-784-8123
MN	Minneapolis, Voyager Elctrns.	612-571-7766
NJ	Sparta, Instrument & Equip.	201-729-4293
NJ	Sparta, Instr. & Equip.	201-447-3525
NJ	Waldwick, Production Supp. & Equip.	201-447-3525
NY	Rockaway Park, Metropolitan Sls.	212-634-3100
OH	Cincinnati, United Radio Inc.	513-761-4030
OR	Portland, United Radio Supp.	503-233-7151
TX	Channelview, R. T. Henry Elctrns.	713-452-4451
TX	Houston, Copper Alarm Supp. Co.	713-868-1794
UT	Dallas, Wholesale Elctrns.	214-824-3001
WA	Bellevue, Solomon Inds.	206-643-5644
EXP	Markham, Ont., Lenbrook Elctrns.	416-477-7722

STAR PORCELAIN, 71 Muirhead Ave., Trenton, NJ 08638, Tel: 609-392-3154; Empl.: 100; *Sls. Mgr.:* Art Hobson

STAR-TRON CORP., 58 Curtis St., Providence, RI 02909, Tel: 401-274-5090, Telex: 929490; FSC No.: 32494; Empl.: 50; *Sls. Mgr.:* Anna Coski

STATEK

STATEK CORP., 512 N. Main St., Orange, CA 92668, Tel: 714-639-7810, Telex: 67-8394, TWX: 910-593-1355; FSC No.: 51791; Empl.: 100; *Sls. Mgr.:* J. Ownby .... **1A**•1429-1431

Local Sales Offices & Reps

AL	Huntsville, Mackay Smith & Assoc.	205-539-8000
AZ	Phoenix, Eltron	602-266-2164
CA	El Toro, Martronix	714-855-6397
CA	Mountain View, Weseloh/Swanson & Assocs.	415-961-0565
CA	San Diego, Mesa Engrg. & Sls. Assocs.	619-278-8021
CO	Denver, Elcom	303-337-2300
FL	Madeira Beach, MacKay, Smith & Assoc.	813-393-7144
FL	Orlando, MacKay, Smith & Assoc.	305-277-1513
GA	Norcross, MacKay, Smith & Assoc.	404-449-7444
IL	Northbrook, Raines & Assocs.	312-498-0890
IN	Fort Wayne, M/S Sls. & Assocs.	219-484-1904
IN	Indianapolis, M/S Sls. & Assocs.	317-257-8916
KS	Overland Park, Thomas L. Dowell & Assoc.	913-648-7373
MD	Baltimore, Professional Reps.	301-653-3600
MA	Woburn, Radian Assocs.	617-933-7386
MO	St. Louis, Thomas L. Dowell & Assocs.	913-648-7373
NJ	Bellmawr, TAI Corp.	609-933-2600
NJ	Manhasset, Win-Cor Elect. Sales Corp.	516-627-9474
NY	Syracuse, PI Tronics	315-455-7340
NC	Charlotte, MacKay, Smith & Assoc.	704-372-1188
NC	Raleigh, MacKay, Smith & Assoc.	919-851-5000
OK	Tulsa, Norcom	918-832-7747
TX	Austin, Norcom	512-451-2757
TX	Dallas, Norcom	214-386-4888
TX	Houston, Norcom	713-778-0392
UT	Salt Lake City, Elcom	801-532-7940
WA	Redmond, Halbar Assoc.	206-882-0990
WA	Vancouver, Halbar Assoc.	206-696-0170

Local Distributors

AL	Huntsville, Contact Elctrns.	205-881-9321
CA	Irvine, Ryno Elctrns.	714-261-2500
CA	Mountain View, Target Elctrns.	415-961-1170
CA	San Diego, Ryno Elctrns.	619-292-6022
FL	Longwood, Intertec	305-834-7777
IL	Palatine, OHM Elctrns.	312-359-5500
IN	Indianapolis, Mar Elctrns. Inc.	317-875-4510
MD	Columbia, Aztech Elctrns.	301-995-1760
MA	Woburn, First Frequency	617-935-3885
MO	St. Louis, Olive Elctrns.	314-426-4500
NY	Buffalo, Summit Distrs.	716-884-3450
OR	Lake Oswego, Rose Elctrn. Distrg. Co.	503-635-8823
TX	Richardson, Ewing Elctrns. Inc.	214-231-6725
WA	Seattle, Rose Elctrn. Distrbg. Co.	206-721-4997

STATE OF THE ART, INC., 2470 Fox Hill Rd., State College, PA 16801, Tel: 814-355-8004

STATIC INC., Rte. 113 & Mensch Rd., P.O. Box 80, Skippack, PA 19474, Tel: 215-584-9600, Telex: 846079; Empl.: 50; *Sls. Mgr.:* R. J. Hoffman

STAVER CO., INC., 47 Saxon Ave., Bay Shore, NY 11706, Tel: 516-666-8000, TWX: 510-227-6142; Empl.: 140; *Sls. Mgr.:* Arnold Lazarus .... **1B**•1105

Local Sales Offices & Reps

CA	Woodland Hill, R. H. McDonald & Assocs.	213-348-3766
IL	Lombard, RMP/McBride Corp.	312-932-9090
MA	Scituate, Jack Goss	617-545-6327
MI	Ann Arbor, Elliott Sls.	313-662-4087
MN	St. Louis Park, Lestronix	612-926-8466
NH	Hancock, Eisenbeis Sls.	603-357-4892
NY	East Northport, Levison Sls. Co.	516-266-5020
NY	Manlius, Bowser & Sapecky Assocs.	315-682-8885
NC	Cary, Tom G. Santel	919-467-7595
OK	Tulsa, Jerry Robinson & Assocs.	918-492-0390
OR	Portland, J. J. Backer Co.	503-297-3776
PA	Colmar, Eastern Scientific Mktg.	215-822-0157
PA	Sewickley, T. H. Stewart Co.	412-741-8665
SC	Mauldin, Carl Hart	803-288-2323
TX	Houston, Cunningham Co.	713-461-4197
VA	Portsmouth, F.B.D. Sls.	804-484-3162
WA	Seattle, J. J. Backer Co.	206-285-1300

STD MICROSYSTEMS, 399 Sherman Ave., Palo Alto, CA 94306, Tel: 415-327-6800; *Sls. Mgr.:* Gary Whittaker; *Dist. Mgr.:* Gary Whittaker

STENNING INSTRUMENTS, INC., 671 Enchanted Way, Pacific Palisades, CA 90272, Tel: 213-459-2930; *Sls. Mgr.:* Charles Stenning

STEP ENGINEERING, P.O. Box 61166, Sunnyvale, CA 94088, Tel: 408-733-7837, TWX: 910-339-9506; Empl.: 30; *Sls. Mgr.:* Stan Trumbull

STERLING INSTR., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040, Tel: 516-328-3300, TWX: 510-223-0642; Empl.: 150

STERLING TRANSFORMER CORP., 510 Driggs Ave., Brooklyn, NY 11211, Tel: 212-782-4200; FSC No.: 97102; Empl.: 45; *Sls. Mgr.:* P. H. Odessey .... **1A**•2293-2297

Local Sales Offices & Reps

OH	Dayton, George Lessis	513-294-1551

STETTNER ELCTRNS., 6135 Airways Blvd., Chattanooga, TN 37421, Tel: 615-892-0291, TWX: 810-573-5224; FSC No.: 52763; *Sls. Mgr.:* Ralph S. Souders

CP COMPUTER PRODUCTS™
POWER CONVERSION

STEVENS-ARNOLD DIV., Computer Prods., Inc., 7 Elkins St., So. Boston, MA 02127, Tel: 617-268-1170, Telex: 95-1465 STEARCO, TWX: 710-339-0855; FSC No.: 80640; Empl.: 300; *Sls. Mgr.:* John T. Parent .... **3**•1705, 1717-1724

Refer to Computer Products, Inc., Pompano Beach, Fl for sales offices and representatives and for distributor listings.

STEVENS PRODUCTS, INC., 128 N. Park St., E. Orange, NJ 07019, Tel: 201-672-2140; Empl.: 50; *Sls. Mgr.:* John Thomson

STEWARD, D. M., MFG. CO., P.O. Box 510, Chattanooga, TN 37401, Tel: 615-867-4100, Telex: 558490; Empl.: 185; *Sls. Mgr.:* Arlin Grant

STOCK DRIVE PRODS., Div. of Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY 11040, Tel: 516-328-0200, TWX: 510-223-0642; Empl.: 210

STOELTING CO., 1350 S. Kostner Ave., Chicago, IL 60623, Tel: 312-522-4500; Empl.: 50; *Sls. Mgr.:* D. A. Peterson

STONE CITY PRODUCTS CO., 1206 Seventh Street, Bedford, IN 47421, Tel: 812-275-3373

STORM PRODUCTS CO., 116 Shore Drive, Hinsdale, IL 60521, Tel: 312-323-9121, TWX: 910-651-0850; *Sls. Mgr.:* John W. Holland

STOW LABS., INC., Kane Ind'l. Dr., Hudson, MA 01749, Tel: 617-562-9347, Telex: 94-8330; Empl.: 15

STRATEGIC SYS. DIV. POWER SYS. OPERATIONS, GTE Prods. Corp. Sylvania Sys. Grp., 520 Winter St., Waltham, MA 02254, Tel: 617-466-3000, Telex: 951-953, TWX: 710-290-0376

STREET ELECTRONICS CORP., 1140 Mark Ave., Carpinteria, CA 93013, Tel: 805-684-4593

STROBE, INC., 897 Independence Ave., Mountain View, CA 94043, Tel: 415-969-5130

STRONGBOX, P.O. Box 84508, Los Angeles, CA 90073, Tel: 213-204-0472; Empl.: 3; *Sls. Mgr.:* Larry Martinek .... **2**•1056, 1057

Advertisement

STRONGBOX Heavy-Duty aluminum Rack-Mount Chassis. EIA-Standard heights, 3½″ to 8¾″. Available 9½″, 12″, 19″ deep. Extension kits for intermediate, extra-long sizes. All fit 19″ racks. Solid or Perforated Covers. Slides, Mounting Panels available. Non-standard heights, depths available. Write/call for free brochure. See catalog, EEM.

Local Sales Offices & Reps

CA	San Diego, Edmonson Co.	714-846-9086
NM	Albuquerque, Betatron	505-344-2381

STRUCTURED DESIGN, INC., 1700 Wyatt Dr. #7, Santa Clara, CA 95054, Tel: 408-988-0725, Telex: 172931; *Sls. Mgr.:* Noel C. Hendricks; *Dist. Mgr.:* Noel C. Hendricks

STRUTHERS-DUNN, Lamb's Rd., Pitman, NJ 08071, Tel: 609-589-7500, TWX: 510-686-7510; FSC No.: 78290; Empl.: 700; *Sls. Mgr.:* W.L. Capewell; *Dist. Mgr.:* A. B. Kinney .... **1B**•1477

Local Sales Offices & Reps

AL	Huntsville, Rep, Inc.	205-881-9270
AZ	Phoenix, Hecht, Henscher & Assoc.	602-275-4411
AR	Little Rock, Controls & Power	501-661-1737
CA	Culver City, DeAngelo, Rothman & Co.	213-827-2202
CA	San Diego, Struthers-Dunn	619-560-9922
CA	Santa Clara, Mollard Mktg.	408-727-2050
CO	Denver, Lindberg Co.	303-758-9033
CT	Bloomfield, Zaslow Sls. Co.	203-242-7781
FL	Miami, Ludlum Assocs.	305-592-6524
FL	Orlando, Ludlum Assocs.	305-894-7761
GA	Tucker, Rep, Inc.	404-938-4358
IL	Glen Ellyn, Rockford Controls Co.	312-469-6016
IA	Bettendorf, BSI, Ltd.	319-355-5623
KS	Wichita, Avionics Engrg.	316-264-6201
LA	Lafayette, Kemp Engrg.	318-269-9452
MI	Southfield, L. H. Dickelman Co.	313-353-8210
MN	Minneapolis, HMR, Inc.	612-831-7400
MO	Maryland Heights, Hitt & Assocs.	314-878-5404
MO	Raytown, E. A. Mais Co.	816-356-0800
NJ	West Caldwell, Grimm, Siegel Assocs.	201-575-9300
NY	Buffalo, H. C. Zang Agency	716-877-3677
NC	Charlotte, J. Rudisill Assocs.	704-377-6901
OH	Cincinnati, Struthers-Dunn	513-772-3108
OH	Strongsville, Struthers-Dunn	216-572-1333
PA	Pittsburgh, R. F. Clark Co.	412-242-9500
TN	Jefferson City, REP, Inc.	615-475-4105
TN	Memphis, Controls & Power	901-332-0036
TX	Arlington, W. Pat Fralia Co.	817-640-9101
TX	Houston, W. Pat Fralia Co.	713-772-1572
WA	Seattle, Eicher-Richards Co.	206-523-7888

ST-SEMICON, 415 N. College Ave., P.O. Box 609, Bloomington, IN 47402, Tel: 812-332-1435, TWX: 810-351-1384; Empl.: 100; *Sls. Mgr.:* Robert Muldoan

SUCKLE CORP., 733 Davis St., Dept. EM, Scranton, PA 18505, Tel: 717-346-3871; Empl.: 200; *Sls. Mgr.:* M. H. Brenner .... **2**•1058

Local Sales Offices & Reps

GA	Lilburn, R. Panyik Assoc.	404-923-3703
NJ	Cherry Hill, T. Cammaroto	609-772-2321
PA	Scranton, J. Castellino	717-346-4097

Sullins

SULLINS ELCTRNS. CORP., P.O. Box 189, 801 Mission Rd., San Marcos, CA 92069, Tel: 619-744-0125, TWX: 910-322-1472; Empl.: 100; *Sls. Mgr.:* Chip Bruss; *Dist. Mgr.:* Chip Bruss .... 2•1574, 1575

Local Sales Offices & Reps

L	Decatur, Tenn Tech, Inc.	205-350-0630
Z	Phoenix, Robert E. Lee Assoc.	602-269-6206
A	Los Angeles, K.C.P. Ent.	213-796-1813
A	Sunnyvale, Schwerin & Merril, Inc.	408-735-7900
O	Arvada, Cluff & Assocs.	303-423-9354
T	Hamden, Impact Sls.	203-281-1331
L	Downers Grove, Circuit Sls., Inc.	312-964-9090
N	Indianapolis, Sukup & Cox	317-253-5501
A	Marion, M-S-B Assoc.	319-377-6261
S	Shawnee Mission, M-S-B Assoc.	913-432-2131
MD	Laurel, CSDS, Inc.	301-490-3800
MA	Needham, Impact Sls.	617-444-3971
MN	Minneapolis, Milt Westlund Assocs.	612-866-5002
MO	St. Charles, M-S-B Assoc.	314-946-5577
J	Medford, Comp. Consultants	609-654-5300
Y	Lynbrook, HLJ Comp-Tech	516-599-2999
Y	Syracuse, Lenard Co.	315-479-9191
H	Beachwood, Elctrn. Salesmasters, Inc.	216-831-9555
A	The Fairway Rydal, Espy Sls.	215-576-0780
X	Austin, T.L. Mktg.	512-453-4586
X	Dallas, T.L. Mktg.	214-357-1752
WA	Bellevue, Elctrn. Mktg. Grp.	206-746-5915
WI	Mequon, Artmor Ltd.	414-241-4040

Local Distributors

AL	Birmingham, Forbes Distr. Co.	205-251-4104
AL	Decatur, Forbes Distr. Co.	205-353-4762
AL	Huntsville, RM Elctrns.	205-852-1550
AL	Mobile, Forbes Distr. Co.	205-479-4535
AZ	Phoenix, Arizona Comps.	602-279-9446
AZ	Phoenix, Kachina Elctrn. Dist.	602-269-6201
A	Burbank, Atwater Elctrns.	818-841-9050
A	Pasadena, Empire Elctrn. Distrs.	213-681-2700
A	San Diego, Patane Avionics, Inc.	619-271-9877
A	San Diego, Sigma Elctrns.	619-565-2000
A	San Jose, Cypress Elctrns.	408-945-8400
A	Simi Valley, Lee Johnson Sls.	213-346-5412
A	Torrance, Cypress Elctrns.	213-530-1900
A	Van Nuys, Mil Conn Dvcs. Inc.	800-824-7885
A	Van Nuys, Patane Avionics, Inc.	818-988-4455
A	Ventura, Bond Electro Sls.	805-653-6487
O	Denver, Integrated Elctrns.	303-292-6121
O	Denver, Denver Wintronics	303-431-7161
O	Ragon, Elctrn. Parts	303-744-3601
L	Miami, Elctrn. Equip.	305-871-3500
L	Pensacola, Forbes Distr. Co.	904-944-5551
A	Atlanta, Ack Radio Supp.	404-351-6340
L	Addison, Lectro Comps.	800-323-2282
L	Chicago, NEP Elctrns.	312-625-8400
L	Melrose Pk., Belford Elctrns.	312-865-2400
L	Wheeling, Hawk Elctrns.	312-459-4030
N	Ft. Wayne, Graham Elctrns.	219-423-3422
N	Indianapolis, RM Elctrns.	317-247-9701
MA	Canton, Impact Sls.	617-821-1500
MI	Grand Rapids, RM Elctrns.	616-531-9300
MI	Walled Lake, Ambur Elctrns.	313-669-3710
J	Audobon, Action Elctrns.	609-858-2450
J	Bellmawr, Mid-Atlantic Elctrns.	609-931-5303
M	Albuquerque, Electronic Parts	505-293-6161
C	Charlotte, Southeastern Elctrns.	704-523-1122
C	Durham, Southeastern Radio Supp.	919-688-8204
C	Raleigh, Southeastern Radio Supp.	919-828-2311
H	Cincinnati, Schuster Electr.	513-489-1400
H	Solon, REH Elctrns.	216-248-1636
H	Twinsburg, Schuster Elec. Co.	216-425-8134
R	Portland, Dunn Elctrns.	503-285-0214
N	Chattanooga, Indl. Elctrns. Dist.	615-698-3413
N	Knoxville, Indl. Electrns.	615-573-7135
X	Dallas, RM Elctrns.	214-235-3100
X	Garland, J&S Elctrns.	214-487-8808
T	Salt Lake City, Kimball Elctrns.	801-328-2075
VA	Seattle, Carlyle Techn. Sls.	206-575-6750
VI	Mequon, Lake-View Elctrns.	414-377-8250

UMITA OPTICAL GLASS MFG. CO., LTD., P.O. Box 521, Millwood, NY 10546, Tel: 914-762-4959; FSC No.: 914-762-7497; *Sls. Mgr.:* Mike Sumita

SUMMAGRAPHICS CORP., 35 Brentwood Ave., Fairfield, CT 06430, Tel: 203-384-1344, Telex: 964348; *Sls. Mgr.:* Anthony Joyce; *Dist. Mgr.:* Ron McClure

SUMMIT CAD CORP., 5222 FM 1960 W100, Houston, TX 77069, Tel: 713-440-1468, Telex: 792831; *Sls. Mgr.:* Gregg Young; *Dist. Mgr.:* Harold Thornton

SUMMIT ELCTRNS., 750 S. Sherman, Richardson, TX 75081, Tel: 214-231-1456; *Sls. Mgr.:* Jack W. Barry .... 3•1784, 1785

Local Sales Offices & Reps

AL	Huntsville, Electro-Mech	205-533-2100
AZ	Phoenix, MacDonald Assoc.	602-998-1848
CA	Agoura, Cal Rep	213-991-1940
CA	Sunnyvale, Sourcetronics	408-773-1931
CA	Woodland Hills, Craig Assocs.	213-887-2444
CO	Broomfield, Wescom Mktg.	303-741-4900
FL	Pompano Beach, Electrocraft	
FL	Winter Park, Electrocraft	305-628-4705
GA	Atlanta, Electro-Mech	404-447-6478
IL	Barrington, Omni Elctrns. Mktg.	312-381-9087
IL	Roselle, Omni Elctrns. Mktg.	312-351-2507
IN	Indianapolis, Wilson Tech. Sls.	317-298-3345
MD	Timonium, Heller Sales	301-252-4780
MA	Braintree, R. F. Duffy & Assocs.	617-848-3550
MI	Detroit, Jack M. Thorpe	313-779-6363
MN	Minneapolis, Electro Serve	612-338-3475
MO	Hazelwood, Stone & Assocs.	314-895-4564
NJ	N. Plainfield, T & K Sls.	201-755-2878
NJ	Upper Sadle River, Bob Cameron	201-825-1304
NM	Albuquerque, McDonald & Assoc.	505-883-0500
NY	Smithtown, T & K Sales	516-724-3456
NC	Raleigh, Electro-Mech	919-851-8165
OH	Cleveland, Arthur Baier Co.	216-461-6161
OH	Dayton, Arthur Baier Co.	513-276-4128
OK	Tulsa, Barry Sls.	918-749-7775
PA	Horsham, TMI	215-441-4300
TN	Nashville, Electro-Mech	615-885-0073
TX	Austin, Barry Sls.	512-837-3616
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255

SUMMIT ENGINEERING CORP., Box 938, Bozeman, MT 59715, Tel: 406-587-4511, TWX: 910-975-1950; Empl.: 300; *Sls. Mgr.:* Marty Connor

SUMX CORP., Box 14864, Austin, TX 78761, Tel: 512-835-0330; Empl.: 30

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Local Sales Offices & Reps

CA	Mission Viejo, Par Mktg.	714-768-6021
CT	Wethersfield, Underwood Sls.	203-563-3046
FL	Altamonte Springs, Gugel-Tuttle-Assocs.	305-788-0845
KS	Leawood, Thunderbird Tech. Sls. & Serv.	913-642-7220
KS	Wichita, Thunderbird Tech. Sls. & Serv.	316-684-3941
MD	Phoenix, Milk-Brown Assocs.	301-628-4848
MA	Lowell, Underwood Sls.	617-256-8191
MI	Farmington Hills, Elcon Michigan Sls.	313-855-3240
MN	Minneapolis, Marsh Sls.	612-729-9345
MO	St. Louis, Thunderbird Tech. Sls.	314-567-6488
NJ	Haddonfield, Mills-Brown	609-429-1005
NJ	Pompton Plains, T. A. Adamo Sls.	201-835-5344
NY	Kings Park, T. A. Adamo Sls.	516-724-2039
TX	Dallas, E. F. Aymond Co.	214-826-7620
TX	San Antonio, Edward F. Aymond Co.	512-366-1526
WA	Bellevue, Comtec Mktg. & Sls. Eng.	206-453-1188

SUNDSTRAND DATA CONTROL, Overlake Ind'l. Pk., Redmond, WA 98052, Tel: 206-885-3711, Telex: 15-2308; Empl.: 2000

SUN ELECTRONIC SYSTEMS, INC., 1331 S. Dixie Hwy., Pompano, FL 33060, Tel: 305-785-1155

SUN-FLEX CO., INC., 20 Pimentel Ct., Novato, CA 94947, Tel: 415-883-1221, Telex: 172-208; *Sls. Mgr.:* Frederick Juer; *Dist. Mgr.:* Frederick Juer

SUN RESEARCH INC., Phase-R, Box 210, Old Bay Rd., New Durham, NH 03855, Tel: 603-859-7110, TWX: 510-297-4444; *Sls. Mgr.:* Michael Mathieson

SUNRISE ELECTRONICS, INC., 524 S. Vermont Ave., Glendora, CA 91740, Tel: 818-914-1924, TWX: 910-584-3847; *Sls. Mgr.:* Richard K. Armstrong

Local Sales Offices & Reps

AZ	Phoenix, Odyssey I	602-246-8846
CA	Inglewood, Basic Sys. Corp.	213-673-4300
CA	San Diego, Basic Sys. Corp.	619-268-8000
CA	Santa Clara, Basic Sys. Corp.	408-727-1800
CO	Castle Rock, Odyssey I	303-688-3555
CT	Hamden, Burton Forrester	203-248-4380
FL	Cocoa Beach, Teqspec	305-783-3444
FL	Hobe Sound, Teqspec	305-746-4987
FL	Palm Harbor, Teqspec	813-785-2276
GA	Atlanta, Teqspec	404-399-6780
IL	Chicago, Berndt Assocs.	312-283-0713
IN	Indianapolis, Carter, McCormic & Peirce	317-844-4175
MA	Braintree, Burton Forrester	617-848-7234
MI	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
MN	Cheska, Electronic Instrmn. Consultants	612-445-7056
MO	Independence, Engrg. Svcs. Co.	816-254-3600
MO	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NJ	Ridgefield, Rical Assocs.	201-945-5250
NM	Albuquerque, Odyssey I	505-265-6645
NY	Penfield, R. Barthel Entprs., Inc.	716-377-3018
NC	Winston-Salem, Teqspec	919-723-8102
OH	Cleveland, Carter, McCormic & Peirce	216-779-5100
OH	Englewood, Carter, McCormic & Peirce	513-836-0951
OK	Broken Arrow, Genzel Sales & Assocs.	918-258-8656
PA	Pittsburgh, Carter, McCormic & Peirce	412-372-4415
TN	Morristown, Teqspec	615-587-0980
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TX	Irving, Crockett Southwest Co.	214-438-2776
TX	Katy, Crockett Southwest Co.	713-578-1836
WA	Redmond, Seattle Telecom & Data	206-883-6336
WI	Milwaukee, Berndt Assocs.	414-545-8400

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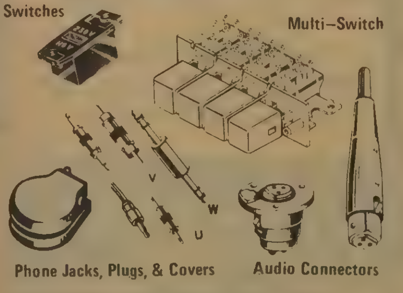

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NY	Rochester, R. L. Kistler, Inc.	716-436-1940
NY	Rochester, Ross Equip. Co. Inc.	716-271-5660
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NC	Charlotte, Superior Elec.	704-535-7777
OH	Medina, Superior Elec.	216-725-8887
PA	Blue Bell, Superior Elec.	215-825-9123
TX	Dallas, Superior Elec.	214-350-1368
VA	Arlington, Gans & Pugh Assoc., Inc.	703-527-3262
WA	Issaquah, Superior Elec.	206-392-8559

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SUPERTEX, INC., 1225 Bordeaux Dr., P.O. Box 3607, Sunnyvale, CA 94086, Tel: 408-744-0100, TWX: 910-339-9388; *Sls. Mgr.:* Richard Siegel

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CA	San Diego, Earle Assocs.	619-278-5441
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CA	Tustin, Sc Cubed	714-731-9206
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FL	Apopka, G. F. Bohman & Assocs.	305-886-1882
IL	Des Plaines, Janus	312-298-9330
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CA	San Diego, Wiley Co.	213-666-1611
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FL	Tamarac, Delmac Sls.	305-726-1330
GA	Marietta, Rick Burns & Assocs.	404-951-1180
HI	Honolulu, Snider Campbell & Sutton Co.	808-941-2400
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IN	Carmel, Marketing Engrs.	317-872-5665
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KS	Overland Park, Thomas L. Dowell & Assoc.	913-648-7373
MA	Waltham, Unesco/Genex	617-890-1535
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AL	Huntsville, Rakes Engrg. & Mktg. Corp.	205-533-3763
CA	Hayward, Pacific Mktg. Inc.	415-887-1620
GA	Atlanta, Rakes Engrg. & Mktg. Corp.	404-447-6937
IL	Arlington Heights, Thermek Inc.	312-577-6900
MA	Hingham, Northeast Reps., Inc.	617-749-8700
MI	Dearborn	313-582-8754
NJ	Haddonfield, G. L. Williams Assocs.	609-428-6060
NJ	Manville, Dynorep Inc.	201-685-0135
NY	Albany, H. C. Johnson Agencies, Inc.	518-459-1239
NY	Buffalo, H. C. Johnson Agencies, Inc.	716-632-7880
NY	Rochester, H. C. Johnson Agencies, Inc.	716-586-0777
NC	Raleigh, Rakes Engrg. & Mktg. Corp.	919-847-5079
OH	Dayton	513-223-6227
OR	Portland, SPS Elctrns.	503-297-6919
PA	Glenshaw, H. C. Johnson Agencies, Inc.	412-961-0414
WA	Redmond, SPS Elctrns.	206-323-4140

SYLVANIA ELECTRONIC, Box 360, Muncy, PA 17756, Tel: 717-546-3191; Empl.: 395; *Sls. Mgr.:* A. M. Serang; *Dist. Mgr.:* S. R. Sisak

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CA	Los Angeles	714-953-6735
FL	Tampa	813-446-8602
NJ	Teterboro	201-768-3280
NY	Seneca Falls	315-568-5881
OH	Cleveland	216-331-1088
TX	Dallas	214-239-9370

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AL	Andalusia, Wholesale Electr. Supps. Co.	205-222-5100
AL	Anniston, Radio Dist. & Sup. Co.	205-236-8654
AL	Birmingham, Forbes Distributing Co.	205-251-4104
AL	Decatur, Forbes Distributing Co.	205-353-4762
AL	Dothan, Carmichael Elctrns. Inc.	205-793-7066
AL	East Gadsden, Radio Dist. & Supp. Co.	205-547-1636
AL	Mobile, Specialty Distributing Co.	205-344-0450
AL	Mobile, Electronic Supp. Co.	205-478-0455
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AL	Montgomery, Forbes-Godfrey TV Elctrns. Inc.	205-263-0283
AL	Muscle Shoals, Jones Elctrns.	205-383-1241
AL	Opelika, Southern Elctrns. Corp.	205-745-5298
AK	Anchorage, Alaska Elctrn. Supp.	907-563-3774
AK	Juneau, Juneau Elctrns.	907-586-2260
AZ	Phoenix, Parts Elctrn. of AZ	602-258-6476
AZ	Phoenix, Dalis Elctrn. Supp.	602-275-2885
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AR	Little Rock, Southern Elctrns. Co.	501-372-4196
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AR	Little Rock, Carlton Bates Co.	501-562-9100
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AR	Springdale, Wise Wholesale Elctrns.	501-751-4814
AR	Texarkana, Lavender Elctrns. Inc.	501-773-4631
CA	Anaheim, Ball Elctrns.	714-828-1310
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CA	Downey, Net Elctrns.	213-923-4591
CA	Dublin, Pacific Radio Supp. Inc.	415-829-5960
CA	Eureka, Redwood Elctrn. Supp.	707-443-3107
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CA	Garden Grove, Sav-On	714-530-0555
CA	Huntington Park, Martin Distributing Co.	213-582-7111
CA	Los Angeles, Radio Equip. Distrs.	213-668-1100
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FL	W. Palm Beach, Dolphin Elctrn. Supp. Inc.	305-659-7166
GA	Albany, Specialty Distributing Co.	912-435-1711
GA	Athens, Specialty Distributing Co.	404-458-1334
GA	Atlanta, Specialty Distributing Co.	404-873-2521
GA	Atlanta, Wholesale Indl. Elctrns.	404-447-8431
GA	Atlanta, Specialty Distributing Co.	404-458-6341
GA	Augusta, Specialty Distributing Co.	404-722-1526
GA	Brunswick, Specialty Distributing Co.	912-265-1927
GA	College Park, Specialty Distributing Co.	404-763-3828
GA	Columbus, Specialty Distributing Co.	404-327-7414
GA	Macon, Specialty Distributing Co.	912-743-5421
GA	Marietta, Specialty Distributing Co.	404-422-4333
GA	Savannah, Specialty Distributing Co.	912-234-1684
GA	Valdosta, Specialty Distributing Co.	912-242-4910
HI	Honolulu, Admor Distr. Corp.	808-537-4501
HI	Honolulu, Electrical Equip. Co., Ltd.	808-533-3884
HI	Honolulu, Nylen Brothers Co. Ltd.	808-538-1171
HI	Honolulu, Precision Radio Ltd.	808-537-5291
ID	Boise, Kimball Elctrns.	208-342-3559
ID	Pocatello, Kimball Elctrns.	208-232-2201
IL	Alton, Ebinger Radio Co.	618-462-9783
IL	Aurora, Mainline Supp. Co., Inc.	312-892-9026
IL	Benton, Lampley Radio Co.	618-435-8194
IL	Berwyn, B-B & W Inc.	312-749-1710
IL	Chicago, U. S. Electronics	312-925-4111
IL	Chicago, Howard Elctrn. Sls.	312-254-1777
IL	Chicago, Alpha Elctrns.	312-525-2840
IL	Elgin, Mainline Supp. Co., Inc.	312-697-6746
IL	Evergreen, Beaty Elctrns. Inc.	312-423-5500
IL	Geneva, Melvin Elctrns., Inc.	312-232-8050
IL	Harrisburg, Standard Distrs.	618-252-1478
IL	Jacksonville, Baptist Elctrn. Supp. Co., Inc.	217-243-6464
IL	Joliet, Mainline Supp. Co., Inc.	815-436-3900
IL	Kankakee, S&S Elctrn. Supp. Co.	815-933-5595
IL	Mattoon, Mattoon Radio & TV Supp. Co.	217-235-5457
IL	Moline, Lofgren Distributing Co.	309-764-7436
IL	Niles, Joseph Elctrns. Inc.	312-297-4200
IL	Oak Forest, Melvin Elctrns. Inc.	312-687-5050
IL	Peoria, Warren Radio Co.	309-674-5998
IL	Quincy, Show Me Elctrns.	217-223-9880
IL	Rockford, Midwest Associated	815-962-8036
IL	Rockford, Jay-tronics	815-965-8786
IL	Salem, Laco Elctrns. Inc.	618-548-3150
IL	Springfield, Baptist Elctrn. Supp. Co., Inc.	217-753-0111
IL	Villa Park, Melvin Elctrns., Inc.	312-279-5010
IN	Angola, Lakeland Elctrn. Supp.	219-665-6311
IN	Bedford, Elex Mart Inc.	812-275-5941
IN	Bloomington, Stansifer Radio Co.	812-336-6339
IN	Chesterton, Chesterton Elctrn. Supp.	219-926-2109
IN	Elkhart, Warren Radio Co.	219-295-4205
IN	Evansville, Ohio Valley Sound	812-425-6173
IN	Evansville, Hutch & Son, Inc.	812-425-7201
IN	Ft. Wayne, Pembleton Elctrns.	219-426-1812
IN	Ft. Wayne, Warren Radio Co.	219-426-5344
IN	Gary, Calumet Elctrn. Supp. Inc.	219-887-4961
IN	Gary, B&B Elctrn. Supp.	219-980-8200
IN	Indianapolis, Warren Radio Co.	317-634-5566
IN	Indianapolis, Elctrn. Svc. Parts	317-632-8586
IN	Indianapolis, Graham Elctrns. Supp. Inc.	317-634-8202
IN	Kokomo, Television Radio Distr.	317-457-5942
IN	Logansport, Television Radio Distr., Inc.	219-753-2879
IN	Marion, J&W Elctrns. Inc.	317-662-1114
IN	South Bend, Television Supp., Inc.	219-289-7036
IN	Terre Haute, Mid West Supp.	812-232-0187
IA	Ames, Electronic Supp. Inc.	515-232-7020
IA	Burlington, Union Supp. Co.	319-754-5745
IA	Cedar Rapids, Iowa Radio Supp. Co.	319-393-4510
IA	Council Bluffs, Meyerson Distributing Co.	712-328-2351
IA	Davenport, Warren Radio Co.	319-322-5301
IA	Des Moines, Gifford-Brown of Des Moines	515-243-1257
IA	Des Moines, Mid State Distributing Co.	515-244-7231
IA	Mason City, Mid State Distributing Co.	515-423-8012
IA	Sioux City, Molstad Dist.	712-255-8023
KS	Kansas City, Video Elctrn. Supp. Co.	913-371-5731
KS	Salina, RSC Electronics	913-823-6353
KS	Wichita, RSC Electronics	316-267-5213
KY	Ashland, Electronic Supp. Inc.	606-325-1511
KY	Bowling Green, Randolph, Hale & Meredith	502-885-5357
KY	Hopkinsville, Randolph & Hale	502-885-5327
KY	Lexington, Service Elctrn. Supp.	606-254-5786
KY	Louisville, P. I. Burks & Co.	502-589-3960
KY	Newport, Holub Dist. Co.	606-431-4211
KY	Paducah, Warren Radio Co.	502-442-4367
LA	Alexandria, Elctrn. Svc. Supp.	318-443-8483
LA	Baton Rouge, Menard Elctrns.	504-355-0323
LA	Gretna, Pelican Elctrn. Supp. Inc.	504-361-4187
LA	Houma, Pelican Elctrn. Supp. Inc.	504-868-1285
LA	Lafayette, Lafayette Radio Equip.	318-234-2364
LA	Lafayette, Ralph's of Lafayette	318-233-0105
LA	Lake Charles, Wholesale Radio Equip.	318-439-2431
LA	Marrero, AFG Elctrn. Supply Inc.	504-368-9696
LA	Metairie, Pelican Elctrn. Supp.	504-888-4720
LA	Monroe, Martin Elctrns. Inc.	318-388-4224
LA	Monroe, Tri-State Elctrns.	218-387-9711
LA	New Orleans, Wm. B. Allen, Inc.	504-525-8222
LA	New Orleans, Radio Parts	504-581-5959
LA	New Orleans, Southern Radio Supp. Co.	504-524-2343
LA	Opelousas, Opelousas Radio Equip.	318-942-5702
LA	Shreveport, Elctrn. Supp. of Shreveport	318-227-9080
LA	Shreveport, Indl. Elctrn. Supp. Inc.	318-222-9459
LA	West Monroe, Brooks Supp. of La	318-323-0344
ME	Bangor, Maine Elctrns. Distr. Inc.	207-947-7396
ME	Lewiston, Stark Wholesale Elctrns.	207-784-6979
ME	Portland, LAD Elctrns. Distrs.	207-772-2174
MD	Baltimore, Modern Elctrns.	301-282-5300
MD	Baltimore, Tritronics	301-256-4400
MD	Baltimore, Fairway Elctrns. of MD Inc.	301-247-8383
MD	Frederic, Hankey's Radio Inc.	301-662-1381
MD	Hagerstown, Fairway Elctrns. Inc.	301-791-0200
MD	Kensington, Fairway Elctrns. Inc.	301-933-4420
MD	Salisbury, Standard Elctrns. Inc.	301-749-7593
MD	Towson, Radio Elec. Svc. Co.	301-823-0070
MD	Towson, Baynesville Elctrns.	301-823-0082

MA	Boston, Tee Vee Supp. Co.	617-522-9330
MA	Brockton, Ware Radio Supp. Corp.	617-583-0810
MA	Fall River, E. A. Ross Co.	617-673-0921
MA	Hyannis, Capewide Elctrn. Supp Corp.	617-775-3277
MA	Lawrence, Lawrence Elctrn. Distrs.	617-683-0257
MA	Lowell, Frank P. McCartin Co.	617-454-9101
MA	New Bedford, Burns Elctrn. Supp. Co.	617-998-3344
MA	New Bedford, C. E. Beckman Co.	617-994-9674
MA	North Woburn, Abbott Elctrns. Co.	617-935-2040
MA	Norwood, Morrison Elctrn. Supp.	617-769-7280
MA	Peabody, Tee Vee Supp. Co.	617-531-5777
MA	Quincy, Electronic Dists. Corp.	617-328-7800
MA	Springfield, Signal Electr. Ctr. of Springfield	413-739-3893
MA	Waltham, MIL Elctrns. Inc.	617-891-6730
MA	Worcester, Stark Wholesale Elctrns. Inc.	617-756-7136
MI	Adrian, Wedemeyer Elctrn. Supp. Co.	313-263-2925
MI	Ann Arbor, Wedemeyer Elctrns.	313-665-8611
MI	Battle Creek, Warren Radio Co.	616-965-3338
MI	Bay City, Kinde Distributing	517-892-1594
MI	Dearborn, West Side Radio	313-933-6972
MI	Detroit, Elctrn. Parts Co.	313-891-7400
MI	Detroit, S & S Elctrns.	313-521-0588
MI	Flint, Shand Elctrns.	313-743-8940
MI	Grand Rapids, T & W Elctrns.	616-241-3645
MI	Grand Rapids, Warren Radio Co.	616-456-5385
MI	Kalamazoo, Warren Radio Co.	616-381-4203
MI	Lansing, Wedemeyer Elctrns.	517-489-9047
MI	Livonia, Norwest Elctrns.	313-261-4551
MI	Livonia, RS Electronics	313-525-1155
MI	Madison Hgts., Warren Radio Co.	313-588-3327
MI	Muskegon, Fitzpatrick Electric Supp.	616-722-6621
MI	Owasso, Warren Radio Co.	517-723-5239
MI	Pontiac, Joe Coomes	313-334-1526
MI	Port Huron, Port Elctrns.	313-985-6185
MI	Saginaw, Ryder Distributing	517-799-2411
MI	Traverse City, Traverse City Elctrns.	616-946-5153
MN	Minneapolis, Electronic Center	612-371-5230
MN	Minneapolis, Ness Elctrns. Inc.	612-824-2646
MN	Minneapolis, Stark Elctrn. Supp. Co.	612-332-1325
MN	Rochester, Pace Elctrns. Inc.	507-288-1853
MN	St. Paul, Ness Elctrns.	612-224-5411
MS	Biloxi, Hooper Elctrn. Supp. Co.	601-432-0584
MS	Biloxi, Electronic Parts Co.	601-435-3221
MS	Greenville, Tri-State Elctrns. Co.	601-335-3594
MS	Greenwood, Moor Elctrns.	601-453-4241
MS	Hattiesburg, N & H Elctrn. Distr. Co.	601-582-5571
MS	Jackson, Tri-State Elctrns. Co.	601-355-3431
MS	McComb, Risher Radio Supp. Co.	601-684-3731
MS	Meridian, Hooper Elctrn. Supp. Co., Inc.	601-693-2668
MS	Pascagoula, Hooper Elctrn. Supp. Co.	601-762-9383
MO	Columbia, Show-Me Elctrns.	314-449-2944
MO	Flat River, Show-Me Elctrns.	317-431-4816
MO	Jefferson City, Central Missouri Distributing Co.	314-636-3149
MO	Jefferson City, Show-Me Elctrns.	314-636-2191
MO	Kansas City, Elctrn. Supp. Co.	816-931-0250
MO	Rolla, Show-Me Elctrns.	314-364-1515
MO	Sikeston, Baileys Elect. Supp.	314-471-6142
MO	Springfield, Mason Elect. Supp.	417-865-5542
MO	Springfield, Show-Me Elctrns.	417-869-0752
MO	St. John, Ralph Toler Radio Co.	314-426-3260
MO	St. Louis, Olive Elctrns. Inc.	314-426-4500
MO	St. Louis, Deltronics Distributing Co.	314-725-6060
MT	Billings, Television & Elec. Supp. Co.	406-252-7193
MT	Great Falls, The Source Inc.	406-761-2420
MT	Havre, Northern Elctrns.	406-265-5568
NE	Lincoln, Leuck Radio Co.	402-476-2797
NE	Omaha, Radio Equip. Co.	402-341-7700
NE	Scottsbluff, D&H Elctrns. Supp. Inc.	308-632-2181
NV	Reno, Bennett Elctrn. Supp. Co.	702-322-2127
NV	Reno, Dunlap Elctrns.	702-329-1308
NH	Dover, American Radio Corp.	603-742-6800
NH	Manchester, Stark Wholesale Elect. of N.H. Inc.	603-688-7611
NH	Nashua, Tee Vee Supp. Co.	603-889-4171
NJ	Eatontown, Atkinson & Smith Co.	201-542-2447
NJ	Edison, William Elctrn. Supp. Inc.	201-985-3700
NJ	Hillside, Leader Elctrn. Supp. Corp.	201-354-4200
NJ	Pleasantville, Kearns Elctrn. Prods. Co.	609-646-7010
NJ	Raritan, Masters Elctrn. Supp.	201-725-3583
NJ	Trenton, Service Parts & Supp. Co.	609-393-7135
NM	Albuquerque, Southwest Elctrns.	505-345-8611
NM	Albuquerque, Elctrn. Parts Co.	505-293-6161
NM	Albuquerque, North American Module Corp.	505-345-4546
NM	Albuquerque, US Module	505-345-7968
NM	Farmington, Walker Farmington Elctrns. Inc.	505-327-6356
NM	Hobbs, Trice Wholesale Elctrns.	505-393-5107
NM	Santa Fe, Sepco Inc.	505-982-1621
NY	Amherst, Standard Elctrns. Inc.	716-691-3061
NY	Brooklyn, Mill Elctrns. Supp. Co.	212-336-4575
NY	Brooklyn, Ceco Communications	212-646-6300
NY	Brooklyn, Alpha Elctrns., Inc.	212-633-2800
NY	Buffalo, Goldcrest Elctrn. Supp.	716-885-5878
NY	Buffalo, Genesee Radio Parts Co.	716-873-9661
NY	Centereach, GTE Elctrn. Supp.	516-585-8111
NY	Commack, Spartan Elctrns. Inc.	516-499-9500
NY	Corning, Corning Elctrns., Inc.	607-962-0555
NY	Cortland, Cortland Elctrn. Supp.	607-756-2523
NY	Endicott, Standard Elctrns. Inc.	607-754-3102
NY	Hempstead, Davis Elctrns. Corp.	516-483-9200
NY	Hicksville, Elctrn. City	516-938-8330
NY	Horseheads, Southern Tier Elctrns. Inc.	607-734-4138
NY	Jamaica, All Parts Elctrns. Whlers., Inc.	212-291-3388
NY	Jamestown, Warren Radio Co.	716-484-1141
NY	Johnson City, Goldcrest Elctrns. Supp.	607-797-2389
NY	Kingston, Greylock Elctrn. Distrs.	914-338-5300
NY	Lackawanna, Metromill Distrs. Inc.	716-826-2600
NY	Massapequa, A&P Elctrns. Corp.	516-541-4200
NY	New Hyde Park, Electronic City	516-352-7145
NY	New York, United Teletronic Parts Corp.	212-569-2330
NY	New York, Dale Elctrns. Corp.	212-255-3660
NY	New York, Consolidated Radio Sls.	212-865-4900
NY	Olean, Standard Elctrns. Inc.	716-372-1800
NY	Port Chester, Wise Comps.	914-939-3940
NY	Rochester, Goldcrest Elctrns. Supp.	716-546-8464
NY	Rochester, Masline Elctrns. Inc.	716-546-5373
NY	Rochester, Standard Elctrns. Inc.	716-254-7590
NY	Schenectady, Goldcrest Elctrns. Supp.	518-377-6424
NY	Syracuse, Standard Elctrns. Inc.	315-422-0421
NY	Syracuse, Goldcrest Elctrns. Supp.	315-471-7115
NY	Troy, Troy Television	518-235-1521
NY	Utica, Grapac Elctrns. Co.	315-732-4674
NY	Watertown, Gateway Elctrns.	315-788-7251
NC	Burlington, Womack Elc. Supp.	919-227-7485
NC	Charlotte, United Elctrns. Supp.	704-372-2650
NC	Concord, Mac Victor Elctrns.	704-786-4175
NC	Durham, Knight Elctrns.	919-682-9371
NC	Fayetteville, Brantley Elctrns.	919-868-8038
NC	Fayetteville, Eastern Radio Supp.	919-485-2161
NC	Gastonia, JMT Elctrns.	704-867-4401
NC	Goldsboro, Womack Elctrns.	919-734-3221
NC	Greensboro, Guilford Elctrns.	919-275-1385
NC	Greenville, Pair Elctrns.	919-756-2291
NC	High Point, Mac Victor Elctrns.	919-889-8024
NC	Lumberton, Knight Elctrns.	919-739-2870
NC	Raleigh, Knight Elctrns.	919-833-6417
NC	Sanford, Knight Elctrns.	919-776-4249
NC	Statesville, Mills Elctrns. Inc.	704-872-8949
NC	Wilmington, Buck's Elctrns.	919-392-4262
NC	Winston Salem, Electronic Distributing Inc.	919-723-1097
ND	Fargo, Radio & TV Inc.	701-232-8993
ND	Fargo, S/S Elctrns., Inc.	701-237-5003
OH	Akron, Akron Elctrn. Supp., Inc.	216-762-8818
OH	Akron, Warren Radio Co.	216-434-6668
OH	Akron, Main TV Supp. Co.	216-253-8161
OH	Alliance, Glasska Elctrns.	216-823-5780
OH	Canton, Electronic Ctr. Inc.	216-456-7133
OH	Cincinnati, United Radio Inc.	513-761-4030
OH	Cleveland, Winteradio Elctrn. Supp. Corp.	216-621-9383
OH	Cleveland, Warren Radio Co.	216-888-5225
OH	Columbus, Whitehead's	614-224-1186
OH	Columbus, Thompson Elctrn. Supp., Inc.	614-228-6191
OH	Dayton, Srepco Elctrns. Div. Pioneer Standard Elctrns. Inc.	513-224-0871
OH	Dover, TV Specialties, Inc.	216-364-6678
OH	Elyria, EL-A-Co	216-323-1805
OH	Fremont, J & B Elctrns.	419-332-9334
OH	Lancaster, Electronic Supp. Co.	614-653-9344
OH	Lima, Warren Radio Co.	419-228-1691
OH	Lima, LRP Elctrns., Inc.	419-228-1220
OH	Marion, Mid Ohio Elctrns. Co.	614-382-1101
OH	Newark, Turner Wilson Co.	614-349-7454
OH	Parma, Superior Elctrn. Parts Co.	216-842-7940
OH	Portsmouth, Fullers Sound Elctrn. Supplier	614-353-0965
OH	Toledo, Warren Radio Co.	419-248-3364
OH	Willowick, Euclid Radio Parts Co.	216-585-5115
OH	Youngstown, Ross Radio Co.	216-746-8881
OH	Youngstown, Glen Elctrns.	216-743-1119
OK	Ardmore, Trice Wholesale Elctrns.	405-223-8540
OK	Enid, Trice Wholesale Elctrns.	405-234-6078
OK	Enid, Enid Walker Elctrns.	405-234-2218
OK	Lawton, Walker Lawton Elctrns. Inc.	405-355-0603
OK	Lawton, Trice Wholesale Elctrns.	405-223-8540
OK	McAlester, Trice Wholesale Elctrns.	918-423-6716
OK	Muskogee, Sooner Radio & TV Supp.	918-682-1384
OK	Muskogee, Trice Wholesale Elctrns.	918-682-2457
OK	Oklahoma City, Radio Supp. Co.	405-232-6127
OK	Oklahoma City, Trice Wholesale Elctrns.	405-681-4647
OK	Oklahoma City, Miller-Jackson Co.	405-235-8426
OK	Oklahoma City, Trice Wholesale Elctrns.	405-524-4411
OK	Ponca City, Trice Wholesale Elctrns.	405-762-5621
OK	Tulsa, Trice Wholesale Elctrns.	918-585-5718
OR	Eugene, United Radio Supp., Inc.	503-342-3381
OR	Portland, United Radio Supp., Inc.	503-233-7151
OR	Portland, Radar Elec.	503-232-3404
OR	Salem, JW Elctrns.	503-399-8565
PA	Allentown, A. A. Peters, Inc.	215-434-5237
PA	Altoona, Hollenback Radio Supp.	814-944-6171
PA	Ambridge, Television Parts Co.	412-266-7700
PA	Braddock, M Leff Radio Parts Co.	412-351-5000
PA	Butler, Bacher Elctrns.	412-283-2095
PA	Clifton Heights, Lazar Elctrns.	215-284-2440
PA	Drexel Hill, Kass Elctrn. Distr.	215-449-2300
PA	Elkins Park, AG Radio Inc.	215-886-5100
PA	Erie, J. V. Duncombe Co.	814-454-5278
PA	Erie, Warren Radio Co.	814-454-5285
PA	Harrisburg, Cumberland Elctrns.	717-233-5885
PA	Marcus Hook, Linwood Wholesale	215-485-0777
PA	New Brighton, Television Parts Co., Inc.	412-846-3000
PA	Philadelphia, JEM Elctrns.	215-743-3030
PA	Philadelphia, HBF Elctrns. Inc.	215-338-1100
PA	Philadelphia, Arlen Supply Co.	215-472-3810
PA	Pittsburgh, South Hills Elctrns.	412-341-6200
PA	Pottsville, Moyer Elctrn. Supp. Co., Inc.	717-622-7866
PA	Reading, Barbey Elctrns.	215-376-7451
PA	Scranton, Key Radio & Supp. Co.	717-342-0161
PA	State College, University Elctrns.	814-238-3093
PA	Tarentum, Huston Elctrn. Distrs.	412-224-8002
PA	Wayne, Peak Elctrns. Corp.	215-293-9000
PA	Wilkes-Barre, Wallco Inc. Elctrn. Dist.	717-823-6181
PA	Williamsport, Williamsport Radio Supp.	717-326-1534
RI	Providence, A&J Distrs. Inc.	401-421-0991
RI	Providence, William Dandreta & Co.	401-861-2800
RI	Providence, Hope Elctrn. Supp.	401-521-5600
RI	Woonsocket, Lectronic Supp. Co.	401-762-0131
SC	Charleston, Wholesale Indl. Elctrns.	803-722-2634
SC	Charleston, Wholesale Indl. Elctrns.	803-747-9672
SC	Columbia, Wholesale Indl. Elctrns.	803-256-0746
SC	Columbia, Hesco Inc.	803-254-4575
SC	Florence, J&M Supply Co.	803-662-7281
SC	Greenville, Sawyer Elctrns.	803-235-0438
SC	Greenville, Wholesale Indl. Elctrns.	803-235-8334
SC	Taylors, Cantrell Wholesale	803-268-1194
SD	Watertown, Burghardt Supp. Co.	605-886-5749
TN	Chattanooga, Specialty Distributing Co.	615-267-9460
TN	Columbia, Randolph & Williams	615-388-7566
TN	Cookeville, Randolph & Parks	615-526-6184
TN	Dyersburg, Warren Radio	901-285-3850
TN	Jackson, Lavender Elctrns. Inc.	901-422-6585
TN	Johnson City, L & S Elctrns.	615-926-3021
TN	Kingsport, Radio Elec. Supp. Co.	615-247-8111
TN	Knoxville, Roden Electrical Supp. Co.	615-546-8755
TN	Knoxville, Bondurant Bros. Co.	615-573-9151
TN	Memphis, Warren Radio	901-274-2460
TN	Memphis, Bluff City Elctrns.	901-345-9500
TN	Memphis, Frank G. Uffer Co.	901-725-6743
TN	Morristown, L & S Elctrns.	615-581-7983
TN	Nashville, Curreys Inc.	615-242-4221
TN	Nashville, Randolph & Rice	615-255-5602
TN	Tullahoma, Randolph Vandergriff Inc.	615-455-4531
TX	Abilene, R & R Elctrn. Supp. Co.	915-677-2974
TX	Amarillo, Trice Wholesale Elctrns.	806-372-5668
TX	Amarillo, R & R Elctrn. Supp. Co.	806-374-2866
TX	Austin, C&M Elctrns. Inc.	512-451-6595
TX	Austin, Wholesale Elctrn. Supp. Co.	512-478-9568
TX	Beaumont, Ralph's Indl. Elctrns.	713-833-9443
TX	Beaumont, Covington Distr.	713-835-5392
TX	Beaumont, Buddy's Wholesale Elctrn. Inc.	713-842-5019
TX	Borger, Trice Wholesale Elctrns.	806-274-5281
TX	Bryan, Mid-State Elctrns.	713-779-1226
TX	Corpus Christi, Elctrn. Suppliers Inc.	512-993-1303
TX	Corpus Christi, Leader Elctrn. Supp. Co.	512-884-5527
TX	Dallas, Wholesale Elect. Supp. Co.	214-824-3001
TX	Denison, Denison Radio Supp.	214-465-2336
TX	El Paso, Midland Specialty Co.	915-533-9555
TX	Ft. Worth, Wholesale Elctrn. Supp.	817-336-0461
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Ft. Worth, Byron's Radio & TV Supp.	817-534-5911
TX	Ft. Worth, Trice Wholesale Elctrns.	817-335-9515
TX	Greenville, Lavender Elctrns. Inc.	214-455-4360
TX	Harlingen, Elctrn. Suppliers, Inc.	512-423-5895
TX	Houston, Ralph's Indl. Elctrns.	713-748-4902
TX	Houston, Houston Wholesale	713-644-8320
TX	Houston, Angie Elctrn. Supp. Co.	713-659-8386
TX	Laredo, Guarantee Radio Supp. Co.	512-723-6913
TX	Longview, VIDCO Elctrns. Inc.	214-757-4911
TX	Lubbock, Trice Wholesale Elctrns.	806-747-2888
TX	Lubbock, R & R Elctrns. Supp. Co.	806-765-7727
TX	McAllen, Richards Elctrns.	512-682-6337
TX	McAllen, Rio Radio Supp. Inc.	512-682-5224
TX	Midland, Trice Wholesale Elctrns.	915-563-0866
TX	Paris, Lavender Elctrns. Inc.	214-785-171
TX	Port Arthur, Diehl Radio & TV Supp.	713-985-8888
TX	Richardson, Trice Wholesale Elctrns.	214-690-4646
TX	San Antonio, Sherman Elctrns.	512-224-100
TX	San Antonio, M-Tronics Inc.	512-736-248
TX	Sherman, Lavender Elctrns. Inc.	214-892-9155
TX	Sherman, Trice Wholesale Elctrns.	214-893-742
TX	Stafford, Harrison Equip. Co.	713-879-2600
TX	Temple, L & M Wholesale Elctrns.	817-778-7679

X	Texarkana, McCulloch Elctrn. Supp. Co.	214-792-6923
X	Texas City, Elctrn. Supp. Co.	713-945-4401
X	Tyler, Lavender Elctrns. Inc.	214-597-6315
X	Tyler, East Texas Elctrn. Inc.	214-593-8253
X	Victoria, Lavender Elctrns. Inc.	512-575-4738
X	Waco, L & M Wholesale Elect.	817-754-4644
X	Wichita Falls, Trice Wholesale Elctrns.	817-322-2151
X	Wichita Falls, Wholesale Elect. Supp. Co.	817-723-8106
T	Provo, Central Utah Elctrns.	801-373-7522
T	Salt Lake City, Kimball Elctrns.	801-328-2075
T	Burlington, Greylock Elctrns.	802-863-3100
T	Rutland, Rutland Elctrn.	802-775-4690
T	White River Jct., Vermont Appliance	802-295-3143
A	Alexandria, Certified Elctrns.	703-548-5115
A	Arlington, Arlington Elctrn. Wholesale	703-524-2412
A	Charlottesville, Virginia Radio Supp. Co., Inc.	804-296-4184
A	Danville, Womack Radio Supp. Co., Inc.	804-793-5131
A	Grundy, Rife Wholesale Inc.	703-935-2188
A	Lynchburg, Womack Radio Supp. Co., Inc.	804-845-5983
A	Martinsville, Womack Radio Supp. Co., Inc.	703-638-2327
A	Norfolk, Radio Parts Dist. Co.	804-461-8095
A	Portsmouth, Distrs. Inc.	804-399-2446
A	Richmond, Banner Elctrns. Inc.	804-321-7255
A	Staunton, Southern Elec. Corp.	703-886-6218
A	Bellevue, United Radio Supp.	206-451-9393
A	Bellingham, Seattle Radio Supp.	206-734-3400
A	Everett, JW Electronics	206-258-4339
A	Seattle, Pearl Elctrns.	206-622-6200
A	Seattle, Electronic Supp. Co.	206-632-2222
A	Seattle, Radar Elec.	206-282-2511
A	Seattle, Westlake Elctrn. Supp.	206-622-6600
A	Spokane, Amfac Elec. Supp.	509-534-0611
A	Tacoma, C & G Elctrns.	206-272-3181
A	Tumwater, JW Elctrns.	206-943-1071
A	Yakima, JW Electronics	509-575-1234
V	Beckley, Halley Elctrns.	304-253-2561
V	Charleston, Elctrn. Materials	304-325-3638
V	Fairmont, State Elctrns.	304-366-4520
V	Morgantown, State Elctrns.	304-292-1641
V	Morgantown, Electro Distributing Co.	304-296-5637
I	Appleton, Appleton Radio	414-734-5767
I	Eau Claire, Indianhead Elctrns.	715-834-3606
I	Fond du Lac, Fedco Elctrns. Inc.	414-922-6490
I	Green Bay, G. M. Popkey Co.	414-437-5445
I	Kenosha, Chester Elctrn. Supp.	414-658-4616
I	Madison, Superior Elctrn. Parts Co.	608-257-1477
I	Madison, G. M. Popkey Co.	608-257-2266
I	Marinette, G. M. Popkey Co.	715-732-0121
I	Milwaukee, Marmax Sls. Div. of World Prod., Inc.	414-272-4048
I	Milwaukee, G. M. Popkey Co.	414-444-4730
I	Racine, Superior Racine, Inc.	414-632-5142
I	Wausau, G. M. Popkey Co.	715-845-4255
Y	Casper, Walker Casper Elctrn. Co.	307-237-1943

YLVANIA MINIATURE LIGHTING, W. Main St., Hillsboro, NH 03244, Tel: 603-464-5533, TWX: 710-366-0387; Empl.: 450; *Sls. Mgr.:* Tom Izbicki .... **1B**•1059-1061

Local Sales Offices & Reps

A	Laguna Hills, English/Damco	714-837-3801
A	Sunnyvale, W.W. Posey Co.	408-746-0771
O	Arvada, Cluff & Assocs.	303-425-6604
T	No. Haven, Coakley, Boyd & Abbett	800-225-8402
L	Ft Lauderdale, Hutto, Hawkins, Peregoy	305-971-5750
L	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
A	Atlanta, Millar Elctrns.	404-261-6160
	Chicago, I.R.I.	312-647-7755
I	Ft. Wayne, R.O. Whitesell & Assocs.	219-432-5591
I	Indianapolis, R.O. Whitesell & Assocs.	317-359-9283
S	Prairie Village, R.W. Kunz	913-648-3535
Y	Louisville, R.O. Whitesell & Assocs.	502-426-7696
A	Kenner, Cartwright & Bean	504-466-0020
IA	Needham, Coakley, Boyd & Abbett	617-444-5470
I	Grand Rapids, R.O. Whitesell & Assocs.	616-942-5420
I	St. Joseph, R.O. Whitesell & Assocs.	616-983-7337
IN	Minneapolis, Stoss & Assocs.	612-925-2757
IO	St. Louis, R.W. Kunz	314-966-4977
J	Long Valley, Paul A. Sweeney	201-852-1434
Y	Rochester, Electra Sls.	716-461-5252
Y	Syracuse, Electra Sls.	315-463-1248
C	Raleigh, Millar Elctrns.	919-787-9585
H	Cincinnati, R.O. Whitesell & Assocs.	513-521-2290
H	Cleveland, R.O. Whitesell & Assocs.	216-447-9020
H	Columbus, R.O. Whitesell & Assocs.	614-888-9396
H	Dayton, R.O. Whitesell & Assocs.	513-298-9546
K	Oklahoma City, Erickson Sls.	405-682-2947
R	Tigard, Electronic Sources Inc.	503-684-0040
A	Pittsburgh, R.O. Whitesell & Assocs.	412-963-6161
A	Trevose, P.S.A. Inc.	215-245-0513
TN	Memphis, Cartwright & Bean	901-276-4442
TX	Dallas, Erickson Sales	214-739-5833
TX	Houston, Erickson Sales	713-980-9606
UT	Salt Lake City, Cluff & Assocs.	801-486-7297
WA	Bellevue, Electronic Sources Inc.	206-451-3500
WI	Milwaukee, F.C. DuBois & Assocs.	414-774-3100

SYLVANIA PARTS, 816 Lexington Ave., Warren, PA 16365, Tel: 814-723-2000, 800-221-3333; Empl.: 1880; *Sls. Mgr.:* R. F. Scalise

SYLVANIA SYS. GRP., Comm. Sys. Div., GTE Prods. Corp., 77 A St., Needham Hgts., MA 02194, Tel: 617-449-2000, Telex: 92-2497; *Sls. Mgr.:* Ken Tong

SYMBEX CORP., 72 Corwin Dr., Box 938, Painesville, OH 44077, Tel: 216-354-0925, TWX: 810-425-2256; Empl.: 130 .... **2**•1586, 1587, 1895

Local Sales Offices & Reps

AL	Huntsville, Elctrn. Sls.	205-533-1735
AZ	Tempe, Elctrn. Dev. and Sls.	602-438-1547
AR	Little Rock, Erickson Sls.	501-225-7379
CA	Anaheim, West Rep.	714-527-2822
CA	Chico, Symbex Corp.	916-891-6410
CA	San Diego, D2 Sls.	619-560-6266
CA	Santa Clara, Symbex Corp.	408-727-5817
CO	Denver, West, Inc.	303-773-8080
CT	Madison, Omni-Rep	203-421-4561
FL	Ft. Lauderdale, Interface Dynamics	305-565-5075
GA	Norcross, Elctrn. Sls.	404-448-6554
IN	Indianapolis, M & L Elctrn. Sls.	317-359-4742
LA	Chalmette, Erickson Sls.	504-271-1976
MD	Baltimore, C.E. Heller Co.	301-256-0245
MA	Burlington, Omni-Rep	617-938-0039
MA	Canton, Symbex Corp.	617-828-8114
MI	Franklin Village, I.E. Hampton & Assocs.	313-851-0820
MI	St. Joseph, I.E. Hampton & Assocs.	616-983-0862
MN	Minneapolis, Parler, Shoap & Assocs.	612-755-6904
MO	Blue Springs, Kathrinus Kelly Baumhauer	816-229-0001
MO	St. Louis, Kathrinus Kelly Baumhauer	314-647-2400
NJ	Englewood, Axelrod, Busch, Sullivan Assoc.	201-871-0020
NJ	Medford, Champion Elctrn. Sls.	609-983-0932
NY	Bainbridge, R.W. Meischer Co.	607-967-7192
NY	Buffalo, R.W. Mitscher Co.	716-633-7970
NY	Pittsford, R.W. Mitscher Co.	716-586-4012
NY	Rochester, R.W. Mitscher Co.	716-227-0839
NY	Syracuse, R.W. Mitscher Co.	315-458-1321
NC	Cary, Elctrn. Sls.	919-467-8486
OH	Painesville, Symbex Corp.	216-354-0925
OH	Rocky River, Norm Case Assocs.	216-333-0400
OK	Oklahoma City, Erickon Sls.	405-682-2947
OR	Falls City, Ecco Mktg.	503-787-3509
PA	Southampton, Symbex Corp.	215-322-8040
TX	Austin, Erickson Sls.	512-244-3068
TX	Dallas, Erickson Sls.	214-739-5833
TX	El Paso, Epec., Inc.	915-593-8481
TX	Euless, Symbex Corp.	817-540-2687
TX	Houston, Erickson Sls.	713-980-9606
UT	Salt Lake City, Meridian West	801-968-4177
WA	Seattle, Ecco Mktg.	206-364-0200
WV	Spokane, Ecco Mktg.	509-924-4410
WI	Colgate, Rep. 1 & Assoc.	414-628-4016

Local Distributors

AZ	Phoenix, Arizona Comps.	602-269-5655
CA	Santa Ana, C.R. Elctrns.	714-556-2040
CT	Danbury, Pilgrim Elctrns	203-792-7274
LA	Shreveport, Indl. Elctrns. Supp.	318-222-9459
MA	Framingham, Now Elctrns.	617-235-9501
MA	Middleboro, Glynn Elctrns.	617-947-4262
MO	St. Charles, Finnigan Elctrns.	314-946-6201
OK	Tulsa, Combined Tech. Comps.	918-582-8242
WA	Seattle, Carlyle Tech. Sls.	206-575-6750
WI	Madison, Schrenk Sls.	608-255-7400
WI	Milwaukee, Marsh Elctrns.	414-475-6000

SYMBICON, 89 Route 101A, Amherst, NH 03031, Tel: 603-673-8898, Telex: 553-059; *Sls. Mgr.:* S. Harrington

SYM-TEK SYS., INC., 3912 Calle Fortunada, San Diego, CA 92123, Tel: 619-569-6800, Telex: 695450; Empl.: 250; *Sls. Mgr.:* Guy Whitlock

Local Sales Offices & Reps

AZ	Phoenix, Scientific Dvs.	602-957-0401
CA	Escondido, Scientific Dvs.	619-480-1287
CA	Los Alamitos, Scientific Dvs.	213-598-7678
CA	San Jose, Scientific Dvs.	408-554-0455
CO	Boulder, Scientific Dvs.	303-449-9466
FL	Longwood, Richard Schoonovier Inc.	305-788-3344
GA	Marietta, More	404-992-5172
MA	Hudson, System Sls.	617-562-9777
NM	Albuquerque, Scientific Devices	505-883-3668
NY	Valley Stream, Levison Sls.	516-266-5020
OH	Brecksville, WRR Assoc.	216-526-2023
TX	Austin, Crockett Southwest	512-250-1776
TX	Dallas, Crockett Southwest	214-251-1776
TX	Houston, Crockett Southwest	713-578-1836

SYMTRON CORP., 2415 E. Charleston Rd., Mountain View, CA 94043, Tel: 415-965-4500, TWX: 910-379-5002; Empl.: 250; *Sls. Mgr.:* Don Atkins .... **2**•1896

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Glendale, Symtron Corp.	602-978-6595
CA	Glendale, Orion Sls.	213-240-3151
CA	San Diego, Hadden Assoc.	619-565-9444
CA	Simi Valley, Symtron Corp.	213-961-4536
CA	Tustin, Orion Sls.	714-832-9687
CO	Golden, Symtron Corp.	303-642-7656
CT	Norwalk, Wendell & Assocs.	203-846-4377
FL	Casselberry, H.A.I.	305-695-8592
FL	Largo, H.A.I.	813-595-8170
GA	Atlanta, Remco	404-447-6937
IL	Lisle, Symtron Corp.	312-420-8100
MD	Rockville, Mechtronics Sls.	301-340-2130
MN	Eden Prairie, Symtron Corp.	612-934-8318
MO	Grandview, Harris-Hanson Co.	816-763-6200
MO	St. Louis, Harris-Hanson Co.	314-432-3611
NH	Seabrook, Symtron Corp.	603-431-6296
NY	Manhasset, Wincor Elctrn.	516-627-9474
NC	Raleigh, Remco	919-847-5079
OH	Cleveland, Arthur H. Baier	216-461-6161
OR	Portland, Component Tech.	503-292-1518
PA	Hatboro, Electro Rep	215-674-4421
TX	Addison, Centurion Mktg.	214-348-0382
TX	Addison, Symtron Corp.	214-233-8991

SYNERGETICS INTL., INC., 6565 Odell Pl., P.O. Box E, Boulder, CO 80306-1236, Tel: 303-530-2020; *Sls. Mgr.:* Mike Sharkey

SYNERTEK, 3001 Stender Way, Santa Clara, CA 95051

SYNTEL DIV., Tegam, Inc., 7230 North Ridge Rd., Madison, OH 44057, Tel: 216-428-7505; Empl.: 15

SYNTEST CORP., 40 Locke Dr., Marlboro, MA 01752, Tel: 617-481-7827, TWX: 710-390-7659; *Sls. Mgr.:* Curtis P. Hoffman .... **3**•1094

Local Sales Offices & Reps

CA	Enceno, King Engrg.	213-981-8677
IN	Columbus, Miltronics	812-376-6321
MD	Silver Spring, Source Assoc.	301-431-0587
MA	Waltham, Digital Assocs.	617-899-4300
NY	Canandaigua, Burt Mamula	716-394-5560
PA	Newtown Square, SWR Assoc	215-356-8550
TX	Dallas, Dean Assocs.	214-458-1321

SYNTRONIC INSTRUMENTS, INC., 100 Industrial Rd., Addison, IL 60101, Tel: 312-543-6444, TWX: 910-651-2191; Empl.: 175; *Sls. Mgr.:* Paul Evans

Local Sales Offices & Reps

CA	Los Altos, Frauman Assocs.	415-941-0660
CA	Woodland Hills, Tronics	213-703-7212
CO	Wheatridge, Waugaman Assocs.	303-423-1020
IA	Davenport, Ensco-Rep	319-386-6600
KS	Overland Park, Ensco-Rep	913-381-7557
KS	Wichita, Ensco-Rep	316-683-1070
MA	Norwood, MPS Elctrns.	617-796-8700
MN	Minneapolis, Torkelson Assocs.	612-835-2414
MO	Maryland Heights, Ensco-Rep	314-423-3935
NJ	Fair Lawn, G. D. Harris Assocs.	201-796-5200
NM	Albuquerque, Waugaman Assocs.	505-294-1436
OR	Portland, Rep-West	503-771-1555
PA	W. Conshohocken, Eastern Comps.	215-825-8610
PA	York, Eastern Comps.	717-764-3114
TX	Austin, Space Elctrns.	512-451-3173
TX	Houston, Space Elctrns.	713-266-9245
TX	Irving, Space Elctrns.	214-251-3636
UT	S. Jordan, Waugaman Assocs.	801-254-0570
VA	Manassas, Eastern Comps.	703-471-1025
WA	Seattle, Rep-West	206-283-8351
EXP	NJ, Fairfield, Pantronics	201-575-1177
EXP	NJ, Oradell, S. Ginsbury Ltd.	201-261-3200

SYRACUSE ELCTRNS., P.O. Box 4770, Syracuse, NY 13221, Tel: 315-488-4911, Telex: 937-232; Empl.: 200

SYSCON INTL., INC., 1108 So. High St., So. Bend, IN 46618-1096, Tel: 219-232-3900, 800-348-2993, TWX: 810-299-2523; Empl.: 40; *Sls. Mgr.:* Les Barney

SYSTEMS FURNITURE CO., 2727 Maricopa St., Torrance, CA 90503, Tel: 213-533-1212, TWX: 910-349-7518; *Sls. Mgr.:* Rick Labowitz

SYSTEMS PLUS, 1120 San Antonio Rd., Palo Alto, CA 94303, Tel: 415-969-7047, TWX: 910-373-2096; Empl.: 35

SYSTEMS RESCH. LABS., INC., 2800 Indian Ripple Rd., Dayton, OH 45440, Tel: 513-426-6000, TWX: 810-450-2621; FSC No.: 14590; Empl.: 1000

SYSTONICS, INC., Box 121, Winchester, MA 01890, Tel: 617-729-4439; Empl.: 11

SYSTRON-DONNER INERTIAL DIV., 2700 Systron Dr., Concord, CA 94518, Tel: 415-682-6161, TWX: 910-481-9478; Empl.: 416

SYSTRON-DONNER INSTR. DIV., 2727 Systron Dr., Concord, CA 94518, Tel: 415-676-5000, Telex: 171996, TWX: 910-481-9472; FSC No.: 52542; Empl.: 1400; *Sls. Mgr.:* Howard W. Mette

SYSTRON-DONNER MICROWAVE DIV., 14844 Oxnard St., Van Nuys, CA 91409, Tel: 818-786-1760, TWX: 910-495-1786; Empl.: 160; *Sls. Mgr.:* Richard Valleroy

SYT, 1220 Barranca, El Paso, TX 79935, Tel: 915-593-1234; Empl.: 70; *Sls. Mgr.:* Larry Crum; *Dist. Mgr.:* John Sullivan

SYTEK, INC., 1225 Charleston Rd., Mountain View, CA 94043, Tel: 415-966-7300; *Sls. Mgr.:* Rhonda St. James

TAB BOOKS, Monterey & Pinola Aves., Blue Ridge Summit, PA 17214, Tel: 717-794-2191; Empl.: 175; *Sls. Mgr.:* B. Sites

TACHTRONIC INSTRUMENTS, INC., New Ulm, MN 56073, Tel: 507-354-3105

TADIRAN BATTERIES, See Plainview Elctrns.

TAFA INC., Dow Rd., Bow, NH 03301, Tel: 603-224-9585, Telex: 94-3424; Empl.: 50; *Sls. Mgr.:* Rick Mitchner; *Dist. Mgr.:* Leon Grant

TA INSTR. CASE CO., 4625 Alger St., Los Angeles, CA 90039, Tel: 213-242-8855, TWX: 910-497-4780; Empl.: 60; *Sls. Mgr.:* Jackie Garrison; *Dist. Mgr.:* Jackie Garrison .... **2•1059**

Local Sales Offices & Reps

AL	Huntsville, Intl. Sci. Instrs.	205-533-6880
AZ	Phoenix, Tri-Fab Sls.	602-265-3341
CA	Mountain View, Connolly & Co.	415-967-6988
CO	Littleton, Omega Ltd.	303-798-7040
CT	Hartford, Sturgeon Co.	203-249-7800
FL	Ft. Lauderdale, Tech-Rep Assocs.	305-968-7792
FL	Melbourne Beach, Tech-Rep Assocs.	305-725-4655
FL	St. Petersburg, Tech-Rep Assoc.	813-577-2779
IL	Chicago, Aktron Corp.	312-658-3538
IN	Ft. Wayne, Aktron Corp.	219-747-3650
IA	Davenport, Ensco-Iowa	319-386-6600
KS	Overland Pk., Ensco-Kansas	913-381-7557
KS	Wichita, Ensco Wichita	316-683-1070
MD	Lanham, Data Sys. Mktg.	301-577-3700
MA	Boston, Sturgeon Co.	617-444-6603
MO	St. Louis, Ensco-Rep	314-423-3935
NJ	Ridgewood, Balloou Inc.	201-444-6990
NM	Albuquerque, C. T. Carlberg Assocs.	505-888-3883
NY	New York, Ballou	212-964-4640
NY	Rochester, Gis Lason Sls.	716-454-4741
PA	Blue Bell, Macron Dynamics	215-643-0400
TX	Arlington, Bell Comps.	817-461-5303
WA	Bellevue, Caruso & Northcutt	206-454-9699

TAKEDA RIKEN IND., 1-32-1 Asahi-cho Nerima-ku, Tokyo 176, Japan, Tel: 930-4111, Telex: 272-2140; Empl.: 800; *Sls. Mgr.:* Hiroshi Yasui

T&B/ANSLEY CORP., Sub. Thomas & Betts, 920 Route 202, Raritan, NJ 08869, Tel: 201-685-1600; Empl.: 250; *Dist. Mgr.:* Roland Kolu

TANO CORP., 4301 Poche Ct., New Orleans, LA 70129, Tel: 504-254-3500, TWX: 810-951-5229; Empl.: 390; *Sls. Mgr.:* T. M. Lowrey, Energy Control Sys.;M. A. Cushman, Marine Sys.

TANSITOR ELCTRNS., West Rd., Bennington, VT 05201, Tel: 802-442-5473, TWX: 710-360-1782; FSC No.: 05079; Empl.: 200; *Sls. Mgr.:* Tom Moore; *Dist. Mgr.:* Tom Moore

TAPECON, INC., 10 Latta Rd., Rochester, NY 14612, Tel: 716-621-8400; Empl.: 80

TAPESWITCH CORP. OF AMERICA, 100 Schmitt Blvd., Farmingdale, NY 11735, Tel: 516-694-6312, Telex: 14-4611; Empl.: 100 .... **1B•1753**

TAPPAN WIRE & CABLE, 256 Oak Tree Rd., Tappan, NY 10983, Tel: 914-359-9300; Empl.: 10; *Sls. Mgr.:* S. Grant

TASKER SYSTEMS, 20131 Sunburst St., Chatsworth, CA 91311, Tel: 213-341-3010, TWX: 910-494-1214; FSC No.: 09017; Empl.: 250; *Sls. Mgr.:* Gary B. Etzler

TAUBER ELCTRNS. INC., 4901 Morena Blvd., Bldg. 314, San Diego, CA 92117, Tel: 619-274-7242; Empl.: 12; *Dist. Mgr.:* Doug Bennett .... **3•1433**

Local Sales Offices & Reps

AL	Huntsville, Macro-Marketing	205-883-9630
AZ	Phoenix, MacDonald & Assocs.	602-998-1848
CA	Fallbrook, Martronix	619-728-7678
CA	Fullerton, Hawk Assocs.	714-773-4152
CA	Northridge, Tauber-Dreyer Assocs.	818-993-0048
CA	San Jose, Al E. Dusseau	408-226-4375
CA	Sunnyvale, GFA Sales	408-738-4751
IL	Wheeling, Ed Joyner & Co.	312-520-1200
OK	Tulsa, Cunningham Comps. Corp.	918-492-0390
OR	Portland, Frank Jackson Assocs.	503-292-2638
TX	Dallas, Cunningham Comps. Corp.	214-233-4303
TX	Houston, Cunningham Comps. Corp.	713-451-4197
WA	Redmond, Frank Jackson Assocs.	206-881-7277

TAURUS CORP., Academy Hill, P.O. Box 278, Lambertville, NJ 08530, Tel: 609-397-2390 .... **3•1095**

Local Sales Offices & Reps

CA	Pasadena, Sci. Sls.	213-793-1244
FL	Clearwater, Brennan Assoc.	813-446-5006
OH	Wickliffe, W. J. Brauer	216-943-0601

TAU-TRON INC., 27 Industrial Ave., Chelmsford, MA 01824, Tel: 617-256-9013, Telex: 951-952; Empl.: 200; *Sls. Mgr.:* Herbert K. Clark

TAYLOR ELECTRONICS, 401 West Orion, Tempe, AZ 85283, Tel: 602-838-4523; *Sls. Mgr.:* Junius Taylor .... **3•1786**

T-BAR INCORPORATED, Switching Components Div., P.O. Box T, 141 Danbury Rd., Wilton, CT 06897, Tel: 203-834-8227, Telex: 68 19 129, TWX: 710 479 3216; *Sls. Mgr.:* Bill Kruppenbacher .... **3•1308**

Local Sales Offices & Reps

AL	Huntsville, CSR Elctrns.	205-533-2444
CA	Arcadia, Van Gott & Assocs.	213-445-9728
CA	Palo Alto, Horne Electro Sls.	415-494-6777
CT	Wilton, T-Bar, Inc.	203-834-8227
FL	St. Petersburg, Tech-Rep Assocs.	813-577-2779
GA	Atlanta, CSR Elctrns.	404-396-3720
MD	Silver Spring, Carwithen Assocs.	301-589-9040
NY	Mount Vernon, Sonkin Assocs.	914-668-9809
NC	Raleigh, CSR Elctrns.	919-878-9200
TX	Richardson, McCoy Assocs. Co.	214-238-1017

Local Distributors

CA	Chatsworth, Integrated Elctrns.	213-998-2200
IL	Chicago, Newark Elctrns.	312-638-4411
MA	Hingham, Sager Elctrl. Supp. Co.	617-749-6700
NY	Hauppauge, JACO Elctrns.	516-273-5500
TX	Fort Worth, Allied Elctrns.	817-336-5401

TDJ CO., INC., 1154 Morena Blvd., San Diego, CA 92110, Tel: 619-276-5920; Empl.: 6; *Sls. Mgr.:* R. Scherr .... **2•1060, 1061**

TDK CORPORATION OF AMERICA, 4711 Golf Rd., Skokie, IL 60076, Tel: 312-679-8200 .... **1A•1189, 1281, 1567, 1630, 2300; 2•1798, 1799; 3•1061, 1787**

Local Sales Offices & Reps

AL	Birmingham, Robert Warnock Co.	205-879-0576
CA	Cupertino, Thresum Assoc.	408-996-9889
CA	Irvine, English-Damco	714-751-8054
CA	Torrance, TDK Corp. of America	213-539-6631
FL	St. Petersburg, Tech. Rep. Assoc.	813-577-2779
ID	Meridian, Intermountain Techn.	208-888-5708
IL	Palatine, Technology Sls.	312-991-6600
IN	Indianapolis, TDK Corp. of America	317-872-0370
MA	Westwood, Comp. Rep. Assoc.	617-329-3454
MN	Bloomington, Smiley-Scott Assoc.	612-888-5551
NJ	Mount Laurel, Comtek Inc.	609-235-8505
NY	East Syracuse, Nycom Inc.	315-437-8343
NY	Port Washington, TDK Corp. of America	516-625-0100, Ext. 2300
NC	Raleigh, Zucker Assoc.	919-782-8433
OH	Cincinnati, Luebbe Sls. Co.	512-871-4211
TN	Knoxville, Insul-Reps	615-691-7586
TX	Richardson, Logic I Sls.	214-234-0765
WA	Seattle, Harry Levinson Co.	206-285-5622

TEAC CORP. OF AMERICA, Indl. Prod. Div., 7733 Telegraph Rd., Montebello, CA 90640, Tel: 213-726-0303, Telex: 67-7014; Empl.: 200; *Sls. Mgr.:* Al Astor; *Dist. Mgr.:* Al Astor

TEC, 2727 N. Fairview, Box 5646, Tuscon, AZ 85703, Tel: 602-792-2230, TWX: 910-952-1377; Empl.: 400; *Sls. Mgr.:* Barry Hamilton; *Dist. Mgr.:* Barry Hamilton

TECA, THERMOELECTRIC COOLING AMERICA CORP., 448 N. Halsted St., Chicago, IL 60622, Tel: 312-666-1600; Empl.: 50 .... **2•1805**

TECCOR ELCTRNS., P.O. Box 619009, Dallas, TX 75261-9009, Tel: 214-252-7651, Telex: 79-1600, TWX: 910-860-5068; Empl.: 700; *Sls. Mgr.:* Gerry Wiley; *Dist. Mgr.:* Don Davis .... **1A•2110, 2111**

Local Sales Offices & Reps

AL	Huntsville, Interep Assocs.	205-533-173
AZ	Tempe, System Sls. of Ariz.	602-829-933
CA	San Diego, Sr Electronics	619-560-833
CA	San Jose, Quantum Coefficient	408-942-107
CA	Torrance, O'Donnell Assocs.	213-539-966
CO	Aurora, Electrodyne	303-695-890
CT	Cheshire, Scientific Comps.	203-272-296
FL	Clearwater Beach, Perrott Assocs.	813-443-521
FL	Orlando, Perrott Assocs.	305-298-774
FL	Sunrise, Perrott Assocs.	305-792-221
GA	Norcross, Interep Assocs.	404-449-868
IL	Arlington Heights, MSI	312-956-100
IN	Fort Wayne, Robert O. Whitesell & Assoc.	219-432-559
IN	Indianapolis, Robert O. Whitesell & Assoc.	317-359-928
IN	Kokomo, Robert O. Whitesell & Assoc.	317-457-912
IA	Cedar Rapids, Dy-Tronix	319-377-827
KY	Louisville, Robert O. Whitesell & Assoc.	502-426-769
MD	Towson, C. H. Newson & Assocs.	301-296-229
MA	Walpole, JEF Components	617-668-669
MI	Detroit, Rathsburg Assocs.	313-882-171
MN	Minneapolis, Electric Comp. Sls.	612-933-259
MO	Bridgeton, Dy-Tronix	314-731-579
MO	Independence, Dy-Tronix	816-373-660
NM	Albuquerque, Sys. Sls. of Arizona Inc.	505-881-887
NY	Canandaigua, Bensman/Upstate Assocs.	716-396-249
NY	Jamaica, S-J Assocs.	212-291-323
NY	Johnson City, Bensman/Upstate Assoc.	607-722-224
NC	Raleigh, J & B Sales	919-772-354
OH	Cincinnati, Robert O. Whitesell & Assoc.	513-521-229
OH	Cleveland, Robert O. Whitesell & Assoc.	216-447-902
OH	Columbus, Robert O. Whitesell & Assoc.	614-888-939
OH	Dayton, Robert O. Whitesell & Assoc.	513-298-954
OK	Tulsa, Bonser Philhower Sls.	918-496-323
PA	Flourtown, C. H. Newson & Assocs.	215-248-337
PA	Glenside, CMS Marketing	215-885-510
PA	Pittsburgh, Robert O. Whitesell & Assoc.	412-963-616
TX	Austin, Bonser Philhower Sls.	512-458-356
TX	Houston, Bonser Philhower Sls.	713-495-311

X	Richardson, Bonser Philhower Sls.	214-234-8438
T	Salt Lake City, Electrodyne	801-486-3801
A	Redmond, Quadra Sls.	206-883-3550
I	Wauwatosa, Larsen Assocs.	414-258-0529

Local Distributors

L	Huntsville, RM Electronics	205-852-1550
Z	Phoenix, Tri-Tek	602-995-9352
Z	Tempe, Anthem Elctrns.	602-244-0900
Z	Tempe, Bell Inds.	602-966-7800
A	Burlingame, Rose Elctrns. Dist.	415-348-2740
A	Chatsworth, Integrated Elctrns.	213-998-2200
A	Chatsworth, Anthem Elctrns.	213-700-1000
A	Irvine, Integrated Elctrns.	714-540-5600
A	San Diego, Anthem Elctrns.	619-279-5200
A	San Jose, Anthem Elctrns.	408-946-8000
A	San Leandro, Electro Comp Dist.	415-352-5210
A	Santee, Mouser Elctrns.	619-449-2220
A	Tustin, Anthem Elctrns.	714-730-8000
O	Englewood, Anthem Elctrns.	303-790-4500
O	Lakewood, Active Comp. Technlg.	303-233-4431
O	Wheatridge, Bell Inds.	303-424-1985
T	East Haven, JV Electronics	203-469-2321
T	Hamden, Almo Elctrns.	203-288-6556
T	Orange, Milgray Elctrns.	203-795-0711
L	Longwood, Intertec Distr.	305-834-7777
L	Winterpark, Milgray Elctrns.	305-647-5747
L	Hoffman Estates, Inter Comp	312-843-2040
L	Lombard, RM Electronics	312-932-5150
L	Rosemont, Advent Elctrns.	312-298-4210
N	Ft. Wayne, Graham Elctrns.	219-423-3422
N	Indianapolis, RM Electronics	317-247-9701
N	Indianapolis, Advent Elctrns.	317-872-4910
N	Indianapolis, Graham Elctrns.	317-634-8202
A	Cedar Rapids, Advent Elctrns.	319-363-0221
S	Overland Park, Milgray Elctrns.	913-236-8800
A	Baton Rouge, Indl. Elctrns. Supply	504-926-0513
A	Shreveport, Indl. Elctrns. Supply	318-222-9459
D	Rockville, Milgray Elctrns.	301-468-6400
D	Rockville, Almo Elctrns.	301-251-1161
D	Savage, Pyttronic Inds.	301-792-0780
A	Burlington, Milgray Elctrns.	617-272-6800
A	Burlington, Zeus Comps.	617-273-0750
A	Woburn, ACI Elctrns.	617-935-7230
I	Farmington Hills, Advent Elctrns.	313-477-1650
I	Wyoming, RM Electronics	616-531-9300
N	Minneapolis, Stark Elctrns.	612-332-1325
E	Lincoln, Scott Elctrns.	402-466-8221
J	Camden, Gen. Radio Supply	609-964-8560
J	Marlton, Milgray Elctrns.	609-983-5490
M	Albuquerque, Bell Inds.	505-292-2700
Y	Buffalo, Summit Distrs.	716-884-3450
Y	Freeport, Milgray Elctrns.	516-546-5600
Y	Jamaica, Archer Indl. Dist.	212-291-3232
Y	Port Chester, Zeus Comps.	914-937-7400
Y	Rochester, Summit Distrs.	716-334-7376
Y	Rochester, Simcona Elctrns.	716-328-3230
C	Greensboro, Hammond Elctrns.	919-275-6391
C	Winston-Salem, Almo Elctrns.	919-760-0432
H	Cincinnati, Graham Elctrns.	513-772-1661
H	Cleveland, CAM/Ohio Indl. Elctrn.	216-461-4700
H	Cleveland, Milgray Elctrns.	216-447-1520
H	Columbus, Graham Elctrns.	614-895-1590
H	Dayton, Stotts Friedman	513-298-5555
R	Portland, Radar Elc. Co.	503-232-3404
A	Enola, Almo Elctrns.	717-732-3681
A	Mc Kean, Advacom	814-476-7774
A	Montgomeryville, Pyttronic Inds.	215-643-2850
A	Philadelphia, Almo Elctrns.	215-698-4000
A	Pittsburgh, Almo Elctrns.	412-931-5990
A	Pittsburgh, CAM/RPC Indl. Elctrns.	412-782-3770
C	Greenville, Hammond Elctrns.	803-233-4121
N	Chatanooga, Techni-Tronics	615-875-5449
N	Nashville, Graham Elctrns.	615-242-2682
X	Austin, Active Comp. Technlg.	512-452-5254
X	Dallas, Active Comp. Technlg.	214-980-1888
X	Dallas, RM Electronics	214-235-3100
X	El Paso, ERA Elctrns.	915-592-4126
X	Houston, Active Comp. Technlg.	713-496-4000
T	Salt Lake City, Bell Inds.	801-972-6969
A	Bellevue, Integrated Elctrns.	206-455-2727
A	Redmond, Anthem Elctrns.	206-881-0850
A	Seattle, Radar Elec. Co.	206-282-2511
I	Milwaukee, Marsh Elctrns.	414-475-6000
I	New Berlin, RM Electronics	414-784-4420

ECHCON SYSTEMS INC., 1059 E. Bedmar St., Carson, CA 90746, Tel: 213-603-8888; Empl.: 25; *Sls. Mgr.:* S. L. Morse

ECH-ETCH INC., 45 Aldrin Rd., Plymouth, MA 02360, Tel: 617-747-0300; Empl.: 125; *Sls. Mgr.:* P. A. Thomas

ECH LABS., INC., Bergen & Edsall Blvds., Palisades Pk., NJ 07650, Tel: 201-944-2221; FSC No.: 83332; Empl.: 31 .... **1B**•1754, 1755

Local Sales Offices & Reps

CA	Granada Hills, C & W Comp. Sls.	213-368-4032
CA	Palo Alto, Mollard Mktg.	415-961-0456
CT	New Preston, NBS Assoc.	203-868-0501
GA	Atlanta, Grady Duckett Sls.	404-451-3529
IL	Glenview, Crimson Engrg. Co.	312-470-0024
KS	DeSoto, Midtec Assocs.	913-441-6565
MI	Jackson, N. Scroggs Co.	517-750-1170
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Haddonfield, Gray Assocs.	609-429-5300
NJ	Upper Saddle River, Bob Cameron, Inc.	201-825-1304
NY	Huntington Station, Haner Assocs.	516-242-7855
NY	Pittsford, Net Sls.	716-467-4538
OH	Cincinnati, Patco	513-931-3311
PA	Pittsburgh, VerHill Assocs.	412-241-5202
TX	Dallas, Southwest Elctrns.	214-690-9881
TX	Houston, Southwest Elctrns.	713-729-1670
WA	Seattle, SPS Elctrns.	206-323-4140

TECHMAR CORP., 2232 S. Cotner Ave., Los Angeles, CA 90064, Tel: 213-478-0046, 800-TECHMAR; Empl.: 12; *Sls. Mgr.:* Karena Bennetto .... **2**•1062, 1063

TECH MATERIALS, 5 Wellington Rd., Lincoln, RI 02865, Tel: 401-333-1700, TWX: 710-384-0600; Empl.: 150; *Sls. Mgr.:* C.B. Harlan

TECHNAR INC., 205 N. 2nd Ave., Arcadia, CA 91006, Tel: 818-445-1143; *Sls. Mgr.:* James Rhodes

TECHNIC, INC., Box 965, Providence, RI 02901, Tel: 401-781-6100, Telex: 927514; Empl.: 100; *Sls. Mgr.:* A. A. Amtos

TECHNICAL DEVICES, 560 Alaska Ave., Torrance, CA 90503, Tel: 213-618-8437; FSC No.: 04772; Empl.: 21; *Sls. Mgr.:* J. Cochran; *Dist. Mgr.:* J. Cochran

TECHNICAL PANELS, INC., 9162 La Rosa Dr., Temple City, CA 91780, Tel: 213-285-3105; Empl.: 13; *Sls. Mgr.:* Janlyn Prendic; *Dist. Mgr.:* Douglas Welch

Local Sales Offices & Reps

AZ	Scottsdale, TC Elctrn. Sls. Inc.	602-994-5153
CA	Temple City, HMC, Inc.	213-285-0485
MO	Ellisville, Larco Sls.	314-394-7141

TECHNICAL RESEARCH & MFG., INC., R.F.D. #10, Manchester, NH 03103, Tel: 603-627-6000, TWX: 710-220-6765; Empl.: 25; *Sls. Mgr.:* A. Marin .... **1B**•1014

Local Sales Offices & Reps

AZ	Mesa, RLS Instrs.	602-892-9329
CA	Los Angeles, RF Assoc./L.A.	213-478-1586
CA	Palo Alto, RF Assoc./P.A.	415-494-3331
CO	Greeley, Howard Assocs.	303-426-3499
CT	Norwalk, Neal Cockerham Assocs.	203-853-2618
CT	Stamford, Ashworth & Assocs.	203-968-0656
FL	Orlando, Gra-Mar	305-894-3351
IL	Chicago, Electro-Tech	312-588-4535
MA	Lowell, Matrix Sales	617-458-2096
MA	Reading, Geder Assocs.	617-544-3105
MO	Grandview, R. R. Burton and Assoc.	816-763-5385
NM	Las Cruces, Sierra Tech. Grp.	505-524-8092
NY	Guilderland, Nu-Tekneex	716-741-9138
NY	My Vernon, Friedman-Smith	914-664-4866
NY	White Plains, SCA Intl.	914-761-1042
PA	Lancaster, Electro-Rep	914-664-4866
TX	Arlington, N & W Sls.	817-461-4443
TX	Dallas, Texas Avionics	214-368-3566
VA	Fairfax, Beacon North	703-591-1300
VA	Fairfax, Schibley Assoc.	703-591-3008

TECHNIPOWER, A PENRIL CO., P.O. Box 222, Commerce Pk., Danbury, CT 06810, Tel: 203-748-7001, TWX: 710-456-9280; FSC No.: 13850; Empl.: 135; *Sls. Mgr.:* Ivan Bourgoin; *Dist. Mgr.:* Gerard F. Voity .... **1A**•2301, **3**•1789

Local Sales Offices & Reps

Power Supply Product Line

TX	Houston, Scientific Sls. Co.	713-460-9170
TX	Richardson, Scientific Sls. Co.	214-231-6541

Variac Product Line

TX	Houston, Scientific Sls. Co.	713-460-9170
TX	Richardson, Scientific Sls. Co.	214-231-6541

Local Distributors

Variac Product Line Only

CA	Hollywood, Yale Radio Elctrn.	213-465-3186, 800-421-4144
CA	Los Angeles, Cal-State Elctrns.	213-933-8187
CA	Oakland, N. A. D'Arcy	415-638-7773
CA	Santa Ana, Action Elctrns.	714-547-5169
CT	Old Saybrook, M.L. Elctrns.	203-388-9718
IL	Chicago, Delta Tech. Prods. Co.	312-478-1134
MD	Baltimore, Philadelphia Elctrns.	800-638-4784
MA	Woburn, Abbott Elctrns. Co.	617-935-2040
MI	Dearborn, Indl. Temperature & Control	313-278-2210
MN	St. Paul, Gopher Elctrns. Co.	612-483-3322
MO	St. Louis, Olive Elctrns.	314-426-4500
NY	Amsterdam, Adirondack Radio Supp.	518-842-8350
NY	Rockville Centre, Midway Indl. Elctrns.	516-764-2400
NC	Charlotte, Jenkins Elec. Co.	704-392-7371
OH	Dayton, Esco Inc.	513-226-1133
OK	Oklahoma City, Inotek	405-495-4620
OK	Tulsa, Inotek	918-622-8570
PA	Philadelphia, Phila. Elctrns.	215-568-7400
TX	Dallas, Inotek	214-243-8370
TX	Ft. Worth, Inotek	817-831-2126
TX	Houston, Inotek	713-688-4494
TX	San Antonio, Inotek	512-654-7811

TECHNIQUES, INC., 235 Jackson St., Englewood, NJ 07631, Tel: 201-569-5900; Empl.: 60

TECHNISERV INC., 1560 Teaneck Rd., Teaneck, NJ 07666, Tel: 201-837-0032; *Sls. Mgr.:* L. G. Mansoor

TECHNI-TOOL, 5 Apollo Rd., Box 368, Plymouth Meeting, PA 19462, Tel: 215-825-4990, Telex: 834-763; Empl.: 40

Local Sales Offices & Reps

CA	W. Covina, Electra-Tec	213-964-9772
FL	Ft. Pierce, Hyber-Sem	305-464-0461
IL	Wauconda, Champion & Assoc.	312-526-3700
KS	De Soto, Midtec Assocs.	913-441-6565
LA	Kenner, EDS Assocs.	504-466-7475
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Hudson, Data Rep	617-481-0333
MI	Detroit, Qualitron Co.	313-534-1511
MO	Florissant, Midtec Assocs.	314-837-5200
NJ	Butler, Genl. Techn.	201-492-1292

Technitrol, Inc.

TECHNITROL, 1952 E. Allegheny, Philadelphia, PA 19134, Tel: 215-426-9105, Telex: 834245; FSC No.: 90095; Empl.: 350; *Sls. Mgr.:* G. Shilling .... **1A**•1568-1574; **1B**•1015-1017

Local Sales Offices & Reps

AL	Huntsville, Murcota	205-539-8476
AZ	Scottsdale, SMS & Assoc.	602-998-0831
CA	San Rafael, Wright Assocs.	415-457-9940
CA	Torrance, Detomasi & Grupp, Inc.	213-327-1775
IL	Wauconda, Cudahy Sls.	312-526-2484
MD	Baltimore, Callas Elctrns.	301-744-7711
MA	Newton, Normell Assoc.	617-969-5478
NY	Fairport, TAC Assoc.	716-425-1070
NY	Jericho, J. Square Mktg.	516-935-3200
NY	Syracuse, Tac Sls.	315-637-9861
NC	Winston-Salem, Murcota	919-722-9445
OH	Galion, Retronics	419-468-4568
PA	Easton, The Kendon Co.	215-253-3100
PA	Pittsburgh, Robert Kneip	412-823-0169
TX	Austin, Elctrns. Mktg. Assoc.	512-837-0893
TX	Grapevine, Elctrns. Mktg. Assoc.	817-481-7502
TX	Houston, Elctrns. Mktg. Assoc.	713-498-8120
WA	Redmond, General Technlg., Inc.	206-881-6456

TECHNO, INC., 14 Crandall Ave., Pompton Lakes, NJ 07442, Tel: 201-839-0740; Empl.: 10; *Sls. Mgr.:* Fredric S. Miller

TECHNO

TECHNO-COMPONENTS CORP., 7803 Lemona, Van Nuys, CA 91405, Tel: 818-781-1642, TWX: 910-495-2015; FSC No.: 17826; Empl.: 135; *Sls. Mgr.:* Vivian Meranda .... **1A**•1939, 2064, 2065

Local Sales Offices & Reps

AZ	Scottsdale, Argus Sls.	602-949-0873
CA	Costa Mesa, Balzer-Wolf Assocs.	714-751-3001

CA	Cupertino, F & F Assocs.	408-446-2349
CA	Sherman Oaks, Clemick-Neenan & Assoc.	818-990-3150
CO	Westminster, Western Region Mktg.	303-430-8883
FL	Casselberry, S-A Assocs.	305-695-6010
GA	Roswell, Edco Sls.	404-587-1886
IL	Crystal Lake, Oak Switch Sys.	815-459-5000
IN	Fort Wayne, Denton Mktg.	219-627-5515
KS	Wichita, Baka Corp.	316-682-8411
MD	Baltimore, Pro Rep	301-653-3600
MA	Newton, Gerber Sls.	617-969-2620
MN	Minnetonka, Gibb Elctrns.	612-935-4600
NJ	Haddonfield, Mills-Brown	609-429-1005
NY	N. Syracuse, Advanced Comps.	315-699-2671
NY	New Hyde Park, R. P. Luce & Co.	516-437-4550
OH	Centerville, E.M.A.	513-433-2800
TX	Bedford, W. Pat Fralia Co.	817-640-9101

Local Distributors

CA	Chatsworth, Shelley Elctrns.	818-998-3333
CA	El Monte, Marshall Elctrns.	213-686-0141
CA	Fullerton, Carden Elctrns.	714-526-7882
CA	San Fernando, Petell Elctrns.	818-365-9841
FL	Tampa, Impala Elctrns.	813-885-4747
MD	Columbia, Aztech Elctrns.	301-995-1760
MA	Burlington, TLC Inc.	617-273-0140
NJ	Oakland, Gordon/Horne	201-337-5200
NY	Farmingdale, Command Elctrns.	516-293-1212
NY	N. Syracuse, ANDCO	315-699-2660
OH	Centerville, I.P.D.	513-435-2086
OH	Dayton, Televox	513-294-4499
TX	Ft. Worth, TTI	817-831-0441
TX	Ft. Worth, Patco Supply	817-429-8596

TECHNOLOGY DYNAMICS inc.

TECHNOLOGY DYNAMICS, 91 E. Carver Ave., Westwood, NJ 07675, Tel: 201-664-7636; *Sls. Mgr.:* James Logan .... **3**•1790-1795

Local Sales Offices & Reps

FL	De Barg, DJE Assocs., Inc.	305-668-6827
MA	Westboro, RJC Assocs.	617-366-0399

TECHNOLOGY PRODS., INC., 8900 Eton Ave., Canoga Park, CA 91304, Tel: 213-998-8555; FSC No.: 8K984; *Sls. Mgr.:* N. Lerman

TECHSONICS, Halfway, OR 97834, Tel: 503-742-7475; Empl.: 6

TECH SPRAY, INC., Box 949, Amarillo, TX 79105, Tel: 806-372-8523, Telex: 738450; Empl.: 25; *Sls. Mgr.:* R. G. Russell; *Dist. Mgr.:* Jack Swanson

TCI

TECHTROL CYCLONETICS, INC., 815 Market St., New Cumberland, PA 17070, Tel: 717-774-2746, TWX: 510-650-7003; FSC No.: 4P572; Empl.: 18; *Sls. Mgr.:* James M. Griffith .... **1A**•1432, 1433

Local Sales Offices & Reps

CA	San Carlos, Westronics Assoc.	415-592-1417
CA	Signal Hill, Thorson Co.	213-595-0361
FL	Clearwater, Brennan Assoc.	813-446-5006
MD	Ellicott City, Nelson Elctrns. Inc.	301-747-7887
MA	Topsfield, R F Assoc.	617-887-9762
NY	Brooklyn, Pensky Assocs.	212-763-4936
PA	Ambler, W & M Assocs.	215-643-4119
TX	Dallas, Airep Elctrns.	214-349-4360

TECKNIT® a TWP company

TECKNIT (EASTERN FACILITY), 129 Dermody St., Cranford, NJ 07016, Tel: 201-272-5500, Telex: 6853079 TCKNT, TWX: 710-996-5961; FSC No.: 07700; Empl.: 300; *Sls. Mgr.:* Robert Bjornsen (East);James L. Fletcher (West) .... **2**•1588-1591, 1916-1923

Local Sales Offices & Reps

AZ	Tempe, Tempe Assoc.	602-829-1901
CA	Granada Hills, C & W Comp. Sls.	213-368-4032
CA	San Diego, Cerco	619-274-1901
CA	Santa Barbara, Tecknit (Western Facility)	809-963-5811
CA	Santa Clara, Nova-Tronix	408-727-9530
CO	Boulder, Comp. Prod. Sls.	303-530-2800
CO	Westminster, Tecknit	303-428-9169
FL	Boca Raton, Lawrence Assocs.	305-368-7373
FL	Clearwater, Lawrence Assocs.	813-584-8110
FL	Fern Park, EIR	305-830-9600
FL	N. Lauderdale, EIR, Inc.	305-830-9600
FL	West Melbourne, Lawrence Assocs.	305-724-8294
IL	Arlington Hgts., Diethert/Angel	312-593-7600
IL	Chicago, Industrial Reps.	312-647-7755
IN	Eden Prairie, Elctrn. Innovators	612-941-0830
IA	Davenport, Ensco-Rep Inc.	319-386-6600
KS	Overland Park, Ensco-Rep Inc.	913-381-7557
KS	Wichita, Ensco-Rep Inc.	316-683-1070
MD	Pikesville, White & Co.	301-484-5400
MA	Waltham, Com-Sale	617-890-0011
MI	Lavonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	Eden Prairie, Elctrn. Innovators Inc.	612-941-0830
MN	St. Paul, Repco	612-642-2828
MO	Maryland Heights, Ensco-Rep Inc.	314-423-3935
NH	Hudson, EMC Sales	603-889-5751
NJ	N. Plainfield, Brady Co.	201-753-7988
NJ	Union, Meridian Entprs.	201-687-6220
OH	Columbus, McFadden Sls.	614-459-1280
OH	Dayton, Jay Engrg.	513-253-2151
OH	N. Royalton, Jay Engrg.	216-237-4235
TX	Austin, P. J. Scanlon & Co.	512-258-7717
TX	Dallas, P. J. Scanlon	214-231-4661
TX	Houston, P. J. Scanlon & Co.	713-370-4908
WA	Vancouver, Ray Over Sls.	206-695-6179

TECMAR, INC., 6225 Cochran Rd., Solon, OH 44139, Tel: 216-349-0600; Empl.: 400; *Sls. Mgr.:* Carolyn Alpert

TECNETICS, Box 910, Boulder, CO 80306, Tel: 303-442-3837, TWX: 910-940-3246; Empl.: 225; *Sls. Mgr.:* V.L. Garrison

TECOM INDS., 21526 Osborne St., Canoga Pk., CA 91304, Tel: 213-341-4010, Telex: 69 8476; FSC No.: 59850001; Empl.: 94; *Sls. Mgr.:* Chester E. Rowley

tecron

TECRON INDUSTRIAL PRODS., Crown Intl., Inc., 1718 W. Mishawaka Rd., Elkhart, IN 46517, Tel: 219-294-5571, Telex: 810-294-2160; Empl.: 300; *Sls. Mgr.:* Howard King .... **3**•1022-1025, 1306, 1307

Local Sales Offices & Reps

CA	Mountain View, IFM Inc.	415-961-2828
CA	Thousand Oaks, HTEC	805-492-2889
CT	Woodbridge, Electronic Marketing Assoc.	203-397-1461
FL	Tampa, Applied Science Mktg.	813-870-0664
IL	Chicago, Berndt Assocs.	312-283-0713
IA	Cedar Rapids, MAI Assocs.	319-396-8030
MI	Livonia, Lowell-Wendt Mktg. Co.	313-464-2722
MN	St. Paul, Skor	612-426-1160
NJ	Wayne, Ramapo, Inc.	201-839-6767
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	Syracuse, Labtronics Inc.	315-455-7314
OH	Brecksville, Audio Mktg. Assoc.	216-526-2426
PA	King of Prussia, Freedman-Malta Assoc.	215-337-9211
WA	Bellevue, Showalter Instrs., Inc.	206-746-7970

TED CORP., 11415 Johnson Dr., Shawnee Mission, KS 66203, Tel: 913-631-6211; FSC No.: 05209; Empl.: 48

TEDEA USA

TEDEA USA, 7800 Deering Ave., Canoga Park, CA 91304, Tel: 818-884-8818, Telex: 67-3382, TWX: 910-494-1951; Empl.: 10; *Sls. Mgr.:* Tony Smalarz .... **1B**•1878; **3**•1172

Local Sales Offices & Reps

AZ	Tempe, Trembly Assocs.	602-967-2058
CA	Carlsbad, Elotek Sys.	714-438-4856
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
GA	Atlanta, Physimetrics	404-955-0155
IL	Hinsdale, I & C Sales	312-323-8201
KS	Shawnee Mission, Tech. Sls. Assocs.	913-888-3330
MA	Lexington, Jodan Technology	617-862-2354
MI	Trenton, I & C Sales	313-671-1320
MN	Minneapolis, CMI	612-566-6930
MO	St. Louis, Tech. Sls. Assocs.	314-725-5361
NJ	Hillsdale, C B Assocs.	201-664-6230
NM	Albuquerque, Trembly Assocs.	505-266-8616
OH	Cincinnati, I & C Sales	513-772-3101
PA	Bethayres, Control Instr. Sls.	215-676-1808
WA	Bellevue, Westerberg & Assocs.	206-453-8881
WA	Bothell, Pacific N.W. Controls Inc.	206-821-0448

TEGAM, 7230 N. Ridge Rd., Madison, OH 44057, Tel: 216-428-7505; Empl.: 25

TEGAL SCIENTIFIC, INC., Box 5905, Concord, CA 94524, Tel: 415-827-1054; *Sls. Mgr.:* L. Rigali

TEKA PRODS., 45 Salem, Providence, RI 02907, Tel: 401-785-4110, TWX: 710-582-4946; Empl.: 28; *Sls. Mgr.:* Jim Mills; *Dist. Mgr.:* Jim Mills

TEKNATIONAL INDS., INC., 430 S. Clinton Ave., Rochester, NY 14620, Tel: 716-232-1291; FSC No.: 24227; Empl.: 15; *Sls. Mgr.:* J. D. Hochheimer

TEKTITE CORP., 4756 Platt Rd., Ann Arbor, MI 48104, Tel: 313-971-9379; *Sls. Mgr.:* Jose Padilla

TEKTONE SOUND & SIGNAL, 1331 S. Killian Dr., Lake Park, FL 33403, Tel: 305-844-2383, Telex: 51-3438; FSC No.: 59-1500771; Empl.: 50; *Sls. Mgr.:* Carlos Mira; *Dist. Mgr.:* Carlos Mira

TEKTRONIX, INC., P.O. Box 500, V3-314, Beaverton, OR 97077, Tel: 800-547-1512, Oregon only 800-452-1877, TWX: 910-467-8708; FSC No.: 80009; Empl.: 20000 .... **3**•1376, 1377

Local Sales Offices & Reps

AL	Huntsville	205-881-2912
AZ	Phoenix	602-268-8861
CA	Concord	415-254-5353
CA	Irvine	714-660-8080
CA	San Diego	619-292-7330
CA	Santa Clara	408-496-0800
CA	Woodland Hills	213-999-1711
CO	Englewood	303-799-1000
CT	Milford	203-877-1494
DC	Gaithersburg	301-948-7151
FL	Ft. Lauderdale	305-973-9300
GA	Atlanta	404-449-4770
IL	Chicago	312-259-7580
IN	Indianapolis	317-545-2351
KS	Overland Park	913-341-3344
LA	New Orleans	504-466-4445
MD	Baltimore	301-628-6400
MA	Boston	617-861-6800
MI	Detroit	313-478-5200
MN	St. Paul	612-484-8571
MO	St. Louis	314-429-7707
NJ	Woodbridge	201-636-8616
NM	Albuquerque	505-265-5541
NY	Albany	518-458-7291
NY	Long Island	516-364-9060
NY	Rochester	716-424-5800
NC	Raleigh	919-782-5624
OH	Cleveland	216-243-8500
OH	Dayton	513-859-3681
OK	Oklahoma City	405-943-8127
OR	Tigaro	503-620-9100
PA	Pittsburgh	412-244-9800
TN	Knoxville	615-690-6422
TX	Houston	713-933-3000
TX	San Antonio	512-496-1161
UT	Salt Lake City	801-486-1091
VA	Arlington	703-920-7770
WA	Seattle	206-575-0180

TELAUTOGRAPH, 8700 Bellanca Ave., Los Angeles, CA 90045, Tel: 213-641-3690, TWX: 910-328-6117; Empl.: 300

TELCOM INC., 8027 Leesburg Pike, Vienna, VA 22180, Tel: 703-893-7700, Telex: 89-2321; Empl.: 125; *Sls. Mgr.:* D. Desmond

TELCO PRODUCTS CO., 44 Sea Cliff, Glen Cove, NY 11542, Tel: 516-759-0300; Empl.: 34

TELEBYTE TECHNOLOGY, INC., Remark Datacom Div., 4 Sycamore Dr., Woodbury, NY 11797, Tel: 516-423-3232, TWX: 510-226-0449; Empl.: 10; *Sls. Mgr.:* Curt DeForest

ELECOMMUNICATIONS DEVICES, 2320 Wisconsin Ave., Downers Grove, IL 60515, Tel: 312-971-3460, TWX: 910-695-3222; Empl.: 45; *Sls. Mgr.:* Joel Peterson;Chuck Pokonosky; *Dist. Mgr.:* Theresa Kanaga

Local Distributors

L	Birmingham, American Elctrns.	205-254-3280
H	Cleveland, Pruit Energy Sources	216-566-1545
H	Harrisburg, Cumberland Elctrns.	717-232-5999
H	Solon, Repco	216-248-8900
N	Knoxville, Bondurant Bros.	615-573-9151

ELECOMMUNICATIONS TECHNIQUES CORP., 444 N. Frederick Ave., Gaithersburg, MD 20877, Tel: 301-258-5011, Telex: 908736; Empl.: 66; *Sls. Mgr.:* John Farrell

Local Sales Offices & Reps

Z	Scottsdale, Barnhill Assocs.	602-947-7841
A	La Crescenta, Beckrep	818-957-1111
A	Mountain View, CSS Telecommunications	415-964-4335
O	Englewood, Barnhill Assocs.	303-779-3600
L	Indian Harbour Beach, General Technlg.	305-777-1133
A	Atlanta, General Technlg.	404-433-0350
	Arlington Heights, Dytec/Central	312-394-3380
	Noblesville, Gerhard & Assocs.	317-877-3710
S	Lenexa, Dytec/South	913-888-0215
	Baton Rouge, Barnhill Assocs.	504-924-6826
D	Silver Spring, GT Assocs.	301-949-8060
	Northville, Gerhard & Assocs.	313-348-6560
N	Edina, RAE Assocs.	612-941-3221
O	Maryland Heights, Dytec/South	314-569-2990
H	Concord, Concord Coms.	603-224-8602
J	Union, Friedman Assocs.	201-946-6200
M	Albuquerque, Barnhill Assocs.	505-299-7658
C	Greensboro/High Point, General Technlg.	919-883-6523
H	Cleveland Heights, Gerhard & Assocs.	216-382-5838
H	Columbus, Gerhard & Assocs.	614-488-9751
H	Dayton, Gerhard & Assocs.	513-435-7696
R	Milwaukee, Control Q	503-654-9295
	Pittsburgh, Gerhard & Assocs.	412-241-6250
	Austin, Barnhill Assocs.	512-451-0217
	Houston, Barnhill Assocs.	713-688-9971
	Murray, Barnhill Assocs.	801-262-3000
	Richardson, Barnhill Assocs.	214-231-2573
A	Redmond, Control Q	206-881-7440

ELECTRO SYS., 96-18 43rd Ave., Corona, NY 11368, Tel: 212-651-8900; Empl.: 75; *Sls. Mgr.:* H. Sussman

ELEDYNE AEROSPACE SYS., 1007 E. 10th St., Fairmont, MN 56031, Tel: 507-235-3355, 507-235-9712, 507-238-9494, TWX: 910-565-2120; FSC No.: 24600; Empl.: 150; *Sls. Mgr.:* Robert L. Johnson

Local Sales Offices & Reps

	Huntsville, Lew Wright	205-536-7961
	Denver, Donohue Sls. Co.	303-458-6384
	Neshanic Station, J & L Assocs.	201-369-3791
	Dallas, R. D. Spooner Co.	214-357-6636
	Shipman, R.P. Assocs	804-263-5981

LEDYNE ANSONIA, Riverside Dr., Ansonia, CT 06401, Tel: 203-735-9311, Telex: 963408; *Sls. Mgr.:* James Cutler

LEDYNE CAMERA SYS., 131 N. Fifth Ave., Arcadia, CA 91006, Tel: 213-359-6691, Telex: 675-423; FSC No.: 14440; Empl.: 96; *Sls. Mgr.:* D. Mathews

LEDYNE-CRYSTALONICS, 147 Sherman St., Cambridge, MA 02140, Tel: 617-491-1670, TWX: 710-320-1196; FSC No.: 12498; Empl.: 185; *Sls. Mgr.:* A. H. Pauk; *Dist. Mgr.:* W. J. Kilgarriff

LEDYNE/GEOTECH, 3401 Shiloh Rd., Garland, TX 75041, Tel: 214-271-2561, Telex: 73-2394; FSC No.: 99019; Empl.: 440

TELEDYNE GURLEY, 514 Fulton St. P.O. Box 88, Troy, NY 12181, Tel: 518-272-6300, TWX: 710-443-8156; *Sls. Mgr.:* G. S. Gordon

TELEDYNE INET, 2750 W. Lomita Blvd., Torrance, CA 90509, Tel: 213-325-5040, Telex: 67-7228; Empl.: 600

TELEDYNE KINETICS, 410 S. Cedros Ave., Solana Beach, CA 92075, Tel: 619-755-1181, TWX: 910-322-1135; Empl.: 80

TELEDYNE MECCA, Box 36393, Houston, TX 77036, Tel: 713-772-2811, TWX: 913-881-7039; Empl.: 75; *Sls. Mgr.:* T. G. Roach

TELEDYNE MICRONETICS, 7155 Mission Gorge Rd., San Diego, CA 92120, Tel: 619-583-3525, TWX: 910-335-2085; Empl.: 120; *Sls. Mgr.:* S. Amarillas

TELEDYNE MICROWAVE, 1290 Terra Bella Ave., Mountain View, CA 94043, Tel: 415-968-2211, TWX: 910-379-6939; FSC No.: 24022; Empl.: 325

TELEDYNE PHILBRICK, Allied Dr. Rte 128, Dedham, MA 02026, Tel: 617-329-1600, TWX: 710-348-6726; Empl.: 250

TELEDYNE RELAYS, 12525 Daphne Ave., Hawthorne, CA 90250, Tel: 213-777-0077, TWX: 910-321-4610; *Sls. Mgr.:* Tom Garland; *Dist. Mgr.:* Charles Fein

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Arcom Sls.	602-947-5745
CA	San Jose, Teledyne Relays	408-996-9944
CO	Denver, Quorum 3	303-696-8480
CT	Stratford, G. Rosen Co.	203-375-5456
FL	Clearwater, Hutto, Hawkins & Peregoy	813-797-4447
FL	Ft. Lauderdale, Hutto, Hawkins & Peregoy	305-971-5750
FL	Maitland, Hutto, Hawkins & Peregoy	305-831-2474
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Glen Ellyn, Teledyne Relays	312-858-1090
IN	South Bend, Schillinger Asso.	219-282-4570
IA	Cedar Rapids, Stan Clothier Co.	319-395-0245
KS	Olathe, C-Tron	913-829-0073
MD	Towson, Arbotek Assocs.	301-825-0075
MA	Framingham, G. Rosen Co.	617-879-5505
MN	Minneapolis, S. Clothier Co.	612-944-3456
MO	St. Louis, R. F. Carlson Co.	314-961-4485
NJ	Cranford, Teledyne Relays	201-272-0020
NM	Albuquerque, Reptronix	505-292-1718
NY	Mount Vernon, Friedman-Smith Elctrns.	914-664-4866
NY	Syracuse, I.A. Hotze Co.	315-479-6641
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Dayton, J.C. Hofstetter Co.	513-296-1010
OH	Medina, J.C. Hofstetter Co.	216-241-4880
OR	Beaverton, B & P Sls.	503-641-3486
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
PA	Pennsauken, Vantage Sls.	609-663-6660
TX	Austin, Kruvand Assocs.	512-441-6777
TX	Dallas, Kruvand Asso.	214-691-4592
TX	Houston, Kruvand Asso.	713-780-9710
UT	Salt Lake City, Quorum 3	801-943-9227
WA	Renton, B & P Asso.	206-454-6571

Local Distributors

AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Wyle	602-249-2232
AZ	Tempe, Time-Arizona	602-967-2000
CA	Anaheim, Time-Anaheim	714-937-0911
CA	El Segundo, Wyle Dist. Grp.	213-322-8100
CA	Irvine, Wyle Dist. Grp.	714-863-9953
CA	Rancho Cordova, Wyle	916-638-5282
CA	San Diego, Wyle Dist. Grp.	619-565-9171
CA	Santa Clara, Wyle Dist. Grp.	408-727-2500
CA	Sunnyvale, Time-N. Cal.	408-734-9888
CA	Torrance, Time-West	213-320-0880
CO	Englewood, Time-Colorado	303-850-7701
CO	Thornton, Wyle Dist. Grp.	303-457-9953
CT	Orange, Milgray/Conn.	203-795-0711
FL	Altamonte Springs, Pioneer Elctrns.	305-834-9090
FL	Dana, Summit	305-920-6253
FL	Ft. Lauderdale, Time-Florida	305-974-4800
FL	Winter Pk., Milgray/Fla.	305-647-5747
GA	Atlanta, Milgray	404-393-9666
GA	Atlanta, Electro-Air-Georgia	404-351-3545
GA	Norcross, Pioneer	404-448-1711
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IN	Indianapolis, Pioneer/Indianapolis	317-849-7300
KS	Overland Pk., Milgray/Kansas City	913-236-8800
MD	Columbia, Time-Maryland	301-964-3090
MD	Gaithersburg, Pioneer/Wash.	301-921-0660
MD	Rockville, Milgray/Wash.	301-468-6400
MA	Burlington, Milgray/New England	617-272-6800
MA	Woburn, Time-New England	617-935-8080
MI	Livonia, Pioneer/Mich.	313-525-1800
MN	Minnetonka, Pioneer	612-935-5444
MO	St. Louis, Time-Mid West	314-391-6444
NJ	Marlton, Milgray/Delaware Valley	609-983-5010
NY	Buffalo, Summit Dist.	716-887-2800
NY	Freeport, Milgray Elctrns.	516-420-9800
NY	Hauppauge, Time-NY	516-273-0100
NY	Pittsford, Milgray	716-385-9330
NY	Rochester, Summit Dist.	716-334-8110
NC	Charlotte, Pioneer	704-527-8188
OH	Cleveland, Milgray/Cleveland	216-447-1520
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OR	Hillsboro, Wyle Dist. Grp.	503-640-6000
PA	Broomall, Time-Mid Atlantic	215-359-1200
PA	Horsham, Pioneer/Delaware Valley	215-674-4000
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Electro-Air-Southwest	214-385-0566
TX	Dallas, Pioneer Std.	214-386-7300
TX	Houston, Kierulff Elctrns.	713-530-7030
TX	Houston, Pioneer Elctrns.	713-988-5555
TX	Richardson, Wyle-Dallas	214-235-9953
UT	Salt Lake City, Wyle Dist. Grp.	801-974-9953
WA	Bellevue, Electro-Air-Northwest	206-641-3640
WA	Bellevue, Wyle Dist. Grp.	206-453-8300

TELEDYNE ROTOLITE, 150 Mt. Bethel Rd., Warren, NJ 07060, Tel: 201-647-1040, TWX: 710-986-3017; *Sls. Mgr.:* Ted Killeen

TELEDYNE SEMICONDUCTOR, 1300 Terra Bella Ave., Mountain View, CA 94040, Tel: 415-968-9241, TWX: 910-379-6494; FSC No.: 15818; Empl.: 2000; *Sls. Mgr.:* Ralph Granchelli

TELEDYNE WESTERN WIRE & CABLE, 2425 E. 30th St., Los Angeles, CA 90051, Tel: 213-587-7103, Telex: 67-7110; Empl.: 250; *Sls. Mgr.:* W. Drolet, Jr.; *Dist. Mgr.:* M. Ibrahim

TELEFUNKEN, See AEG Telefunken

TELEMET, 185 Dixon Ave., Amityville, NY 11701, Tel: 516-842-2300, TWX: 510-227-9850; Empl.: 60

TELERAM COMMUNICATIONS, 2 Corporate Park Dr., White Plains, NY 10604, Tel: 914-694-9270, Telex: 64-6658; Empl.: 50; *Sls. Mgr.:* R. R. Ansell

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- SERIAL INTERFACE (RS 232 AND CURRENT LOOP)
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TELETERMINAL CORP., Greenland, NH 03840, Tel: 603-431-1200; Empl.: 13

TELETYPE, 5555 Touhy Ave., Skokie, IL 60076, Tel: 312-982-2000, Telex: 25-4051, TWX: 910-223-3611; FSC No.: 5815; Empl.: 6,000; *Sls. Mgr.:* D. M. Printz

TELEVIDEO SYS., INC., 1170 Morse Ave., Sunnyvale, CA 94086, Tel: 408-745-7760, TWX: 910-338-7633; *Sls. Mgr.:* Steve Tatum (VDT Div.); Chuck Kempton (Sys. Div.)

TELEVISION EQUIP. ASSOCS., Box 393, So. Salem, NY 10590-0393, Tel: 914-763-8893, TWX: 710-575-2600; Empl.: 10

TELEVISION MICROTIME, INC., 1280 Blue Hills Ave., Bloomfield, CT 06002, Tel: 203-242-4242, TWX: 710-425-2390; Empl.: 80

TEL LABS, inc.

TEL LABS, INC., 154 Harvey Rd., Londonderry, NH 03053, Tel: 603-625-8994, TWX: 710-220-1844; FSC No.: 94322; Empl.: 225 ....**1A**•1941-1943

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Sls.	205-881-5031
AZ	Phoenix, MR Engrg. Sls. Co.	602-956-4670
CA	La Mirada, Select Elec.	714-739-8891
CA	Mountain View, Serra Assoc.	415-964-4300
CO	Aurora, Sage Sales	303-750-3501
FL	Clearwater, Beacon Elec. Sls.	813-796-2378
FL	Ft. Lauderdale, Beacon Elec. Sls.	305-491-1054
FL	Maitland, Beacon Elec. Sls.	305-647-3498
FL	Melbourne, Beacon Elec. Sls.	305-724-8010
GA	Atlanta, Beacon Elec. Sls.	404-256-9640
IL	Downers Grove, Richmar Elec. Corp.	312-968-0118
IN	West Lafayette, Richmar Elec. Corp.	317-846-6383
MD	Randallstown, Precision Mktg.	301-521-5353
MA	Topsfield, RFC Assoc.	617-887-8545
MN	Osseo, Gaffney Sls. Co.	612-425-5484
NJ	Clifton, Ossmann	201-778-8888
NY	Rochester, Ossmann Comps.	716-424-4460
NY	Syracuse, Ossmann Comp.	315-455-6611
NC	Greensboro, Beacon Elec. Sls.	919-275-9997
NC	Raleigh, Beacon Elec. Sls.	919-787-0330
OH	Akron, Augnat Assoc.	216-535-4396
OH	Dayton, Augnat Assoc.	513-298-1507
OK	Tulsa, ION Assoc.	918-664-0186
OR	Aloha, Caruso & Northcutt	503-624-1606
PA	Ardmore, Precision Mktg.	215-649-6301
PA	Pittsburgh, Augnat Assoc.	412-281-8283
TN	Johnson City, Beacon Elec. Sls.	615-282-2421
TX	Austin, ION Assoc.	512-458-2108
TX	Grand Prairie, ION Assoc.	214-647-8225
TX	Houston, ION Assoc.	713-681-6266
UT	Salt Lake City, Sage Sales	801-467-5451
WA	Bellevue, Caruso & Northcutt	206-454-9699
WI	Butler, Richmar Elec. Corp.	414-781-1730

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TELONIC/BERKELEY, 2825 Laguna Canyon Rd., Laguna Beach, CA 92652, Tel: 714-494-9401, Telex: 182720; FSC No.: 04423; Empl.: 75; *Sls. Mgr.:* H. Elmes ....**1A**•1777

Local Sales Offices & Reps

AZ	Phoenix, RLS Instrs.	602-892-9329
CA	Agoura Hills, Relcon	818-991-4221
KS	Overland Park, Advanced Tech. Sls.	913-642-6675
OH	Cincinnati, Delta Sls. Engrg.	513-271-5444
WA	Bellevue, SDR Squared	206-747-9424

TELPAR, INC., P.O. Box 796, 4132 Billy Mitchell Rd., Addison, TX 75001, Tel: 214-233-6631, Telex: 73-2561; Empl.: 28; *Sls. Mgr.:* Wm. Konrad ....**3**•1096

TELTONE, 10801-120 Ave. NE, Kirkland, WA 98033, Tel: 206-827-9626, TWX: 910-449-2862; Empl.: 450; *Sls. Mgr.:* D. E. Johnson; *Dist. Mgr.:* Mike Arndt

TEMESCAL, 2850 Seventh St., Berkeley, CA 94710, Tel: 415-841-5720, TWX: 910-366-7366; Empl.: 300

TEMPIL DIV., Big Three Inds., Hamilton Blvd., S. Plainfield, NJ 07080, Tel: 201-757-8300, Telex: 138-662; Empl.: 38; *Sls. Mgr.:* A. P. Jeanguenin

TEMPO INSTRUMENT, INC., 87 Modular Ave., Commack, NY 11725, Tel: 516-694-4400, TWX: 510-224-6421; FSC No.: 07031; Empl.: 120

TEMPOSONICS, 131 East Ames Ct, Plainview, NY 11803, Tel: 516-349-1950, TWX: 510-226-3787; *Sls. Mgr.:* W. Brenner

TEMPTRONIC
CORPORATION

TEMPTRONIC, 55 Chapel St., Newton, MA 02158, Tel: 617-969-2501, Telex: 200-119; Empl.: 95; *Sls. Mgr.:* H. P. Mierop

Local Sales Offices & Reps

AZ	Scottsdale, Allen Assocs.	602-994-1305
CA	Santa Clara, Comtronics	408-773-9800
CO	Boulder, Specialty Sls.	303-444-0954
FL	West Palm Beach, PSA, Inc.	305-689-0575
IN	Kokomo, AW, Inc.	317-453-7671
KS	De Soto, Gary Yantis	913-441-6565
MD	Laurel, ARA Electrn. of VA	301-953-1733
MA	Boston, TEC Systems	617-834-4663
MI	Milford, Technical Sls. Assoc.	313-363-1427
MN	St. Paul, Dytec-North Inc.	612-645-5816
MO	Florissant, Midtec Assocs.	314-837-5200
NM	Albuquerque, Allen Assoc.	505-345-4245
NY	New City, RMC Assocs.	914-634-0054
NY	Rochester, Scientific Devices of N. Y.	716-334-2445
NC	Durham, PSA Inc.	919-832-3896
OH	Dayton, Tech. Sls. Assoc.	513-222-1892
OH	Lyndhurst, Technical Sls. Assoc.	216-461-0826
OR	Beaverton, Systems Specialists	503-641-7771
PA	Willow Grove, Harry Nash Assoc.	215-657-2213
TX	Austin, Alphatech	512-458-9179
UT	Salt Lake City, Specialty Sls. Co.	801-561-0222
VA	Richmond, ARA Electrn. of UA	804-285-9309
WA	Mukilteo, System Specialists	206-355-0404

TENCOR INSTR., 2400 Charleston Road, Mountain View, CA 94043, Tel: 415-969-6767; *Sls. Mgr.:* Barry Hart

TENNELEC, 601 Turnpike, Oak Ridge, TN 37830, Tel: 615-483-8405, TWX: 810-572-1018; Empl.: 50

Tenney
ENGINEERING, INC.

TENNEY ENGRG., 109 Springfield Rd., Union, NJ 07083, Tel: 201-686-7870, TWX: 710-985-4725; Empl.: 204; *Sls. Mgr.:* Jerome Perlstein ....**3**•1181

Local Sales Offices & Reps

AL	Huntsville, Equipment Sales Co., Inc.	205-536-5399
AZ	Phoenix, Jayson Co.	602-867-1964
CA	Sunnyvale, Equip. Sls.	408-739-8011
CA	Van Nuys, Environment Assocs.	213-997-3791
CO	Englewood, Tenney Engrg.	303-798-0955
CT	Hamden, Equip. Sls.	203-281-4578
FL	Altamonte Springs, Equip. Sls.	305-339-2972
FL	Coral Springs, Equip. Sls.	305-781-3522
IL	Des Plaines, Marsland Assocs.	312-298-2620
IN	Indianapolis, Marsland Assocs.	317-293-5437
MD	Wheaton, Brimberg Sls.	301-946-2670
MA	Lowell, Equip. Sls. Co.	617-459-7000
MI	Warren, Dietrich & Assoc.	313-751-4990
MO	Blue Springs, Tenney Engrg., Inc.	816-229-7667
NJ	Mt. Laurel, Dittco	609-235-4565
NJ	Union, Richard Wenke	201-686-7870
NY	Fayetteville, M. P. Andrews	315-637-3144
NC	Raleigh, Equip. Sls.	919-872-8376
OH	Cleveland, Dietrich & Assocs.	216-781-1855
OH	Dayton, Dietrich & Assoc.	513-223-6042
PA	Pittsburgh, Dietrich & Assoc.	412-892-2992
TX	Garland, Carey, McMahill & Zerbe Co.	214-681-1414
TX	Houston, Carey, McMahill & Zerbe Co.	713-771-1500
WA	Redmond, Tenney Engrg., Inc.	206-885-2054
WI	New Berlin, Marsland Assocs., Inc.	414-786-6611

TENOR, 17020 W. Rogers Dr., New Berlin, WI 53151, Tel: 414-782-3800, Telex: 26-706; Empl.: 30; *Sls. Mgr.:* P. Yoblin; *Dist. Mgr.:* P. Yoblin

TENSOLITE, Old Post Rd., Rte. 9A, Buchanan, NY 10511, Tel: 914-737-5600, TWX: 710-573-2341; Empl.: 350; *Sls. Mgr.:* David Yellin

TENSOR, Box 14843, Austin, TX 78761, Tel: 512-251-4131; Empl.: 15

TEN-TEC, Industrial Park, Sevierville, TN 37862, Tel: 615-453-7172, Telex: 261337 ACTAUR; Empl.: 110; *Sls. Mgr.:* Daniel Tomcik

TEPRO OF FLORIDA, 2608 Enterprise Rd., Clearwater, FL 33575, Tel: 813-796-1044; FSC No.: 15915; Empl.: 97; *Sls. Mgr.:* Roger C. Mayo; *Dist. Mgr.:* Olga G. Sumner

TERADO, 1068 Raymond Ave., St. Paul, MN 55108, Tel: 612-646-2868; Empl.: 17; *Sls. Mgr.:* Don Munson; *Dist. Mgr.:* Fred Munson

TERADYNE, INC., 183 Essex St., Boston, MA 02111, Tel: 617-482-2700, TWX: 710-321-1055; Empl.: 3200; *Sls. Mgr.:* D. O'Connell

TERADYNE CONNECTION SYS., 44 Simon St., Nashua, NH 03060, Tel: 603-889-5156, TWX: 710-228-1431; FSC No.: 31413; Empl.: 1,400; *Sls. Mgr.:* D. Murphy

TERMINAL DATA CORP., 11878 Coakley Circle, Rockville, MD 20852, Tel: 301-881-7655; Empl.: 12

TERMINAL SYS., See A & B Technical Services

TERRA TECHNLG. CORP., 3860 148th Ave. N.E., Redmond, WA 98052, Tel: 206-883-7300, Telex: 15-2070; *Sls. Mgr.:* Irl Davis

TEST & MEASUREMENT SYSTEMS, INC., 349 Cobalt Way, Ste. 301, Sunnyvale, CA 94086, Tel: 408-720-8877, Telex: 297584 TEAM UR; *Sls. Mgr.:* George Stoeppel

TESTLINE, See Fairchild Test Sys. Grp., Testline Instrs.

TESTOTERM, P.O. Box 111509, Nashville, TN 37211, Tel: 615-834-5082, Telex: 55-5112

TEST PROBES, INC., Box 2113, La Jolla, CA 92038, Tel: 619-459-4197, Telex: 697192; *Sls. Mgr.:* Hal Wardein; *Dist. Mgr.:* Hal Wardein ....3•1379

Local Distributors

AL	Huntsville, W. A. Brown Instrs.	205-883-8860
AZ	Phoenix, Metermaster	602-243-4111
CA	Hayward, Allied Elctrns.	415-487-5250
CA	Irvine, Western Elctrn. Supp.	714-751-3941
CA	Los Angeles, Metermaster	213-685-7340
CA	Los Angeles, Allied Elctrns.	213-725-7111
CO	Englewood, Beta Distrs.	303-779-4494
CT	Monroe, Connecticut Cal Labs	203-261-9518
FL	Fort Lauderdale, Allied Elctrns.	305-486-0500
GA	Norcross, Metermaster	404-446-0166
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Rolling Meadows, Commodore 1	312-394-5441
IN	Indianapolis, Commodore 1	317-636-3318
KS	Kansas City, Commodore 1	816-842-8585
LA	Baton Rouge, Beta Eistrs.	504-924-6826
MD	Burtonsville, Eastern Instrmn.	301-384-8500
MA	Burlington, Contact East	617-272-5051
MA	Natick, Calcotron	617-879-7650
MI	Royal Oak, The Satullo Co.	313-549-3910
MN	Minneapolis, Commodore 1	612-370-0881
MO	St. Louis, Commodore 1	314-454-0138
NJ	Belle Meade, Gestalt Sys.	201-359-0018
NM	Albuquerque, Beta Distrs.	505-299-7658
NY	Bayshore, Caesar Elctrns.	516-242-8477
NY	Great Neck, The Instr. Mart	516-487-7430
NY	Mineola, Allied Elctrns.	516-248-2360
NY	New York City, Advance Elctrns.	212-730-7030
NC	Pineville, E.M.I.S.	704-588-4624
OH	Cleveland, Metermaster	216-651-4100
OH	Willoughby, Allied Elctrns.	216-951-0908
OR	Portland, Westcon	503-283-0132
PA	Bala Cynwood, Allied Elctrns.	215-667-6940
TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Garland, Metermaster	214-271-5671
UT	Murray, Beta Distrs.	801-262-3000
VA	Norfolk, Priest Elctrns.	804-855-0105
WA	Seattle, Allied Elctrns.	206-767-5772
WI	Milwaukee, Allied Elctrns.	414-463-2662

TETTEX INSTRUMENTS, INC., P.O. Box 281, Fairview Village, PA 19409-0281, Tel: 215-539-6050, Telex: 753-899 TETTEX; Empl.: 100; *Sls. Mgr.:* R. E. Seeberger ....3•1309

TEXAS INSTRS., INC., Box 225012-MS-84, Dallas, TX 75265, Tel: 214-995-6611, TWX: 910-867-4702; Empl.: 85,000

TEXAS INSTRS., Data Sys. Group, P.O. Box 2909 MS 2222, Austin, TX 78769, Tel: 214-995-6611, Telex: 73324 TEXINS DAL, TWX: 910-867-4702; Empl.: 80,696

TEXAS INSTRS., Matls. & Controls Grp., 34 Forrest St., Attleboro, MA 02703, Tel: 617-699-3800, Telex: 92-7708, TWX: 710-346-0566

TEXAS TRANSFORMER CORP., P.O. Box 220, Plano, TX 75074, Tel: 214-424-1581; *Sls. Mgr.:* David Keeler

Distributor

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TEXMATE INC

TEXMATE, INC., 348 S. Cedros Ave., P.O. Box 2000, Solana Beach, CA 92075, Tel: 619-481-7177, TWX: 910-322-1738; Empl.: 36 ....3•1351-1355

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Intl	Australia, Sydney	(02) 792-9222
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Intl	Germany, Dusseldorf	02 11/66 61 45
Intl	Germany, Hanover	05 11/88 6086
Intl	Germany, Munich	089-47 3023
Intl	Germany, Quickborn	041 06/612-1
Intl	Germany, Stuttgart	07 11/73 63 57
Intl	India, Bangalore	812-52321; 812-52322
Intl	Spain, Barcelona	(93) 692-35-19
Intl	Sweden, Stockholm	08-710 06 20
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Can	Edmonton	403-432-7746
Can	Montreal	514-337-0425
Can	Ottawa	613-238-7077
Can	Toronto	416-238-3193

TEXSCAN INSTRUMENTS, 3169 N. Shadeland, Indianapolis, IN 46226, Tel: 317-545-4196, Telex: 810-341-3184, TWX: 27-2110; FSC No.: 23042; Empl.: 765; *Sls. Mgr.:* Alan Whitlock; *Dist. Mgr.:* Rob Shenlot

TEX-TECHS INTL., 10021 Cayuga, Dallas, TX 75228, Tel: 214-328-6200, Telex: 73-0796 TEX TECH DAL; *Sls. Mgr.:* Rick Prindle

TEXTOOL PRODUCTS, Electronic Products Division/3M, 1410 W. Pioneer Dr., Irving, TX 75061, Tel: 214-259-2676; *Sls. Mgr.:* Marlan Carlson

Local Sales Offices & Reps

AK	Anchorage	907-561-1030
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GA	Atlanta	404-447-7000
HI	Honolulu	808-422-2721
IL	Chicago	312-496-6500
MA	Boston	617-449-0300
MI	Detroit	313-477-5000
MN	St. Paul	612-733-3300
MO	St. Louis	314-997-8500
NJ	West Caldwell	201-575-2000
NC	High Point	919-889-7181
OH	Cincinnati	513-482-3100
OH	Cleveland	216-362-1700
PA	Philadelphia	215-728-5300
TX	Dallas	214-324-8100
WA	Seattle	206-244-7200

T-F ELCTRNS., 9415 Neils Thompson Dr., Austin, TX 78759, Tel: 512-836-7323, Telex: 77-6427; FSC No.: 50307; Empl.: 55

TGM DETECTORS, INC., 166 Bear Hill Rd., Watham, MA 02154, Tel: 617-890-2090

THERMAL AMER. FUSED QUARTZ, Change Bridge Rd., Montville, NJ 07045, Tel: 201-334-7770, Telex: 136477; Empl.: 65; *Sls. Mgr.:* G.A. Miller

THERMALLOY, INC., 2021 W. Valley View, Dallas, TX 75234, Tel: 214-243-4321, TWX: 910-860-5542; Empl.: 250; *Sls. Mgr.:* L. Tucker

THERMAX WIRE, 32-02 Linden Pl., Flushing, NY 11354, Tel: 212-939-8300, Telex: 645587, TWX: 710-582-2551; FSC No.: 12814; Empl.: 220; *Sls. Mgr.:* R. Prusak

Therm O Disc®

THERM-O-DISC, INC., Sub. Emerson Elec. Co., 1320 South Main St., P. O. Box 3538, Mansfield, OH 44907, Tel: 419-756-5911, Telex: 987455; *Sls. Mgr.:* J. A. Kight ....1B•1823

THERMODYNE INTERNATIONAL LTD., 20850 S. Alameda, Long Beach, CA 90810, Tel: 213-603-1976; *Sls. Mgr.:* Walter Wolf

THERMO ELEC., 109 Fifth St., Saddle Brook, NJ 07662, Tel: 201-843-5800, TWX: 710-990-5108; Empl.: 350; *Sls. Mgr.:* H. Korman

THERMOELECTRICS, See Borg-Warner Thermoelectrics.

THERMOGRAPHICS MEASUREMENTS LTD., 3733 W. 139th St., Hawthorne, CA 90250, Tel: 213-675-9182, Telex: 674432; *Sls. Mgr.:* Andrew Hilbert

THERMOLAB, 13345 Saticoy St., N. Hollywood, CA 91605, Tel: 213-875-0105, Telex: 662494, TWX: 910-499-2156

THERMOMETRICS, INC., 808 U.S. Hwy. #1, Edison, NJ 08817-4695, Tel: 201-287-2870, Telex: 844-387; FSC No.: FSCM 58090; Empl.: 150; *Sls. Mgr.:* Harold Broitman ....1B•1825

Local Sales Offices & Reps

CA	Garden Grove, Elsco Elctrns.	714-891-4621
CA	San Diego, Elsco Elctrns.	619-292-1771
NY	Central Square, Bastian Sls. Agy.	315-668-2957
NY	Fairport, Bastian Sls. Agy.	716-223-0237

THERMONICS, 3350 Scott Blvd., Bldg. 32, Santa Clara, CA 95051, Tel: 408-496-6838, Telex: 172-353; *Sls. Mgr.:* James D. Martin; *Dist. Mgr.:* James D. Martin

THERMOPLASTIC PROCESSES, INC., 1268 Valley Rd., Stirling, NJ 07980, Tel: 201-647-1000, TWX: 710-997-9583; FSC No.: 08230; *Sls. Mgr.:* Robert B. Scheffler; *Dist. Mgr.:* William Kaufman

THERMOSEN, P.O. Box 1254, Stamford, CT 06904, Tel: 203-324-6125, Telex: 965846; FSC No.: 00428; Empl.: 33

Local Sales Offices & Reps

CA	San Carlos, Elctrn. Engrg. Assoc.	415-593-2189
CA	Santa Monica, REP Assoc.	213-393-9666
CO	Denver, Lindberg Co.	303-758-9033
FL	Melbourne, Electro Mechanical Standards	305-724-1027
MA	Newton, Normell Assocs.	617-969-5478
MN	Minneapolis, Intl. Sls. Co.	612-831-8423
NM	Albuquerque, Lindberg Co.	505-881-1006
OH	Cincinnati, John O. Olsen Co.	513-574-7711
OH	Cleveland, John O. Olsen Co.	216-662-3454
OR	Portland, Syscom	503-644-2505
PA	Glenside, Elcom, Inc.	215-885-1715
PA	Pittsburgh, John O. Olsen Co.	412-279-2550
TX	Austin, John B. Guenther, Inc.	512-472-3825
TX	Dallas, John B. Guenther, Inc.	214-691-8500
TX	Houston, John B. Guenther, Inc.	713-974-0383
UT	Salt Lake City, Lindberg Co.	801-467-1794
VT	Bennington, Magyar Assocs.	802-442-5858
WA	Kirkland, Syscom Sls.	206-821-4575

THERMOTECH, See ITT Thermotech.

THETA INSTR. CORP., 24 Dwight Pl., Fairfield, NJ 07006, Tel: 201-227-1700, Telex: 13-8621; Empl.: 85; *Sls. Mgr.:* R. Kemp

THICKFILM INT'L., Rt. 1-Box 85-0, Indian Head, MD 20640, Tel: 301-375-8666, TWX: 710-829-0590; Empl.: 14; *Sls. Mgr.:* P. Gundotra

THIELEX PLASTICS CORP., 201 11th St., Piscataway, NJ 08854, Tel: 201-968-5300, TWX: 710-997-9662; *Sls. Mgr.:* M. A. DeMatteo

THINCO DIV., HULL CORP., Davisville Rd., Hatboro, PA 19040, Tel: 215-672-7800, TWX: 510-665-6822; Empl.: 8; *Sls. Mgr.:* John L. Hull

THIRD DOMAIN, P.O. Box 35400, Tucson, AZ 85740-5400, Tel: 602-293-6310; Empl.: 26; *Sls. Mgr.:* Julia Gerdes

T&B
Electronics Group

THOMAS & BETTS, Electronics Group Hdqtrs., 920 Route 202, Raritan, NJ 08869, Tel: 201-469-4000, Telex: 844372; FSC No.: 59730; Empl.: 2000 ....2•1593-1612

Local Sales Offices & Reps

CA	Burbank, T & B Elctrns. Grp.	213-841-9670
CA	San Jose, T & B Elctrns. Grp.	408-248-9111
IL	Naperville, T & B Elctrns. Grp.	312-357-0404
NJ	Flemington, T & B Elctrns. Grp.	201-788-5900

Local Distributors

AL	Huntsville, Hall-Mark	205-837-8700
AZ	Phoenix, Hall-Mark	602-243-6601
AZ	Phoenix, Wyle Labs., Elctrns. Mktg. Grp.	602-249-2232
AZ	Tempe, Time Elctrns.	602-967-2000
CA	Anaheim, Time Elctrns.	714-937-0911
CA	El Segundo, Hall-Mark	213-643-9101
CA	Irvine, Wyle Labs., Elctrns. Mktg. Grp.	714-863-1611
CA	Los Angeles, Wyle Labs., Elctrns. Mktg. Grp.	213-322-8100
CA	Orange County, Hall-Mark	714-669-0662
CA	Riverside, Electronic Supp.	714-683-7300
CA	San Diego, Hall-Mark	619-268-1201
CA	San Diego, Wyle Labs., Elctrns. Mktg. Grp.	619-565-9171
CA	San Fernando, Hall-Mark	818-716-7300
CA	San Jose, Hall-Mark	408-946-0900
CA	Santa Clara, Wyle Labs., Elctrns. Mktg. Grp.	408-727-2500
CA	Sunnyvale, Time Elctrns.	408-734-9888
CA	Torrance, Time Elctrns.	213-320-0880
CO	Denver, Hall-Mark	303-790-1662
CO	Denver, Wyle Labs., Elctrns. Mktg. Grp.	303-457-9953
CT	Wallingford, Marshall Inds.	203-265-3822
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Ft. Lauderdale, Hall-Mark	305-971-9280
FL	Orlando, Pioneer	305-834-9090
FL	Orlando, Hall-Mark	305-855-4020
FL	Tampa Bay, Hall-Mark	813-530-4543
GA	Atlanta, Marshall Inds.	404-923-5750
GA	Atlanta, Hall-Mark	404-447-8000
IL	Chicago, Pioneer	312-437-9680
IL	Chicago, Hall-Mark	312-860-3800
IN	Indianapolis, Pioneer	317-849-7300
KS	Kansas City, Hall-Mark	913-888-4747
MD	Baltimore, Hall-Mark	301-988-9800
MD	Columbia, Time Elctrns.	301-964-3090
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MA	Boston, Marshall Inds.	617-272-8200
MA	Burlington, Lionex Corp.	617-272-9400
MA	Woburn, Time Elctrns.	617-935-8080
MI	Livonia, Pioneer	313-525-1800
MN	Minneapolis, Hall-Mark	612-854-3223
MN	Twin Cities, Pioneer	612-935-5444
MO	St. Louis, Hall-Mark	314-291-5350
MO	St. Louis, Time Elctrns.	314-391-6444
NJ	Cherry Hill, Hall-Mark/Philadelphia	609-424-7300
NJ	Fairfield, Lionex Corp.	201-227-7960
NJ	Fairfield, Hall-Mark	201-575-4415
NY	Binghamton, Marshall Inds.	607-754-1570
NY	Farmingdale, Iris Elctrns.	516-420-8400
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Hauppauge, Lionex Corp.	516-273-1660
NY	Mt. Vernon, QAR Indl. Elctrns.	516-484-9207
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rochester, Marshall Inds.	716-235-7620
NC	Charlotte, Pioneer	704-527-8188
NC	Raleigh, Hall-Mark	919-872-0712
OH	Cleveland, Hall-Mark	216-473-2907
OH	Cleveland, Pioneer	216-587-3600
OH	Columbus, Hall-Mark	614-891-4555
OH	Dayton, Pioneer	513-236-9900
OK	Tulsa, Hall-Mark	918-665-3200
OR	Beaverton, Almac Elctrns.	503-641-9070
OR	Portland, Wyle Labs., Elctrns. Mktg. Grp.	503-640-6000
PA	Broomall, Time Elctrns.	215-359-1200
PA	Delaware Valley, Pioneer	215-674-4000
PA	Horsham, Lionex Corp.	215-443-5150
PA	Pittsburgh, Pioneer	412-782-2300
TX	Austin, Hall-Mark	512-258-8848
TX	Austin, Pioneer	512-835-4000
TX	Dallas, Southwest Elctrns.	214-234-3050
TX	Dallas, Pioneer	214-386-7300
TX	Dallas, Hall-Mark	214-341-1147
TX	Houston, Hall-Mark	713-781-6100
TX	Houston, Southwest Elctrns.	713-491-4900
TX	Houston, Pioneer	713-988-5555
UT	Salt Lake City, Wyle Labs., Elctrns. Mktg. Grp.	801-974-9953
WA	Bellevue, Almac Elctrns.	206-643-9992
WA	Seattle, Wyle Labs., Elctrns. Mktg. Grp.	206-453-8300
WI	Milwaukee, Electronic Expeditors	414-228-8100
WI	Milwaukee, Hall-Mark	414-761-3000

THOMAS & SKINNER, Box 150 B, Indianapolis, IN 46206, Tel: 317-923-2501, Telex: 02-7335; Empl.: 250; *Sls. Mgr.:* Sherman Smith

THOMAS ELCTRNS., 100 Riverview Dr., Wayne, NJ 07470, Tel: 201-696-5200, TWX: 710-988-5836; Empl.: 380; *Sls. Mgr.:* Ben Setticase

Local Sales Offices & Reps

CA	Los Altos, Cain-White & Co.	415-948-6533
CO	Wheatridge, Waugaman Assocs.	303-423-1020
MA	Norwood, MPS Elctrns.	617-769-8700
NJ	Fairfield, Pantronics	201-575-1177
OR	Portland, Components West	503-643-5588
PA	Flourtown, Eastern Comps.	215-836-1616
TX	Irving, Space Elctrns.	214-251-3636
VA	Herndon, Eastern Comp.	703-471-1025
WA	Seattle, Components West	206-243-2133
EXP	NJ, Oradell, Sylvan Ginsbury	201-261-3200
EXP	NY, New York, Far East Mercantile (KBK)	212-687-8564

THOMSON-CSF COMPS CORP., Dumont Div., 550 Mt. Pleasant Ave., Dover, NJ 07801, Tel: 201-328-1400

THOMSON-CSF COMPS. CORP., DuMont Div., 750 Bloomfield Ave., Clifton, NJ 07015, Tel: 201-773-2000; FSC No.: 18778; Empl.: 250; *Sls. Mgr.:* George Petro

THOMSON-CSF COMPS. CORP., Electron Tube Div., 301 Route 17 N., Rutherford, NJ 07070, Tel: 201-438-2300, TWX: 710-989-7286; *Sls. Mgr.:* Stephen Barthelmes

THOMSON-CSF COMPS. CORP., Metals & Chemicals Div., 6660 Variel Ave., Canoga Pk., CA 91303, Tel: 213-887-1010, Telex: 69-8481, TWX: 910-494-1954; Empl.: 3; *Sls. Mgr.:* Wm. E. Wheeler

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Local Sales Offices & Reps

AL	Huntsville, E.S.I.	205-533-1735
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CO	Englewood, Grimes Mktg. Co.	303-740-6063
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IL	Itasca, L-Tec, Inc.	312-773-2900
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OH	Cincinnati, Frank J. Campisano Co.	513-574-7111
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WA	Mercer Island, Elctrn. Comp Sls.	206-232-9301

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THOMSON-CSF COMPS. CORP., Special Prods. Div., 301 Rte. 17 North, Rutherford, NJ 07070, Tel: 201-438-2300, TWX: 710-989-7286; *Sls. Mgr.:* Hans H. Sandager

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THOR ELCTRNS., 321 Pennsylvania Ave., Linden, NJ 07036, Tel: 201-486-3300, Telex: 138 968; Empl.: 50; *Sls. Mgr.:* Jack Rose

THORN EMI GENCOM INC., 23 Madison Rd., Fairfield, NJ 07006, Tel: 516-433-5900, Telex: 22-1236 TEGI UR; Empl.: 35; *Sls. Mgr.:* L. Lieberman ....**1A•2366, 2367**

Local Sales Offices & Reps

AZ	Phoenix, Odessey-1	505-883-4019
CA	N. Hollywood, O'Halloran Assocs.	213-877-0173
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CO	Denver, Odessey-1	505-883-4019
FL	Orange Park, Pulcir	904-264-7615
NM	Albuquerque, Odessey-1	505-883-4019
PA	Elkins Park, Snow Assocs.	215-379-4700
TN	Oak Ridge, Pulcir	615-483-6358
TX	Dallas, SW Eng. & Equip.	214-340-1741
TX	Houston, SW Eng. & Equip.	713-820-2500
WA	Seattle, Underwood Assocs.	206-451-8223

THORN EMI TECHNOLOGY INC., 8601 Dunwoody Pl., Atlanta, GA 30338, Tel: 404-587-0017, 800-243-2572, TWX: 810-766-2267 ....**3•1310**

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NM	Albuquerque	505-884-0541
VA	Reston	703-620-6056

THORSON ENGRG. CO., 6225 76th St. S.E., Snohomish, WA 98290, Tel: 206-334-4214

3D OPTICS, Box 224, 4 Strathmore Cir., Braintree, MA 02184, Tel: 617-848-8002; Empl.: 2

3M CO., see listing under letter "M"

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TIDEWATER TECHNOLOGICAL, INC., 611 Industrial Pk. Dr., Newport News, VA 23602, Tel: 804-874-2800; Empl.: 25

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FL	St. Petersburg, Southern Engrg. Assocs.	813-577-7700
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MA	Westwood, Northern Computer Sls. (OEM)	617-326-3454
MN	St. Paul, ACT Comms.	612-738-7794
TX	Bonham, ACT Comms.	214-583-9541

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CT	Hamden, MacArthur & Co.	203-281-5847
FL	Coral Springs, CBC Elctrns.	305-755-1111
FL	Orlando, CBC Electronics	305-831-5380
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HI	Honolulu, Dougherty Enterprises	808-395-4114
IL	Berkeley, Cadre Technical Reps.	312-449-3900
IN	Indianapolis, Baehr, Greenleaf & Assoc.	317-842-6204
IA	Cedar Rapids, PMR, Inc.	319-362-9177
KS	Overland Park, PMR, Inc.	913-381-0004
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TX	Houston, Ammon & Rizos	713-781-6240
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WA	Bellevue, Elctrn. Sources	206-643-0400

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CA	Los Angeles, Radio Hardware	213-679-3381
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TITCHENER, E. H., & CO., 1 Titchener Pl., Binghamton, NY 13902, Tel: 607-772-1161, TWX: 510-252-1985; Empl.: 235

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Distributor

TNR TECHNICAL INC., Saft & Gould/Portable Battery Div., 63 Marine St., Farmingdale, NY 11735, Tel: 516-249-3777; *Sls. Mgr.:* Wayne Thaw p.762

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NH	Nashua, Northeast Reps.	603-880-8199
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NY	Charlotte, R. W. Mitscher Co.	704-598-8644
NY	E. Syracuse, Nycom	315-437-8343
NC	Raleigh, R. W. Mitscher Co.	919-848-0941
OH	Akron, Imtech, Inc.	216-666-1185
OH	Dayton, Imtech, Inc.	513-278-6507
PA	Pittsburgh, Imtech, Inc.	412-344-0844
TN	Johnson City, R. W. Mitscher Co.	615-929-7258
TX	Austin, J. Clay Co.	512-346-7340
TX	Dallas, J. Clay Co.	214-350-1281
UT	Midvale, PLS Assocs.	801-566-0671
VA	McLean, Creative Mktg. Assocs.	703-442-9100
WA	Bellevue, Venture Elctrns.	206-454-4594

TODD SYSTEMS, 50 Ash St., Yonkers, NY 10701, Tel: 914-963-3400; Empl.: 45; *Sls. Mgr.:* S. Edwards .... **1A**•2308-2311

Local Distributors

AL	Mobile, Irving Ripps Supp.	205-432-3068
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FL	Miami, Graybar Elec.	305-325-0910
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IL	Chicago, Irv. Wolfson Co.	312-267-7828
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MD	Bethesda, Albee Sales	301-897-8088
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NY	Bronx, Rim Elctrns.	212-295-4300
NY	L.I.C., H.L. Dalis Elctrns.	212-361-1100
NY	New York City, Rosetta Elec.	212-247-6430
OH	Lima, Lima Elec. Parts	419-227-7327
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PA	Philadelphia, H & Z Sls.	215-WA2-2500
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TOKO AMERICA, INC., 5520 W. Touhy Ave., Skokie, IL 60077, Tel: 312-677-3640, Telex: 230-724372; *Sls. Mgr.:* Greg Dugan .... **1A**•1282, 1575, 1631

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IL	Chicago, Esco Assocs.	312-763-0800
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IL	Skokie, Toko America Inc.	312-674-3640
MI	Troy, Zimmerman & Sons	313-879-1150
VA	Lynchburg, M&S Mfg.	804-528-0681

TOKYO ELEC. CO., LTD., 1-1 Nishiki-Cho, Kanda, Chiyoda-Ku, Tokyo, 101 , Japan, Tel: (03) 292-1011, Telex: 0222-3575, TWX: S

TOPAZ ELECTRONICS, 9192 Topaz Way, San Diego, CA 92123-1164, Tel: 619-279-0831, TWX: 910-335-1526; FSC No.: 06049; Empl.: 450; *Sls. Mgr.:* Ruxton Tucker; *Dist. Mgr.:* Chuck Roberts

TOPFLIGHT, 160 East 9th Ave., York, PA 17404, Tel: 717-843-9901, TWX: 510-657-4849; Empl.: 250; *Sls. Mgr.:* James Danser

TORAD COIL CO., INC., 283 Linden Rd., Wayne, NJ 07470, Tel: 201-835-6195; *Sls. Mgr.:* Dan Gupta

TORELCO INC., 14 Paine Ave., P.O. Box 108, Irvington, NJ 07111, Tel: 201-374-8641; Empl.: 20; *Sls. Mgr.:* Stewart H. Cook

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TORIN CORP., 100 Franklin Drive, Torrington, CT 06790, Tel: 203-482-4422, Telex: 962-456, TWX: 710-439-2343; Empl.: 1300; *Sls. Mgr.:* Robert S. Sobolewski

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CA	Redwood City, Hickey Industrial Sls.	415-368-3849
CA	San Diego, California Elctrn. Mktg.	619-692-3551
CA	Santa Ana, Calif. Elctrn. Mktg.	714-835-2702
CO	Broomfield, Ramark	303-469-1758
GA	Atlanta, L & D Inc.	404-455-3483
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Hiawatha, Gassner & Clark Co.	319-393-5763

KS	Overland Park, AME Sls.	913-262-3971
MD	Towson, Dickison Sls. Co.	301-823-0923
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NY	Endicott, Advanced Comps.	607-785-3191
NY	Manhasset, Win-Cor Elec. Sls.	516-627-9474
NY	Rochester, Advanced Comps.	716-544-7017
NY	Scottsville, Advanced Comps.	716-889-1429
NY	Syracuse, Advanced Comps.	315-699-2671
NC	Greensboro, L & D Inc.	919-292-3201
NC	Raleigh, L & D Inc.	919-876-5301
OH	New Lebanon, J. N. Bailey Assoc.	513-687-1325
OH	Westlake, JN Bailey & Assocs.	216-892-1513
PA	Birchrunville, Jadelectronic Assocs.	215-296-3800
PA	Philadelphia, Jadelectronics	215-455-0664
TN	Seymour, L & D, Inc.	615-577-1549
TX	Austin, Oeler & Menelaides	512-453-0275
TX	Dallas, Oeler & Menelaides	214-361-8876
TX	Houston, Oeler & Menelaides	713-772-0730

TOROTRON, 230 E. 7th St., Mt. Vernon, NY 10550, Tel: 914-664-2050; Empl.: 14; *Sls. Mgr.:* Lee Abramson ......**3**•1311

TORQ CORP., 32 W. Monroe St., Bedford, OH 44146, Tel: 216-232-4100; Empl.: 135

TORRINGTON CO., 59 Field St., Torrington, CT 06790, Tel: 203-482-9511; *Sls. Mgr.:* N. W. Couch

TORWICO ELCTRNS. INC., Rte. 70, Lakewood, NJ 08701, Tel: 201-364-1800, TWX: 710-723-8343; Empl.: 240 ......**1A**•2322, 2323

Local Sales Offices & Reps

CA	El Cajon, KCE Corp.	619-588-1198
CA	Menlo Park, Long and Assocs.	415-327-1300
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IA	Davenport, Ensco Rep	319-386-6600
KS	Overland Park, Ensco Rep	913-381-7557
KS	Wichita, Ensco Rep	316-683-1070
MD	Riderwood, W. S. Warrington & Assoc.	301-823-8759
MA	Hingham, N.E. Reps.	617-749-8700
MO	Maryland Heights, Ensco Rep	314-423-3935
NJ	Marlton, BGR Assocs.	609-983-1020
NY	Albany, H. C. Johnson	518-459-1239
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NY	Rochester, H. C. Johnson	716-586-0777
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TX	Irving, Kite Elctrns. Sls. Co.	214-438-9336

TOSHIBA CORPORATION, See General Products Corp.

TOWNSEND INDUSTRIES, 51 Carl Rd., Orange, CT 06477, Tel: 203-795-0241, TWX: 710-465-1898; *Sls. Mgr.:* Charles Dorsa

TOYO COMM. EQUIP. CO., LTD., No. 8 Nori Bldg., 20-4, Nichi-Shimbashi, 3-Chome Minato-Ku, Tokyo 105, Japan, Tel: 03-436-2180, Telex: 02423115 Toyocoj.; Empl.: 1800; *Sls. Mgr.:* T. Nagai

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UT	Salt Lake City, Technology Mktg., Inc.	801-363-3303
VA	Roanoke, Cox Sls. Co.	703-345-2636
WA	Mukilteo, Krippner & Assoc.	206-743-3579
WI	Milwaukee, Ellsworth Systems	414-352-1230

TRACOR INSTRUMENTS, 6500 Tracor La., Bldg. 27, Austin, TX 78721, Tel: 512-929-2051, TWX: 910-874-1366; Empl.: 7800; *Sls. Mgr.:* Harry L. Thomas; *Dist. Mgr.:* Will Hoover

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TRAK MICROWAVE, 735 Palomar Ave., Sunnyvale, CA 94086, Tel: 408-735-9660, TWX: 910-339-9309; FSC No.: 29111; *Sls. Mgr.:* Thomas L. Roberts ......**1A**•1783

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FL	Sarasota, Bass Assocs.	813-922-9538
GA	Atlanta, Magaro & Assocs.	404-451-8862
IN	Ft. Wayne, TX Sales	219-489-4447
MD	Ashton, Blackwood Assocs.	301-924-2858
MA	Cochituate, High-Tech Sls., Inc.	617-653-3838
NM	Albuquerque, Jim Smith Assocs.	505-265-3406
NC	Greensboro, Magaro & Assocs.	919-294-4783
PA	Huntingdon Valley, Rabal Assocs.	215-947-4825
TX	Arlington, J. T. Houston Assocs.	817-265-2931
EXP	CT, Stamford, Dage Corp.	203-324-3123

TRANSAMERICA DELAVAL, Gems Sensors Div., Cowles Rd, Plainville, CT 06062-9990, Tel: 203-677-1311, Telex: 99-306; Empl.: 203; *Sls. Mgr.:* M. W. Brown; *Dist. Mgr.:* M. W. Brown

TRANS AMERICAN TRANSFORMER, 142 Peconic Ave., Medford, NY 11763, Tel: 516-654-1880; Empl.: 23; *Sls. Mgr.:* Joe Latimer ......**1A**•2325

Local Sales Offices & Reps

CT	Washington, Tri-Com Assocs.	203-563-2241
FL	Melbourne, Reynolds & Assocs., Inc.	305-259-7000
GA	Acworth, Reynolds & Assocs., Inc.	404-451-9558
MA	Burlington, Tri-Com Assocs.	617-272-8163
NC	Winston-Salem, Reynolds & Assocs.	919-725-6196
PA	Philadelphia, Technical Instr. Sls. Co.	215-836-2222

TRANSCO PRODS., 4241 Glencoe Ave., Marina del Rey, CA 90291, Tel: 213-822-0800, Telex: 65-2448, TWX: 910-343-6469; Empl.: 400; *Sls. Mgr.:* T. G. Katter

Local Sales Offices & Reps

CA	Marina del Rey, Michael Robinson	213-822-0800
CA	San Jose, Jon Walker	408-244-6150
CA	San Juan Capistrano, Bruce Ridill	714-643-0506
GA	Marietta, John Underhill	404-977-5819
MD	Ellicott City, VPI, Inc.	301-461-2525
MA	Acton, Rollie Merrick	617-275-1247
MO	Ellisville, Hi Grant Wilson	314-227-0737
NY	Bayside, R. L. Diamond Inc.	212-423-7330
PA	Dresher, Joseph Belcher	215-886-4806
TX	Richardson, Ronald B. Patton	214-669-1951
WA	Bellevue, Poggi Assocs., Inc.	206-454-2026

TRANSDUCERS and SYSTEMS

TRANSDUCERS AND SYSTEMS INC., A Prime Technology Company, Twin Lakes Rd., P.O. Box 185, N. Branford, CT 06471, Tel: 203-481-5721, TWX: 710-452-3092; Empl.: 60; *Sls. Mgr.:* J. L. Jamieson ......**1B**•1880

Local Sales Offices & Reps

CA	Huntington Beach, Transducer Sys.	714-840-5357
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CT	Washington, Tri-Com Assocs.	203-563-2241
FL	Indian Rocks Beach, PAR Assocs.	813-596-8841
GA	Atlanta, PAR Assocs.	404-391-9117
IL	Des Plaines, Marsland Assocs.	312-298-2620
IA	Cedar Rapids, Marsland Assocs.	319-396-8030
MA	Burlington, Tri-Com Assocs.	617-272-8163
MI	Mt. Clemens, O'Hara Assocs.	313-791-7140
MN	Minneapolis, Marsland Assocs.	612-545-4481
MO	St. Louis, Marsland Assocs.	314-991-1399
NY	Binghamton, TAE-REP	607-772-6952
NY	Fishkill, TAE-REP	914-896-6966
NY	Rochester, TAE-REP	716-586-8710
OH	Dayton, RIXAN Assocs.	513-278-4216

TRANSDUCER SYSTEMS, INC., 1510 Delp Dr., Kulpsville, PA 19443, Tel: 215-256-4611, Telex: 846078; Empl.: 310 ......**1B**•1879

Local Sales Offices & Reps

CA	Burbank, J. D. Hannam & Assocs.	213-846-9378
CA	Santa Clara, Nelson Elctrn. Sls.	408-980-1950
MI	Madison Heights, L. C. Nyman & Co.	313-543-6520
MN	Mendota, GII Sls.	612-454-3086
OH	Chagrin Falls, K. F. Nauerz Co.	216-338-8450
OH	Cleveland, Staffco	216-331-5100

Transduktor®

TRANSDUKTOR INC., 600 Steamboat Rd., Greenwich, CT 06830, Tel: 203-661-5726, Telex: 996491 SID; *Sls. Mgr.:* Carl A. Svensson ......**1A**•2326-2328

TRANSENE, Rte. 1, Rowley, MA 01969, Tel: 617-948-2501; Empl.: 21; *Sls. Mgr.:* J. Doucette

TRANSFORMATION ELCTRNS. CORP., 170 Wilbur Pl., Bohemia, NY 11716, Tel: 516-563-1117, TWX: 510-222-0972; *Sls. Mgr.:* Ken Isabelle;David Baum ......**3**•1802

Local Sales Offices & Reps

CA	Pasadena, EMI	213-795-7193
CA	Sunnyvale, Schwerin & Merrill	408-735-7900
CO	Englewood, Elctrn. Comp. Sys.	303-781-5904
FL	Longwood, Boetto Corp.	305-331-1771
GA	Norcross, New South Mktg. Ltd.	404-449-1140
IL	Downers Grove, Spion Assocs.	312-963-7011
KS	Kansas City. BC Elctrns.	913-342-1211
MD	Pikesville, Imagitron Sls. Co.	800-638-3592
MA	Wakefield, Kentronics	617-246-0245
MN	Minneapolis, Bohlig & Assocs.	612-698-6921
TN	Morristown, New South Mktg. Ltd.	615-646-0154
TX	Arlington, Hite Elctrn. Sls. Co.	817-265-2912
WA	Bellevue, Elctrn. Mktg. Grp.	206-746-5915
WI	Brookfield, Sumer, Inc.	414-784-6641

TRANSFORMER DESIGN, INC., 78th & Clinton, Milwaukee, WI 53223, Tel: 414-358-5300

TRANSISTOR DEVICES, 274 S. Salem St., Randolph, NJ 07869, Tel: 201-361-6622; Empl.: 350; *Sls. Mgr.:* J. A. Gilson ......**3**•1312, 1313

Local Sales Offices & Reps

CA	Costa Mesa, FLW Inc.	714-751-7512
CA	Los Altos, Cain-White Co.	415-948-6533
GA	Atlanta, Magaro & Assocs.	404-252-6609
IL	Elmhurst, Scott Assocs.	312-279-5681
MD	Ellicott City, Dyna-Rep Co.	301-992-4350
MA	Lexington, E. F. Delfino, Inc.	617-862-1118
NJ	Ridgewood, Hansen Assocs.	201-652-7055
NY	North Syracuse, Advanee Components	315-699-2671
OH	Medina, McShane Inc.	216-725-4568
OR	Hillsboro, Controlek Sls.	503-640-8444
PA	Fort Washington, GCM Inc.	215-646-7535
TX	Lewisville, J. Hughes Co.	817-430-1683
VA	Alexandria, Dyna-Rep Co.	703-354-1222
EXP	NY, New York, Singer Prods.	212-432-1400

TRANSKINETIC SYS., 110 Shawmut Rd., Canton, MA 02021, Tel: 617-828-3000; Empl.: 7

TRANSMAGNETICS, 210 Adams Blvd., Farmingdale, NY 11735, Tel: 516-293-3100, TWX: 510-224-6420; FSC No.: 17755; Empl.: 40; *Sls. Mgr.:* Fred Haber ......**3**•1170, 1171

Local Sales Offices & Reps

CA	Santa Clara, Industrial Modules, Inc.	408-988-1911
TX	Bellaire, Seaton Corp.	713-731-2649
TX	Carrollton, Seaton Corp.	214-380-0414

TRANSMET CORP., 4290 Perimeter Dr., Columbus, OH 43228, Tel: 614-276-5522, 800-245-5253, TWX: 810-482-1016; *Sls. Mgr.:* Ronald A. Crossman; *Dist. Mgr.:* Robert M. Simon

TRANS-MET ENGRG., 601 S. Palm St., La Habra, CA 90631, Tel: 213-691-2266; Empl.: 25; *Sls. Mgr.:* Robert J. Powers

TRAN-SPECTRA, INC., Rte. 1-Box 27A, Greenfield, TN 38230, Tel: 901-235-2218; Empl.: 50; *Sls. Mgr.:* D. Cole

TRANS-TECH, 12 Meem Ave., Gaithersburg, MD 20760, Tel: 301-948-3800, Telex: 898-303, TWX: 710-828-0549; FSC No.: 14591; Empl.: 74; *Sls. Mgr.:* Blair W. Stiles; *Dist. Mgr.:* Blair W. Stiles

TRANS-TECH, INC., Alpha Inds., Inc., 20 Sylvan Rd., Woburn, MA 01801, Tel: 617-935-5150, Telex: 949436, TWX: 710-396-1236; FSC No.: 17540; *Sls. Mgr.:* Blair Stiles

TRANS-TEK, P.O. Box 338, Rte. 83, Ellington, CT 06029, Tel: 203-872-8351, Telex: 99207; FSC No.: 27109; Empl.: 35; *Sls. Mgr.:* William R. Padin

TRAN-TEC, Box 1044, Columbus, NE 68601, Tel: 402-564-2748; Empl.: 46; *Sls. Mgr.:* Cliff Schroeder

Local Sales Offices & Reps

CA	Redwood City, Woodworth Co.	415-365-0252
CA	Tustin, Sierra-Pacific Engrg. Co.	714-731-3411
CO	Golden, Pierce-Robbins Assocs.	303-399-6618
FL	Winter Park, Russell Assocs.	813-526-1134
GA	Atlanta, Russell Assocs.	404-225-8422
N	Indianapolis, Scott Elctrns, Inc.	317-897-9976
A	Cedar Rapids, Ard Sls. Co.	319-366-8733
MD	Bel Air, Russell Assocs.	301-879-9180
MA	Wakefield, H.C. Jappe Co.	617-245-9359
NJ	Fair Haven, Russell Assocs.	201-747-0600
NY	Bay Shore, Russell Assocs.	516-666-6500
NY	Cazenovia, Naylor Electric Co.	315-655-8174
OH	Cleveland, D. Steffen & Assocs.	216-461-8333
TX	Dallas, Russell Assocs.	214-699-0383
WA	Bellevue, Russell Assocs.	206-455-3694

TRAN-TROL CO., 2525 N. Alvernon Way, C-6, Tucson, AZ 85712, Tel: 602-795-8008

TRENDATA/STANDARD MEMORIES, 3400 W. Segerstrom, Santa Ana, CA 92704, Tel: 714-540-3605, TWX: 910-595-1596; Empl.: 200; *Sls. Mgr.:* M.S. Efron

TRENT, INC., 201 Leverington Ave., Philadelphia, PA 19127, Tel: 215-482-5000; Empl.: 55

TRIAD POWER SYSTEMS, 10362 Miller Road, Dallas, TX 75238, Tel: 214-341-8700; FSC No.: 214-341-1804; *Sls. Mgr.:* Jack Conn

Local Sales Offices & Reps

ME	Acton, Array Prods., Inc.	617-263-1128
MD	Bethesda, Powell-Pendergraph	301-656-4535
MI	Detroit, Datacenter Power	313-592-1082
NY	Piermont, Elctrl. Information Svcs.	914-359-4909
OK	Oklahoma City, Computer Power of Oklahoma	405-521-1163
OK	Tulsa, Computer Power of Oklahoma	918-252-5406
PA	Willow Grove, Powell-Pendergraph	215-657-0330
TX	Houston, SGA & Assocs., Inc.	713-688-6159
TX	San Antonio, Environmental & Power Sys. Inc.	512-699-0684
VA	Richmond, Powell-Pendergraph	804-270-1400

TRIAD-UTRAD

Standard Products

TRIAD-UTRAD, 1124 E. Franklin St., Huntington, IN 46750, Tel: 219-356-6500, TWX: 810-333-1532; Empl.: 750; *Dist. Mgr.:* Dave N. Miller .... **1A**•2330-2337; **3**•1918, 1919

Local Sales Offices & Reps

AK	Anchorage, H.J. Lang & Assocs.	907-279-5741
AZ	Phoenix, Steve Fisher Assocs.	602-247-7865
AR	Little Rock, J. Y. Schoonmaker Co.	501-375-2168
CA	Chino, Tracy Elec. Sls.	714-591-4736
CA	Santa Clara, Logan Sls.	408-496-0660
CO	Denver, West Inc.	303-692-0131
CT	Guilford, A&M Elctrn. Reps.	203-453-1612
FL	Maitland, Hutto-Hawkins-Peregoy	305-831-2474
GA	Atlanta, Effective Mktg. Force	404-948-6023
HI	Honolulu, Hawaii Elctrn. Svc.	808-845-8207
IL	Wilmette, J. Wasserman Assocs.	312-256-3566
KS	Overland Park, T.L. Dowell, Inc.	913-648-7373
LA	Little Rock, J. Y. Schoonmaker	501-375-2168
MA	Needham, A&M Elctrn. Reps.	617-444-8170
MN	Minneapolis, Elec. Comp. Sls.	612-933-2594
MO	St. Louis, T.L. Dowell, Inc.	314-849-4234
NJ	Medford, Champion Elctrn. Sls.	609-654-0475
NY	Rochester, Marchese, Marsey, Barden	716-544-4300
NY	Rockville Centre, Schmitt Industrial Mktg.	516-486-3510
OH	Cincinnati, F.E. Kahsar Sls.	513-922-3133
OH	Hudson, F.E. Kahsar Sls.	216-650-1089
OK	Tulsa, J.Y. Schoonmaker	918-936-1423
OR	Portland, J.J. Backer Co.	503-297-3777
OR	Salem, J. J. Backer Co.	503-362-0717
TX	Dallas, J. Y. Schoonmaker Co.	214-349-1650
WA	Seattle, J.J. Backer Co.	206-285-1300
EXP	Westbury, N.Y., Minthorne Int'l.	516-546-4700

Local Distributors

AL	Birmingham, Forbes Distributing	205-251-4104
AZ	Phoenix, Dalis Elctrn. Supply	602-275-2885
AR	Little Rock, Carlton Bates Co.	501-562-9100
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Mountain View, Abacus Elctrns.	415-961-1500
CA	Palo Alto, Zack Elctrns.	415-326-5432
CA	Riverside, Elctrn. Supply	714-683-7300
CO	Denver, Integrated Elctrns.	303-534-6121
FL	Ft. Lauderdale, Peerless Radio Corp. of Florida	305-973-4141
GA	Atlanta, Ack Radio Supply	404-351-6340
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Inds.	312-982-9210
IN	Lafayette, CWY Elctrns.	317-448-1611
IA	Cedar Rapids, Deeco, Inc.	319-365-7551
KY	Louisville, P. I. Burks Co.	502-589-3960
LA	New Orleans, William B. Allen Co.	504-525-8222
MD	Rockville, Capitol Radio Whls.	301-881-2270
MA	Burlington, Marshall Wilshire Elctrns.	617-272-8200
MA	Wilmington, Cronin Elctrns.	617-449-0500
MI	Grand Rapids, S-F Elctrns.	616-459-0216
MI	Livonia, R. S. Elctrns.	313-525-1155
MN	St. Paul, Gopher Elctrns.	612-483-4450
MO	St. Louis, Olive Industrial Elctrn.	314-426-4500
NE	Lincoln, Scott Elctrn. Supp. Corp.	402-466-8221
NH	Hudson, C & H Elctrns.	603-882-1133
NJ	Camden, General Radio Supp.	215-922-7037
NJ	Springfield, Route Elctrns.	201-379-7710
NM	Albuquerque, Electronic Parts Co.	505-293-6161
NY	Hauppauge, Broadline Elctrn. Distr.	516-231-4100
NY	Rochester, Simcona	716-328-3230
NY	Rockville Centre, Midway Indl. Elctrns.	516-764-2400
NY	Rome, Rome Elctrns.	315-337-5400
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Cleveland, Pioneer Standard Elctrns.	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OK	Tulsa, Combined Technlgs.	918-582-8242
OR	Portland, United Radio Supply	503-233-5346
PA	Philadelphia, Almo Electronics	215-698-4000
RI	Warwick, W. H. Edwards Elctrns.	401-781-8000
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Memphis, Bluff City Elctrns.	901-345-9500
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Houston, Altair Co.	713-462-3029
UT	Provo, Omega Elctrns.	801-375-4664
WA	Seattle, Almac	206-643-9992
WI	New Berlin, RM/Wisconsin	414-784-4420

TRI-COM, INC., 7304 Grove Rd., Frederick, MD 21701, Tel: 301-694-6666, Telex: 64828 TRICOM; Empl.: 35; *Sls. Mgr.:* Marc Vivori

TRIDAK, 1120 Federal Rd., Brookfield, CT 06804, Tel: 203-775-1287, TWX: 710-456-1372; Empl.: 20; *Sls. Mgr.:* Alan Boucher; *Dist. Mgr.:* F.C. Herot

TRI-DATA CORP., 505 E Middlefield Rd., Mountain View, CA 94043, Tel: 415-969-3700, Telex: 910-379-6978; Empl.: 173

TRILOG, 17391 Murphy Ave., Irvine, CA 92714, Tel: 714-549-4079, TWX: 910-595-2798; Empl.: 35; *Sls. Mgr.:* Jack Rice

TRIMM, INC., Div. of Newton Instr. Co., 400 W. Lake St., Box 489, Libertyville, IL 60048, Tel: 312-362-3700; Empl.: 90; *Dist. Mgr.:* H. Lewis

TRIM-TRONICS, INC., 67 Albany St., Cazenovia, NY 13035, Tel: 315-655-9528, TWX: 710-541-1530; Empl.: 20; *Sls. Mgr.:* James E. Dowd

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Local Sales Offices & Reps

AZ	Phoenix, Bill Earl & Assocs.	602-994-3813
CA	N. Hollywood, Bert Moore & Assocs.	818-877-5455
CA	San Rafael, Wright Assocs.	415-457-9940
FL	Tampa, J. R. Controls	813-961-9478
IL	Chicago, Jerry Golten Co.	312-792-1991
IN	Ft. Wayne, Walter W. Bieberich	219-432-2537
IN	New Albany, Walter W. Bieberich	812-945-3187
LA	Metairie, Automation Supplies	504-831-2183
MA	Hopkinton, Berkshire Elctrns.	617-435-9356
MI	Sturgis, Kesler Assocs.	616-651-7619
MO	St. Louis, Hill & Co.	314-432-1136
NJ	Burlington, V.D.E. Elctrn. Sls.	609-387-9331
NY	Rochester, V.D.E. Elctrn. Sls.	716-473-5015
OH	Cincinnati, Stegman Blaine Mktg.	513-729-1969
OH	Vandalia, Stegman Blaine Mktg.	513-890-7975

TRIO LABS., 80 Dupont St., Plainview, NY 11803, Tel: 516-349-0400, TWX: 510-221-1861; FSC No.: 00638; Empl.: 60; *Sls. Mgr.:* John Crawford

TRIO-TECH INTL., 2040 N. Lincoln St., Burbank, CA 91504, Tel: 818-846-9200, Telex: 194811; Empl.: 266

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Local Sales Offices & Reps

AZ	Phoenix, Shefler-Kahn	602-257-9015
CA	Burlingame, Polach & Bensinger	415-697-2525
CA	Costa Mesa, Berman-Gravley, Inc.	714-549-2122
CO	Arvada, Cluff & Associates	303-423-9354
CO	Aurora, R & R Instrmn.	303-364-8325
FL	Lighthouse Pt., Jack Krutek & Assocs.	305-941-6544
FL	Maitland, Jack Krutek & Assocs.	305-628-4837
GA	Atlanta, Millar Elctrns.	404-261-6160
IL	Berkeley, G. Petitt Co.	312-449-8000
IN	Ft. Wayne, W. Bieberich	219-432-2537
IN	New Albany, W. Bieberich	812-945-3187
KS	Olathe, SPS Associates Ltd	913-764-4460
MD	Baltimore, Sunshine Sci. Inst.	301-661-5900
MD	Reisterstown, Massey Assoc.	301-833-2039
MI	Grosse Point Woods, A & D Elctrn. Sls.	313-884-1956
MN	Minneapolis, Hei-Lite Sls.	612-861-6051
NJ	Englewood Cliffs, Masin Esco	201-569-8868
NY	Hauppauge, Masin Esco	516-273-3500
NY	Rochester, Marchese, Marsey & Barden	716-544-4300
NC	Charlotte, Brownell-Electro Inc.	704-597-1270
NC	Raleigh, Millar Elctrns.	919-787-9564
OH	Centerville, Dolfuss-Root	513-433-6776
OH	Strongsville, Dolfuss-Root	216-238-0300
OR	Portland, J.J. Backer	503-297-8744
PA	Bridgeville, Dolfuss-Root	412-221-4420
PA	Trevose, PSA	215-245-0513
RI	Lincoln, Adams-McGregor	401-726-1300
RI	West Warwick, Adams McGregor Inc.	401-822-0896
TX	Dallas, Forner Sls.	214-241-2166
WA	Seattle, J.J. Backer	206-285-1300

Local Distributors

AL	Birmingham, Brownell-Electro	205-322-3374
AL	Mobile, Brownell-Electro	205-479-8581
AZ	Phoenix, Metermaster Div.	602-243-4111
CA	Glendale, Western Elctrn. Supp.	213-245-1226
CA	Irvine, Meter Craft/Larson	714-261-7135
CA	Los Angeles, Metermaster Div.	213-685-4340
CA	Los Angeles, E.I.L. Instrs.	213-685-7020
CA	Palo Alto, Metermaster Div.	415-968-0313
CA	San Diego, Metermaster Div.	619-560-4841
CA	Santa Clara, Dynametron	408-727-6531
CA	Santa Clara, Fisher/Brownell	408-988-6041
CO	Denver, Meter-master	303-722-5766
CT	Middletown, E. I. L. Instruments	203-346-6646
FL	Hialeah, Kimball Elctrn. Lab.	305-822-5792
FL	Miami, Brownell-Electro	305-591-3215
FL	Orlando, Brownell-Electro	305-843-6770
GA	Atlanta, Brownell-Electro	404-762-5181
GA	Atlanta, Process Measurement Control	404-696-7481
HI	Honolulu, Kems, Inc.	808-845-6402
IL	Bridge View, E.I.L. Instrs.	312-430-2292
IL	Elk Grove Village, Metermaster	312-593-8650
IL	Elk Grove Village, Meter-Makers	312-439-5050
IL	Oak Park, Pacific Indicator	312-261-1330
IN	Evansville, Electro-Lab Svcs.	812-423-5211
IN	Indianapolis, E.I.L. Instrs.	317-545-1373
KS	Overland Park, Brooks Elec.	913-648-3131
KY	Louisville, E. I. L. Instr.	502-454-3432
LA	New Orleans, Indl. Instr. Works	504-733-8355
MD	Gaithersburg, Pioneer/Instrumentation	301-921-0660
MD	Savage, Pyttronic	301-792-0780
MD	Sparks, E.I.L.	301-771-4800
MA	Burlington, E. I. L. Instr.	617-272-9450
MA	Waltham, Calibron	617-894-6440
MI	Ferndale, Ram Meter	313-398-6767
MN	Minneapolis, Instr. Control	612-871-2514
MO	St. Louis, ISL Corporation	314-535-5760
NJ	Belleville, Marshall Inst.	201-751-1190
NJ	N. Caldwell, Hosica Labs	201-256-7724
NY	Clarence, Trott Elctrns.	716-634-8500
NY	L.I.C., Metermod Instr.	212-726-4850
NC	Charlotte, Brownell-Electro	704-597-1270
NC	Raleigh, Brownell-Electro Inc.	919-876-6524
NC	Raleigh, Meter-Meterics, Div. of I.T.R.	919-872-5456
NC	Raleigh, Speed Instr. Div. Owen-Barbot	919-876-4919
OH	Cleveland, Pioneer/Instrumentation	216-587-3600
OH	Cleveland, Weschler Elec.	216-238-2550
OH	Dayton, Pioneer/Dayton	513-236-9900
OK	Tulsa, Tri-State Instr.	918-836-0286
PA	Philadelphia, Sunshine Sci.	215-673-5600
PA	Pittsburgh, E.I.L.	412-731-5230
PA	Pittsburgh, CAM/RPC	412-963-1885
TN	Knoxville, Brownell-Electro	615-966-3441
TN	Memphis, Instrument Repair Service	901-278-0762
TN	Memphis, Brownell-Electro	901-795-8487
TN	Nashville, Brownell-Electro	615-889-8230
TX	Beaumont, Straughn Elec.	409-838-4563
TX	Dallas, Ultra Instr.	214-357-0297
TX	Garland, Metermaster	214-271-5671
TX	Houston, Meters & Instrs.	713-644-1631
TX	Houston, Quality Instr.	713-524-0528
TX	Odessa, Whitlock Instr.	915-337-3412
VA	Richmond, Meter Metrics (I.T.R.)	804-275-1431
WA	Seattle, E&L Instrs. Inc.	206-762-0880
WA	Seattle, Eicher-Richards	206-523-7888
WI	Milwaukee, E-M Instrs.	414-272-7799

TRIPP-LITE, 500 No. Orleans, Chicago, IL 60610, Tel: 312-329-1777; Empl.: 80; *Sls. Mgr.:* Priscilla Galgan; *Dist. Mgr.:* Priscilla Galgan

TRI-STAR ELCTRNS., INC., 362 Main Street #2, Venice, CA 90291, Tel: 213-823-5779, Telex: 182058 Tristarel Vnce, TWX: 910-343-7448; FSC No.: 5935, 5999, 5120, 5280; *Sls. Mgr.:* Tom Magdalik

TRITON MFG. CO., P.O. Box 361, East Haddam, CT 06423, Tel: 203-838-4666, Telex: 955439; FSC No.: 54195; *Sls. Mgr.:* Jack Spangler

TRI-TRONICS CO. INC., 13420 Wright Cir., Tampa, FL 33624, Tel: 813-855-4453; Empl.: 27; *Sls. Mgr.:* Robert A. Warner

TRIVEX, 3180 Redhill Ave., Costa Mesa, CA 92626, Tel: 714-546-7781, TWX: 910-595-2589; Empl.: 180; *Sls. Mgr.:* R. Martin

TRO DYNE CORP., 900 Corporate Dr., Mahwah, NJ 07430, Tel: 201-529-1800, TWX: 710-988-2138; FSC No.: 17346; Empl.: 55; *Sls. Mgr.:* T. Mazzaccaro

TROMPETER ELECTRONICS, INC., 8936 Comanche, Chatsworth, CA 91311, Tel: 818-882-1020, TWX: 910-494-1210; FSC No.: 14949; Empl.: 95; *Sls. Mgr.:* Paul Cox; *Dist. Mgr.:* E. Fischle

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak and Frazier	205-536-1506
AZ	Phoenix, Aztec Entprs.	602-944-9185
CA	Los Angeles, Trompeter Elctrns.	818-882-1020
CA	Menlo Park, Long & Assocs.	415-327-1300
CO	Littleton, Aztec Entprs.	303-795-0250
CT	Wethersfield, Underwood Sls.	203-563-3046
FL	Orlando, Currie, Peak & Frazier	305-855-0843
GA	Norcross, Currie, Peak & Frazier	404-449-7662
IL	Wheeling, Engineering Prods	312-537-4860
IN	Indianapolis, Engrg. Prods. Assoc.	317-894-7156
IA	Iowa City, Engineering Prods. Assoc.	319-354-5344
MD	Silver Spring, Sel-Tronics	301-589-3391
MA	Lowell, Underwood Sls.	617-256-8191
MN	Edina, Engineering Prods. Assoc.	612-835-9022
NJ	Elmwood Park, L & M Assoc. Eng. Rep.	201-797-0441
NM	Albuquerque, Aztec Entprs.	505-262-1688
NY	Binghamton, T.A.E. Rep.	607-772-6952
NY	New York, L & M Assocs. Eng. Rep.	212-243-6155
NY	Rochester, T A E Reps.	716-586-8710
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-854-5939
PA	Andalusia, L & M Assocs.	215-245-6658
TX	Lewisville, Milestek	214-436-1597
UT	Ogden, Aztec Entprs.	801-621-1655
WA	Lynnwood, Blum & Assocs.	206-775-6656

TRUE DATA, 17092 Pullman St. #B, Irvine, CA 92714, Tel: 714-979-4842, TWX: 910-595-1917; Empl.: 37

TRULINE CORP., P.O. Box 1469, Visalia, CA 93279, Tel: 209-625-3237; *Sls. Mgr.:* Charlie Torres

TRW CAPACITOR DIV., 301 West "O" St., Ogallala, NE 69153, Tel: 308-284-3611, TWX: 910-620-0321; *Sls. Mgr.:* Dennis Lienemann; *Dist. Mgr.:* Ron Hollmann ..... **1A**•1191-1199

Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, ISDS	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, ISDS	619-571-1544
CA	Santa Ana, ISDS	714-973-2162
CA	Woodland Hills, ISDS	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000

L	Orlando, TRW/ECG	305-857-3650
A	Norcross, TRW/ECG	404-447-6154
	Chicago, TRW/ECG	312-693-7730
N	Ft. Wayne, R. O. Whitesell & Assocs.	219-432-5591
N	Indianapolis, R. O. Whitesell & Assocs.	317-359-9283
N	Kokomo, R. O. Whitesell & Assocs.	317-457-9127
A	Cedar Rapids, C. H. Horn & Assoc.	319-393-8703
S	De Soto, Midtec Assoc.	913-441-6565
Y	Louisville, R. O. Whitesell & Assocs.	502-426-7696
D	Columbia, TRW/ECG	301-964-9110
A	Framingham, TRW/ECG	617-620-0625
I	Grand Rapids, R. O. Whitesell & Assocs.	616-942-5420
I	Southfield, R. C. Whitesell & Assocs.	313-559-5454
I	St. Joseph, R. O. Whitesell & Assocs.	616-983-7337
N	Minneapolis, TRW/ECG	612-854-6616
O	St. Louis, John G. Macke Co.	314-432-2830
E	Panama, Norris Stricker	402-788-2700
Y	Rochester, TRW/ECG	716-425-3775
C	Greensboro, TRW/ECG	919-852-4676
H	Cincinnati, R. O. Whitesell & Assocs.	513-521-2290
H	Cleveland, R. O. Whitesell & Assocs.	216-447-9020
H	Columbus, R. O. Whitesell & Assocs.	614-888-9396
H	Dayton, R. O. Whitesell & Assocs.	513-298-9546
R	Tigard, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R. O. Whitesell & Assocs.	412-963-6161
TN	Greeneville, R. O. Whitesell & Assocs.	615-639-6154
TX	Austin, Technig. Sls. Co.	512-346-9940
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, TRW/ECG	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Phoenix, R. V. Weatherford Co.	602-272-7144
AZ	Tempe, Arrow Elctrns.	602-968-4800
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Gardena, Bell Inds.	213-515-1800
CA	Glendale, R. V. Weatherford Co.	213-849-3451
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Sunnyvale, Bell Inds.	408-734-8570
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Denver, R. V. Weatherford Co.	303-428-6900
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Hall-Mark Elctrns.	813-530-4543
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	Palm Bay, Arrow Elctrns.	305-725-1480
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Bensenville, Hall-Mark Elctrns.	312-860-2678
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
KS	Lenexa, Hall-Mark Elctrns.	913-888-4747
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Columbia, Hall-Mark Elctrns.	301-988-9800
MA	Norwood, Gerber Radio Supp. Co.	617-769-6000
MA	Woburn, Hall-Mark Elctrns.	617-935-9777
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Edina, Arrow Elctrns.	612-830-1800
MO	Maryland Hgts., Hall-Mark Elctrns.	314-291-5350
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Cherry Hill, Hall-Mark Elctrns.	609-424-7300
NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Marlton, Arrow Elctrns.	609-596-8000
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Rochester, Arrow Elctrns.	716-427-0300
NC	Charlotte, Elctrns. Mktg. Corp.	704-394-6195
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Raleigh, Hall-Mark Elctrns.	919-872-0712
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Columbus, Elctrn. Mktg.	614-299-4161
OH	Solon, Arrow Elctrns.	216-248-3990
OH	Solon, Hall-Mark Elctrns.	216-349-4632
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Phila. Elctrn.	215-568-7400
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Austin, Hall-Mark Elctrns.	512-258-8848
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Dallas, Hall-Mark Elctrns.	214-341-1147
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Houston, Hall-Mark Elctrns.	713-781-6100
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
WA	Seattle, R. V. Weatherford Co.	206-575-1340
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000
WI	Oak Creek, Arrow Elctrns.	414-764-6600

TRW/CINCH-GRAPHIK, 200 S. Turnbull Canyon Rd., City of Industry, CA 91744; Tel: 213-333-1201, TWX: 910-584-1861; *Sls. Mgr.:* James Kirby

TRW CONNECTOR DIV., TRW Electronic Components Grp., 1501 Morse Ave., Elk Grove Village, IL 60007, Tel: 312-981-6000, TWX: 910-222-1796; *Sls. Mgr.:* B. Walthall; *Dist. Mgr.:* Jim Hartranft Jr. ....**2**•1613-1715

Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, IS DS	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, IS DS	619-571-1544
CA	Santa Ana, IS DS	714-973-2162
CA	Woodland Hills, IS DS	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Fort Wayne, R. O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assocs.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assocs.	317-457-9127
IA	Cedar Rapids, C. H. Horn & Assocs.	319-393-8703
KS	De Soto, Midtec Assocs.	913-441-6565
KY	Louisville, R. O. Whitesell & Assocs.	502-426-7696
MA	Framingham, TRW/ECG	617-620-0625
MI	Grand Rapids, R. O. Whitesell & Assocs.	616-942-5420
MI	Southfield, R. O. Whitesell & Assocs.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assocs.	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, J. G. Macke Co.	314-432-2830
NM	El Paso, Straube Assocs.	915-594-8259
NY	Fairport, TRW/ECG	716-425-3775
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, R. O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R. O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R. O. Whitesell & Assocs.	513-298-9546
OR	Tigard, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R. O. Whitesell & Assocs.	412-963-6161
TN	Greeneville, R. O. Whitesell & Assocs.	615-639-6154
TX	Austin, TRW/ECG	512-345-2331
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, TRW/ECG	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Phoenix, Kierulff Elctrns.	602-243-4101
AZ	Phoenix, R. V. Weatherford Co.	602-272-7144
AZ	Tempe, Fisher-Brownell	602-967-1464
AZ	Tempe, Arrow Elctrns.	602-968-4800
AZ	Tempe, Hamilton/Avnet Elctrns.	602-231-5100
AR	Ft. Smith, Carlton Bates Co.	501-646-8201
AR	Little Rock, Carlton Bates Co.	501-562-9100
CA	Alhambra, Fisher-Brownell	213-289-0255
CA	Anaheim, R. V. Weatherford Co.	714-634-9600
CA	Chatsworth, Arrow Elctrns.	213-700-8668
CA	Costa Mesa, Avnet Elctrns.	714-754-6088
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Culver City, Hamilton Electro Sls.	213-558-2121
CA	El Segundo, Hallmark Elctrns.	213-643-9101
CA	Glendale, R. V. Weatherford Co.	213-849-3451
CA	Los Angeles, Newark Elctrns.	213-671-7066
CA	Los Angeles, Kierulff Elctrns.	213-725-0325
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	Palo Alto, Kierulff Elctrns.	415-968-6292
CA	Pomona, R. V. Weatherford Co.	714-623-1261
CA	Riverside, Elctrn. Supp.	714-787-9220
CA	Sacramento, Hamilton/Avnet Elctrns.	916-920-3150
CA	San Diego, Fisher-Brownell	619-560-8545
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	San Diego, Hamilton/Avnet Elctrns.	619-571-7510
CA	San Diego, Kierulff Elctrns.	619-278-2112
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Diego, R. V. Weatherford Co.	619-695-1700
CA	San Francisco, Zack Radio Supp.	415-626-1444
CA	Santa Clara, Fisher-Brownell	408-988-6041
CA	Santa Clara, Wyle Dist. Grp.	408-727-2500
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Sunnyvale, Hamilton/Avnet Elctrns.	408-743-3355
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Tustin, Kierulff Elctrns.	714-731-5711
CO	Denver, Kierulff Elctrns.	303-371-6500
CO	Denver, Newark Elctrns.	303-757-3351
CO	Denver, Arrow Elctrns.	303-758-2100
CO	Denver, Integrated Elctrn.	303-292-6121
CO	Englewood, Hall-Mark Elctrns.	303-790-1662
CO	Englewood, R. V. Weatherford Co.	303-770-9762
CO	Englewood, Hamilton/Avnet Elctrns.	303-779-9998
CO	Thornton, Wyle Dist. Grp.	303-457-WYLE
CT	Danbury, Hamilton/Avnet Elctrns.	203-797-2800
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Ft. Lauderdale, Kierulff Elctrns.	305-463-4940
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Hamilton/Avnet Elctrns.	305-971-2900
FL	Largo, Lodan Elctrns.	813-586-2851
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	St. Petersburg, Kierulff	813-576-1966
FL	St. Petersburg, Hamilton/Avnet Elctrns.	813-576-3930
GA	Norcross, Kierulff Elctrns.	404-447-5252
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Hamilton/Avnet Elctrns.	404-447-7507
GA	Norcross, Arrow Elctrns.	404-449-8252
HI	Honolulu, Precision Radio Ltd.	808-537-5291
IL	Bensenville, Hamilton/Avnet Elctrns.	312-860-7780
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IL	Champaign, Klaus Radio	217-356-1896
IL	Chicago, Electronic Connector	312-767-2200
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Chicago, Bell Elctrns.	312-982-9210
IL	Elk Grove Village, Kierulff Elctrns.	312-640-0200
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	La Salle, Klaus Radio	815-223-7400
IL	Palatine, Ohm Elctrns.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IL	Quincy, Klaus Radio	217-223-7560
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Ft. Wayne, Graham Elctrn.	219-423-3422
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, Hamilton/Avnet Elctrns.	317-844-9333
IN	Indianapolis, Graham Elctrns.	317-634-8202
IN	Indianapolis, Pioneer/Ind.	317-849-7300
IA	Cedar Rapids, Arrow Elctrns.	319-395-7230
IA	Cedar Rapids, DEECO, Inc.	319-365-7551
IA	Eldridge, Klaus Radio	319-285-8484
KS	Lenexa, Hall-Mark Elect.	913-888-4747
KS	Overland Park, Hamilton/Avnet Elctrns.	913-888-8900
LA	Baton Rouge, Indl. Elctrn. Supp.	504-926-0513
LA	Lafayette, Ralph's of Lafayette	318-234-4507
LA	Shreveport, Indl. Elctrn. Supp.	318-222-9459
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Baltimore, Hall-Mark Elctrns.	301-796-9300
MD	Columbia, Powell Elctrn.	301-621-4070
MD	Columbia, Hamilton/Avnet Elctrns.	301-995-3500
MD	Gaithersburg, Pioneer/Washington	301-948-0710
MD	Rockville, Capitol Radio Whlsrs.	301-881-2270
MD	Timonium, Zebra Elctrns.	301-252-6576
MA	Billerica, Kierulff Elctrns.	617-935-5134
MA	Hingham, Sager Elec. Supp.	617-749-6700
MA	Norwood, Gerber Radio Supp.	617-329-2400
MA	Woburn, Hall-Mark Elctrns.	617-935-9777
MA	Woburn, Arrow Elctrns.	617-933-8130
MA	Woburn, Hamilton/Avnet Elctrns.	617-935-9700
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Ann Arbor, Wedemeyer Elec. Supp.	313-665-8611
MI	Grand Rapids, Hamilton/Avnet Elctrns.	616-243-8805
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Livonia, R.S. Elect. Corp.	313-525-1155
MI	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
MI	Oak Park, Newark Elctrns.	313-967-0600
MN	Bloomington, Hall-Mark Elect.	612-854-3223
MN	Edina, Kierulff Elctrns.	612-941-7500
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, Newark Elctrns.	612-331-6350
MN	Minnetonka, Hamilton/Avnet Elctrns.	612-932-0600
MN	St. Paul, Gopher Elctrns.	612-483-3322
MO	Earth City, Hamilton/Avnet Elctrns.	314-344-1200
MO	Maryland Hgts., Kierulff Elctrns.	314-739-0855
MO	Maryland Hgts., Hall-Mark Elect.	314-291-5350
MO	St. Louis, Arrow Elctrns.	314-567-6888
MO	St. Louis, Olive Indl. Elctrns.	314-426-4500
NE	Lincoln, Scott Elctrn. Supp.	402-466-8221
NE	Omaha, Scott Elctrn. Supp.	402-734-6750
NH	Manchester, Arrow Elect.	603-668-6968
NJ	Cherry Hill, Hall-Mark Elctrns.	609-424-0880
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-424-0100

NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Fairfield, Kierulff Elctrns.	201-575-6750
NJ	Fairfield, Hamilton/Avnet Elctrns.	201-575-3390
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Hanover, State Elec. Parts Corp.	201-887-2550
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Moorestown, Arrow Elect.	609-235-1900
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NM	Albuquerque, Hamilton/Avnet Elctrns.	505-765-1500
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Binghamton, Harvey Elctrns.	607-748-8211
NY	Buffalo, Summit Dist.	716-884-3450
NY	East Syracuse, Hamilton/Avnet Elctrns.	315-437-2641
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Jaco Elect.	516-273-5500
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Melville, Hamilton/Avnet Elctrns.	516-454-6060
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, Simcona Elctrns. Corp.	716-328-3230
NY	Rochester, Hamilton/Avnet Elctrns.	716-475-9130
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Ronkonkoma, Hall-Mark Elctrns.	516-737-0600
NY	Ronkonkoma, Conco Elctrns. Corp.	516-467-8200
NC	Cary, Powell Elctrns.	919-467-1212
NC	Greensboro, Kierulff Elctrns.	919-852-9440
NC	Greensboro, Hammond Elec. of Carolina	919-275-6391
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Raleigh, Hamilton/Avnet Elctrns.	919-829-8030
NC	Raleigh, Hall-Mark Elect.	919-872-0712
NC	Winston-Salem, Arrow Elect.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cincinnati, Hall-Mark Elctrns.	513-563-5980
OH	Cincinnati, Hughes Peters, Inc.	513-351-2000
OH	Cleveland, Newark Elctrns.	216-447-8860
OH	Cleveland, Hamilton/Avnet Elctrns.	216-831-3500
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4161
OH	Columbus, Hughes Peters, Inc.	614-294-5351
OH	Dayton, Hamilton/Avnet Elctrns.	513-433-6010
OH	Dayton, Stotts-Friedman	513-298-5555
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Highland Hgts., Hall-Mark Elctrns.	216-473-2907
OH	Solon, Hall-Mark Elctrns.	216-349-4632
OH	Solon, Arrow Elctrns.	216-248-3990
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Oklahoma City, Trice Wholesale Elctrns.	405-524-4411
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
OR	Lake Oswego, Hamilton/Avnet Elctrns.	503-635-8157
OR	Portland, Kierulff Elctrns.	503-641-9150
OR	Tigard, Arrow Elctrns.	503-684-1690
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Almo Elctrns. Corp.	215-698-4000
PA	Philadelphia, Powell Elctrns.	215-365-1900
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
PA	Pittsburgh, CAM/RPC	412-782-3770
PA	Wayne, Peak Elect.	215-293-9000
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Austin, Hall-Mark Elect.	512-258-8848
TX	Austin, Hamilton/Avnet Elctrns.	512-837-8911
TX	Dallas, Kierulff Elctrns.	214-343-2400
TX	Dallas, Intl. Elctrns.	214-233-9323
TX	Dallas, R. V. Weatherford Co.	214-980-1110
TX	Dallas, Hall-Mark Elctrns.	214-341-1147
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	El Paso, Intl. Elctrns.	915-778-9761
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Hamilton/Avnet Elctrns.	713-780-1771
TX	Houston, R. V. Weatherford Co.	713-688-7406
TX	Houston, Hall-Mark Elctrns.	713-781-6100
TX	Irving, Hamilton/Avnet Elctrns.	214-659-4111
TX	Richardson, Fisher Brownell	214-235-3177
TX	Stafford, Harrison Equip.	713-879-2729
TX	Stafford, Arrow Elctrns.	713-491-4100
UT	Salt Lake City, Kierulff Elctrns.	801-973-6913
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
UT	Salt Lake City, Hamilton/Avnet Elctrns.	801-972-4300
UT	Salt Lake City, Standard Supp. Co.	801-486-3371
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Bellevue, Hamilton/Avnet Elctrns.	206-643-3950
WA	Bellevue, Wyle Dist. Grp.	206-453-8300
WA	Bellevue, Almac/Stroum Elctrns.	206-643-9992
WA	Seattle, R. V. Weatherford Co.	206-243-6340
WA	Tukwila, Kierulff Elctrns.	206-575-4420
WI	Madison, Arrow Elctrns.	608-273-4977
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Milwaukee, Elctrn. Expeditors	414-228-8100
WI	New Berlin, Hamilton/Avnet Elctrns.	414-784-4510
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000
WI	Oak Creek, Arrow Elctrn.	414-764-6600

TRW CYLINDRICAL CONNECTOR DIV., TRW Electronic Components Grp., 8821 Science Center Dr., Minneapolis, MN 55428, Tel: 612-537-1010, TWX: 910-576-2748; *Sls. Mgr.:* Gene Schmidt; *Dist. Mgr.:* Gene Schmidt .... **2**•1716-1735

Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, ISDS	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, ISDS	714-571-1544
CA	Santa Ana, ISDS	714-973-2162
CA	Woodland Hills, ISDS	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Ft. Wayne, R. O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assocs.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assocs.	317-457-9127
IA	Cedar Rapids, C. H. Horn & Assocs.	319-393-8703
KS	De Soto, Midtec Assocs.	913-441-6565
KY	Louisville, R. O. Whitesell & Assocs.	502-426-7696
MA	Framingham, TRW/ECG	617-620-0625
MI	Grand Rapids, R. O. Whitesell & Assocs.	616-942-5420
MI	Southfield, R. O. Whitesell & Assocs.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assocs.	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, J. G. Macke Co.	314-432-2830
NY	Rochester, TRW/ECG	716-424-2830
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, R. O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R. O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R. O. Whitesell & Assocs.	513-298-9546
OR	Tigard, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R. O. Whitesell & Assocs.	412-963-6161
TN	Greeneville, R. O. Whitesell & Assocs.	615-639-6154
TX	Austin, TRW/ECG	512-345-2331
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, TRW/ECG	915-594-8259
TX	El Paso, Straube Assocs.	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773

Local Distributors

CA	Brea, Aeroflite	714-773-4251
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Newport Beach, Arrow Elctrns.	714-851-8961
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CO	Denver, Arrow Elctrns.	303-758-2100
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Palm Bay, Arrow Elctrns.	305-725-1480
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Chicago, Electronic Connector	312-767-2200
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IA	Cedar Rapids, Arrow Elctrns.	319-395-7230
MD	Baltimore, Arrow Elctrns.	301-247-5200
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MN	Edina, Arrow Elctrns.	612-830-1800
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Ronkonkoma, Conco	516-467-8200
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Solon, Arrow Elctrns.	216-248-3990
PA	Monroeville, Arrow Elctrns.	412-856-7000
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Dallas, Hall-Mark	214-341-1147
TX	Houston, Hall-Mark	713-781-6100
TX	Stafford, Arrow Elctrns.	713-491-4100
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
WA	Bellevue, Arrow Elctrns.	206-643-4800
WI	Madison, Arrow Elctrns.	608-273-4977
WI	Oak Creek, Arrow Elctrns.	414-764-6600

TRW, Dynalco Controls Div., 5200 NW 37th, P.O. Box 8187, Ft. Lauderdale, FL 33310, Tel: 305-739-4300, Telex: 514833; Empl.: 125; *Sls. Mgr.:* Kurlin Wilson; *Dist. Mgr.:* Joe Stephens

TRW ELECTRONIC COMPONENTS GRP., 2525 E. El Segundo Blvd., El Segundo, CA 90245, Tel: 213-536-0600

TRW FIBER OPTIC PRODS., CONNECTOR DIV., TRW Elctrn. Comps. Grp., 401 N. Broad St., Philadelphia, PA 19108, Tel: 215-922-8900, TWX: 710-670-2286; *Sls. Mgr.:* James Finnerfock .... **2**•1693, 1694

TRW INDUCTIVE PRODUCTS DIV., 150 Varick St., New York, NY 10013, Tel: 212-255-3500, TWX: 710-581-2722; Empl.: 325; *Sls. Mgr.:* A. Profeta .... **1A**•1298-1305, 1642, 2338-2363

Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, Integrated Sls.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, Integrated	619-571-1544
CA	Santa Ana, Integrated	714-973-2162
CA	Woodland Hills, Integrated Sls.	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Fort Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Fort Wayne, R.O. Whitesell Assoc.	219-432-5591
IN	Indianapolis, R.O. Whitesell Assoc.	317-359-9283
IN	Kokomo, R.O. Whitesell Assoc.	317-457-9127
IA	Cedar Rapids, C.H. Horn & Assocs.	319-393-8703
KS	DeSoto, Midtec Assocs.	913-441-6565
KY	Louisville, R.O. Whitesell Assoc.	502-426-7696
MD	Columbia, TRW/ECG	301-964-9110
MA	Framingham, TRW/ECG	617-620-0625
MI	Grand Rapids, R.O. Whitesell Assoc.	616-942-5420
MI	Southfield, R.O. Whitesell Assoc.	313-559-5454
MI	St. Joseph, R.O. Whitesell Assoc.	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, John G. Macke Co.	314-432-2830
NJ	Rowayton, TRW/ECG	203-853-4466
NM	El Paso, S.W. Sales	915-594-8259
NY	Fairport, TRW/ECG	716-425-3775
NY	Rowayton, Conn., TRW/ECG	203-853-4466
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, R.O. Whitesell Assoc.	513-521-2290
OH	Cleveland, R. O. Whitesell Assoc.	216-447-9020
OH	Columbus, R.O. Whitesell Assoc.	614-888-9396
OH	Dayton, R.O. Whitesell Assoc.	513-298-9546
OR	Portland, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R.O. Whitesell Assoc.	412-963-6161
TN	Greeneville, R.O. Whitesell Assoc.	615-639-6154
TX	Austin, Technology Sls. Co.	512-345-2331
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, S.W. Sls.	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773
EXP	PR, Rio Piedras, Elctrn. Sls. Assocs.	809-769-2911

Local Distributors

AZ	Tempe, Arrow	602-968-4800
CA	Chatsworth, Arrow	213-701-7500
CA	El Segundo, Hall-Mark	213-643-9101
CA	Garden Grove, Bell	714-220-0681
CA	San Diego, Arrow	619-565-4800
CA	San Diego, Weatherford	619-695-1700
CA	San Diego, Hall-Mark	619-268-1201
CA	San Jose, Hall-Mark	408-946-0900
CA	San Jose, Irvine	714-540-5600
CA	Sunnyvale, Arrow	
CA	Sunnyvale, Weatherford	408-738-8694
CO	Denver, Weatherford	303-428-6900
CT	Wallingford, Arrow	203-265-7741
FL	St. Petersburg, Hall-Mark	813-576-8691
IL	Schaumburg, Arrow	312-397-3440
IN	Indianapolis, Pioneer/Indiana	317-849-7300
IN	Indianapolis, Arrow	317-243-9353
MD	Columbia, Hall-Mark	301-988-9800
MD	Gaithersburg, Pioneer/Washington	301-921-0660
MA	Hall-Mark, Woburn	617-935-9777
MN	Minneapolis, Newark	612-331-6350
NJ	Cherry Hill, Hall-Mark	609-424-7300
NJ	Fairfield, Hall-Mark	201-575-4415
NJ	Fairfield, Arrow	201-575-5300
NJ	Malton, Arrow	609-596-8000
NM	Albuquerque, International Elctrns.	505-345-8127
NY	Rochester, Newark	716-473-6600
NC	Charlotte, Pioneer/Carolina	704-527-8188
NC	Hall-Mark, Arrow	919-872-0712
NC	Raleigh, Arrow	919-876-3132

OH	Centerville, Arrow	513-435-5563
OH	Valley View, Newark	216-447-8860
OH	Westerville, Hall-Mark	614-891-4555
OR	Tigard, Arrow	503-684-1690
TX	Addison, Weatherford	214-931-7333
TX	Austin, Arrow	512-835-4180
TX	Austin, Hall-Mark	512-258-8848
TX	Dallas, Hall-Mark	214-341-1147
TX	El Paso, International Elctrns.	915-598-3406
TX	Garland, Newark	214-487-8144
WA	Bellevue, Arrow	206-643-4800

TRW LSI PRODUCTS, PO Box 2472, La Jolla, CA 92038, Tel: 619-457-1000, Telex: 697957, TWX: 910-335-1571; Empl.: 400; *Sls. Mgr.:* Doug Turnage; *Dist. Mgr.:* Ron Courtois

TRW MICROWAVE, 825 Stewart Dr., Sunnyvale, CA 94086, Tel: 408-732-0880, TWX: 910-339-9207; FSC No.: 21847; Empl.: 600; *Sls. Mgr.:* J. Moore

TRW MOTOR DIVISION, Industrial/Commerical Products, Napierfield Road, Postal Route 6, Box M-30A, Dothan, AL 36303, Tel: 205-983-3542, Telex: 810-744-1000; *Sls. Mgr.:* Dave Hall .... **1B**•1120

TRW MOTOR DIV. (MILITARY), 2275 Stanley Ave., Dayton, OH 45404, Tel: 513-228-3171, Telex: 288-224, TWX: 810-459-1642; Empl.: 580; *Sls. Mgr.:* Bill Pelfrey; *Dist. Mgr.:* Tom Coyle ....**1B**•1186-1204; **2**•1852, 1853

Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, Integrated Sls.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, Integrated Sls.	619-571-1544
CA	Santa Ana, Integrated Sls.	714-973-2162
CA	Woodland Hills, Integrated Sls.	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Ft. Wayne, R. O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assocs.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assocs.	317-457-9127
IA	Cedar Rapids, C. H. Horn & Assocs.	319-393-8703
KS	De Soto, Midtec Assoc.	913-441-6565
KY	Louisville, R. O. Whitesell & Assocs.	502-426-7696
MD	Baltimore, TRW/ECG	301 964-9110
MA	Framingham, TRW/ECG	617-620-0625
MI	Grand Rapids, R. O. Whitesell & Assocs.	616-942-5420
MI	Southfield, R. O. Whitesell & Assocs.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assocs.	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, John G. Macke Co.	314-432-2830
NY	Fairport, TRW/ECG	716-425-3775
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, R. O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R. O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R. O. Whitesell & Assocs.	513-298-9546
OR	Tigard, N. R. Schultz Co.	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R. O. Whitesell & Assocs.	412-963-6161
TN	Greeneville, R. O. Whitesell & Assocs.	615-639-6154
TX	Austin, Technlg. Sls.	512-346-9940
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, TRW/ECG	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773

Local Distributors

AL	Huntsville, Hamilton/Avnet Elctrns.	205-837-7210
AL	Huntsville, Arrow Elctrns.	205-882-2730
AL	Huntsville, Hallmark Elctrns.	205-837-8700
AZ	Phoenix, Hallmark Electronics	602-243-6601
AZ	Tempe, Fisher Brownell	602-967-1464
AZ	Tempe, Arrow Elctrns.	602-968-4800
AZ	Tempe, Hamilton/Avnet Elctrns.	602-231-5100
CA	Alhambra, Fisher Brownell	213-289-0255
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Chatsworth, Avnet Elctrns.	213-700-2600
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Culver City, Hamilton/Avnet Elctrns.	213-558-2252
CA	El Segundo, Hallmark Elctrns.	213-643-9101
CA	Sacramento, Hamilton/Avnet Elctrns.	916-925-2216
CA	San Diego, Hallmark Elctrns.	619-268-1201
CA	San Diego, Fisher Brownell	619-560-8545
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Diego, Hamilton/Avnet Elctrns.	619-571-7510
CA	San Jose, Hallmark Elctrns.	408-946-2575
CA	Santa Clara, Fisher Brownell	408-988-6041
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Hallmark Elctrns.	408-946-0900
CA	Sunnyvale, Hamilton/Avnet Elctrns.	408-743-3355
CA	Tustin, Arrow Elctrns.	714-838-5422
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Englewood, Hallmark Elctrns.	303-790-1662
CO	Englewood, Hamilton/Avnet Elctrns.	303-740-1000
CT	Danbury, Hamilton/Avnet Elctrns.	203-797-2800
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Clearwater, Hallmark Elctrns.	813-530-4543
FL	Ft. Lauderdale, Hamilton/Avnet Elctrns.	305-971-2900
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Hallmark Elctrns.	305-971-9280
FL	Orlando, Hallmark Elctrns.	305-855-4020
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	St. Petersburg, Hamilton/Avnet Elctrns.	813-576-3930
FL	Winter Park, Hamilton/Avnet Elctrns.	305-628-3888
GA	Norcross, Hamilton/Avnet Elctrns.	404-447-7507
GA	Norcross, Hallmark Elctrns.	404-447-8000
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Bensenville, Hamilton/Avnet Elctrns.	312-860-7700
IL	Bensenville, Hallmark Elctrns.	312-860-3800
IL	Elk Grove Village, Pioneer/Chicago	312-437-9680
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Carmel, Hamilton/Avnet Elctrns.	317-844-9333
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, Pioneer/Indiana	317-849-7300
KS	Lenexa, Hallmark Elctrns.	913-888-4747
KS	Overland Park, Hamilton/Avnet Elctrns.	913-888-8900
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Bethesda, Arrow Elctrns.	301-564-3000
MD	Columbia, Hallmark Elctrns.	301 988-9800
MD	Columbia, Hamilton/Avnet Elctrns.	301-995-3500
MA	Woburn, Hallmark Elctrns.	617-935-9777
MA	Woburn, Arrow Elctrns.	617-933-8130
MA	Woburn, Hamilton/Avnet Elctrns.	617-273-7500
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Grand Rapids, Hamilton/Avnet Elctrns.	616-243-8805
MI	Livonia, Pioneer/Michigan	313-525-1800
MI	Livonia, Hamilton/Avnet Elctrns.	313-522-4700
MN	Bloomington, Hallmark Elctrns.	612-854-3223
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minnetonka, Pioneer/Twin Cities	612-935-5444
MN	Minnetonka, Hamilton/Avnet Elctrns.	612-932-0600
MO	Earth City, Hamilton/Avnet Elctrns.	314-344-1200
MO	Maryland Heights, Hallmark Elctrns.	314-291-5350
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-688-6968
NJ	Cherry Hill, Hallmark Elctrns.	609-424-7300
NJ	Cherry Hill, Hamilton/Avnet Elctrns.	609-424-0100
NJ	Fairfield, Hamilton/Avnet Elctrns.	201-575-3390
NJ	Fairfield, Hallmark Elctrns.	201-575-4415
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Marlton, Arrow Elctrns.	609-596-8000
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NM	Albuquerque, Hamilton/Avnet Elctrns.	505-765-1500
NY	E. Syracuse, Hamilton/Avnet Elctrns.	315-437-2641
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Hamilton/Avnet Elctrns.	516-434-7421
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Rochester, Hamilton/Avnet Elctrns.	716-475-9130
NY	Rochester, Arrow Elctrns.	716-427-0300
NY	Ronkonkoma, Hallmark Elctrns.	516-737-0600
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Raleigh, Hallmark Elctrns.	919-872-0712
NC	Raleigh, Hamilton/Avnet Elctrns.	919-878-0819
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cincinnati, Hallmark Elctrns.	513-563-2980
OH	Cleveland, Hamilton/Avnet Elctrns.	216-831-3500
OH	Cleveland, Pioneer/Cleveland	216-587-3600
OH	Dayton, Pioneer/Dayton	513-236-9900
OH	Dayton, Hamilton/Avnet Elctrns.	513-443-0610
OH	Solon, Arrow Elctrns.	216-248-3990
OH	Solon, Hallmark Elctrns.	216-349-4632
OH	Westerville, Hallmark Elctrns.	614-891-4555
OK	Tulsa, Hallmark Elctrns.	918-665-3200
OR	Lake Oswego, Hamilton/Avnet Elctrns.	503-635-8157
OR	Tigard, Arrow Elctrns.	503-684-1690
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Pittsburgh, Pioneer/Pittsburgh	412-782-2300
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Austin, Hallmark Elctrns.	512-258-8848
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Dallas, Hall-Mark Elctrns.	214-343-5000
TX	Houston, Hamilton/Avnet Elctrns.	713-780-1771
TX	Houston, Hallmark Elctrns.	713-781-6100
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Irving, Hamilton/Avnet Elctrns.	214-659-4111
TX	Richardson, Fisher Brownell	214-235-3177
UT	Salt Lake City, Hamilton/Avnet Elctrns.	801-972-2800
WA	Bellevue, Hamilton/Avnet Elctrns.	206-643-3950
WA	Bellevue, Arrow Elctrns.	206-643-4800
WI	New Berlin, Hamilton/Avnet Elctrns.	414-784-4510
WI	Oak Creek, Arrow Elctrns.	414-764-6600
WI	Oak Creek, Hallmark Elctrns.	414-761-3000

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Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, Integrated Sys. & Device Sls.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, Integrated Sys. & Device Sls.	619-571-1544
CA	Santa Ana, Integrated Sys. & Device Sls.	714-973-2162
CA	Woodland Hills, Integrated Sys. & Device Sls.	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Ft. Wayne, Robert O. Whitesell	219-432-5591
IN	Indianapolis, Robert O. Whitesell	317-359-9238
IN	Kokomo, Robert O. Whitesell	317-457-9127
IA	Cedar Rapids, C. H. Horne & Assocs.	319-393-8703
KS	DeSoto, MIDTEC Assocs.	913-441-6565
KY	Louisville, Robert O. Whitesell	502-426-7696
MD	Columbia, TRW/ECG	301-964-9110
MA	Framingham, TRW/ECG	617-620-0625
MA	Maynard, Byrne Assoc.	617-897-3131
MI	Farmington Hills, TRW/ECG	313-478-7210
MI	Grand Rapids, Robert O. Whitesell	616-942-5420
MI	Southfield, Robert O. Whitesell	313-559-5454
MI	St. Joseph, Robert O. Whitesell	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, John G. Macke Co.	314-432-2830
NM	Albuquerque, S. W. Sales	505-883-1388
NY	Fairport, TRW/ECG	716-425-3775
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, Robert O. Whitesell	513-521-2290
OH	Cleveland, Robert O. Whitesell	216-447-9020
OH	Columbus, Robert O. Whitesell	614-888-9396
OH	Dayton, Robert O. Whitesell	513-298-9546
OR	Tigard, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, Robert O. Whitesell	412-963-6161
TN	Greenville, Robert O. Whitesell	615-639-6154
TX	Austin, Technology Sls. Co.	512-346-9940
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, S.W. Sls.	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assoc.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773
PR	Rio Piedras, Electronics Sls. Assoc.	809-769-2911

Local Distributors

AL	Huntsville, Arrow Elctrns.	205-882-2730
AL	Huntsville, Hamilton-Avnet	205-837-7210
AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AL	Huntsville, Pioneer Elctrns.	205-837-9300
AZ	Phoenix, Hall-Mark Elctrns.	602-243-6601
AZ	Tempe, Fisher/Brownell	602-967-1464
AZ	Tempe, Hamilton-Avnet	602-231-5100
AZ	Tempe, Arrow Elctrns.	602-968-4800
CA	Alhambra, Fisher/Brownell	213-289-0255
CA	Chatsworth, Anthem Elctrns.	213-700-1000
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Chatsworth, Integrated Elctrns. Corp.	213-998-2200
CA	Costa Mesa, Avnet Elctrns.	714-754-6111
CA	Costa Mesa, Hamilton Electro Sls.	714-641-4100
CA	Culver City, Hamilton Electro Sls.	213-558-2121
CA	El Segundo, Hall-Mark Elctrns.	213-643-9101
CA	Garden Grove, Bell Inds.	714-220-0681
CA	Gardena, Bell Inds.	213-515-1800
CA	Manhattan Beach, Prime Electro	213-379-3642

CA	Sacramento, Hamilton-Avnet	916-925-2216
CA	San Diego, Hamilton-Avnet	619-571-7510
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Diego, Anthem Elctrns.	619-279-5200
CA	San Diego, Hall-Mark Elctrns.	619-268-1201
CA	San Diego, Fisher/Brownell	619-560-8545
CA	Santa Ana, Pacesetter Elctrns.	714-557-7131
CA	Santa Clara, Fisher/Brownell	408-988-6041
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Hamilton-Avnet	408-743-3355
CA	Sunnyvale, Pacesetter Elctrns.	408-734-5470
CA	Sunnyvale, Hall-Mark Elctrns.	408-773-9990
CA	Tustin, Anthem Elctrns.	714-730-8000
CA	Tustin, Arrow Elctrns.	714-851-8961
CA	Woodland Hills, Avnet Elctrns.	213-883-0000
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Englewood, Hamilton-Avnet	303-740-1000
CO	Englewood, Hall-Mark Elctrns.	303-790-1662
CO	Wheatridge, Bell Inds.	303-424-1985
CT	Danbury, Hamilton-Avnet	203-797-2800
CT	Wallingford, Arrow Elctrns.	303-740-1000
FL	Altamonte Spring, Pioneer Elctrns.	305-834-9090
FL	Clearwater, Hall-Mark Elctrns.	813-530-4543
FL	Ft. Lauderdale, Pioneer Elctrns.	305-771-7520
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
FL	Orlando, Chip Supp. Co.	305-298-7100
FL	Palm Bay, Arrow Elctrns.	305-725-1480
FL	Winter Park, Hamilton-Avnet	305-628-3888
GA	Norcross, Pioneer Elctrns.	404-448-1711
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
GA	Norcross, Hamilton-Avnet	404-447-7507
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Bensenville, Hall-Mark Elctrns.	312-806-3800
IL	Bensenville, Hamilton-Avnet	312-860-7700
IL	Elk Grove Vlg., Pioneer Elctrns.	312-437-9680
IL	Lombard, R M Elctrns.	312-932-5150
IL	Northbrook, Classic Comps.	312-272-9650
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Carmel, Hamilton-Avnet	317-844-9333
IN	Indianapolis, Pioneer Elctrns.	317-849-7300
IN	Indianapolis, Arrow Elctrns.	317-243-9353
IN	Indianapolis, R M Elctrns.	317-247-9701
IA	Cedar Rapids, Arrow Elctrns.	319-395-7230
KS	Lenexa, Hall-Mark Elctrns.	913-888-4747
KS	Overland Park, Hamilton-Avnet	913-888-8900
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Columbia, Hamilton-Avnet	301-995-3500
MD	Columbia, Hall-Mark Elctrns.	301-988-9800
MD	Gaithersburg, Pioneer Elctrns.	301-921-0660
MA	Newton, Greene-Shaw Elctrns.	617-969-8900
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Woburn, Hall-Mark Elctrns.	617-935-9777
MA	Woburn, Arrow Elctrns.	617-933-8130
MA	Woburn, Hamilton-Avnet	617-273-7500
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Grand Rapids, Hamilton-Avnet	616-243-8805
MI	Livonia, Hamilton-Avnet	313-522-4700
MI	Livonia, Pioneer Elctrns.	313-525-1800
MI	Wyoming, R M Elctrns.	616-531-9300
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minnetonka, Hamilton-Avnet	612-932-0600
MN	Minnetonka, Pioneer Elctrns.	612-935-5444
MO	Earth City, Hamilton-Avnet	314-344-1200
MO	Maryland Hts., Hall-Mark Elctrns.	314-291-5350
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Cherry Hill, Hamilton-Avnet	609-424-0100
NJ	Cherry Hill, Hall-Mark Elctrns.	609-424-7300
NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Fairfield, Hamilton-Avnet	201-575-3390
NJ	Marlton, Arrow Elctrns.	609-235-1900
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NM	Albuquerque, Hamilton-Avnet	505-765-1500
NM	Albuquerque, Bell Inds.	505-292-2700
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	East Syracuse, Hamilton-Avnet	315-437-2641
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Melville, Arrow Elctrns.	516-694-6800
NY	Melville, Hamilton-Avnet	516-454-6060
NY	Port Chester, Zeus Comps.	914-937-7400
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Rochester, Hamilton-Avnet	716-475-9130
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Ronkonkoma, Hall-Mark Elctrns.	516-737-0600
NC	Charlotte, Pioneer Elctrns.	704-527-8188
NC	Raleigh, Hall-Mark Elctrns.	919-872-0712
NC	Raleigh, Hamilton-Avnet	919-878-0819
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cincinnati, Hall-Mark Elctrns.	513-563-5980
OH	Cleveland, Pioneer Elctrns.	216-587-3600
OH	Cleveland, Hamilton-Avnet	216-831-3500
OH	Dayton, Hamilton-Avnet	513-433-0610
OH	Dayton, Pioneer Elctrns.	513-237-9900
OH	Highland Heights, Hall-Mark Elctrns.	216-473-2907
OH	Solon, Arrow Elctrns.	216-248-3990
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
OK	Tulsa, Quality Comps.	918-664-8812
OR	Lake Oswego, Hamilton-Avnet	503-635-8157
OR	Lake Oswego, Bell Inds.	503-241-4115
OR	Tigard, Arrow Elctrns.	503-684-1690
PA	Dallas, Arrow Elctrns.	214-386-7500
PA	Horsham, Pioneer Elctrns.	215-674-4000
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Pittsburgh, Pioneer Elctrns.	412-782-2300
TX	Addison, Quality Comps.	214-387-4949
TX	Austin, Hall-Mark Elctrns.	512-258-8848
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Austin, Pioneer Elctrns.	512-835-4000
TX	Austin, Quality Comps.	512-835-0220
TX	Austin, Hamilton-Avnet	512-837-8911
TX	Dallas, Hall-Mark Elctrns.	214-341-1147
TX	Dallas, Pioneer Elctrns.	214-386-7300
TX	Dallas, Intl. Elctrns.	214-233-9323
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Houston, Hamilton-Avnet	713-780-1711
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Houston, Pioneer Elctrns.	713-988-5555
TX	Houston, Hall-Mark Elctrns.	713-781-6100
TX	Irving, Hamilton-Avnet	214-659-4111
TX	Richardson, Fisher/Brown	214-235-3177
TX	Sugarland, Quality Comps.	713-491-2255
UT	Salt Lake City, Hamilton-Avnet	801-972-2800
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
UT	Salt Lake City, Bell Inds.	801-972-6969
VA	Richmond, Arrow Elctrns.	804-282-0413
WA	Bellevue, Hamilton-Avnet	206-453-5844
WA	Bellevue, Arrow Elctrns.	206-653-4800
WA	Bellevue, Bell Inds.	206-747-1515
WI	New Berlin, Classic Comps.	414-786-5300
WI	New Berlin, Hamilton-Avnet	414-784-4510
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000
WI	Oak Creek, Arrow Elctrns.	414-764-6600

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Local Sales Offices & Reps

AL	Huntsville, TRW/ECG	205-533-7600
AZ	Scottsdale, TRW/ECG	602-994-0441
CA	Los Angeles, Integrated Sls.	213-478-0183
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, Integrated Sls.	619-571-1544
CA	Santa Ana, Integrated Sls.	714-973-2162
CA	Woodland Hills, Integrated Sls.	213-883-7130
CO	Westminster, Straube Assocs.	303-426-0890
CT	Rowayton, TRW/ECG	203-853-4466
FL	Ft. Lauderdale, TRW/ECG	305-772-3000
FL	Orlando, TRW/ECG	305-857-3650
GA	Norcross, TRW/ECG	404-447-6154
IL	Chicago, TRW/ECG	312-693-7730
IN	Ft. Wayne, R. O. Whitesell & Assocs.	219-432-5591
IN	Indianapolis, R. O. Whitesell & Assocs.	317-359-9283
IN	Kokomo, R. O. Whitesell & Assocs.	317-457-9127
IA	Cedar Rapids, C. H. Horn & Assocs.	319-393-8703
KS	De Soto, Midtec Assocs.	913-441-6565
KY	Louisville, R. O. Whitesell & Assocs.	502-426-7696
MD	Columbia, TRW/ECG	301-964-9110
MA	Framingham, TRW/ECG	617-620-0625
MI	Grand Rapids, R. O. Whitesell & Assocs.	616-942-5420
MI	Southfield, R. O. Whitesell & Assocs.	313-559-5454
MI	St. Joseph, R. O. Whitesell & Assocs.	616-983-7337
MN	Minneapolis, TRW/ECG	612-854-6616
MO	St. Louis, Jack Macke Co.	314-432-2830
NY	Fairport, TRW/ECG	716-425-3775
NC	Greensboro, TRW/ECG	919-852-4676
OH	Cincinnati, R. O. Whitesell & Assocs.	513-521-2290
OH	Cleveland, R. O. Whitesell & Assocs.	216-447-9020
OH	Columbus, R. O. Whitesell & Assocs.	614-888-9396
OH	Dayton, R. O. Whitesell & Assocs.	513-298-9546
OR	Portland, TRW/ECG	503-620-5032
PA	Bala Cynwyd, TRW/ECG	215-667-3400
PA	Pittsburgh, R. O. Whitesell & Assocs.	412-963-6161
TN	Greeneville, R. O. Whitesell & Assocs.	615-639-6154
TX	Austin, Technlg. Sls. Co.	512-345-2331
TX	Dallas, TRW/ECG	214-248-8000
TX	El Paso, S. W. Sales	915-594-8259
TX	Houston, TRW/ECG	713-772-5541
UT	Salt Lake City, Straube Assocs.	801-263-2640
VA	Richmond, TRW/ECG	804-288-8334
WA	Bellevue, TRW/ECG	206-641-9996
WI	Brookfield, TRW/ECG	414-784-7773

Local Distributors

AL	Huntsville, Hamilton/Avnet	205-837-7210
AL	Huntsville, Arrow Elctrns.	205-882-2730
AZ	Phoenix, R. V. Weatherford	602-272-7144
AZ	Phoenix, Hamilton/Avnet	602-231-5100
AZ	Phoenix, Kierulff	602-243-4101
AZ	Tempe, Arrow Electronics	602-968-4800
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tucson, Kierulff	602-624-9986
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Gardena, Bell Inds.	213-515-1800
CA	Glendale	213-849-3451
CA	Glendale, R. V. Weatherford	213-849-3451
CA	Los Angeles, Avnet	213-558-2345
CA	Los Angeles. Hamilton	213-558-2121
CA	Los Angeles, Kierulff	213-725-0325
CA	Orange County, Hamilton	714-641-4100
CA	Orange County, Arrow Electronics	714-838-5422
CA	Orange County, Avnet	714-754-6111
CA	Sacramento, Arrow Electronics	916-925-7456
CA	Sacramento, Hamilton/Avnet	916-925-2216
CA	San Diego, Hamilton/Avnet	619-571-7510
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	San Fernando Valley, Hamilton	213-558-2323
CA	San Fernando Valley, Avnet	818-700-2600
CA	San Francisco, Hamilton/Avnet	408-743-3355
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CO	Denver, Hamilton/Avnet	303-779-9998
CO	Denver, Arrow Elctrns.	303-758-2100

O	Englewood, Intl. Elctrns.	303-740-2266
T	Danbury, Hamilton/Avnet	203-797-2800
T	Wallingford, Midan Elctrns.	203-265-2077
T	Wallingford, Arrow Elctrns.	203-265-7741
L	Ft. Lauderdale, NRC Elctrns.	305-772-4500
L	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
L	Melbourne, Hamilton/Avnet	305-725-2700
L	Miami, Hamilton/Avnet	305-971-2900
L	Orlando, Hamilton/Avnet	305-628-3888
L	Orlando, Kierulff	305-352-8475
L	Palm Bay, Arrow Elctrns.	305-725-1480
L	St. Petersburg, Hamilton/Avnet	813-576-3930
L	Tampa, Impala Elctrns.	813-885-4747
GA	Atlanta, Hamilton/Avnet	404-447-7507
GA	Norcross, Arrow Elctrns.	404-449-8252
L	Chicago, Hamilton/Avnet	312-860-7700
L	Chicago, Bell Inds.	312-982-9210
L	Chicago, Newark Elctrns.	312-638-4411
L	Schaumburg, Arrow Elctrns.	312-893-9420
N	Indianapolis, Hamilton/Avnet	317-844-9333
N	Indianapolis, Arrow Elctrns.	317-243-9353
N	Indianapolis, Graham Elctrns.	317-634-8202
A	Cedar Rapids, Arrow Elctrns.	319-395-7230
A	Cedar Rapids, Deeco	319-365-7551
KS	Kansas City, Hamilton/Avnet	913-888-8900
KS	Wichita, Hamilton/Avnet	800-532-6702
KY	Lexington, Hamilton/Avnet	800-543-4783
KY	Louisville, Hamilton/Avnet	800-428-6012
MD	Baltimore, Hamilton/Avnet	301-995-3500
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Timonium, Zebra Elctrns.	301-252-6576
MA	Boston, Hamilton/Avnet	617-273-7500
MA	Norwood, Gerber Elctrns.	617-769-6000
MA	Wilmington, R.C. Components	617-273-1860
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MI	Detroit, Hamilton/Avnet	313-522-4700
MI	Grand Rapids, Arrow Elctrns.	616-243-0912
MI	Grand Rapids, Hamilton/Avnet	616-243-8805
MI	Livonia, R.S. Elctrns.	313-525-1155
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, Hamilton/Avnet	612-932-0600
MN	Minneapolis, Newark Elctrns.	612-331-6350
MO	St. Louis, Hamilton/Avnet	314-344-1200
MO	St. Louis, Arrow Elctrns.	314-567-6888
NE	Lincoln, Hamilton/Avnet	800-255-6702
NE	Omaha, Hamilton/Avnet	800-255-6702
NH	Manchester, Arrow Elctrns.	603-668-6968
NH	Windham, Newark Elctrns.	603-893-6100
NJ	Cherry Hill, Hamilton/Avnet	609-424-0100
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Fairfield, Hamilton/Avnet	201-575-3390
NJ	Hanover, State Elctrns.	201-887-2550
NJ	Marlton, Arrow Elctrns.	609-596-8000
NJ	Mountainside, Enox Resistors	201-654-7600
NM	Albuquerque, Hamilton/Avnet	505-765-1500
NM	Albuquerque, Intl. Elctrns.	505-345-8127
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Hauppauge, Arrow Elctrns.	516-231-1000
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Liverpool, Arrow Elctrns.	315-652-1000
NY	Melville, Hamilton/Avnet	516-454-6060
NY	Melville, Arrow Elctrns.	516-694-6800
NY	Rochester, Hamilton/Avnet	716-475-9130
NY	Rochester, Arrow Elctrns.	716-275-0300
NY	Rochester, Rochester Radio	716-454-7800
NY	Syracuse, Hamilton/Avnet	315-437-2641
NC	Raleigh, Hamilton/Avnet	919-878-0810
NC	Raleigh, Resco/Raleigh	919-781-5700
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Cleveland, Hamilton/Avnet	216-831-3500
OH	Columbus, Electronic Mktg.	614-299-4161
OH	Dayton, Bell Inds.	513-434-8231
OH	Dayton, Hamilton/Avnet	513-433-0610
OH	Kettering, Elctrns. Mktg. Corp.	513-439-4711
OH	Solon, Arrow Elctrns.	216-248-3990
OH	Valley View, Newark Elctrns.	216-447-8860
OK	Tulsa, Arrow Elctrns.	918-665-7700
OR	Portland, Hamilton/Avnet	503-635-8831
PA	Philadelphia, Hamilton/Avnet	215-831-1300
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
PA	Pittsburgh, Hamilton/Avnet	800-321-6890
PA	Pittsburgh, Arrow Elctrns.	412-351-4000
PA	Wayne, Peak Elctrns.	215-293-9000
SC	Columbia, Hamilton/Avnet	800-334-1597
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Austin, Hamilton/Avnet	512-837-8911
TX	Dallas, Hamilton/Avnet	214-659-4111
TX	Dallas, Intl. Elctrns.	214-233-9323
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Dallas, R. V. Weatherford	214-980-1110
TX	El Paso, Intl. Elctrns.	915-598-3406
TX	Garland, Newark Elctrns.	214-494-5911
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Houston, Hamilton/Avnet	713-780-1771
TX	Houston, R. V. Weatherford	713-688-7406
TX	Richardson, Jaco Elctrns.	214-235-9575
UT	Salt Lake City, Hamilton/Avnet	801-972-2800
UT	Salt Lake City, Arrow Elctrns.	801-539-1135
VA	Richmond, Arrow Elctrns.	804-282-0413
WA	Bellevue, Arrow Elctrns.	206-643-4800
WA	Seattle, Hamilton/Avnet	206-453-5844
WA	Seattle, Robert E. Priebe Co.	206-682-8242
WV	Charleston, Hamilton/Avnet	800-543-4783
WV	Huntington, Hamilton/Avnet	800-543-4783
WI	Madison, Arrow Elctrns.	608-273-4977
WI	Milwaukee, Hamilton/Avnet	414-784-4510
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Oak Creek, Arrow Elctrns.	414-764-6600

TRW, RF Devices Div., 14520 Aviation Blvd., Lawndale, CA 90260, Tel: 213-536-0888, TWX: 910-325-6206; Empl.: 1000; *Sls. Mgr.:* D. Faigenblat; *Dist. Mgr.:* G. Vegvari

TRW UTC TRANSFORMERS, See TRW Inductive Products Div.

T S PRODUCTS, 12455 Brandford St., Unit 22, Arleta, CA 91331, Tel: 818-896-6676; *Sls. Mgr.:* Wm. Denzel; *Dist. Mgr.:* Wm. Denzel .... **3**•1119

TTI

TTE, INC., 2214 S. Barry Ave., Los Angeles, CA 90064, Tel: 213-478-8224; FSC No.: 07766; *Sls. Mgr.:* S. J. Sodaro .... **1A**•1632-1641

Local Sales Offices & Reps

CA	Culver City, Sodaro	213-478-7733

TTS-TELECOM TERMINAL SYSTEMS, 3877 Grandview Blvd., Los Angeles, CA 90066, Tel: 213-390-9494, Telex: 182405, TWX: 910-343-6453; Empl.: 18; *Sls. Mgr.:* L. Winters

TUCKER ELCTRNS., Box 461060, Garland, TX 75046, Tel: 214-348-8800, 800-527-4642, Telex: 79-1726; Empl.: 45; *Sls. Mgr.:* Clay Aclin

TUNGSTONE BATTERIES, INC., 18 Billings St., Sharon, MA 02067, Tel: 617-784-2000, Telex: 951908; Empl.: 8; *Sls. Mgr.:* J. McMahon

TURNER DESIGNS, 2247 Old Middlefield Way, Mountain View, CA 94043-2489, Tel: 415-965-9800; Empl.: 16; *Sls. Mgr.:* John Griffin

Local Sales Offices & Reps

CA	Garden Grove, Advanced Digital Grp.	714-897-0319
CA	Santa Clara, MANCO	408-496-6611
CO	Wheat Ridge, Active Component Technlg.	303-422-9229
MD	Baltimore, Rep-Tron, Inc.	301-799-7490
MA	North Reading, Martindale Assocs.	617-942-0514
NY	Fayetteville, Martin P. Andrews	315-637-5291
TX	Addison, Active Component Technlg.	214-980-1888
TX	Austin, Active Component Technlg.	512-452-5254

TUSONIX

TUSONIX, INC., 7741 N. Business Park Drive, P.O. Box 37144, Tucson, AZ 85740-7144, Tel: 602-744-0400, Telex: 102-299640, TWX: 310-299640; FSC No.: 59660; *Sls. Mgr.:* Robert H. Jones; *Dist. Mgr.:* John Hohlrich .... **1A**•1201-1207

Local Sales Offices & Reps

AZ	Tucson, Tusonix, Inc.	602-744-0400
CA	N. Hollywood, Tusonix	818-509-0449
CA	Redwood City, James S. Heaton Co.	415-367-9000
FL	Winter Park, Tusonix	305-647-2936
IA	Cedar Rapids, J.R. Sls. Engrg.	319-393-2232
MA	Andover, Richard Purinton Inc.	617-475-7055
NY	Rochester, Tusonix, Inc.	716-328-4070
NC	Greensboro, Tusonix	919-292-4286
OR	Portland, Components West	503-643-5588
WA	Renton, Components West	206-271-5252

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Tempe, Powell Elctrns.	602-967-7538
AZ	Tempe, Arrow Elctrns.	602-968-4800
CA	Chatsworth, Arrow Elctrns.	213-701-7500
CA	Costa Mesa, Powell Elctrns.	714-754-1717
CA	Inglewood, Newark Electrns.	213-678-0441
CA	San Diego, Arrow Elctrns.	619-565-4800
CA	Sunnyvale, Powell Elctrns.	408-739-4321
CA	Sunnyvale, Arrow Elctrns.	408-745-6600
CA	Tustin, Arrow Elctrns.	714-838-5422
CO	Aurora, Arrow Elctrns.	303-696-1111
CO	Denver, Newark Elctrns.	303-423-7941
CT	Wallingford, Arrow Elctrns.	203-265-7741
FL	Dania, Summit	305-920-6253
FL	Ft. Lauderdale, Arrow Elctrns.	305-776-7790
FL	Ft. Lauderdale, Newark Elctrns.	305-587-2372
FL	Ft. Lauderdale, Powell Elctrns.	305-979-5000
FL	Palm Bay, Arrow Elctrns.	305-725-1480
GA	Norcross, Arrow Elctrns.	404-449-8252
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Schaumburg, Arrow Elctrns.	312-397-3440
IN	Indianapolis, Arrow Elctrns.	317-243-9353
MD	Baltimore, RESCO	301-529-0500
MD	Baltimore, Arrow Elctrns.	301-247-5200
MD	Beltsville, RESCO	301-937-9100
MD	Beltsville, Powell Elctrns.	301-937-4030
MA	Westborough, Powell Elctrns.	617-366-6100
MA	Woburn, Arrow Elctrns.	617-933-8130
MI	Ann Arbor, Arrow Elctrns.	313-971-8220
MN	Edina, Arrow Elctrns.	612-830-1800
MN	Minneapolis, Newark Electrns.	612-331-6350
MO	St. Louis, Arrow Elctrns.	314-567-6888
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Englewood, Powell Elctrns.	201-894-0800
NJ	Fairfield, Arrow Elctrns.	201-575-5300
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NM	Albuquerque, Arrow Elctrns.	505-243-4566
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit	716-884-3450
NY	Hauppauge, Arrow Elctrns.	315-652-1000
NY	Hauppauge, Fairmont Elctrns. Sls.	516-231-3313
NY	Liverpool, Arrow Elctrns.	516-694-6800
NY	Melville, Arrow Elctrns.	516-694-6800
NY	Rochester, Summit	716-334-8110
NY	Rochester, Arrow Elctrns.	716-275-0300
NC	Gary, Powell Elctrns.	919-467-1212
NC	Raleigh, RESCO	919-781-5700
NC	Raleigh, Arrow Elctrns.	919-876-3132
NC	Winston-Salem, Arrow Elctrns.	919-725-8711
OH	Centerville, Arrow Elctrns.	513-435-5563
OH	Solon, Arrow Elctrns.	216-248-3990
OK	Tulsa, Altair	918-252-5781
PA	Monroeville, Arrow Elctrns.	412-856-7000
PA	Philadelphia, Powell Elctrns.	215-365-1900
TX	Austin, Arrow Elctrns.	512-835-4180
TX	Dallas, Arrow Elctrns.	214-386-7500
TX	Houston, Arrow Elctrns.	713-530-4700
TX	Houston, Altair	713-462-3029
TX	Irving, Powell Elctrns.	214-350-4186
TX	Richardson, Altair	214-231-5166
WA	Bellvue, Arrow Elctrns.	206-643-4800
WI	Oak Creek, Arrow Elctrns.	414-764-6600

TUSTIN ELCTRNS. CO., 1431 E. Saint Andrews Pl., Santa Ana, CA 92705, Tel: 714-549-0391; FSC No.: 7025-0010; *Sls. Mgr.:* Saul Tunkelrott

TWP, INC., 2133 4th St., Berkeley, CA 94710, Tel: 415-548-4434, Telex: 717-267; Empl.: 10; *Sls. Mgr.:* R. Moreno

TYCO INSTR. DIV., See Data Instrs.

TYTON CORP., Box 23055, 7930 N. Faulkner Rd., Milwaukee, WI 53223, Tel: 414-355-1130, TWX: 910-262-3094; *Sls. Mgr.:* Tom Bednar

Local Sales Offices & Reps

CA	Encinitas	619-692-3144
CA	Manhattan Beach	714-581-3334
CA	Palmdale	818-343-3527
CO	Denver	303-447-2141
FL	Lake Mary	305-323-0120
GA	Smyrna	404-433-8818
IL	Homewood	312-964-6225
IL	Plano	312-964-6225
IN	Noblesville	317-872-9573
MA	Sekonk	617-376-2166
MI	Holly	313-647-7399
MI	Ypsilanti	313-647-7399
MO	Grandview	314-344-9237
NJ	Middletown	201-671-7034
NY	E. Islip	516-277-6098
NY	Liverpool	315-422-7539
NC	Charlotte	704-376-5269
OH	Elyria	216-888-2800
PA	Drexel Hill	215-853-3330
TN	Nashville	615-747-5888
TX	Dallas	214-253-6611
TX	Humble	713-525-1713
WA	Alderwood Manor	206-622-3195
WI	Milwaukee	414-355-1130

UBER GRAFIC INSTRS., Box 4, Palo Alto, CA 94302, Tel: 415-327-4732; Empl.: 2

UCE, INC., 24 Fitch St., Norwalk, CT 06855, Tel: 203-838-7509; Empl.: 20; *Sls. Mgr.:* Richard Eicher

UID SWITCHES INC., Sub. of ITW, 6615 W. Irving Park Rd., Chicago, IL 60634, Tel: 312-282-4040, Telex: 4330130, TWX: 910-221-0275; *Sls. Mgr.:* R. Schmidt; *Dist. Mgr.:* R. Scrivner

ULTRA CARBON, Box X-747, Bay City, MI 48707, Tel: 517-894-2911, TWX: 810-265-1222; Empl.: 200; *Sls. Mgr.:* R. J. Anthony

ULTRONIX, INC., P.O. Box 1090, Grand Junction, CO 81502, Tel: 303-242-0810, TWX: 910-929-6965; FSC No.: 05347; Empl.: 220; *Sls. Mgr.:* Gerald Krebill; *Dist. Mgr.:* Gerald Krebill **1A**•1992-1999

Local Sales Offices & Reps

AL	Huntsville, Remco	205-533-3763
AZ	Phoenix, Howe & Howe Sls.	602-264-7971
CA	Anaheim, Westrep	714-527-2822
CA	San Diego, Westrep	619-276-0751
CA	Santa Clara, Westrep	408-988-8833
CO	Denver, West Inc.	303-692-0131
FL	Orlando, Donato & Assocs.	305-352-0727
FL	Palm Harbor, Donato & Assocs.	813-785-3327
GA	Atlanta, Remco	404-447-6937
IL	Elk Grove Village, Parcom	312-228-6360
IN	Ft. Wayne, Giesting & Assocs.	219-486-1912
IA	Cedar Rapids, Stan Clothier Co.	319-395-0245
KS	Parker, S. W. Wollard Co.	913-890-6552
MD	Beltsville, Applied Engrg. Consultants	301-792-2211
MA	Newton Upper Falls, Anchor Engrg.	617-964-6205
MI	Coloma, Giesting & Assoc.	616-468-4200
MI	Novi, Giesting & Assoc.	313-348-3811
MN	Minneapolis, S. Clothier Co.	612-944-3456
MO	St. Louis, Abrams & Assoc.	314-569-0447
NJ	Cherry Hill, Danco Corp.	609-424-5590
NY	Jericho, J-Square Mktg.	516-935-3200
NY	Rochester, Apex Assocs.	716-254-6050
NC	Raleigh, Remco	919-847-5079
OH	Cincinnati, Giesting & Assoc.	513-521-8800
OH	Mentor, Giesting & Assocs.	216-942-3407
PA	Pittsburgh, Giesting & Assocs.	412-963-0727
TX	Austin, O. M. Sls.	512-452-1838
TX	Dallas, O. M. Sls.	214-241-3876
TX	Houston, O. M. Sls.	713-789-4426
UT	Salt Lake City, West Inc.	801-466-5739
WA	Bellevue, Vantage Corp.	206-455-3460
WA	Kent, R & R Assoc.	206-251-5396
EXP	CT, Stamford, Dage Corp.	203-324-3123

Local Distributors

CA	Chatsworth, IEC/JACO	213-998-2200
CA	North Hollywood, T.T.I., Inc.	213-982-0201
CA	Orange, IEC/JACO	714-540-5600
CA	Sacramento, IEC/JACO	916-424-5297
CA	San Fernando, Petell Electronics	213-365-3984
CA	San Jose, IEC/JACO	408-263-1100
CO	Denver, IEC/JACO	303-292-6121
FL	Orlando, Hammond Elctrns.	305-849-6060
FL	Orlando, T.T.I-2	305-859-1000
FL	Tampa, Impala Elctrns.	813-885-4747
IL	Chicago, IEC/JACO	312-843-2040
MD	Columbia, Azteck Elctrns.	301-995-1760
MA	Burlington, TLC Elctrns.	617-273-0140
MA	Woburn, T.T.I., Inc.	617-938-8800
NY	Bohemia, T.T.I., Inc.	516-567-1500
NY	Farmingdale, SAI, Inc.	516-293-2710
NY	Hauppauge, JACO	516-273-5500
NY	Valley Stream, L&S Elctrns.	800-645-2235
OH	Dayton, Electro-Line	513-461-5683
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Fort Worth, T.T.I., Inc.	800-433-7092
UT	Salt Lake City, IEC/JACO	801-298-1868
WA	Bellevue, Integrated Elctrns. Corp.	206-455-2727
WA	Kent, Shannon Ltd.	206-763-0545
WA	Seattle, IEC/JACO	206-455-2727

ULVAC NORTH AMERICA, P.O. Box 890, Kennebunk, ME 04043, Tel: 207-985-7169, TWX: 510-299-0007; Empl.: 600; *Sls. Mgr.:* C. Carman

UNARCO-ROHN, See UNR-Rohn

UNDERWRITERS SAFETY DEVICE, An Allied Co., 7300 W. Wilson Ave., Chicago, IL 60656, Tel: 312-867-4600, TWX: 910-221-3474; Empl.: 200; *Sls. Mgr.:* J. A. VanCura; *Dist. Mgr.:* R. S. Heyne

UNGAR, Div. Eldon Inds., Inc., 100 W. Manville St., Compton, CA 90224-6005, Tel: 213-774-5950, Telex: 4720750 Eldon; FSC No.: 78976; Empl.: 140; *Sls. Mgr.:* George Mellevold

Local Sales Offices & Reps

AZ	Scottsdale, R.F. Rich & Assoc.	602-941-1475
CA	Gardena, Ungar Sls. Assocs.	213-538-2811
CA	Hawthorne, Eldon Inds.	213-642-7716
CA	Los Altos, Ewing-Foley	415-941-4525
CO	Colorado Springs, MID-MTI-REP	303-598-1369
CT	Woodstock, Neff Co.	203-974-1281
FL	Lauderdale Lakes, Seacom Sls.	305-486-0260
HI	Compton, Ungar	213-774-5950
IL	Chicago, Restronics	312-960-1205
IN	Indianapolis, Robert Milsk Co.	317-842-3400
KS	Kansas City, Thomas L. Dowell & Assoc.	913-648-7373
MA	Boston, Neff Co.	617-582-4216
MI	Southfield, R. Milsk Co.	313-354-3310
MN	Minneapolis, Restronics	612-941-9135
MO	St. Louis, Thomas L. Dowell & Assocs.	314-849-4234
NJ	Marlton, Fahy Mktg. Assocs.	609-983-2366
NY	Oceanside, Bittan Assocs.	516-678-6222
TX	Houston, Rich Sls.	713-695-9240
TX	Rockwall, Rich Sls.	214-257-0761
WA	Seattle, Sproul & Assoc.	206-789-3300
EXP	Inglewood, Eldon Industries, Inc.	213-642-7716

UNHOLTZ-DICKIE CORP., 6 Brookside Dr., Wallingford, CT 06492, Tel: 203-265-3929, Telex: 643802; Empl.: 49

unibox® PACKAGING SYSTEM

UNIBOX, Div. of Amerex, P.O. Box 2815, Riverside, CA 92516, Tel: 714-686-1400; *Sls. Mgr.:* Roger Orton **2**•1005

UNICO, 3725 Nicholson Rd., Franksville, WI 53126-0505, Tel: 414-886-5678, TWX: 910-271-2385; Empl.: 175; *Sls. Mgr.:* A. L. Engle

UNICORN ENGRG. CO., Membrane Keyboard Div., 6201 Harwood Ave., Oakland, CA 94618, Tel: 415-428-1626; *Sls. Mgr.:* Steve Gensler

UNICORP, 291 Cleveland St., Orange, NJ 07050, Tel: 201-674-1700; FSC No.: 04729; Empl.: 50; *Sls. Mgr.:* B. Levine **2**•1868

Local Sales Offices & Reps

CT	Milford, Todino Engrg. Sls.	203-874-6643
CT	Stamford, George Reiss	203-348-0007
FL	Melbourne Beach, Brennan Assoc.	305-724-0854
IL	Palatine, Claeson Assocs.	312-359-7230
IN	Indianapolis, M&L Elctrn. Sls.	317-359-4742
MA	Needham Hgts., Todino Engrg. Sls.	617-444-7925
MI	Farmington, Amtech Rep.	313-474-8300
MN	Bloomington, Termatech	612-854-2001
OR	Portland, Frank Jackson Assocs.	503-292-2638
TX	Richardson, Precision Techn. Assocs.	214-234-8071
TX	Round Rock, Precision Techn. Assocs.	512-250-0201
WA	Seattle, Frank Jackson Assocs.	206-523-6300

UNIFORM TUBES, Collegeville, PA 19426, Tel: 215-539-0700, Telex: 84-6428, TWX: 510-660-6107; FSC No.: 93306; Empl.: 400; *Sls. Mgr.:* Lloyd Deery

UNILATOR TECHNICAL CERAMICS INC., 6290 Sunset Blvd., Ste. 1126, Los Angeles, CA 90028, Tel: 213-463-5618, TWX: 910 321-2903; *Sls. Mgr.:* Norman R. Sutherland

Local Sales Offices & Reps

AL	Lake Guntersville, Kelley Sys.	205-582-8677
AZ	Tempe, Qualtech	602-967-4655
CA	Los Angeles, Yarbrough Sls. Co.	213-254-5101
FL	Tampa, APM Assocs.	813-886-2457
IL	La Grange Park, Bierhaus Sls.	312-354-5100
KS	Wichita, Electro Mechanical Assocs.	316-682-9433
MD	Baltimore, Stitzer Assocs.	301-823-2600
MA	Waltham, Carlisle Tech. Sls.	617-890-1456
MI	Union Lake, Ashby Assocs.	313-363-1100
MO	Bridgeton, Electro Mechanical Assocs.	314-291-8661
NH	Amherst, Carlisle Tech. Sls.	603-673-4690
NJ	Ridgewood, Ballou Inc.	212-964-4640
NM	Albuquerque, Qualtech	505-243-5605
NY	Rochester, R. P. Kennedy Co.	716-271-6322
OH	Dayton, Ashby Assocs.	513-252-5627
OH	Lyndhurst, Ashby Assocs.	216-461-0826
PA	Paoli, Stitzer Assocs.	215-644-5500
TX	Richardson, Eagle Mktg. Inc.	214-238-5383
WI	Elm Grove, Bierhaus Sls.	414-784-5212

UNIMAX SWITCH CORP., Ives Rd., Wallingford, CT 06492, Tel: 203-269-8701, Telex: 96-3485, TWX: 710-476-1397; FSC No.: 80207; Empl.: 300; *Dist. Mgr.:* Richard Brache **1B**•1756

Local Sales Offices & Reps

AZ	Phoenix, Mercury Engrg. Sls., Inc.	602-244-0123
CA	Brea, M. A. Stolaroff Co.	714-529-0866
CA	Los Altos, Ewing-Foley	415-941-4525
CA	Los Angeles, M. A. Stolaroff Co.	213-295-7781
CA	Santee, M. A. Stolaroff Co.	
CA	Simi Valley, M. A. Stolaroff Co.	
CO	Englewood, CompuTech Marketing	303-773-2981
CT	Ansonia, Zaslow Sls.	203-735-9581
CT	Bloomfield, Zaslow Sls.	203-242-7781
FL	Tampa, J. R. Controls	813-961-9478
IL	Lisle, Wasson-Gallagher	312-963-5954
IN	Ft. Wayne, O. H. Bromberg & Assocs.	219-744-1636
KY	Louisville, O. H. Bromberg & Assocs.	502-245-8916
LA	Metairie, Automation Supps.	504-831-2183
MD	Silver Spring, NKA, Inc.	301-585-6141
MD	Silver Spring, L. G. White & Co.	301-434-1555
MA	Northboro, Zaslow Sls.	617-393-8150
MA	Waltham, Zaslow Sls.	617-894-8393
MA	Watertown, Zaslow Sls. Co.	617-823-8118
MI	Grosse Pointe Park, Greiner Assoc.	313-499-0188
MN	Minneapolis, Jos-Co. Sls. Engrg.	612-861-3343
MO	Creve Coeur, Hill & Co.	314-432-1136
NH	Londonderry, Zaslow Sls.	603-432-8907
NJ	West Caldwell, Grimm, Siegel Assoc.	201-575-9300
NY	Ballston Lake, Nycom	518-899-4104
NY	E. Syracuse, Nycom	315-437-8343
NY	Williamsville, Nycom	
NC	Winston-Salem, L. G. White & Co.	919-725-3612
OH	Cincinnati, O. H. Bromberg & Assocs.	513-771-9333
OH	Dayton, O. H. Bromberg & Assocs.	513-434-8788
OH	Medina, J. C. Hofstetter Co.	216-241-4880
PA	Broomall, White-Whiddett	215-353-6343
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
SC	Greenville, Sunbelt Sls.	803-877-0771
SC	Greenville, L. G. White & Co.	803-271-0630
TN	Taft, Sunbelt Sls.	615-425-6164
TX	Arlington, W. Pat Fralia Co.	817-640-9101
VA	Richmond, L. G. White & Co.	804-740-7093
WA	Mercer Island, J. H. Andersen	206-232-0484

Local Distributors

AL	Decatur, Forbes Distr. Co.	205-353-4762
AL	Montgomery, Southern Controls	205-277-5030
AZ	Phoenix, Continental Light & Supp.	602-263-6000
AZ	Phoenix, Electro Comps.	602-258-2665
AR	Fort Smith, Southern Elec.	501-646-5500
CA	Belmont, Lodan Elctrns.	415-592-4600
CA	Belmont, Arndt Elctrns.	415-592-6718
CA	Covina, Selecta Switch	213-915-3409; 213-967-4123
CA	Fountain Valley, Components Ctr.	213-582-0667
CA	Gardena, California Switch & Signal	213-538-9830

CA	Los Angeles, Master Distrs.	213-829-4956
CA	Riverside, Electronic Supp.	714-683-7300
CA	Sacramento, Dunlap Elctrns.	916-442-5801
CA	Santa Clara, Cypress Elctrns.	408-727-7080
CA	Santa Monica, Master Distrs.	213-452-1229; 213-829-4656
CA	Van Nuys, Pacific Switch	213-873-4802
CO	Denver, Fistell's Elec. Supp.	303-629-1312
CT	East Haven, J.V. Elctrns.	203-469-2321
CT	Manchester, Economy Elec. Supp.	203-646-2830
CT	W. Hartford, Atlantic Switch Controls	203-525-6907
FL	Hialeah, Atlas Elec. Supp.	305-885-8941
FL	Lakeland, Switch Controls	813-644-7564
FL	Largo, Lodan Elctrns.	813-586-2851
FL	Miami, Electronic Equip.	305-871-3500
IL	Arlington Hgts., LoDan	312-398-5311
IL	Chicago, Newark Elctrns.	312-638-4411
IL	Lombard, R.M. Elctrns.	312-932-5150
IL	Wheaton, Connectrix	312-653-1460; 800-323-9431
IA	West Des Moines, Ramco	515-225-6933
KY	Louisville, Main Elect. Equip.	502-587-6511
LA	Marrero, AFG Elctrns.	504-368-9696
LA	New Orleans, William B. Allen Supp.	504-525-8222
ME	Portland, Rockingham Elect. Supp.	207-772-4614
MA	Hingham, Sager Elec. Supp.	617-749-6700
MI	Augusta, Great Lakes Elctrns.	616-731-4156
MI	St. Claire Shores, Specialties Mfg. Co.	313-771-2700
MN	Minneapolis, Joel Co.	612-545-5669
MO	Maryland Hgts., Western Extralite	314-432-4560
NJ	Fair Lawn, Relay Specialities	201-797-3313
NJ	Mt. Laurel, Jerseyswitch	609-778-8190
NJ	Paterson, Feldman Brothers Elec. Supp.	201-742-7330
NY	Bohemia, Key Comps.	516-567-7500
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Geneva, Gersh	315-789-4505
NY	Hempstead, Elctrn. Equip.	516-538-5510
NY	Rochester, Summit Elctrns.	716-334-8110
NY	Sodus, AED Distrs.	315-483-6561
NY	Woodside, Switches Unltd.	212-478-5000
NC	Charlotte, Dixie Elctrns.	704-377-4348
NC	Winston-Salem, Kirkman Elect.	919-722-9131
OH	Cincinnati, Cartessa Corp.	513-385-7700
OH	Cincinnati, Rilco	513-231-3400
OH	Columbus, Ohio Switch	614-885-0319
OK	Tulsa, Radio, Inc.	918-587-9123
OR	Portland, Johnstone	503-231-4833
PA	Philadelphia, Herbach & Rademan	215-426-1700
PA	Pittsburgh, Alder-tronics	412-821-5565
SC	Columbia, Dixie Elctrns.	803-779-5332
TX	Dallas, Texaswitch	214-357-1768
TX	El Paso, Ideal Indl. Elctrn. Supp.	915-779-6647
TX	San Antonia, Purvis Bearing	512-299-1010
TX	Waco, Purvis Bearing	
TX	Waco, Hargis Co.	817-754-5667
VA	Alexandria, Techn. Distrs.	703-971-8979
VA	Roanoke, Peoples Elctrn. Supp.	703-342-8933
WI	Mequon, Taylor Elec.	414-241-4321

EVEREADY. ENERGIZER®

UNION CARBIDE CORPORATION

UNION CARBIDE CORPORATION, Battery Prods. Div., Old Ridgebury Rd., Danbury, CT 06817, Tel: 203-794-5300 .... 3•1434, 1435

Local Sales Offices & Reps

CA	San Francisco	415-765-1000
CT	Danbury, Military & Govt. App. Only	203-794-7547
GA	Norcross	404-446-2400
IL	Itasca	312-773-3444
NJ	Saddle Brook	201-845-5400
OH	Middleburg Hgts.	216-826-4444
TX	Dallas	214-241-9100

UNION CARBIDE CORP., ELCTRNS. DIV., Component Dept., Box 5928, Greenville, SC 29606, Tel: 803-963-6348, Telex: 57-0496, TWX: 810-287-2536; FSC No.: 31433; *Sls. Mgr.:* C. E. Volpe; *Dist. Mgr.:* J. A. Bruorton .... 1A•1096-1118

Refer to Kemet, Union Carbide Corp., Elctrns. Div. for sales office information and for distributor listings.

UNION CARBIDE CORPORATION, Elctrns. Div., Crystal Prods. Dept., 9320 Chesapeake Dr., Ste. 104, San Diego, CA 92123, Tel: 619-279-4500, Telex: 695-465; Empl.: 125; *Sls. Mgr.:* J. J. Beeman

UNION ETCHANTS INTL., INC., 8-10 Green St., Bldg. G, Woburn, MA 01801, Tel: 617-935-8878

UNIQUE OPTICAL CO., Diversified Optical Corp., P.O. Box 585, Farmingdale, NY 11735, Tel: 516-420-0288, TWX: 510-224-6598

UNITED CHEMI-CON

UNITED CHEMI-CON

UNITED CHEMI-CON INC., 9801 W. Higgins Rd., Rosemont, IL 60018, Tel: 312-696-2000, Telex: 28-3557, TWX: 910-253-2964; Empl.: 50; *Sls. Mgr.:* Joe Tanney .... **1A**•1208, 1209

Local Sales Offices & Reps

AL	Huntsville, R. D. Whitesell	205-883-5110
AZ	Scottsdale, Thorson Desert States, Inc.	602-998-2444
CA	Culver City, DeAngelo, Rothman Co.	213-827-2202
CA	Mountain View, Straube Assocs.	415-969-6060
CA	San Diego, De Angelo, Rothman Co.	619-758-8129
CO	Westminster, Straube Assocs. Mountain States, Inc.	303-426-0890
FL	Altamonte Springs, Semtronic Assocs., Inc.	305-831-8233
FL	Clearwater, Semtronic Assocs., Inc.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs., Inc.	305-731-2484
ID	Boise, Cascade Comps., Inc.	208-343-9886
KY	Louisville, R. D. Whitesell	502-426-7696
MD	Baltimore, Pro-Rep, Inc.	301-653-3600
MA	Lexington, John E. Boeing Co., Inc.	617-862-2500
MN	Bloomington, Twist Co.	612-835-2120
NJ	Medford, Mack McCoy Inc.	609-953-0770
NM	Albuquerque, Straube Assocs. Mountain States, Inc.	303-426-0890
NY	Jamaica, S-J Assocs., Inc.	212-291-3232
NY	Pittsford, Franklin Sls. Corp.	716-248-8251
OH	Cincinnati, Makin Assoc.	513-871-2424
OH	Cleveland, Makin & Assocs.	216-921-0080
OH	Columbus, Makin Assoc.	513-871-2424
OK	Tulsa, ION Assocs., Inc.	918-664-0186
OR	Portland, Earl & Brown	503-245-2283
PA	Dowington, Jack McCoy Inc.	215-363-0350
TN	Greeneville, R. D. Whitesell	615-639-6154
TX	Austin, ION Assocs., Inc.	512-346-7160
TX	Grand Prairie, ION Assocs., Inc.	214-647-8225
TX	Houston, ION Assocs., Inc.	713-977-4354
UT	Salt Lake City, Straube Assocs. Mountain States, Inc.	801-263-2640
WA	Seattle, Earl & Brown	206-284-1121
WI	Wauwatosa, Twist Co.	414-782-2670

Local Distributors

AL	Huntsville, Contact Elctrn. Inc.	205-881-9321
CA	Mountain View, Cornett Elctrns.	415-969-5420
CA	San Diego, Cetec Elctrns.	619-278-5020
CA	San Jose, Cetec Elctrns.	408-263-7373
CA	Santa Ana, National Electro Sls.	714-541-6184
CA	Santa Ana, Projections Unltd., Inc.	714-641-1472
CA	Santa Clara, Intl. Standard Comps., Inc.	408-496-0411
CA	South Gate, Cetec Elctrns.	213-773-6521
CA	Van Nuys, National Electro Sls.	213-781-0505
FL	Orlando, Hammond Elctrns., Inc.	305-849-6060
GA	Norcross, Hammond Elctrns., Inc.	404-524-7502
IL	Northbrook, Classic Comps. Supp., Inc.	312-272-9650
MA	Hopkinton, Interface Elctrns. Corp.	617-435-6858
MA	Middleboro, Glynn Elctrns.	617-947-4262
MN	Minneapolis, The Joel Co.	612-545-5669
NJ	Clifton, J-Mar Elctrns., Inc.	201-772-6400
NC	Greensboro, Hammond Elctrns., Inc.	919-275-6391
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Exton, VSH	215-876-8654
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
SC	Greenville, Hammond Elctrns., Inc.	803-233-4121
TX	Austin, Captronics, Inc.	512-459-4328
TX	Dallas, Captronics, Inc.	214-340-3592
WA	Bellevue, Bell Inds.	
WI	New Berlin, Classic Comps. Supp., Inc.	414-786-5300

UNITED DETECTOR TECH., 12525 Chadron Ave., Hawthorne, CA 90250, Tel: 213-978-0516, Telex: 18-2458; FSC No.: 50486; Empl.: 200; *Sls. Mgr.:* Michael Feeney; *Dist. Mgr.:* Al Seck

UNITED ELEC. CONTROLS, 85 School St., Watertown, MA 02172, Tel: 617-WA6-1000, Telex: 92 2445; Empl.: 420; *Dist. Mgr.:* Susan Janes

UNITED FOAM PLASTICS, 172 E. Main St., Georgetown, MA 01833, Tel: 617-352-2200, TWX: 710-347-0315; FSC No.: 55900; Empl.: 163

Local Sales Offices & Reps

CT	Pawcatuck	203-599-1242
FL	Orlando	305-843-7075
GA	Fairburn	404-964-5888
NJ	Somerset	201-560-9550

UNITED SOLDER WRAP INC., 2608 Electronic La., Ste 509, Dallas, TX 75220, Tel: 214-350-4978, Telex: 79-1535; Empl.: 80; *Sls. Mgr.:* Perry L. Gross

UNITED STATES CRYSTAL CORP., 3605 McCart St., Ft. Worth, TX 76110, Tel: 817-921-3014, TWX: 910-893-4084; FSC No.: *; Empl.: 75

UNITED STATES TESTING CO., INC., 1415 Park Ave., Hoboken, NJ 07030, Tel: 800-631-3096, 201-792-2400, Telex: 126493, TWX: 219504; FSC No.: 93282; *Sls. Mgr.:* R. Donohue

UNITED TECHNOLOGIES, Terminal Prods., 1230 Sabine St., Huntington, IN 46750, Tel: 219-356-2700, Telex: 23-2461, TWX: 810-332-1519; Empl.: 465

UNITED WIRE & CABLE, 425 Shrewsbury St., Worcester, MA 01604, Tel: 617-757-3872, TWX: 710-340-0635; FSC No.: 51348; Empl.: 10; *Sls. Mgr.:* T. P. Andrews

UNIT INDS., 1140 E. Valencia Dr., Fullerton, CA 92631, Tel: 714-871-4161; Empl.: 40

UNITRACK DIV., Calabro Inds., Inc., Goshen Corp. Pk., P.O. Box 1927, 1372 Enterprise Dr., West Chester, PA 19380, Tel: 215-692-0800, TWX: 510-663-0000; Empl.: 25 .... **2**•1068

Local Sales Offices & Reps

AZ	Phoenix, Finn-Pat Co.	602-954-0301
CA	Agoura, Robert A. Borden	213-991-1940
CA	Sunnyvale, Ruby Sls.	408-224-0881
CO	Aurora, Delltron Co.	303-373-0300
FL	Coral Springs, H.A., Inc.	305-752-7520
GA	Atlanta, Magaro & Assoc.	404-252-6609
IL	Des Plaines, Lincoln, Hodges & Assoc.	312-297-3810
IN	Ft. Wayne, Aktron Corp.	219-747-3650
MA	Northboro, Henik Assoc.	617-393-3127
MI	Grand Rapids, C.A. Geer Co.	616-534-9449
MN	St. Paul, Countrymen Assoc.	612-645-9151
MO	Blue Springs, Chesco	816-229-1404
NJ	Lebanon, Churchill Assocs.	201-735-8971
NY	Melville, Jarms	516-752-0404
NY	Syracuse, Lenard Co.	315-479-9191
OH	Akron, Augnat Assocs.	216-273-1211
PA	King of Prussia, Rivco January	215-265-5211
TX	Houston, Milco Mktg.	713-946-2841
TX	Richardson, Air Quip/Robleyco	214-234-3285
VA	Herndon, Eastern Comps.	703-471-1025
WA	Bellevue, Eltech	206-643-4330

Local Distributors

CA	Los Angeles, El-Com	213-404-2961
CO	Denver, Integrated Elctrns.	303-534-6121
MA	Northboro, Papi Supp.	617-393-3127
MA	Woburn, Rush Indus.	617-935-2400
MI	Grand Rapids, S-F Elctrn. Supp. Co.	616-459-0216
NC	Winston-Salem, Kirkman Elctrns.	919-724-0541
OH	Dayton, ESCO	513-226-1133
TX	Richardson, Air Quip/Robleyco	214-234-3285

UNITRODE CORP., 5 Forbes Rd., Lexington, MA 02173, Tel: 617-861-6540, Telex: 95-1064, TWX: 710-326-6509; Empl.: 2,000; *Sls. Mgr.:* Frederick Myers; *Dist. Mgr.:* John Flannery .... **1A**•1681-1683

UNITRODE CORP., Capacitor Div., 11494 Sorrento Valley Road, San Diego, CA 92121, Tel: 619-453-8020

Unitron
INCORPORATED

UNITRON INC., 2826 W. Kingsley Rd., Dept. G, Box 472159, Garland, TX 75041, Tel: 214-271-4531, Telex: 73-0644; FSC No.: 6130; Empl.: 95; *Sls. Mgr.:* R. L. Beutel .... **3**•1831, 1832

Local Sales Offices & Reps

CA	Sunland, Unitron (Jim Crevier)	818-352-7348
GA	Byron, Unitron (Joe Joiner)	912-956-2866
PA	Landsdowne, Unitron (Douglas S. Feisler)	215-622-4811

UNITRONIX CORP., 197 Meister Ave., Somerville, NJ 08876, Tel: 201-231-9400, Telex: 833184; Empl.: 35; *Sls. Mgr.:* Frank Zimmer; *Dist. Mgr.:* Joseph Murawski

Local Sales Offices & Reps

FL	Winter Park, Unitronix Corp.	305-671-9600
NJ	Somerville, Unitronix Corp.	201-231-9400

UNIVERSAL AD-YU ELCTRNS., INC., 2517 E. Norwich St., Milwaukee, WI 53207, Tel: 414-482-4100; FSC No.: 90101; Empl.: 10

UNIVERSAL CAPACITORS, See TRW/Capacitor Div.

UNIVERSAL ELECTRONICS INC., 3475 A. Victor St., Santa Clara, CA 95050, Tel: 408-970-0455, Telex: 3719249 UNIVESAL; FSC No.: 94-2845455; *Sls. Mgr.:* Paul Shieh

UNIVERSAL INSTRS., P.O. Box 825, Binghamton, NY 13902, Tel: 607-775-1102, TWX: 510-252-1990; Empl.: 1,600

UNIVERSAL INSTRS. CORP., MECHANIZED ELCTRN. ASSEMBLY (MEA) DIV., See Mechanized Elctrn. Assembly Div., Universal Instrs. Corp.

UNIVERSAL MFG. CO., INC., 1168 Grove St., Irvington, NJ 07111, Tel: 201-374-9800, TWX: 710-995-4647; Empl.: 70; *Sls. Mgr.:* M. Mayer

UNIVERSAL SHIELDING CORP., 20 W. Jefryn Blvd., Deer Park, NY 11729, Tel: 516-667-7900, Telex: 221213 TTC UR; Empl.: 35

UNIVERSAL VOLTRONICS, 27 Radio Circle Dr., Mt. Kisco, NY 10549, Tel: 914-241-1300, TWX: 710-571-2142; Empl.: 135; *Sls. Mgr.:* Bob Pampin .... 3•1803

Local Sales Offices & Reps

FL	Winter Park, McMahan Assocs.	305-645-0463
IL	Chicago, Ropek, Cahill & Vogt	312-631-0070
MI	Detroit, EQS	313-961-3042
MN	Minneapolis, R.J. Sls.	612-866-3661
NM	Albuquerque, Fry Gates Co.	505-262-1525
NY	Commack, RC Engrg. Sls.	516-543-3325
OH	Chesterland, EQS	216-729-2222
OH	Dayton, EQS	513-294-2476
PA	Audubon, Holmes Assocs.	215-666-0636
TX	Richardson, Spectra Sls.	214-234-3600

UNIVERSITY COMPUTING CO., UCC Tower Exchange Park, Dallas, TX 75235, Tel: 214-688-7100, TWX: 910-861-4990; Empl.: 700 (U.S.), 900 (Europe)

UNIVERSITY SOUND, 9500 W. Reno, Oklahoma City, OK 73126, Tel: 405-354-5311, Telex: 748-510

UNIVERSITY SOUND, Altec Corp., 1250 N. Red Gum St., Anaheim, CA 92806, Tel: 714-632-7117, Telex: 655415; Empl.: 200; *Sls. Mgr.:* G. H. Rilling

UPSYSTEMS, INC., 15737 Garfield Ave. Bldg. #18, Paramount, CA 90723, Tel: 213-634-0621, TWX: 910-346-7814; FSC No.: 3698; *Sls. Mgr.:* Howard Pendleberry

URBAN ELCTRNS., P. O. Box 456, Dover, MA 02030, Tel: 617-329-4068, TWX: 710-325-1579; Empl.: 50; *Sls. Mgr.:* G. Urban

U S CAPACITOR CORP., See U S Microtek Components

DIGITAL

U.S. DIGITAL, 12371 Kensington Rd., Los Alamitos, CA 90720, Tel: 213-594-0094 .... 1B•1881

Local Distributors

MA	Waltham, SSC Instrmn. Inc.	
Intl	UK, Bedford, Control Transducers, Ltd.	

USECO DIV., Litton Inds, 13536 Saticoy St, Van Nuys, CA 91409, Tel: 213-786-9388, TWX: 910-495-1700; Empl.: 250

U.S. INSTR. RENTALS, 2988 Campus Dr., San Mateo, CA 94403, Tel: 415-572-6600; Empl.: 300; *Sls. Mgr.:* David G. Fletcher

U S MICROTEK COMPONENTS CORPORATION, 11144 Penrose St., Sun Valley, CA 91352, Tel: 818-767-6770, TWX: 910-498-4998; FSC No.: 59942; Empl.: 180; *Sls. Mgr.:* Donald F. Hosmer .... 1A•1211

Local Sales Offices & Reps

AZ	Tucson, Clemick & Assocs.	602-749-4003
CA	Cupertino, F & F Assocs.	408-446-2349
CA	San Diego, Clemick-Neenan & Assoc.	619-268-8540
CA	Sherman Oaks, Clemick-Neenan & Assoc.	818-990-3150
CO	Denver, High Plains Mktg.	303-751-7150
FL	Coral Springs, EPM Corp.	305-755-5387
FL	Orlando, EPM Corp.	305-425-6149
GA	Roswell, Edco Sls.	404-587-1886
IL	Schaumburg, Gassner & Clark	312-882-8608
IA	Marion, MSB Assocs. Inc.	319-377-6261
KS	Shawnee Mission, MSB Assocs. Inc.	913-532-2131
MA	Needham, Hatch Assocs.	617-444-3310
MN	Bloomington, Merrill Franklin Co.	612-854-9446
MO	St. Charles, MSB Assocs. Inc.	314-946-5577
NY	Cazenovia, S. T. Woolard	315-655-8145
NY	Commack, Kaelber & Mack	516-499-2924
OH	Cleveland, Baehr, Greenleaf & Assocs.	216-221-9030
OH	Columbus, Baehr, Greenleaf & Assocs.	614-486-4046
OH	Dayton, Baehr, Greenleaf & Assocs.	513-439-0724
OR	Hillsboro, Gentech	503-640-6324
PA	Broomall, Sapinosa Assocs.	215-353-7267
TX	Austin, OM Sales Co., Inc.	512-452-1838
TX	Dallas, OM Sales Co., Inc.	214-241-3876
TX	Houston, OM Sales Co., Inc.	713-789-4426
UT	Salt Lake City, High Plains Mktg.	801-968-9456
WA	Redmond, Gentech	206-881-6456

U.S. SCIENTIFIC INSTRS., 61 North Beacon St., Boston, MA 02134, Tel: 617-787-2411; Empl.: 50; *Sls. Mgr.:* S. Eric Kondi

U.S. TERMINALS, 7502 Camargo Rd., Cincinnati, OH 45243, Tel: 513-561-8145, TWX: 810-461-2290; FSC No.: 12615; *Sls. Mgr.:* G.L. Stepp

Local Sales Offices & Reps

AZ	Phoenix, Gramer & Co.	602-995-9455
FL	Melbourne, Jerry Williams, Inc.	305-259-7700
IL	Chicago, L-Tec, Inc.	312-773-2900
IA	Cedar Rapids, J.R. Sls. Engrg., Inc.	319-393-2232

U.S. TOYO FAN CORPORATION

U.S. TOYO FAN CORP., 4915 Walnut Grove Ave., San Gabriel, CA 91776, Tel: 213-287-5297, TWX: 910-589-1540; Empl.: 20; *Sls. Mgr.:* R. L. Rosenthal; *Dist. Mgr.:* R. L. Rosenthal .... 2•1854, 1855

Local Sales Offices & Reps

AL	Huntsville, Par Mktg.	205-837-6534
AZ	Tempe, Delta Elctrn. Sls.	602-224-1601
CA	San Diego, Noo Rep Tech Sls.	619-483-4861
CA	San Gabriel, U.S. Toyo Fan Corp.	213-287-5297
CA	Santa Clara, U.S. Toyo Fan Corp.	408-984-2618
CO	Denver, Troy Sls./Wintronics	303-934-2406
FL	Clearwater, WMM Assoc.	813-442-3913
GA	Marietta, Par Mktg.	404-953-4168
ID	Boise, Quest Mktg.	208-343-9969
IL	Elk Grove, Martec Assoc.	312-956-8090
KS	DeSoto, Midtec Assoc.	913-441-6565
MA	Westboro, Tech. Mktg. Svcs. Co.	617-366-6655
MN	Osseo, Gaffney Sls. Co.	612-425-5484
MO	Florissant, Midtec Assoc.	314-837-5200
NH	Windham, Tech. Mktg. Svcs. Co.	603-434-2716
NJ	Madison, Livera-Polk Assoc.	201-377-3220
NY	Cooperstown, Fitzelle Assoc.	607-547-9333
NY	Glen Head, Livera-Polk Assoc.	516-759-9300
NC	Raleigh, Par Mktg.	919-872-2726
OH	Cleveland, Geotronix	216-526-2535
OH	Trotwood, Geotronix	513-854-5939
OR	Beaverton, Quest Mktg.	503-644-8077
PA	Horsham, Dalbrook Corp.	215-441-8380
TX	Richardson, Zonk Assoc.	214-238-7651
WA	Renton, Quest Mktg.	206-223-1541

Local Distributors

AZ	Phoenix, Aero-Space Southwest	602-861-1785
CA	Fremont, Terminal Sls. Corp.	415-656-7722
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Santa Ana, Pacesetter Elctrns.	714-557-7131
CA	Torrance, Cypress Elctrns.	213-530-1900
CA	Tustin, Added Value Elctrns. Distrib.	714-730-5848
CO	Denver, Wintronics	303-934-2406
FL	Longwood, Intertec Comps.	305-834-7777
IL	Elk Grove, Martec Assoc.	312-956-8090
MA	Westboro, TMSC Elctrns. Supp.	617-366-8462
NV	Las Vegas, Kiesub Corp.	702-733-3888
NJ	Collingswood, Index	609-429-4055
NJ	Middleville, Allegri Comps.	201-383-0086
NY	Elmsford, Multimeterics	914-347-3666
NY	Glen Head, Livera-Polk Assoc.	516-759-9300
OH	Cleveland, Alpha Distr. Corp.	216-526-3716
OR	Beaverton, Hansen Elctrns.	503-642-4455
TX	Dallas, Cypress Elctrns.	214-869-1435
TX	Richardson, Zec Sales	214-238-7651
WA	Kent, Shannon Ltd.	206-763-0545

USUS, INC., UCSD Pascal Sys. User's Society, P.O. Box 1148, La Jolla, CA 92038

UTE MICROWAVE, 3500 Sunset Ave., Asbury Park, NJ 07712, Tel: 201-922-1009, Telex: 13-2461; FSC No.: 23261; Empl.: 20

Local Sales Offices & Reps

AZ	Phoenix, Sigma Eng. Sls.	602-997-1822
CA	Goleta, Thorson Co.	805-964-8751
CA	Palo Alto, R-V Assocs.	415-967-5994
FL	Melbourne, EMS Assocs.	305-724-1027
MA	Wakefield, Nerem	617-245-4426
NY	Commack, Richman Sls.	516-543-5532
OH	Dayton, Fred Ohmer Assocs.	513-434-1454
TX	Dallas, Airep Elctrns.	214-349-4360
VA	Annandale, Q.T. Elctrn.	703-941-4242
EXP	FL, Boca Raton, Microwave Intl. Corp.	305-391-7475

UTI INSTRUMENTS CO., 325 N. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-738-3301, TWX: 910-339-9546; Empl.: 80; *Sls. Mgr.:* Jim Nicholson

UVP, INC., 5100 Walnut Grove Ave., P.O. Box 1501, San Gabriel, CA 91778, Tel: 818-285-3123, Telex: 688-461; Empl.: 100; *Sls. Mgr.:* Paul Gilchrist

VACO PRODS., 1510 Skokie Blvd., Northbrook, IL 60062, Tel: 312-564-3300; TWX: 910-686-0658; Empl.: 250; *Sls. Mgr.:* Fred Grede

VACTRONIC LAB. EQUIP., 65 Brightside Ave., E. Northport, NY 11731, Tel: 516-AN1-2660; Empl.: 18

VALHALLA SCIENTIFIC, 7576 Trade St., San Diego, CA 92121, Tel: 619-578-8280, Telex: 181750 VALHALLA SDG; Empl.: 30; *Sls. Mgr.:* Kerry Clark

VALIDYNE ENGRG. CORP., 8626 Wilbur Ave., Northridge, CA 91324, Tel: 818-886-2057, Telex: 65-1303; Empl.: 200; *Sls. Mgr.:* Max J. Kopp

VALLEY ELECTROMAGNETICS CORP., P.O. Box 557, Crystal Lake, IL 60014, Tel: 815-459-3080, Telex: 72-2417

VALLEY ELECTROMAGNETICS, P.O. Box 131, Spring Valley, IL 61362, Tel: 815-664-2348; Empl.: 70; *Sls. Mgr.:* G. Adair

VALOR ELECTRONICS, INC., 2950 Airway Ave., Bldg. C-5, Costa Mesa, CA 92626, Tel: 714-540-9261, TWX: 910-595-2480; FSC No.: 15003; *Sls. Mgr.:* T. N. Kasabali

VALPEY-FISHER, 75 South St, Hopkinton, MA 01748, Tel: 617-435-6831, Telex: 94-8332; Empl.: 160; *Sls. Mgr.:* Donald Elliott .... 1A•1434-1436

Local Sales Offices & Reps

AL	Huntsville, Montgomery Mktg.	205-830-0498
AZ	Scottsdale, Verein Corp.	602-948-3571
CA	Carlsbad, Addem	714-695-2050
CA	Cupertino, F & F Assocs.	408-446-2349
CA	Orange, ETA/Cen-Tec Sales Corp.	714-998-9241
CT	Hamden, Impact Sls.	203-281-1331
FL	Altamonte Springs, WMM Assocs.	305-831-4530
FL	Clearwater, WMM Assocs.	813-422-3913
FL	Davie, WMM Assocs.	305-581-7036
FL	Indialantic, WMM Assocs.	305-773-1157
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Chicago, Indl. Reps.	312-647-7755
IN	Ft. Wayne, Dillon Sls.	219-486-1868
KS	Overland Park, Jones Mktg. Co.	913-649-3020
MA	Canton, Impact Sls.	617-821-1500
NJ	Cherry Hill, Danco Elctrns	609-424-5590
NM	Albuquerque, Reptronix, Ltd.	505-881-8001
NY	Hicksville, J. Square Mkt	516-935-3200
NY	Rochester, Eiss Assocs.	716-328-3000
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Rocky River, Norm Case Assoc.	216-333-0400
TX	Austin, Sundance Sls.	512-250-0320

X	Plano, Sundance Sales	214-867-0592
X	Stafford, Sundance Sls.	713-499-9671
A	Blaine, O.E.M. Sls. Inc.	206-621-7249
I	Milwaukee, Indl. Reps.	414-259-0965

ALTEC, Sub. of U.S. Philips, 99 Hartwell St., West Boylston, MA 01583, Tel: 617-835-6082, Telex: 92-0355; FSC No.: 8N865; Empl.: 220; *Sls. Mgr.:* Pieter M. deBruijn

AMISTOR CORP., 115 Industrial Park, Sevierville, TN 37862, Tel: 615-453-0001, Telex: 810-570-4931; Empl.: 49; *Sls. Mgr.:* George Hebner; *Dist. Mgr.:* George Hebner

ANGUARD ELCTRNS. CO., 1480 W. 178th St., Gardena, CA 90248, Tel: 213-323-4100, TWX: 910-346-7067; FSC No.: 03550; Empl.: 250; *Sls. Mgr.:* T.A. Crawford; *Dist. Mgr.:* T. A. Crawford .... **1A**•1276

Local Sales Offices & Reps

Z	Tempe, Piper Sales	602-949-0048
L	Coral Springs, EPM Corp.	305-752-0054
	Franklin Park, Dekotech	312-455-5100
N	Ft. Wayne, TX Sls., Indiana	219-489-4447
A	Cedar Rapids, S&O Sls.	319-393-1845
A	Lexington, JESCO	617-863-1598
A	Topsfield, R. F. Assoc.	617-887-9762
N	St. Paul, Murnco	612-484-8200
J	Wayne, SHL Assoc.	201-790-1714
Y	Cazenovia, ST Woolard Co.	315-655-8145
X	Dallas, Tritex	214-350-1927

Local Distributors

D	Baltimore, Radio Elec. Service Co.	301-823-0070

ANGUARD RELAY CORP., 225 Cortland St., Lindenhurst, NY 11757, Tel: 516-226-5000; *Sls. Mgr.:* B. S. Gilman

VANN INSTRUMENTS

ANN INSTRUMENTS, 1200 Schofield La., Farmington, NM 87401, Tel: 505-326-7557; *Sls. Mgr.:* Michael E. Vann .... **3**•1316

ARIAN ASSOCS., Indl. Equip. Grp., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, TWX: 910-373-1731; Empl.: 1500

ARIAN ASSOCS., Instr. Grp., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, TWX: 910-373-1731

ARIAN ASSOCIATES, INC., Microwave Tube Div., 611 Hansen Way, Palo Alto, CA 94303, Tel: 415-493-4000, Telex: 910-373-1731; *Sls. Mgr.:* Frank Rich

ARIAN CANADA, INC., 45 River Drive, Georgetown, ON , Canada, Tel: 416-877-0161

ARIAN DATA MACHINES, See Sperry Univac, Mini-Comp. Opers.

ARO, INC., Electron Devices Div., 2203 W. Walnut St., Garland, TX 75040, Tel: 214-272-3561, TWX: 910-860-5093; FSC No.: 27777; Empl.: 250; *Sls. Mgr.:* Lon Hodge

ARO SEMICONDUCTOR, INC., 2800 W. Kingsley Dr., Garland, TX 75046, Tel: 214-271-8511, TWX: 910-860-5178; Empl.: 550; *Sls. Mgr.:* Charlie Merz; *Dist. Mgr.:* Mike Hawkins .... **1A**•2112

Local Sales Offices & Reps

L	Huntsville, Rep, Inc.	205-881-9270
Z	Scottsdale, SMS & Assocs.	602-998-0831
A	Los Angeles, Corcoran Assocs.	213-823-4589
A	Sunnyvale, W. W. Posey Co.	408-746-0771
O	Parker, Technology Mktg. Assocs.	303-841-3435
T	North Haven, Comp Rep Assocs.	203-239-9762
L	Orlando, OEM Mktg. Corp.	305-299-1000
A	Tucker, Rep, Inc.	404-938-4358
L	Chicago, D. Dolin Sales Co.	312-286-6200
N	Frankfort, C-S Electronic Sls.	317-659-1874
S	Overland Park, Electri-Rep	913-649-2168
MD	Baltimore, Professional Rep.	301-653-3600
MD	Towson, DG Representatives	301-583-1360
MA	Westwood, Comp Rep Assocs.	617-329-3454
MI	Farmington, Amtech Reps.	313-474-8300
MN	Minneapolis, Electric Comp. Sls.	612-933-2594
MO	St. Louis, Electri-Rep	314-878-8209
NY	Great Neck, Cooper-Simon & Co.	516-487-1142
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NC	Raleigh, Rep, Inc.	919-851-3007
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OK	Oklahoma City, Ammon & Rizos Co.	405-942-2552
OR	Hillsboro, Western Tech. Sls.	503-640-4621
PA	Huntingdon Valley, Knowles Assocs.	215-322-7100
PA	Pittsburgh, J. C. Hofstetter Co.	412-356-2305
TN	Jefferson City, Rep, Inc.	615-475-9012
TX	Austin, Ammon & Rizos Co.	512-454-5131
TX	Dallas, Ammon & Rizos Co.	214-644-5591
TX	Houston, Ammon & Rizos Co.	713-781-6240
UT	Salt Lake City, Technology Mktg. Assocs.	801-364-3296
WA	Bellevue, Western Tech. Sls.	206-641-3900
WA	Spokane, Western Tech. Sls.	509-922-7600
WI	Milwaukee, D. Dolin Sales Co.	414-482-1111

Local Distributors

AL	Huntsville, Resistacap	205-883-4270
AZ	Tempe, Bell Inds.	602-966-7800
AZ	Tempe, Anthem Elctrns.	602-244-0900
CA	Chatsworth, Anthem Elctrns.	213-700-1000
CA	Garden Grove, Bell Inds.	714-220-0681
CA	Gardena, Bell Inds.	213-515-1800
CA	Hayward, Allied Elctrns.	415-487-5250
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Anthem Elctrns.	619-279-5200
CA	San Jose, Anthem Elctrns.	408-946-8000
CA	Sunnyvale, Bell Inds.	408-734-8570
CA	Tustin, Anthem Elctrns.	714-730-8000
CO	Denver, Integrated	303-292-6121
CO	Wheat Ridge, Bell Inds.	303-424-1985
CT	Hamden, Allied Elctrns.	203-248-8900
CT	Orange, Milgray Elctrns.	203-795-0711
FL	Winterpark, Milgray Elctrns.	305-647-5747
GA	Atlanta, Milgray Elctrns.	404-393-9666
IL	Elgin, Allied Elctrns.	312-697-8200
IL	Elk Grove Village, Pioneer Std.	312-437-9680
IL	Palatine, OHM Elctrns.	312-359-5500
IL	Peoria, Klaus Radio	309-691-4840
IN	Fort Wayne, Graham Elctrns.	219-423-3422
IN	Indianapolis, Graham Elctrns.	317-634-8202
IA	Cedar Rapids, Deeco	319-365-7551
KS	Overland Park, Milgray Elctrns.	913-236-8800
MD	Rockville, Milgray Elctrns.	301-468-6400
MA	Burlington, J. V. Elctrns.	617-273-4300
MA	Burlington, Milgray Elctrns.	617-272-6800
MI	Wyoming, RM Elctrns.	616-531-9300
MN	Minnetonka, Pioneer Std.	612-935-5444
NJ	Marlton, Milgray Elctrns.	609-983-5010
NY	Buffalo, Summit Distrs.	716-887-2800
NY	Farmingdale, Milgray Elctrns.	516-391-3000
NY	Pittsford, Milgray Elctrns.	716-385-9330
NC	Greensboro, Hammond Elctrns.	919-275-6391
OH	Cincinnati, Graham Elctrns.	513-772-1661
OH	Cleveland, Milgray Elctrns.	216-447-1520
OH	Cleveland, Pioneer Std.	216-587-3600
OH	Dayton, Pioneer Std.	513-236-9900
OH	Dayton, Stotts Friedman	513-298-5555
OR	Lake Oswego, Bell Inds.	503-241-4115
PA	Pittsburgh, Pioneer Std.	412-782-2300
SC	Greenville, Hammond Elctrns.	803-233-4121
TN	Memphis, Bluff City Elctrns.	901-345-9500
TX	Dallas, Pioneer Std.	214-386-7300
TX	Fort Worth, Allied Elctrns.	817-336-5401
TX	Houston, Altair Co.	713-462-3029
TX	Richardson, Altair Co.	214-231-5166
UT	Salt Lake City, Standard Supply	801-486-3371
UT	Salt Lake City, Bell Inds.	801-972-6969
WA	Bellevue, Bell Inds.	206-747-1515
WA	Seattle, Priebe Elctrns.	206-682-8242
WI	Milwaukee, Marsh Elctrns.	414-475-6000
WI	Waukesha, Bell Inds.	414-547-8879

VARTA BATTERIES, INC., 150 Clearbrook Rd., Elmsford, NY 10523, Tel: 914-592-2500, Telex: 996-548; *Sls. Mgr.:* Dominick Isola .... **3**•1436

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
CO	Denver, Moss Mktg.	303-455-7205
IL	Palatine, Technology Sls.	312-991-6600
KS	Shawnee Mission, K & M Sls.	913-262-1444
NY	Glen Head, Livera-Polk	201-377-3239
PA	Broomall, TCA Assocs.	215-353-2022

Local Distributors

CA	La Mirada, Energy Devices	213-921-8775
GA	Atlanta, Falcon Batteries	404-953-3500
IL	Downers Grove, Telecommunications Dvcs.	312-971-3460
MA	Sharon, Adcour	617-784-8123
NY	Commack, Brentronics	516-499-5155

VECTOR CABLE CO., 555 Industrial Rd., Sugarland, TX 77478, Tel: 713-240-9196

VECTOR ELECTRONIC CO., INC., 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, CA 91342, Tel: 818-365-9661, TWX: 910-496-1539; FSC No.: 82893; Empl.: 140; *Sls. Mgr.:* F. L. Hill .... **2**•1069, 1094, 1095; **3**•1117

VECTROL, Division of Westinghouse Elec. Corp., 110 Douglas Rd, Oldsmar, FL 33557, Tel: 813-855-4621, Telex: 803784; Empl.: 120; *Sls. Mgr.:* G. Lierman

VECTRONICS MICROWAVE CORP., 276 Lincoln Blvd., Middlesex, NJ 08846, Tel: 201-356-2377, Telex: 833560; FSC No.: 32846; *Sls. Mgr.:* John G. Vogler

Local Sales Offices & Reps

CA	N. Hollywood, Crown Elctrns.	818-877-3550
IL	Palatine, R-Tek, Inc.	312-991-4404
MA	Woburn, Microwave Comp. Mktg.	617-273-3106
NJ	Moorestown, Stern Assocs.	609-234-0661
TX	Garland, Tesco Elctrn. Sls. Co.	214-681-1376
VA	Fairfax, Schibley Assocs.	703-591-3008

VECTRON LABS., 166 Glover Ave., Norwalk, CT 06850, Tel: 203-853-4433, TWX: 710-468-3796; FSC No.: 27802; Empl.: 275; *Sls. Mgr.:* Larry Jawitz .... **1A**•1438-1442

Local Sales Offices & Reps

AZ	Phoenix, Fetty/Schoenduve	602-241-9009
CA	El Segundo, Fetty/Schoenduve	213-322-4991
CA	Mountain View, Fetty/Schoenduve	415-962-8330
CA	San Diego, Fetty/Schoenduve	619-292-5136
CO	Parker, Techn. Mktg. Assocs.	303-841-3435
CT	Cheshire, Meco	800-225-3409
FL	Melbourne, Saber Assocs.	800-432-6288
FL	Pensacola, Saber Assocs.	800-327-0853
GA	Atlanta, Saber Assocs.	800-327-0853
IL	Bannockburn, Heth, Inc.	312-295-8440
IN	Indianapolis, Ihrig Assocs.	317-783-7630
KS	OLATHE, C-Tron Inc.	913-829-0073
LA	Metairie, Automation Supplies	504-831-2183
MA	Reading, Meco	617-944-6660
MI	Detroit, R. P. Urban Assocs.	313-535-2355
MI	Grand Rapids, R. P. Urban Assocs.	616-245-0511
MN	Burnsville, Heth, Inc.	612-435-7876
MO	St. Louis, AME Sales	314-965-1779
NJ	Woodcliff Lake, F & F Assoc.	201-391-6792
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NY	Great Neck, F & F Assoc.	516-482-4080
NY	Syracuse, Rep Tech	315-437-2845
NC	Clayton, Saber Assocs.	800-327-0853
NC	North Hills, Saber Assocs.	800-327-0853
OH	Englewood, A. Nace Co.	513-836-0931
OH	Richfield, A. Nace Co.	216-659-7178
PA	Newtown Sq., SWR Assocs.	215-356-8550
PA	Pittsburgh, A. Nace Co.	412-922-7225
SC	W. Columbia, Saber Assocs.	800-327-0853
TX	Dallas, Texas Avionics	214-363-6324
UT	Salt Lake City, Techn. Mktg. Assocs.	801-364-3296
VA	Springfield, Tech-Reps	703-569-6868
WA	Seattle, Datacom	206-285-2525

VEECO INSTRS. INC., 370 San Aleso Ave., Sunnyvale, CA 94086, Tel: 408-733-3700, TWX: 910-339-9263; Empl.: 95; *Sls. Mgr.:* T. McKee

VEECO INSTRUMENTS INC., Terminal Dr., Plainview, NY 11803, Tel: 516-349-8300; *Sls. Mgr.:* Tony Carrozzo

VEEDER-ROOT, 70 Sargeant St., Hartford, CT 06102, Tel: 203-527-7201, Telex: 9-9219; Empl.: 1200; *Sls. Mgr.:* J. R. Garrison; *Dist. Mgr.:* K. Boyle

VEETRONIX, INC., Sub. Reach Electronics, Box 480, Lexington, NE 68850, Tel: 308-324-4600; Empl.: 25; *Sls. Mgr.:* Robert M. Wallace .... **1B**•1757

Local Sales Offices & Reps

CA	Arcadia, Van Gott & Assocs., Inc.	213-445-9728
CA	San Jose, Ruby Sls.	408-224-0881
CO	Denver, Moss Mktg.	303-455-7205
CT	Bethany, The Rep. Corp.	203-393-0024
MA	Wellesly, Reps. Corp.	617-237-6476
NM	Albuquerque, Moss Mktg.	505-292-7505
PA	Albrightsville, Centurion Linear	717-722-0166
UT	Bountiful, Moss Mktg.	801-292-8660

VEGA PRECISION LABS., 800 Follin La., Vienna, VA 22180, Tel: 703-938-6300, Telex: 89-2521; Empl.: 350; *Sls. Mgr.:* W. E. Kinsley

Local Sales Offices & Reps

CA	Camarillo	805-484-8584
FL	Ft. Walton Beach	904-863-2994

VELONEX, DISPLAY PRODS., 560 Robert Ave., Santa Clara, CA 95050, Tel: 408-727-7370, TWX: 910-338-0114; Empl.: 60; *Sls. Mgr.:* Douglas Greenwood .... 3•1359

Local Sales Offices & Reps

AL	Huntsville, Pen-Tech	205-881-9298
AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CA	Los Altos, Hoeke-Reeser	415-941-4080
CA	Pasadena, Beckrep	213-957-1111
CO	Denver, R. A. Mayes Co.	303-893-2264
FL	Melbourne, Saber Assoc.	305-724-0920
GA	Griffin, Saber Assoc.	404-228-2084
IL	Chicago, K. W. Meyers Co.	312-882-4808
IN	Indianapolis, K. W. Meyers Co.	317-243-6681
MD	Rockville, Electronic Mktg.	301-744-7700
MA	Needham, Addelco	617-444-4554
MN	Minneapolis, K. W. Meyers Co.	612-920-7080
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	Smithtown, PAF Assoc.	516-360-0940
OH	Medina, McShane, Inc.	216-725-4568
TX	Dallas, R. A. Mayes Co.	214-235-3043
TX	Houston, R. A. Mayes Co.	713-783-3856
WA	Lynnwood, Indl. Electhics	206-775-3516
WI	Brookfield, K. W. Meyers Co.	414-784-3790

VELONEX, INSTR. DIV., 560 Robert Ave., Santa Clara, CA 95050, Tel: 408-727-7370, TWX: 910-338-0114; Empl.: 60 .... 3•1359

Local Sales Offices & Reps

AZ	Phoenix, R. A. Mayes Co.	602-279-5243
CA	S. Pasadena, Beckrep	213-957-1111
CA	Sunnyvale, Kousen Sls.	408-249-5858
CO	Denver, R. A. Mayes Co.	303-893-2264
DC	Washington, Electronic Mktg.	301-881-5300
FL	Orlando, Saber Assocs.	305-869-8417
GA	Atlanta, Saber Assocs.	404-945-1398
IL	Schaumberg, K. W. Meyers Co.	312-882-4808
IN	Indianapolis, K. W. Meyers Co.	317-243-6681
MD	Baltimore, Electronic Mktg.	301-744-7700
MA	Needham, Addelco	617-444-4754
MI	Detroit, Hocker Assocs.	313-549-3910
MN	Minneapolis, K. W. Meyers Co.	612-920-7080
NJ	Bloomingdale, Eastern Metro	201-492-1747
NM	Albuquerque, R. A. Mayes Co.	505-292-2330
NY	Plainview, Eastern Metro Assocs.	516-931-1414
NC	Clayton, Saber Assocs.	919-553-5564
OH	Cleveland, Hocker Assocs.	216-235-6504
OH	Dayton, Hocker Assocs.	513-298-8638
PA	Plymouth Meeting, Electronic Mktg.	215-828-7400
TX	Houston, R. A. Mayes Co.	713-783-3856
TX	Richardson, R. A. Mayes Co.	214-235-3043
WA	Lynnwood, Indl. Elctrn.	206-775-3516

VEMALINE PRODS. DIV., 487 Jefferson Blvd., Warwick, RI 02886, Tel: 401-739-7600, Telex: 927573; FSC No.: 08730; Empl.: 30; *Sls. Mgr.:* Paul Vamvaketis; *Dist. Mgr.:* Paul Vamvaketis

VENABLE INDUSTRIES, INC., 3555 Lomita Blvd., Torrance, CA 90505, Tel: 213-539-2522, Telex: 752421; Empl.: 20; *Sls. Mgr.:* Wayne H. Tuttle; *Dist. Mgr.:* Shelley Scott

VENT-RAK DIV., P.O. Box 39100, Indianapolis, IN 46239-9632, Tel: 317-897-7000, Telex: 27-2169; Empl.: 150; *Sls. Mgr.:* J. Bradford .... 2•1034, 1035

Local Sales Offices & Reps

AZ	Phoenix, Synder Eng.	602-279-2010
CA	Fullerton, Groh Assocs.	714-994-7105
CA	Mountain View, G. C. Woempner Co.	415-964-5454
CO	Boulder, R. F. Mayo Assoc.	303-499-2155
CT	North Haven, Coakley, Boyd & Abbett	203-481-2828
FL	Maitland, J. Krutek & Assoc.	305-628-4837
FL	North Miami, J. Krutek & Assoc.	305-941-6544
IL	Glencoe, Howard Benjamin Assoc.	312-835-0150
IN	Noblesville, Century Elctrns.	317-849-2026
KS	Shawnee Mission, Lowell-Kangas & Assoc.	913-631-3515
MA	Needham, Coakley, Boyd & Abbett	617-444-5470
MI	Plymouth, J. Plass Assoc.	313-455-8262
MN	Bloomington, Northport Engrg.	612-854-5556
MO	St. Louis, Lowell-Kangas & Assoc.	314-821-4050
NH	Plaistow, Coakley, Boyd & Abbett	617-444-5470
NJ	Mountainside, H. G. Richter	201-233-4615
NY	Fayetteville, H. G. Richter	315-637-6713
OH	Cincinnati, Comp.	513-866-0661
OH	Cleveland, Comp.	216-243-9200
OK	Tulsa, Advance Tech. Sls.	918-664-0482
PA	Doylestown, Monteiro & Assoc.	215-345-5855
PA	Pittsburgh, Components	412-824-1600
TX	Austin, Advance Tech. Sls.	512-459-1351
TX	Dallas, Advance Tech. Sls.	214-340-1300
TX	Houston, Advance Tech. Sls.	713-440-3888
WA	Olympia, Bergford & Assoc.	206-866-2001
EXP	IN, Indianapolis, General Devices Co.	317-897-7000

VENUS

VENUS SCIENTIFIC, INC., 399 Smith St., Farmingdale, NY 11735, Tel: 516-293-4100, TWX: 510-224-6492; Empl.: 450; *Sls. Mgr.:* Jack Reilly .... 3•1805

Local Sales Offices & Reps

AZ	Scottsdale, Venus Scientific Inc.	602-991-9684
MA	Norwood, MPS Electronics Inc.	617-769-8700

VERBATIM CORP., 323 Soquel Way, Sunnyvale, CA 94086, Tel: 408-245-4400, Telex: 940-692, TWX: 910-339-9381; Empl.: 1800; *Sls. Mgr.:* S.P. Cochran; *Dist. Mgr.:* Earl Liebich

VERMONT AUTOMATION CO., INC., 18 Morse Dr., Essex Junction, VT 05452, Tel: 802-879-7571; Empl.: 7; *Sls. Mgr.:* J. Littlefield

VERMONT PRECISION RESISTOR, Box 1170, Stowe, VT 05672, Tel: 802-253-8567; Empl.: 5

VERMONT RESCH. CORP., Precision Pk., N. Springfield, VT 05150, Tel: 802-886-2256, TWX: 710-363-6533; Empl.: 175; *Sls. Mgr.:* Richard Simmons

Local Sales Offices & Reps

CA	Encinitas	619-942-5820
IL	Northfield	312-441-5811
PA	Lansdale	215-362-6440
VT	North Springfield	802-886-2256

VERNAY LABORATORIES, INC., S. College St., Yellow Springs, OH 45387, Tel: 513-767-7261; Empl.: 600; *Sls. Mgr.:* Alex Le Pera

VERNITECH, 300 Marcus Blvd., Deer Pk., NY 11729, Tel: 516-586-5100, TWX: 510-227-6079; Empl.: 250; *Sls. Mgr.:* S. Wexler .... 1A•2066, 2067; 1B•1019, 1206, 1207, 1882, 1883; 3•1934

Local Sales Offices & Reps

AL	Huntsville, Remco	205-883-9260
AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Parker, Techn. Mktg. Assoc.	303-841-3435
CT	Cheshire, Selmark Assocs.	203-272-8764
FL	Maitland, MYR Assocs.	305-724-0350
GA	Atlanta, Remco	404-447-6937
IL	Glencoe, Howard Benjamin Assocs.	312-835-0150
IA	Cedar Rapids, Dytronix	319-377-8275
MD	Baltimore, R.P. Luce & Co.	301-752-8200
MA	Millis, Selmark Assocs.	617-376-2914
MA	Norwell, Bordewieck Eng. Sls.	617-659-4915
MI	Farmington Hills, C.P.&P. Inc.	313-477-7700
MN	St. Paul, Vikeland Sls.	612-645-4747
MO	Bridgeton, Dytronix	314-731-5799
MO	Independence, Dytronix	816-373-6600
NH	Concord, Selmark Assocs.	603-623-5774
NJ	Cherry Hill, Lanson Assocs.	609-424-4670
NM	Albuquerque, Technology Mktg.	505-265-5661
NY	Endicott, Tech-Mark	607-748-7473
NY	Melville, Comtronic Engrg. Sls.	516-249-0505
NY	Pittsford, Net Sls. Co.	716-467-4538
NC	Raleigh, Remco	919-847-5079
OH	Dayton, Rixan Assocs.	513-278-4216
OH	Dayton, George Lessis	513-294-1551
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Beaverton, Halbar Assocs.	503-226-0451
PA	Philadelphia, R.P. Luce & Co.	215-884-8365
TX	Bellaire, Seaton Corp.	713-731-2649
TX	Dallas, Seaton Corp.	214-380-0414
UT	Sandy, TMA, Inc.	801-254-6410
VA	Powhatan, R.P. Luce & Co.	804-598-4804
WA	Redmond, Halbar Assocs.	206-882-0990
WA	Seattle, G.M. Gillette & Assoc.	206-284-3344
WA	Vancouver, Halbar Assocs.	206-696-0170

VERNITRON CORP., Control Comps. Div., 1601 Precision Park La., San Diego, CA 92073, Tel: 619-428-5581, TWX: 910-322-1862; *Sls. Mgr.:* S. W. Silverman .... 1B•1208, 1209

Local Sales Offices & Reps

AZ	Fountain Hills, Halbar Assocs.	602-837-2464
CA	Glendale, Halbar Assocs.	213-246-8263
CA	San Mateo, Halbar Assocs.	415-349-4700
CO	Parker, Techn. Mktg. Assocs.	303-841-3435
CT	North Haven, Kitchen & Kutchin	203-239-0212
FL	Ft. Lauderdale, Electrocomp Assocs.	305-491-4141
FL	St. Petersburg, Electrocomp Assocs.	813-327-9677
IL	Glencoe, Howard Benjamin Assocs.	312-835-0150
MD	Baltimore, Callas Elctrns.	301-744-7711
MA	Burlington, Kitchen & Kutchin	617-229-2660
MI	Lathrup Village, R. C. Nordstrom Co.	313-559-7373
MN	Edina Prairie, Techco Ltd.	612-929-9497
NJ	Cherry Hill, Lanson Assocs.	609-424-4670
NJ	Harrington Park, Metro Tech. Sls.	201-768-8495
NY	Fairport, NET Sls.	716-467-4538
NY	Jericho, Metro Tech. Sls.	516-935-3330
OH	Dayton, Rixan Assocs.	513-222-0011
TX	Dallas, M. Kruvand Co.	214-691-4592
TX	Houston, Kruvand Assocs.	713-780-9710
WA	Redmond, Halbar Assocs.	206-882-0990

VERNITRON ELEC. COMPS., See Beau Prods. Div.

VERNITRON PIEZOELECTRIC DIV., 232 Forbes Rd., Bedford, OH 44146-5478, Tel: 216-232-8600, TWX: 810-427-2274; Empl.: 120; *Sls. Mgr.:* William K. Dorn .... 1A•1437

Local Sales Offices & Reps

CA	Fullerton, GRU Assocs.	714-738-0903

VERSALOGIC, 87070 Dukhobar Rd., Eugene, OR 97402, Tel: 503-485-8575

VERTEL INC., P.O. Box 535, 125 Ellsworth St., Clifton, NJ 07012, Tel: 201-472-1331, TWX: 710-989-7021; *Sls. Mgr.:* Ron Byer

VERTOX CO., 9252 Garden Grove Blvd. #22, Garden Grove, CA 92644, Tel: 714-530-4541, Telex: 678401 TAB IRIN; FSC No.: 53688; *Sls. Mgr.:* Steve Hacker

VIABLE SYSTEMS INC., Box 438, Needham, MA 02192, Tel: 617-449-4570; Empl.: 15

VIBRAC, 1 Columbia Dr., Amherst, NH 03031, Tel: 603-882-6777; Empl.: 35; *Sls. Mgr.:* R. Searle

VIBRA-METRICS, 385 Putnam Ave., Hamden, CT 06517, Tel: 203-288-6158, TWX: 710-465-0169; Empl.: 25

Local Sales Offices & Reps

AZ	Scottsdale, Dave Menegay Assocs.	602-994-9591
CA	Long Beach, Saber Enterprises	213-595-5646
CA	Palo Alto, Gado Instr. Sls.	415-961-2222
CO	Boulder, Measurement Consultants	303-449-7506
CT	Hamden, JBL Assoc.	203-281-3161
FL	Ft. Lauderdale, Elctrn. Devices & Controls	305-974-2500
IL	Chicago, Comtel-Midwest	312-539-4838
IN	Indianapolis, Comtel Corp.	317-253-1681
IA	Cedar Rapids, Comtel Corp.	319-377-9434
KS	Shawnee Mission, Comtel Corp.	913-722-1030
MD	Rockville, Farrel Assocs.	301-424-9460
MA	Bedford, Claflin Assocs.	617-275-7428
MI	Southfield, Comtel Instrs.	313-358-2505
MN	Wayzata, Comtel Corp.	612-476-1551
MO	St. Louis, Comtel Corp.	314-991-5363
NJ	Basking Ridge, Blejwas Assocs.	201-221-1440
NM	Albuquerque, Measurement Consits.	505-265-6471
NY	Baldwinsville, Oshex Assocs., Inc.	315-635-6027
NC	Raleigh, Lee-Carolinas	919-848-8818
OH	Cleveland, Comtel Instrs.	216-442-8080
OH	Dayton, Comtel Instrs.	513-298-7573
OH	Hilliard, Comtel Instrs.	614-876-8305
PA	Pittsburgh, Comtel Instrs.	412-922-5720
TN	Knoxville, Mace Instr. Co.	615-938-3773
TX	Richardson, Scientific Sls. Co.	214-231-6541
UT	Salt Lake City, Measurement Consits.	801-364-3174
WA	Bellevue, Scientific Devices-NW	206-747-5169
WI	New Berlin, Comtel Corp.	414-544-6042

VIBRATION INSTRS. CO., 1614 Orangethorpe Way, Anaheim, CA 92801, Tel: 714-879-6085, Telex: 692433; FSC No.: 32102; Empl.: 21; *Sls. Mgr.:* L. Rothberg

VIBRO-METER CORP., 1 Progress Rd., Billerica, MA 01821, Tel: 617-663-7322, Telex: 948145, TWX: 710-320-1872; FSC No.: 617-667-1944; Empl.: 50; *Sls. Mgr.:* Carl Nicolino .... 1B•1885

Local Sales Offices & Reps

AL	Huntsville, Currie, Peak & Frazier	205-536-1506
AK	Anchorage, Arctic Technlg.	907-277-6418
AK	Anchorage, Harry J. Lang & Assocs.	907-279-5741
CA	Costa Mesa, FLW Inc.	714-751-7512
CA	San Carlos, W. I. Carsons & Assocs.	415-591-8616
CA	San Diego, FLW Inc.	619-277-0993
CT	North Haven, Pat Jenks Assocs.	203-239-6201
FL	Maitland, Meagher & Assocs.	305-645-3063
HI	Honolulu, EMC Corp.	808-836-1138
IL	Cary, J.E.M. Entprs.	312-639-1770
IN	Indianapolis, Loren Green Assocs.	317-293-9827
MD	Towson, MRT Co.	301-685-7425
MA	Woburn, Pat Jenks Assocs.	617-938-0488
MI	Mt. Clemens, R. J. O'Hara Assocs.	313-791-7140
MN	St. Paul, Resource Technlg.	612-644-3064
MO	St. Louis, Ozark Elctrn. Mktg.	314-423-7200
NJ	Cedar Grove, KLS Assoc.	201-785-4450
NY	Dewitt, D. B. Assocs.	315-446-0220
NC	Greensboro, Currie, Peak & Frazier	919-373-0380
OH	Columbus, R.D. Cloon Assoc.	614-459-2890
PA	Radnor, Roberts Engrg. Sls.	215-688-6526
TX	Dallas, Griffin Sls.	214-234-5013
WA	Monroe, Envirotest	206-794-6640

VICLAN, 7373A Engineers Rd., San Diego, CA 92138, Tel: 619-292-1411, TWX: 910-335-1264; FSC No.: 51959; Empl.: 250; *Sls. Mgr.:* Bob Goodman

VICON INDS., 125 E Bethpage Rd., Plainview, NY 11803, Tel: 516-293-2200, Telex: 144581; Empl.: 320

VICTOREEN, INC., Component Div., 10101 Woodland Ave., Cleveland, OH 44104, Tel: 216-795-8200, TWX: 810-421-8287 ....**1A**•2000-2003

Local Sales Offices & Reps

AZ	Tuscon, Shelley Elctrns.	602-622-2226
CA	Chatsworth, Shelley Elctrns.	818-998-3333
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, Shelley Elctrns.	415-969-1820
CO	Boulder, Shelley Elctrns.	303-442-2718
MD	Gaithersburg, Axis Elctrns.	800-368-2815
MA	Boston, Precision Sls.	617-969-4905
MA	Newton, Precision Sls.	617-969-0594
OH	Cleveland, Pruitt Energy Sources	216-566-1545
WA	Edmonds, EDCO Sls.	206-776-8922

Local Distributors

AZ	Tuscon, Shelley Elctrns.	602-622-2226
CA	Chatsworth, Shelley Elctrns.	818-998-3333
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Jose, Shelley Elctrns.	415-969-1820
CO	Boulder, Shelley Elctrns.	303-442-2718
MD	Gaithersburg, Axis Elctrns.	800-368-2815
MA	Boston, Precision Sls.	617-969-4905
OH	Cleveland, Pruitt Energy Sources	216-566-1545
WA	Edmonds, EDCO Sls.	206-776-8922

VICTOR ELEC. WIRE & CABLE, 618 Main St., W. Warwick, RI 02893, Tel: 401-821-1700, SALES 401-821-7800, Telex: 952122, TWX: 710-382-1534; Empl.: 900; *Sls. Mgr.:* E. M. Colasanto

VICTOR WIRE & CABLE CORP., 3601 Holdrege Ave., Los Angeles, CA 90016, Tel: 213-870-9933; Empl.: 30

VICTORY ENGRG. CORP., Victory Rd., Springfield, NJ 07081, Tel: 201-379-5900, TWX: 710-983-4430; Empl.: 300; *Sls. Mgr.:* J. Bacek

VIDAIRE ELCTRNS., 150 Buffalo Ave., Freeport, NY 11520, Tel: 516-623-6696; Empl.: 20

VIDCO, P.O. Box 25452, Portland, OR 97225, Tel: 503-292-4104; Empl.: 4; *Sls. Mgr.:* Tom Inloes

VIDEO AUTOMATION SYSTEMS, Upper Shad Rd., Pound Ridge, NY 10576, Tel: 914-764-4613; Empl.: 5

VIDEO LOGIC CORP., 597 No. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-245-8622, Telex: 35-7400

VIDEO MONITORS, INC., 3833 N. White Ave., Eau Claire, WI 54703, Tel: 715-834-7785; *Sls. Mgr.:* J. Carpentier

VIKING CONNECTORS, 21001 Nordhoff St., P.O. Box 2379, Chatsworth, CA 91311, Tel: 818-341-4330, TWX: 910-494-2094; FSC No.: 05574; Empl.: 500; *Sls. Mgr.:* Bob Ploudre ....**2**•1737

Local Sales Offices & Reps

AZ	Scottsdale, Southwest Mktg. Sys.	602-998-0831
CA	Los Gatos, Landia Sls. Grp.	415-490-5651
CA	Milpitas, Viking Connectors	408-943-0888
CA	San Diego, La Playa Co.	619-223-6580
CA	Tarzana, Viking Connectors	818-881-9980
CO	Castle Rock, Romulus Elctrns.	303-688-5753
FL	Casselberry, Elctrn. Mktg. Corp.	305-339-7070
FL	Lake Worth, Elctrn. Mktg. Corp.	305-969-0097
GA	Stone Mtn., Mountain Electro Prods.	404-469-0603
HI	Honolulu, Indl. Elctrns.	808-533-6095
ID	Boise, N. R. Schultz Co.	208-377-8686
IL	Lisle, W G Controls	312-963-5954
IL	Palatine, Viking Connectors	312-934-1278
IN	Indianapolis, C C Elctrns.	317-255-1508
KS	Merriam, Midwest Techl. Sls.	913-236-8557
KS	Wichita, Midwest Techl. Sls.	316-262-7240
KY	Louisville, KW Elctrn. Sls.	502-451-1860
MD	Phoenix, Chesapeake Mktg. Assoc.	301-628-4848
MA	Brockton, Forsberg Sls.	617-522-6300
MA	Wakefield, Viking Connectors	617-245-4110
MI	Livonia, Elctrn. Salesmasters	313-591-2433
MN	Minneapolis, D E Beck-Hats Assoc.	612-835-3610
MN	Minneapolis, Viking Connectors	612-925-9889
MN	St. Charles, Midwest Techl. Sls.	314-441-1012
NJ	Wayne, G. T. Assocs.	201-694-6040
NY	Syracuse, Leonard D. Allen, Inc.	315-437-8387
NC	Durham, Mountain Electro Prods.	919-286-7737
OH	Benchwood, Elctrn. Salesmasters	216-831-9555
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Heights, KW Elctrn. Sls.	216-491-9177
OH	Worthington, KW Elctrn. Sls.	614-888-0483
OR	Beaverton, N. R. Schultz Co.	503-643-1644
PA	Allison Park, KW Elctrn. Sls.	412-487-4300
PA	New Cumberland, La Playa Co.	717-938-2439
PA	Prospect Park, Elf Sls.	215-534-3340
TX	Arlington, Pro-Comp Sls.	817-640-4336
TX	Dallas, Viking Connectors	214-680-9931
WA	Bellevue, N. R. Schultz Co.	206-454-0300
WA	Seattle, La Playa Co.	206-524-1111
PR	Rio Piedras, Klamco Elctrns.	809-752-6169

Local Distributors

AL	Huntsville, Hall-Mark Elctrns.	205-837-8700
AZ	Phoenix, Sterling Elctrns.	602-258-4531
AZ	Phoenix, Sterling Elctrns.	602-268-2122
AZ	Tempe, Richey Western	602-894-9251
AZ	Tempe, Time Elctrns.	602-967-2000
AZ	Tempe, Acacia Sls.	602-894-2874
CA	Anaheim, Time Elctrns.	714-937-0911
CA	Belmont, LoDan Elctrns.	415-592-4600
CA	Citrus Heights, Hall-Mark Elctrns.	916-722-8600
CA	Irvine, Acacia Sls.	714-660-0834
CA	Los Angeles, Richey Western	213-820-3777
CA	San Diego, Richey Western	619-271-4511
CA	San Diego, Acacia Sls.	619-565-4365
CA	Santa Clara, Richey Western	408-727-7411
CA	Sun Valley, Richey Western	213-768-3800
CA	Sunnyvale, Acacia Sls.	408-745-7200
CA	Torrance, Time Elctrns.	213-320-0880
CO	Englewood, Hall-Mark Elctrns.	303-694-1662
CO	Lakewood, Acacia Sls.	303-232-2882
CT	New Canaan, Richey Western	203-972-1458; 203-972-1165
CT	Stratford, Utronics	203-378-4201
CT	Wallingford, Sterling Elctrns.	203-265-9535
FL	Clearwater, Hall-Mark Elctrns.	813-530-4543
FL	Ft. Lauderdale, Time Elctrns.	305-974-4800
FL	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
FL	Largo, LoDan Elctrns.	813-595-5811
FL	Orlando, Hall-Mark Elctrns.	305-855-4020
GA	Atlanta, Electro Air Corp.	404-351-3545
GA	Norcross, Hall-Mark Elctrns.	404-447-8000
IL	Arlington Hgts., LoDan Elctrns.	312-398-5311
IL	Bensenville, Hall-Mark Elctrns.	312-860-3800
IN	Indianapolis, MAR Elctrns.	317-875-4510
IN	Indianapolis, MAR Elctrns.	317-875-4510
KS	Lenexa, Hall-Mark Elctrns.	913-888-4747
LA	Metarie, Sterling Elctrns.	504-887-7610
MD	Columbia, Time Elctrns.	301-964-3090
MD	Columbia, Hall-Mark Elctrns.	301-988-9800
MA	North Chelmsford, Pilgrim Elctrns.	617-251-8746
MA	Waltham, Sterling Elctrns.	617-894-6200
MA	Woburn, Time Elctrns.	617-935-8080
MI	Livonia, LWC Dists.	313-464-7700
MN	Bloomington, Hall-Mark Elctrns.	612-854-3223
MN	Minneapolis, Indl. Comps.	612-831-2666
MO	Maryland Heights, Hall-Mark Elctrns.	314-291-5350
MO	St. Louis, Time Elctrns. Mid-West	314-391-6444
NJ	Bellmawr, Mid Atlantic Elctrns.	609-931-5303
NJ	Cherry Hill, Hall-Mark Elctrns.	215-355-7300
NJ	Fairfield, Hall-Mark Elctrns.	201-575-4415
NJ	Perth Amboy, Sterling Elctrns.	201-442-8000
NM	Albuquerque, Betatron	505-344-2381
NM	Albuquerque, Sterling Elctrns.	505-884-1900
NY	Buffalo, Summit Dists.	716-887-2800
NY	Hauppauge, Time Elctrns.	516-273-0100
NY	Plainview, Landmark Elctrns.	516-293-7441
NC	Raleigh, Hall-Mark Elctrns.	919-872-0712
OH	Cincinnati, Hall-Mark Elctrns.	513-563-5980
OH	Dayton, Electro Line, Inc.	513-461-5683
OH	Solon, Hall-Mark Elctrns.	216-349-4632
OH	Westerville, Hall-Mark Elctrns.	614-891-4555
OK	Tulsa, Hall-Mark Elctrns.	918-665-3200
OK	Tulsa, Sterling Elctrns.	918-663-2410
OR	Beaverton, Acacia Sls.	503-646-3377
PA	Broomall, Time Elctrns.	215-359-1200
TX	Austin, Sterling Elctrns.	512-836-1451
TX	Austin, Hall-Mark Elctrns.	512-258-8848
TX	Dallas, Hall-Mark Elctrns.	214-343-5000
TX	Dallas, Sterling Elctrns.	214-243-1600
TX	Dallas, Target Elctrns.	214-788-0761
TX	Houston, Sterling Elctrns.	713-627-9800
TX	Houston, Hall-Mark Elctrns.	713-781-6100
VA	Richmond, Sterling Elctrns.	804-226-2190
WA	Bellvue, Electro Air	206-641-3640
WA	Seattle, Richey Western	206-575-1910
WI	Oak Creek, Hall-Mark Elctrns.	414-761-3000

VIKING ELECTRONICS, Industrial St., Hudson, WI 54016, Tel: 715-386-8861; Empl.: 24; *Sls. Mgr.:* Bill Wiese

VIKING LABS., INC., 440 Bernardo Ave., Mountain View, CA 94043, Tel: 415-969-5500, TWX: 910-379-6555; Empl.: 90; *Sls. Mgr.:* Jack Eagan, Prod. Reliability; *Dist. Mgr.:* M. J. Marchman, Comp. Test

Distributor

VILLARREAL ELECTRONICS, Box 43A, RD 2, South Rd., Millbrook, NY 12545, Tel: 914-677-3447 ....**2**•1064

V.I.P. INDS. INC., 246 Knickerbocker Ave., Paterson, NJ 07503, Tel: 201-345-5800; *Sls. Mgr.:* John M. Sonatore

VIRGINIA PANEL, 1400 New Hope Rd., Waynesboro, VA 22980, Tel: 703-949-8376, TWX: 710-839-0406; Empl.: 225; *Sls. Mgr.:* Jeff Stowers

VIRGINIA PLASTICS CO., P.O. Box 4577, Roanoke, VA 24015-0577, Tel: 703-985-3811, TWX: 710-870-0440; FSC No.: 59608; Empl.: 120; *Sls. Mgr.:* Charles Bogese ....**2**•1738-1740, 2151

Local Sales Offices & Reps

AZ	Tempe, General Comps. Grp.	602-829-8124
CA	Granada Hills, C&W Comps.	213-368-4032
CA	San Jose, Pitts Sls. Assocs.	408-252-6177
CO	Parker, Mikro Sls. Co.	303-841-4131
CT	Middletown, Gerber Sls.	203-347-3000
CT	Old Saybrook, Gerber Sls.	203-388-4386
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Longwood, APM Assocs.	305-869-6831
FL	Merritt Island, APM Assocs.	305-453-4322
FL	Tampa, APM Assocs.	813-886-2457
GA	Stone Mountain, H & H Mktg.	404-296-9830
IL	Palatine, Claeson Assocs.	312-359-7230
MD	Silver Spring, Carwithen Assocs.	301-589-9040
MA	Newton, Gerber Sls.	617-969-2620
MN	Minneapolis, Northstar Comps.	612-553-1888
NJ	Haworth, Kay Sls.	201-384-3261
NY	Syracuse, Canavan-Scanlon Assocs.	315-437-1271
PA	Southampton, Campbell Assocs.	215-322-6630
TX	Houston, AID Elctrns.	713-955-6204
TX	Irving, Aid Elctrns.	214-259-4761

Local Distributors

MA	Newton, Atlantic Comps.	617-969-2620
MN	Minneapolis, K&H Elctrn. Distributing	612-553-1312

VIRTIS CO., Rte. 208, Gardiner, NY 12525, Tel: 914-255-5000, Telex: 926474; Empl.: 92; *Sls. Mgr.:* J. D. Schmidt

VISHAY

...to be precise®

VISHAY RESISTIVE SYS. GRP., 63 Lincoln Hwy., Malvern, PA 19355, Tel: 215-644-1300, TWX: 510-668-8944; Empl.: 500 .... **1A**•2004-2015, 2070

Local Sales Offices & Reps

AL	Huntsville, Montgomery Marketing	205-830-0498
AZ	Phoenix, Compass Mktg. & Sls.	602-266-5400
CA	Cupertino, Vishay Resistive Sys. Grp.	408-730-1292
CA	La Habra, Vishay Resistive Sys. Grp.	714-738-1581
CO	Denver, Comps. Sls. Inc.	303-759-1666
CT	North Haven, Comp Rep Assocs.	203-239-9762
FL	Altamonte Springs, Semtronic Assocs.	305-831-8233
FL	Clearwater, Semtronic Assocs.	813-461-4675
FL	Ft. Lauderdale, Semtronic Assocs.	305-731-2404
GA	Norcross, Montgomery Mktg.	404-447-6124
IL	Elk Grove Village, Oasis Sls. Corp.	312-640-1850
IN	Carmel, Shamrock Elctrn. Sls.	317-848-5265
MD	Lutherville, J. A. Dougherty Sls. Co.	301-321-7890
MA	Westwood, Comp Rep Assocs.	617-329-3454
MI	Bloomfield Hills, Enco Mktg.	313-642-0203
MN	St. Paul, Proud Inds.	612-646-9428
NJ	Flanders, K & R Engrg. Sls. Co.	201-584-5235
NY	E. Syracuse, L-Mar Assocs.	315-437-7779
NY	Rochester, L-Mar Assocs.	716-544-8000
NC	Cary, Montgomery Mktg.	919-467-6319
OH	Aurora, EMA, Inc.	216-562-6104
OH	Centerville, EMA, Inc.	513-433-2800
TX	Dallas, Vishay Resistive Sys. Grp.	214-245-7306
TX	Houston, Vishay Resistive Sys. Grp.	713-550-0568
WA	Bellevue, SDR^2	206-747-9424
WI	Brookfield, Oasis Sls. Corp.	414-782-5660
EXP	Mayaguez, Comp Rep Assocs.	809-832-9529

Local Distributors

AZ	Tempe, Shelley Elctrns.	602-894-2058
CA	Chatsworth, Shelley Elctrns., Inc.	213-998-3333
CA	Los Alamitos, Semi-Dice, Inc.	213-594-4631
CA	North Hollywood, TTI, Inc.	213-982-0201
CA	San Diego, Shelley Elctrns., Inc.	619-453-7133
CA	San Jose, Shelley Elctrns., Inc.	408-942-9111
CA	San Jose, TTI, Inc.	408-943-9155
CA	Santa Clara, Semi-Dice, Inc.	408-980-9777
CO	Boulder, Shelley Elctrns., Inc.	303-442-2718
FL	Orlando, TTI, Inc.	305-859-1000
FL	Tampa, Impala Elctrns., Inc.	813-885-4747; 800-237-7777
IL	Palatine, Ohm Elctrns.	312-359-5500
MD	Beltsville, RESCO/Washington	301-937-9100
MD	Whitemarsh, RESCO/Baltimore	301-529-0500; 800-638-1242
MA	Canton, Semi-Dice, Inc.	617-821-0070
MA	Framingham, Cavalier Comps., Inc.	617-875-2000
MA	Woburn, TTI, Inc.	617-938-8800
NJ	Fairfield, CHPS, Inc.	201-882-0997
NJ	Flanders, VKR Svcs., Inc.	201-584-5235; Outside NJ 800-631-9362
NY	Bohemia, TTI, Inc.	516-567-1500
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
OH	Dayton, Micro Mil Div.	513-434-8231
PA	Royersford, Hybrid Service Lab	215-948-6880
TX	Fort Worth, TTI, Inc.	817-831-0441
TX	Houston, The Cunningham Co.	713-468-3882

VIZ

AUTHORIZED DISTRIBUTORS

RAG ELECTRONICS, INC.

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VISHAY-MANN, Vishay Resistive Systems Group, 63 Lincoln Hwy., Malvern, PA 19355, Tel: 215-644-1300, Telex: 510-668-5812 ...**1A**•2014, 2015

Please refer to sales representatives listed under Vishay Resistive Systems Group

Please see distributors listed under Vishay Resistive Systems Group.

VISHAY ANGSTROHM, 1 Precision Pl., Hagerstown, MD 21740, Tel: 301-739-8722, TWX: 710-853-6834; FSC No.: 17745; Empl.: 250; *Sls. Mgr.:* John Kinnaw; *Dist. Mgr.:* Jeff Reed ....**1A**•2011-2013

VISION ENGRG. INC., 570 Danbury Rd., New Milford, CT 06776, Tel: 203-355-3776, Telex: 643769; Empl.: 15; *Sls. Mgr.:* R. N. Gable

VISTAR CORP., 13740 McCormick Dr., Tampa, FL 33625, Tel: 813-855-6611; Empl.: 25; *Sls. Mgr.:* J. Looney ....**3**•1317

Local Sales Offices & Reps

AL	Huntsville, Synergetic Reps.	205-882-1691
CT	North Haven, Pat Jenks Assocs.	203-239-6201
FL	Largo, Synergetic Reps.	813-586-2871
GA	Lawrenceville, Synergetic Reps.	404-963-0968
IL	Rolling Meadows, Commodore I	312-394-5441
MD	Silver Springs, Sel-Tronics	301-589-3391
MA	Woburn, Pat Jenks Assocs.	617-938-0488
NY	Port Chester, Radiation Elctrns.	914-937-2300
NY	Syracuse, Labtonics, Inc.	315-455-7314
NC	Greensboro, Synergetic Reps.	919-272-9303
OH	Euclid, Bradcor Elctrns. Co.	216-261-0888
OR	Portland, Scientific Devices	503-292-6934
PA	Mechanicsville, John Bell Assocs.	215-794-7075
TX	Richardson, Scientific Dvcs.	214-231-8106
WA	Bellevue, Scientific Dvcs.	206-747-5169

VISUAL COMMUNICATIONS CO., P.O. Box 986, El Segundo, CA 90245, Tel: 213-822-4727; Empl.: 9; *Sls. Mgr.:* J. Savage ....**1B**•1106-1108

Local Sales Offices & Reps

AL	Huntsville, Remco	205-553-3763
AZ	Phoenix, Bob Anderson Co.	602-266-2070
CA	Mountain View, Westech Sls.	415-961-1422
CA	San Diego, Harvey King Inc.	619-566-5252
CA	Torrance, Assoc Reps.	213-328-6708
FL	Melbourne, Beacon Elctrns.	305-724-8010
GA	Atlanta, Remco	404-447-6937
IL	Elmhurst, Utronix Sls.	312-834-1100
MA	Peabody, Eastern Natl. Assoc.	617-535-5536
MI	Jenison, R. C. Nordstrom & Co.	616-457-5762
MI	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
MN	Eden Prairie, Bohlig & Assoc.	612-944-8404
NY	New York, Robert Smith Assocs.	212-541-4885
NY	Plainview, Robert Smith Assocs.	516-681-3155
NY	Spring Valley, Robert Smith Assocs.	914-354-6067
NC	Raleigh, Remco	919-847-5079
OH	Dayton, Dynel Co.	513-434-6467
PA	Philadelphia, Rayco Sls.	215-757-1899
TX	Austin, J. B. Guenther	512-472-3825
TX	Dallas, J. B. Guenther	214-691-8500
TX	Houston, J. B. Guenther	713-974-0383
VA	Fairfax, Beacon No.	703-591-1300
VA	Forest, Beacon North	804-239-8486
WA	Redmond, Elctrn. Mktg. Grp.	206-882-0962
EXP	CT, Litchfield, Intrade	203-567-5901

Local Distributors

AL	Huntsville, Component Distr.	205-883-7501
AZ	Tempe, Anjon Entprs.	602-894-1332
AR	Little Rock, Component Distr.	501-227-6278
CA	Costa Mesa, Orange County Comps.	714-979-3597
CA	Los Angeles, Electric Switch	213-660-1310
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Torrance, WBC Electro Supp.	213-328-6871
CO	Englewood, Industrial Elctrns. Inc.	303-694-9444
FL	Ft. Lauderdale, Component Distr.	305-971-4950
GA	Norcross, Component Distrs.	404-441-3320
MA	Lynn, Land Elctrn. Supp.	617-592-2220
MI	Grand Rapids, S. F. Elctrns. Supp.	616-459-0216
MN	Blaine, Chris Elctrn. Distr.	612-757-6341
NJ	Bellmawr, Midatlantic Elctrns.	609-931-5303
NY	Elmsford, Ancar Elctrn. Supp.	914-592-7100
NY	Plainview, Plainview Elctrns.	516-249-6677
NC	Raleigh, Component Distr.	919-834-9465
OH	Aurora, IPD	216-562-8113
OH	Centerville, IPD	513-435-2086
TX	Houston, Solid State Elctrns.	713-772-8483
TX	Irving, Solid State Elctrns.	214-438-5700
VA	Falls Church, Component Distr.	703-241-8227
WA	Redmond, Paccom	206-883-9200
EXP	CT, Litchfield, Intrade	203-567-5901

VISUAL INFO. INSTITUTE, Box 33, Xenia, OH 45385, Tel: 513-376-4361; FSC No.: 27432; Empl.: 45

Local Sales Offices & Reps

CA	San Diego, DRF Assocs.	619-292-9431
CA	San Diego, Perspective Meas.	619-278-8931
CA	San Jose, Fox Marketing	408-984-2221
CO	Bailey, Scientific Sys.	303-838-4615
FL	Melbourne, EME III, Inc.	305-259-2711
GA	Decatur, EME II, Inc.	404-325-0165
MA	Clemsford, Meritron Corp.	617-250-1774
NC	High Point, EME, Inc.	919-869-3335
VA	Williamsburg, EME IV, Inc.	804-253-0171

VITEK ELCTRNS., 4 Gladys Ct., Edison, NJ 08817, Tel: 201-287-3200; *Sls. Mgr.:* Joe Griffin

VITRAMON N.A., P. O. Box 544, Bridgeport, CT 06601, Tel: 203-268-6261, TWX: 710-450-3640; Empl.: 606; *Sls. Mgr.:* Paul Davis; *Dist. Mgr.:* S Judt

VIZ TEST EQUIPMENT, Div. VIZ Mfg., 335 E. Price St., Philadelphia, PA 19144, Tel: 215-844-2626, TWX: 710-670-2626; Empl.: 500

Local Sales Offices & Reps

CA	N. Hollywood, MCS Marketing	213-980-1188
CA	Sunnyvale, W. W. Posey	408-746-0771
CO	Denver, Mountain Reps.	303-623-0972
FL	Ft. Lauderdale, Unirep, Inc.	305-587-7481
GA	Roswell, Henry W. Phillips Co.	404-992-3070
IL	Park Ridge, Bob Burns & Assoc.	312-775-1233
IN	Carmel, Midwest Reps. & Assoc.	317-844-4555
MD	Columbia, Par-Nell Sls. Co.	301-992-5454
MA	Milford, Jonel Sls.	617-478-4650
MI	Ferndale, Hilltronics	313-398-5556
MN	White Bear Lake, Yore Co.	612-770-9760
MO	Raytown, Marty Taraski Sls. Co.	816-358-1442
NJ	Fort Lee, TMC Sls. Corp.	201-944-8340
NY	Grand Island, L. J. McTaggart Assocs.	716-773-9222
OH	Cincinnati, John O. Olson Co.	513-574-7711
OR	Portland, Joseph V. Belusko	503-222-4279
PA	Langhorne, Par-Nell Sls. Co.	215-750-0380
PA	Pittsburgh, John O. Olson Co.	412-341-8391
TX	Dallas, Crockett Sls. Co.	214-350-3377

VLSI TECHNOLOGY, INC., 1101 McKay Dr., San Jose, CA 95131, Tel: 408-942-1810, Telex: 278807; Empl.: 450; *Sls. Mgr.:* Ronald C. Kasper

Local Sales Offices & Reps

CA	San Jose	408-942-1810
IL	Arlington Heights	312-358-8000
MA	Burlington	617-229-6555
TX	Dallas	214-231-6716

VOICE IDENTIFICATION, Box 714, Somerville, NJ 08876, Tel: 201-526-3408; Empl.: 7

VOICE MACHINE COMMS., INC., KTI, 1000 S. Grand Ave., Santa Ana, CA 92705, Tel: 714-541-0454; *Sls. Mgr.:* Rod Runge; *Dist. Mgr.:* Rod Runge

VOLITION SYSTEMS, P.O. Box 1236, Del Mar, CA 92014, Tel: 619-481-2286, Telex: 695000 COMEX SDG; Empl.: 7; *Sls. Mgr.:* Joe Caporaletti

VOLTAGE MULTIPLIERS, INC., 8711 W. Roosevelt Ave., Visalia, CA 93291, Tel: 209-651-1402, Telex: 176-559; FSC No.: 60211; Empl.: 40; *Sls. Mgr.:* Ken Haag ....**1A**•2113

Local Sales Offices & Reps

AZ	Phoenix, High Voltage Sls., Inc.	602-861-9043
CA	Milpitas, Voltage Multipliers, Inc.	408-946-1254

CA	Tarzana, High Voltage Sls.	213-881-9194
CO	Castle Rock, Romulus Elctrns., Ltd.	303-688-5127
GA	Stone Mountain, Mountain Electro Prods., Inc.	404-469-0603
L	Arlington Heights, M. J. Petersen & Assoc., Ltd.	312-577-8200
N	Fort Wayne, Walter W. Bieberich, Inc.	219-432-2537
MD	Glen Burnie, Macrotech Assoc., Ltd.	301-437-5588
MA	Chelmsford, Encotronics	617-256-4207
MO	St. Louis, Robert J. Ruzicka Co.	314-353-7378
NY	Hicksville, J-Square Mktg., Inc.	516-935-3200
NY	Rochester, Robert F. Lamb Co. Inc.	716-323-1250
NY	Syracuse, Robert F. Lamb Co. Inc.	315-455-2469
OH	Dayton, L. D. Bruno Co.	513-434-1847
OK	Tulsa, Cunningham Comps. Corp.	918-492-0390
OR	Portland, Electronic Comp. Sls.	503-245-2342
PA	Washington Crossing, DVS Co.	215-493-4642
TX	Dallas, Cunningham Comps. Corp.	214-233-4303
TX	Houston, Cunningham Comps. Corp.	713-461-4197
WA	Mercer Island, Electronic Comp. Sls.	206-232-9301

VOLTAMPERE CORP., 146 Horton Ave., Lynbrook, NY 11563, Tel: 516-887-9443; FSC No.: 7U805; Empl.: 10

VOLTARC TUBES, 176 Linwood Ave., Fairfield, CT 06430, Tel: 203-255-2633, Telex: 96-4337; Empl.: 180; *Sls. Mgr.:* Albert H. Katz

VOLTEX, 3460 Great Neck Rd., Amityville, NY 11701, Tel: 516-842-2772; Empl.: 55; *Sls. Mgr.:* S. Vogel ....3•1806

Local Sales Offices & Reps

CT	Milford, Cumming Assocs.	203-878-3946
MA	Randolph, Bengal Assocs.	617-961-4120
NJ	Oxford, Malin Assocs.	201-689-7398
NM	Albuquerque, RLS Instrs. Co.	505-293-7931
NY	Fulton, Jones Sudders, Inc.	315-598-3838

VOLTRONICS, West St., P.O. Box 366, E. Hanover, NJ 07936, Tel: 201-887-1517, TWX: 710-986-8253; FSC No.: 18736; Empl.: 70; *Sls. Mgr.:* Richard J. Newman

VOTAN, 4487 Technology Dr., Fremont, CA 94538, Tel: 415-490-7600; *Sls. Mgr.:* Robert Russo

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VRN INTERNATIONAL, Div. Vernitron, 2801 72nd St. N., Box 44000, St. Petersburg, FL 33743, Tel: 813-347-2181, Telex: 68105306, TWX: 810-863-0357; Empl.: 550; *Sls. Mgr.:* R. Fumr; *Dist. Mgr.:* R. Fumr ....1A•2068, 2069; 3•1067

Local Sales Offices & Reps

AL	Brownsboro, JHU Assoc.	205-536-7455
AZ	Tempe, System Sls. of Az.	602-829-9338
CA	Alhambra, MW Riedel & Co.	213-283-7694
CA	Cupertino, Thresum Assoc.	408-996-9889
CA	San Diego, D2 Sls.	619-560-6266
CO	Boulder, Front Range Mktg.	303-443-4780
CT	Stratford, Gerald Rosen Co.	203-375-5456
FL	Boca Raton, Lawrence Assoc.	305-368-7373
FL	Clearwater, Lawrence Assoc.	813-584-8110
GA	Atlanta, JHU Assoc.	404-634-1000
IL	Downers Grove, Circuit Sls.	312-964-9090
IN	Fort Wayne, Ro Whitesell & Assoc.	219-432-5591
IN	Indianpolis, Ro Whitesell & Assoc.	317-359-9283
IN	Kokomo, Ro Whitesell & Assoc.	317-457-9127
KS	Merriam, MTS	913-236-8557
KY	Louisville, Ro Whitesell & Assoc.	502-426-7696
MA	Framingham, Gerald Rosen Co.	617-879-5505
MI	Grand Rapids, Ro Whitesell & Assoc.	616-942-5420
MI	Southfield, Ro Whitesell & Assoc.	313-559-5454
MI	St. Joseph, Ro Whitesell & Assoc.	616-983-7337
MN	Minneapolis, PSI	612-944-8545
NM	Albuquerque, Sys. Sls. of Alb.	505-881-8877
NY	Buffalo, Quality Comps.	716-837-5430
NY	Great Neck, Mos Assoc.	516-487-3966
NY	Manlius, Quality Comps.	315-682-8885
NC	Greensboro, JHU Assoc.	919-852-9097
OH	Cincinnati, Ro Whitesell & Assoc.	513-521-2290
OH	Cleveland, Ro Whitesell & Assoc.	216-447-9020
OH	Columbus, Ro Whitesell & Assoc.	614-888-9396
OH	Dayton, Ro Whitesell & Assoc.	513-298-9546
OK	Broken Arrow, Genzel Sls.	918-258-8656
OR	Tigard, Elctrn. Sources	503-684-0040
PA	Broomall, LD Lowery	215-528-5170
PA	Hummelstown, LD Lowery	717-533-7095
PA	Pittsburg, Ro Whitesell & Assoc.	412-963-6161
TN	Talbott, JHU Assoc.	615-581-4141
TX	Austin, TL Mktg.	512-453-4586
TX	Dallas, TL Mktg.	214-357-1752
UT	Salt Lake City, Front Range Mktg.	801-364-6481
VA	Charlottesville, LD Lowery	804-973-6672
VA	Lanexa, LD Lowery	804-966-5455
WA	Bellevue, Elctrn. Sources	206-451-3500

Local Distributors

CA	Chatsworth, IEC/JACO	213-998-2200
CA	Gardena, Bell Inds.	213-515-1800
CA	Manhattan Beach, Prime Electro Prods.	213-772-1724
CA	San Diego, Bell Inds.	619-268-1277
CA	San Fernando, Petell Elec.	213-365-9841
CA	San Jose, Cypress Elctrns.	408-945-8400
CA	Sunnyvale, Bell Inds.	408-734-8570
CO	Denver, Denver-Wintronics	303-431-7161
CT	Norwalk, Cobra Comps.	203-847-6442
CT	Wallingford, Sager Elctrl. Supp.	203-265-4600
FL	Ft. Lauderdale, Dielco	305-973-8700
FL	Ft. Lauderdale, NRC Elctrns.	305-772-4500
FL	Orlando, TTI Inc.	305-849-1000
FL	Tampa, Impala Elctrns.	813-885-4747
IL	Addison, Lectro Comps.	312-543-1680
IL	Chicago, Bell Inds.	312-982-9210
IA	Cedar Rapids, Deeco	319-365-7551
ME	Woburn, TTI Inc.	617-938-8800
MD	Rockville, M S Elctrns.	301-340-6400
MA	Hingham, Sager Elctrl. Supp.	617-749-6700
MI	Farmington Hills, Advent Elctrns.	313-477-1650
MN	Minneapolis, Aero-Space	612-884-4725
MN	Minneapolis, Merit Elctrns.	612-546-5383
NJ	East Hanover, State Elctrns.	201-887-2550
NJ	New Brunswick, Brothers Elctrns.	201-238-2200
NJ	Whippany, Tonar Ind.	201-884-1400
NY	Bohemia, TTI Inc	516-567-1500
NY	E. Syracuse, Add Elctrns. Corp.	315-437-0300
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Farmingdale, Command Elctrns. Corp.	516-293-1212
NY	Hauppauge, Jaco Elctrns.	516-273-5500
NY	Hauppauge, Fairmont Elec. Sls.	516-231-3313
NY	Huntington Station, Sherburn Elctrns.	516-231-4300
NY	Rochester, Rochester Radio Supp.	716-454-7800
NY	Valley Stream, L & S Elctrns.	516-561-2474
NC	Charlotte, Elctrns. Mktg.	704-394-6195
OH	Columbus, Elctrns. Mktg.	614-299-4161
OH	Dayton, Bell Micro-Mil	513-434-8231
OK	Tulsa, Radio	918-587-9123
PA	Montgomeryville, Pyttronic Inds.	215-643-2850
PA	Philadelphia, TRW Elctrn. Supp.	215-923-8230
PA	Philadelphia, Philadelphia Elctrns.	215-568-7400
TX	Ft. Worth, TTI Inc.	817-831-0441
VA	Charlottesville, Virginia Radio	804-296-4184
WA	Bellevue, Bell Inds.	206-747-1515
WA	Seattle, Robert E. Priebe Co.	206-682-8242
WI	Milwaukee, Marsh Elctrns.	414-475-6000

VTM MICROWAVES, INC., 4975 W. 80 Ave., Westminster, CO 80030, Tel: 303-426-6866; Empl.: 15

V-TRON ELCTRNS. CORP., 84 Fountain St., Pawtucket, RI 02860, Tel: 401-728-6140; Empl.: 250; *Sls. Mgr.:* Richard E. French

VU-DATA, 7122 Convoy Ct., San Diego, CA 92111, Tel: 619-279-6572, TWX: 910-335-1586; FSC No.: 34160; Empl.: 15

WABASH, First & Webster Sts., Wabash, IN 46992, Tel: 219-563-3111, TWX: 810-333-1533; Empl.: 400; *Sls. Mgr.:* Stan Kalin

WABASH RELAY & ELCTRNS., First & Webster Sts., Wabash, IN 46992, Tel: 219-563-2191, TWX: 810-290-2722; Empl.: 250; *Sls. Mgr.:* David L. Snodgrass ....1B•1478, 1479

Local Sales Offices & Reps

AL	Huntsville, 20th Century Mktg.	205-533-9281
AZ	Phoenix, M/R Engrg. Sls. Co.	602-956-4670
CA	Glendale, Halbar	213-246-8263
CA	San Mateo, Halbar	415-349-4700
CO	Aurora, Mountain View Mktg.	303-360-9641
DE	Medford, Comp. Conslt.	609-654-5300
FL	Ft. Lauderdale, APM Assocs.	305-565-0056
FL	Longwood, APM Assocs.	305-869-6831
FL	Tampa, APM Asocs.	813-886-2457
GA	Stone Mountain, 20th Century Mktg.	404-292-7088
IL	Arlington Hgts., M. J. Petersen Assocs.	312-577-8200
IN	Fort Wayne, M/S Sales	219-484-1904
KS	De Soto, Midtec Assoc.	913-441-6565
MD	Glen Burnie, Macrotech Assocs. Ltd.	301-437-5588
MA	Andover, Crawford Assocs.	617-470-2122
MI	Novi, Lektronics	313-349-3304
MN	Edina, PWC Inc.	612-831-5999
MO	Florissant, Midtec Assoc.	314-837-5200
NJ	Watchung, Dolan Assocs.	201-753-2671
NY	Penfield, Upstate Comp. Sls.	716-381-6070
NC	Raleigh, Tingen Tech. Sls.	919-781-1100
OH	Dayton, KW Elctrn. Sls.	513-890-2150
OH	Shaker Heights, KW Elctrn. Sls.	216-491-9177
OH	Worthington, KW Elctrn. Sls.	614-888-0483
PA	Medford, Comp. Consultants	609-654-5300
TN	Knoxville, 20th Century Mktg.	615-690-1618
TX	Dallas, Stevens Sls. Co.	214-350-2476
VA	Glen Burnie, Macrotech Assocs. Ltd.	301-437-5588
WA	Redmond, Halbar Assocs. Inc	206-882-0990
WA	Vancouver, Halbar Assocs.	206-696-0170

Local Distributors

IL	Elk Grove Village, Nu-Way Elctrn. Distrs.	800-323-7957

WABER ELECTRIC, See SGL Waber Electric.

WADSWORTH ELEC., 20 W. 11th St., Covington, KY 41011, Tel: 606-431-0900; *Sls. Mgr.:* D. W. Phillips

WAGNER ELECTRIC CORP., Tung-Sol Div., 100 Misty Lane, Parsippany, NJ 07054, Tel: 201-386-9300

WAGO CORP., 6657 N. Sidney Pl., Milwaukee, WI 53209-3217, Tel: 414-352-1035, Telex: 260123; *Sls. Mgr.:* Michael A. Lane

WAHL INSTRUMENTS, INC., 5750 Hannum Ave., Culver City, CA 90230, Tel: 213-822-6144, TWX: 910-343-6867; Empl.: 48

WALDES KOHINOOR, 47-16 Austel Pl., Long Island City, NY 11101, Tel: 212-392-3100, Telex: 126-829; Empl.: 450

WALDOM ELCTRNS., 4301 W. 69th St., Dept. EEM, Chicago, IL 60629, Tel: 312-585-1212, Telex: 25-4604; FSC No.: 92219; Empl.: 143; *Sls. Mgr.:* E. R. Beutler

WALKER SCIENTIFIC, Rockdale St., Worcester, MA 01606, Tel: 617-852-3674, Telex: 92-0489; Empl.: 83; *Sls. Mgr.:* B. Langley

WALL, A. T., CO., 55 Service Ave., Warwick, RI 02886, Tel: 401-739-0740, TWX: 710-382-1535; Empl.: 75; *Sls. Mgr.:* Carl Gibbs; *Dist. Mgr.:* R. Huntsman

WALL-ABLE MANUFACTURING CORP., 1800 N. Clybourn Ave., Chicago, IL 60614, Tel: 312-440-1000; Empl.: 100; *Sls. Mgr.:* Dennis O'Brien ..2•1742, 1743

Local Sales Offices & Reps

IL	Wheeling, AL&W Sls. Co.	312-541-9080
MA	Norwell, Carl Morris & Assoc.	617-659-2968
NY	Dobbs Ferry, L. J. Valle, Inc.	914-693-5089

WALL INDS., 2 Franklin, Lawrence, MA 01840, Tel: 617-688-1287; Empl.: 55; *Sls. Mgr.:* Mark P. Aiello

WALL LENK, Box 3349, Dept. EEM-71, Kinston, NC 28501, Tel: 919-527-4186; Empl.: 60; *Sls. Mgr.:* Richard W. Cooper

Local Sales Offices & Reps

CA	Laguna Hills, Kendall Mktg.	714-581-9951
CO	Aurora, S.O.S. Mktg.	303-366-7667
FL	Tampa, SRT Mktg.	813-884-4805
GA	Stone Mountain, Advanced Elctrns. Equip.	404-289-6100
IN	Noblesville, R & D Electronics	317-849-2026
MA	Rochdale, Robert L. May Assoc.	617-885-4370
MI	Brighton, A. P. Assocs.	313-229-6550
MN	Minneapolis, John Anderson Co.	612-823-6459
MO	Kansas City, W. D. Burt & Assoc.	816-931-2384
NY	Guilderland, The Solder Pot	518-355-1829
NC	Raleigh, South States Mktg.	919-781-3220
TX	Houston, Natl. Mktg. Assoc.	713-460-0989
UT	Ogden, Johnson Co.	801-393-1202

WAMCO, INC., 11555-A Coley River Cir., Fountain Valley, CA 92708, Tel: 714-545-5560, Telex: 678-459; *Sls. Mgr.:* Gordon R. Calvert; *Dist. Mgr.:* Sheila A. Sherman

WARD LEONARD ELEC., 31 South St., Mt. Vernon, NY 10550, Tel: 914-664-1000, TWX: 710-562-0144; FSC No.: 63743; Empl.: 600; *Dist. Mgr.:* Barry Daly

WARREN COMMS., 101 Okner Pkwy., Livingston, NJ 07039, Tel: 201-992-6200, Telex: 139-384, TWX: 710-994-4852; Empl.: 200; *Sls. Mgr.:* William Vandertulip

Local Sales Offices & Reps

CA	Santa Ana, Comm. Prods.	714-730-1220
NJ	Glen Ridge, Michael Ostella	201-429-9377

Local Distributors

AZ	Phoenix, Dortan Enterprises	602-944-2947
CA	Los Angeles, M. A. Stolaroff Co.	213-295-7781
CA	San Diego, Masco Inc.	619-234-6905
CA	San Francisco, Blach & Bensinger	415-697-2525
FL	Indian Rocks Bch., Tech-Reps Assocs.	813-577-2779
IL	S. Elgin, R. K. Elctrns.	312-695-8552
MN	Minneapolis, HMR, Inc	612-831-7400
NJ	Westfield, Erich Maertz, Inc.	201-232-4643
NY	Rochester, R. P. Kennedy Co.	716-271-6322
TX	Carollton, Seaton Corp.	214-380-0414
VA	Alexandria, TDI	703-971-8982

WARREN-KNIGHT INSTR. CO., Warren Inds., Inc., 2045 Bennett Rd., Philadelphia, PA 19116, Tel: 215-464-9300; Empl.: 50; *Sls. Mgr.:* Richard M. Marron

WAVETEK ROCKLAND SCI., 245 Livingston St., Northvale, NJ 07647, Tel: 201-767-7100, TWX: 710-991-9619; Empl.: 200; *Sls. Mgr.:* Howard Siegerman

WASATCH HIGH VOLTAGE, P.O. Box 9027, Salt Lake City, UT 84109, Tel: 801-466-9561; Empl.: 9; *Sls. Mgr.:* T. J. Bruzenak

Local Sales Offices & Reps

CA	Encino, King-way Assocs.	213-788-4124

WATERS MFG., Longfellow Ctr., Wayland, MA 01778, Tel: 617-358-2777, Telex: 948441; Empl.: 125; *Sls. Mgr.:* Ralph Pietro

WATKINS-JOHNSON CO., 3333 Hillview Ave., Palo Alto, CA 94304, Tel: 415-493-4141, Telex: 34-8415, TWX: 910-373-1253; FSC No.: 14482; Empl.: 2800

WATKINS-JOHNSON CO., Stewart Div., 440 Mount Herman Road, Scotts Valley, CA 95060, Tel: 408-438-2100

WATT-CLOCK CORP., P.O. Box 697, Stratford, CT 06497, Tel: 203-378-2500; Empl.: 5; *Sls. Mgr.:* M. Dee

WAVECOM, 9036 Winnetka Ave., Northridge, CA 91324, Tel: 818-882-3010, TWX: 910-493-2172; FSC No.: 28979; Empl.: 93

WAVELINE, Box 718, W. Caldwell, NJ 07006, Tel: 201-226-9100, TWX: 710-734-4324; FSC No.: 00443; Empl.: 95; *Sls. Mgr.:* R. A. Powell

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrn. Assocs.	205-881-5031
AZ	Scottsdale, Territorial Mktg.	602-994-8665
CA	Mt. View, Pacific Technical Mktg.	415-969-3010
CA	Tarzana, Midwin & Olifson	213-996-9093
FL	Ft. Lauderdale, Beacon Elctrn.	305-491-1054
FL	Maitland, Beacon Elctrn. Assn.	305-647-3498
GA	Atlanta, Beacon Elctrn.	404-256-9640
KY	Ft. Mitchel, GW. Thelen	606-341-8181
MD	Glen Arm, Hodgins Assocs.	301-592-7047
MA	Needham Hgts., O'Sullivan & Murphy	617-449-4141
NY	Hartsdale, Spectrum Sls.	914-472-8600
NY	Skaneateles, Robtron	315-685-5731
NC	Raleigh, Beacon Elctrns.	919-780-0330
OH	Medina, GW Thelen	216-723-1293
TX	Arlington, N&W Sls.	817-461-4443
WA	Seattle, Rep-West	206-283-8351
EXP	NJ, Oradell, Sylvan Ginsbury	201-261-3200

WAVETEK INDIANA, INC., 5808 Churchman, Beech Grove, IN 46107, Tel: 317-787-3332, TWX: 810-341-3226; FSC No.: 34280; Empl.: 900; *Sls. Mgr.:* Dick Koerner .... **1A•**1784, 1785; **3•**1318

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown Instrs.	205-883-8660
AZ	Scottsdale, Barnhill Assoc.	602-947-7841
CA	Redondo Beach, Ward/Davis	213-973-7772
CA	San Diego, Ward/Davis	619-292-1000
CA	Santa Clara, Ward/Davis	408-245-3700
CO	Englewood, Barnhill Assoc.	303-779-3600
CT	No. Haven, P. Jenks Assoc.	203-239-6201
FL	Ft. Lauderdale, W. A. Brown Instrs.	305-776-4800
FL	Melbourne, W. A. Brown Instrs.	305-723-0766
GA	Norcross, W. A. Brown Instrs.	404-441-2980
HI	Honolulu, EMC Corp.	808-836-2044
IL	Arlington Hgts., Dytec Central	312-394-3380
IN	Indianapolis, Dytec Central	317-247-1316
KS	Lenexa, Dytec South	913-888-0215
LA	Mandeville, W. A. Brown Instrs.	504-626-9701
MA	Woburn, P. Jenks Assoc.	617-938-0488
MI	Madison Hgts., WKM Assocs.	313-588-2300
MN	St. Paul, Dytec North	612-645-5816
MO	Maryland Hgts., Dytec South	314-569-2990
NM	Albuquerque, Barnhill Assoc.	505-299-7658
NY	Fairport, Naco Elctrns.	716-223-4490
NY	N. Syracuse, Naco Elctrns.	315-699-2651
NY	Utica, Naco Elctrns.	315-732-1801
NC	Durham, W.A. Brown Instrs.	919-682-2383
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5930
OK	Tulsa, Data Mktg. Assoc.	918-496-1457
OR	Beaverton, Northwest Test & Meas.	503-646-9966
PA	Bensalem, Eastern Instrmn.	215-245-6660
PA	Pittsburgh, WKM Assocs.	412-892-2953
SC	Columbia, W. A. Brown Instrs.	803-798-8070
TN	Oak Ridge, W. A. Brown Instrs.	615-482-5761
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assoc.	214-661-0300
TX	Houston, Data Mktg. Assoc.	713-780-2511
TX	San Antonio, Data Mktg. Assoc.	512-342-3031
UT	Murray, Barnhill Assoc.	801-262-3000
VA	McLean, Creative Mktg. Assoc.	703-442-9100
WA	Redmond, Northwest Test & Meas.	206-881-8857

WAVETEK ROCKLAND SCIENTIFIC, INC., 10 Volvo Dr., Rockleigh Indl. Pk., Rockleigh, NJ 07647, Tel: 201-767-7900, TWX: 710-991-9852; Empl.: 100

Local Sales Offices & Reps

AL	Huntsville, W. A. Brown Instr.	205-883-8660
AZ	Scottsdale, Barnhill Assoc., Inc.	602-947-7841
CA	Irvine, Wavetek Rockland Sci.	714-261-8600
CA	Redondo Beach, Ward/Davis Assoc.	213-643-6977
CA	San Diego, Ward/Davis Assocs.	619-292-1000
CA	San Jose, Wavetek Rockland Sci.	408-286-8040
CA	Santa Clara, Ward/Davis Assoc.	408-245-3700
CO	Englewood, Barnhill Assoc., Inc.	303-779-3600
CT	N. Haven, Pat Jenks Assocs.	203-239-6201
FL	Fort Lauderdale, W. A. Brown Instr.	305-776-4800
FL	Melbourne, W. A. Brown Instr.	305-723-0766
FL	Orlando, W. A. Brown Instrs.	305-425-5505
FL	Tampa, Wavetek Rockland Sci.	813-626-6333
GA	Atlanta, W. A. Brown Instrs.	404-455-2035
GA	Norcross, W. A. Brown Instr.	404-441-2980
GA	Tucker, Wavetek Rockland Sci.	404-491-7614
HI	Honolulu, EMC Corp.	808-836-1138
IL	Arlington Hgts., Dytec/Central	312-394-3380
IN	Indianapolis, Dytec/Central	317-247-1316
IA	Iowa City, Dytec/South	319-683-2282
KS	Lenexa, Dytec/South	913-888-0215
LA	Mandeville, W. A. Brown Instr.	504-626-9701
MA	Burlington, Wavetek Rockland Sci.	617-273-4557
MA	Woburn, Pat Jenks Assocs.	617-938-0488
MI	Madison Hgts., WKM Assocs.	313-588-2300
MN	St. Paul, Dytec/North	612-645-5816
MO	Maryland Hgts., Dytec/South	314-569-2990
NM	Albuquerque, Barnhill Assoc., Inc.	505-299-7658
NY	Fairport, Naco Elec. Corp.	716-223-4490
NY	Great Neck, RTI	516-829-3770
NY	N. Syracuse, Naco Elec. Corp.	315-699-2651
NY	Utica, Naco Elec. Corp.	315-732-1801
NC	Durham, W. A. Brown Instr.	919-683-1580
OH	Dayton, WKM Assocs.	513-434-7500
OH	Independence, WKM Assocs.	216-524-5903
OH	Worthington, Wavetek Rockland Sci.	614-888-6060
OK	Tulsa, Data Mktg. Assocs.	918-496-1457
OR	Beaverton, Northwest Test & Meas.	503-646-9966
PA	Bensalem, Eastern Instrmn.	215-245-6660
PA	Montgomeryville, Wavetek Rockland Sci.	215-822-7001
PA	Pittsburgh, WKM Assocs.	412-892-2953
SC	Columbia, W. A. Brown Instr.	803-798-8070
TN	Oak Ridge, W. A. Brown Instr.	615-482-5761
TX	Austin, Data Mktg. Assocs.	512-451-5174
TX	Dallas, Data Mktg. Assocs.	214-661-0300
TX	Houston, Data Mktg. Assocs.	713-780-2511
TX	San Antonio, Data Mktg. Assocs.	512-828-0937
UT	Murray, Barnhill Corp.	801-262-3000
VA	McLean, Wavetek Rockland Sci.	703-442-0600
VA	McLean, Creative Mktg. Assoc.	703-442-9100
WA	Redmond, Northwest Test & Meas.	206-881-8857

WAVETEK SAN DIEGO, Div. of Wavetek, 9045 Balboa Ave., P.O. Box 85265, San Diego, CA 92123, Tel: 619-279-2200, TWX: 910-335-2007; Empl.: 470; *Sls. Mgr.:* Sam Lewis

WAYNE KERR, INC., W.K.R. Ltd., 400 West Cummings Pk., Woburn, MA 01801, Tel: 617-938-8390, Telex: 6817257 WKERR WOBN; *Sls. Mgr.:* Ken Berquist

WAYNE TRANSFORMER CO., INC., 99 Hazel St., Paterson, NJ 07503, Tel: 201-278-7674; *Sls. Mgr.:* Fred DeMauro .... **1A•**2365

WECKESSER CO. INC., 4444 W. Irving Park Rd., Chicago, IL 60641, Tel: 312-282-8626; Empl.: 90

WECO

WECO ELCTRL. CONNECTORS INC., **Weco Wester, Ebbinghaus & Co.,** P.O. Box 84, Ste. Anne DeBellevue P.Q., Canada H9X3L4, Tel: 514-457-3648, Telex: 05-821840; *Sls. Mgr.:* Heiner Kammann; *Dist. Mgr.:* Heiner Kammann .... **2•**1745-1747

Local Sales Offices & Reps

CA	Fullerton, ISI Mktg. Co.	714-773-0411
CO	Littleton, Protronics Grp.	303-973-3096
FL	Coral Springs, HAI Elctrns.	305-752-7520
IL	Carol Stream, Lectro Comps.	312-690-0520
NH	Nashua, Bell Controls Inc.	603-882-6984
OR	Portland, SPS Elctrns.	503-297-6919
WA	Redmond, SPS Elctrns.	206-323-4140

Local Distributors

CA	Fullerton, ISI Mktg. Co.	714-773-0411
IL	Carol Stream, Lectro Comps.	312-690-0520

WEED INSTR. CO., INC., 707 Jeffrey Way, P.O. Box 300, Round Rock, TX 78664-0300, Tel: 512-255-7043, Telex: 776492; Empl.: 110; *Sls. Mgr.:* Tom Kurys

WEI CORP., 1405 S. Village Way, Santa Ana, CA 92705, Tel: 714-834-9333, TWX: 910-595-1709; FSC No.: 51272; Empl.: 50; *Sls. Mgr.:* R. H. Thomason

WEIDMULLER TERMINATIONS, 821 Southlake Blvd., Richmond, VA 23236, Tel: 804-794-2877, Telex: 828376; Empl.: 31; *Sls. Mgr.:* James G. Dunn; *Dist. Mgr.:* Mort Gelfand .... **2•**1748

Local Sales Offices & Reps

AZ	Scottsdale, Bill Earl Assoc.	602-994-3813
CA	Huntington Beach, Weidmuller Terminations	714-960-9264
CA	Lamesa, Weidmuller Terminations	619-466-5644
CA	Santa Clara, DC Elctrns.	408-980-1199
CA	Woodland Hills, Weidmuller Terminations	213-716-8929
CO	Denver, Weidmuller Terminations	303-753-1499
CT	Trumbull, Weidmuller Terminations	203-268-1496
FL	Apopka, Weidmuller Terminations	305-889-2791
GA	Marietta, Weidmuller Terminations	404-971-6472
IL	Barrington, R. Fisk Mktg.	312-381-0653
IL	Crete, Weidmuller Terminations	312-672-4460
LA	Baton Rouge, General Power & Control	504-924-3919
MA	Revere, Weidmuller Terminations	617-289-2122
MI	Highland, Holly & Upleger	313-363-8800
NJ	Port Reading, Weidmuller Terminations	201-636-7021
NY	E. Syracuse, L-Mar Assoc.	315-437-7779
NY	Rochester, L-Mar Assoc.	716-323-1000
NY	West Hempstead, Schmitt Indl. Mktg.	516-486-5510
OH	Cincinnati, J. W. Murray & Assoc.	513-574-8500
OH	Mentor, Weidmuller Terminations	216-255-1990
OK	Tulsa, Electrotech Sys.	918-496-2021
PA	Philadelphia, Weidmuller Terminations	215-698-8285
TX	Grapevine, Electrotech Sys.	817-481-1583
TX	Houston, Weidmuller Terminations	713-870-1515
TX	Missouri City, Weidmuller Terminations	713-437-2011
UT	Salt Lake City, Control Agency	801-320-4305
WA	Issaquah, Weidmuller Terminations	206-392-4333
WI	Milwaukee, Weidmuller Terminations	414-444-9441

WEINSCHEL ENGRG., One Weinschel La., Gaithersburg, MD 20877, Tel: 301-948-3434, 800-638-2048, Telex: ITT 440702, TWX: WU 89-8352; FSC No.: 93459; Empl.: 325; *Sls. Mgr.:* Ron Bastien .... **1A•**1787; **3•**1319

Local Sales Offices & Reps

AL	Huntsville, Beacon Elctrns. Assoc.	205-881-5031
AZ	Tempe, Sierra Tech. Grp.	602-894-2335
AR	Little Rock, Beacon Elctrns. Assoc.	501-224-5449
CA	Malibu, G. McNamara	213-457-4563
CA	Rodondo Beach, Ward Davis Assoc.	213-643-6977
CA	San Diego, Ward Davis Assoc.	619-292-1000
CA	Santa Clara, Ward Davis Assoc.	408-245-3700
CO	Englewood, Sierra Tech. Grp.	303-790-1700
FL	Clearwater, Beacon Elctrns. Assoc.	813-796-2378
FL	Ft. Lauderdale, Beacon Elctrns. Assoc.	305-491-1054
FL	Maitland, Beacon Elctrns. Assoc.	305-647-3498
FL	Melbourne, Beacon Elctrns. Assoc.	305-724-8010
GA	Atlanta, Beacon Elctrns. Assoc.	404-256-9640
IL	Arlington Heights, Dytec Central	312-394-3380
IN	Indianapolis, Dytec Central	317-247-1316
KS	Lenexa, Dytec South	913-888-0215
MA	Burlington, R. J. Sickles Assoc.	617-862-5100
MN	St. Paul, Dytec North	612-645-5816

MO	Maryland Hgts., Dytec South	314-569-2990
NJ	Hackensack, Tech. Mktg.	201-342-4008
NM	Las Cruces, Sierra Tech. Grp.	505-524-8092
NY	Fairport, Naco Elctrns.	716-223-4490
NY	No. Syracuse, Naco Elctrns.	315-699-2651
NY	Utica, Naco Elctrns.	315-732-1801
NC	Raleigh, Beacon Elctrns. Assoc.	919-787-0330
OR	Portland, Arva-Hudson	206-455-0773
PA	Bensalem, Eastern Inst.	215-245-6660
TX	Austin, Sci. Dvcs.-Southwest, Inc.	512-442-6215
TX	El Paso, Sierra Tech. Grp.	915-591-5890
TX	Houston, Scientific Dvcs. - Southwest	713-864-1711
TX	Richardson, Scientific Dvcs. - Southwest	214-231-8106
TX	San Antonio, Ashcraft Assocs.	512-681-0477
UT	Salt Lake City, Sierra Tech. Grp.	801-322-3069
VA	McLean, Creative Mktg. Assocs.	703-442-9100
WA	Bellevue, Arva-Hudson	206-455-0773

WELLMAN THERMAL SYS., 1 Progress Rd, Shelbyville, IN 46176, Tel: 317-398-4411, TWX: 810-260-2616; FSC No.: 4S017; Empl.: 600; *Sls. Mgr.:* E. W. Abel; *Dist. Mgr.:* W. L. McNamee

WELLS ELCTRNS., 1701 S. Main St., South Bend, IN 46613, Tel: 219-287-5941, Telex: 25-8325; Empl.: 180; *Sls. Mgr.:* Michael Myers .... **2**•1750-1755

Local Sales Offices & Reps

AL	Huntsville, Southeastern Mktg.	205-882-1633
AZ	Tempe, Foley, Tallent & Lee, Inc.	602-894-2345
CA	Los Angeles, EESCO	213-242-8823
CA	San Jose, Western Indl. Network	408-559-8118
CO	Denver, Foley, Tallent & Lee, Inc.	303-973-4934
CT	Wethersfield, Com/Pak, Inc.	203-563-4784
FL	Maitland, Lobo Mktg. Assocs., Inc.	305-628-8911
L	Glencoe, Howard Benjamin Assocs. Inc.	312-835-0150
N	Greenfield, France Entprs., Inc.	317-462-6098
A	Davenport, Electro Tech Assocs.	319-386-1134
MA	Woburn, Com/Pak, Inc.	617-938-8580
MI	Ypsilanti, TAMCO, Inc.	313-572-1950
MN	Minneapolis, Electro-Tech Assocs.	612-927-5878
MO	St. Louis, KKB & Co.	314-647-2400
NJ	Berkeley Heights, Cambridge Allen and Assocs.	201-464-7987
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NY	Syracuse, T-Squared Elctrns. Co., Inc.	315-463-8592
NC	Raleigh, Tingen Tech. Sls., Inc.	919-781-1100
OR	Beaverton, Caruso & Northcutt, Inc.	503-646-4973
TX	El Paso, EPEC, Inc.	915-593-8481
TX	Irving, AID Elctrns., Inc.	214-259-4761
WA	Bellevue, Caruso & Northcutt, Inc.	206-454-9699
WI	Colgate, Rep 1 & Assocs.	414-628-4016

Local Distributors

AZ	Tempe, Waltronic Sls.	602-967-1020
CA	Anaheim, A To Z Elctrns., Inc.	714-634-3620
CA	North Hollywood, Elctrn. Hardware, Ltd.	213-982-6100
CA	San Jose, Cypress Elctrns., Inc.	408-945-8400
CO	Denver, CSID, Inc.	303-292-9594
FL	Pompano Beach, Comps. South	305-971-0350
L	Chicago, Semiconductor Specialists, Inc.	312-279-1000
MA	Burlington, Schaal Assocs.	617-272-7940
MA	Mendon, Add Elctrn. Corp.	617-478-4200
MI	Southfield, L.S.I. Mktg.	313-356-7002
MN	Minneapolis, Semiconductor Specialists, Inc.	612-854-8841
MO	Kansas City, Semiconductor Specialists, Inc.	816-452-3900
NH	Hampstead, Astrum Elctrns.	603-329-5656
NJ	Bellmawr, Mid-Atlantic Elctrns. Corp.	609-931-5303
NY	East Syracuse, Add Elctrn. Corp.	315-437-0300
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Hauppauge, Schaal Assocs.	516-234-4600
NC	Charlotte, Elctrns. Mktg. Corp.	704-394-6195
OH	Columbus, Elctrns. Mktg. Corp.	614-299-4161
OR	Tigard, Moore Elctrns. Inc.	503-684-3100
PA	Pittsburgh, Semiconductor Specialists, Inc.	412-963-7241
X	Houston, Kent Elctrns. Inc.	713-780-7770
X	Richardson, Kent Elctrns. Inc.	214-669-2600

WELTEK INTL., INC., 760 W. Cotter St., South Bend, IN 46613, Tel: 219-232-5400, Telex: 23-3131; Empl.: 28; *Sls. Mgr.:* Tom Gerschoffer

Local Sales Offices & Reps

CA	Fremont, HJR Entprs.	415-490-7911
CO	Littleton, Production Equip. Sls.	303-795-5022
DC	Washington, Harry Wise & Co.	202-363-9417
L	Lake Worth, GRY Associates	305-965-5111
N	Noblesville, King Sls	317-842-1035
KS	Prairie Village, Dougherty & Assoc.	913-649-3515
MA	Tewksbury, Hunt Assocs.	617-851-9042
MI	Royal Oak, Murray Percival & Co.	313-548-1971
MN	Edina, PEC/LEVI	612-94-8540
MO	St. Louis, John E. Metz Co.	314-993-1979
Y	Fair Haven, Feikert Assoc., Inc.	315-947-5994
C	Cary, Interbit, Inc.	919-467-3200

WESCO ELECTRICAL CO., 201 Munson St., Greenfield, MA 01301, Tel: 413-774-4358; FSC No.: 12673; Empl.: 190; *Sls. Mgr.:* James R. DeSanty .... **1A**•1212-1217

Local Sales Offices & Reps

CA	Costa Mesa, Electro-Mech Sls. Co.	714-642-2390
CA	La Jolla, Southwest Tech. Sls.	619-454-2034
CA	Santa Clara, Gagner-Toomey Assocs.	408-244-2200
CT	Milford, Cuming Assoc.	203-878-3946
FL	Fern Park, EIR Inc.	305-830-9600
IL	Addison, Banner Tech. Sls.	312-279-6070
IN	Columbus, J. H. Weaver Co.	812-372-3625
MA	Framingham, Bengal Assocs.	617-877-2639
MA	Randolph, Bengal Assocs.	617-961-4120
MN	Bloomington, Electronic Sls. Agcy.	612-884-8291
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Glen Head, Livera-Polk Assocs.	516-759-9300
NC	Raleigh, Leigh Sls.	919-872-1484
OH	Wickliffe, W. Brauer & Assoc.	216-943-0601
OR	Beaverton, L-D Elctrns.	503-649-6177
PA	Pittsburgh, W. Brauer & Assoc.	412-921-3213
TX	Dallas, Blackburn Assocs.	214-692-8885
WA	Snohomish, L-D Elctrns.	206-568-0511

WESCOM, PO Box 1458, Downers Grove, IL 60515, Tel: 312-985-9000, Telex: 253656, TWX: 910-695-4735; *Sls. Mgr.:* R. Don Webster

WESCORP ANTISTATIC PRODS., 144 S. Whisman Rd., Mountain View, CA 94041, Tel: 415-969-7717, Telex: 345507; Empl.: 15; *Sls. Mgr.:* Lourdes Rivera

Distributor

WES-GARDE COMPONENTS GROUP, INC., 190 Elliott St., Hartford, CT 06114, Tel: 203-525-6907 .... **1B**•1742

WESTAMP, 1542 15th St., Santa Monica, CA 90404, Tel: 213-393-0401, TWX: 910-343-7443; Empl.: 90

WESTBERG MFG., INC., 3400 Westach Way, Sonoma, CA 95476, Tel: 707-938-2121; *Sls. Mgr.:* R. R. Westberg

WEST-CAP ARIZONA, Sub. of San Fernando Electric Mftg. Co., 2201 East Elvira Road, Tucson, AZ 85706, Tel: 602-294-2646

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WESTCODE SEMICONDUCTORS, INC., 0-02 Fair Lawn Ave., Fair Lawn, NJ 07410, Tel: 201-791-3020, Telex: 130389; *Sls. Mgr.:* E. Hultz, Jr.

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FL	Oldsmar, Boggs & Assocs.	813-855-1812
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OH	Cleveland, Electronic Salesmasters	216-831-9555
TX	Dallas, Delta Comps.	214-287-6333
WI	New Berlin, Reko, Inc.	414-784-3430

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WESTERN ELECTRO. MECH. CO. INC.; 300 Broadway, Oakland, CA 94607, Tel: 415-452-1936; *Sls. Mgr.:* W. J. Foster

WESTERN GEAR CORP., Applied Tech. Div., 14724 E. Proctor, City of Industry, CA 91744, Tel: 818-968-6525, TWX: 910-584-4856; Empl.: 1125; *Sls. Mgr.:* D. Waite

WESTERN GRAPHTEC, 12 Chrysler St., Irvine, CA 92714, Tel: 714-770-6010, 800-854-8385

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CA	Laguna Hills, Westpower Co.	714-380-0277
CA	Los Angeles, Westpower Co.	818-579-8230
CA	Mountain View, Westinghouse Elec.	415-949-0610
CA	Santa Clara, Engineering Assoc. Corp.	408-988-5001
CO	Denver, Lindberg Co.	303-758-9033
CT	Madison, HV Engrg.	203-401-4561
FL	Altamonte Springs, Semtronic Assoc.	305-831-8233
FL	Clearwater, Semtronic Assoc.	813-461-4675
GA	Atlanta, JWL Assocs.	404-429-8010
IL	Chicago, L & W Power Corp.	312-887-8909
IL	Wheaton, Westinghouse	312-462-0404
IA	Cedar Rapids, Dy-Tronix	319-377-8275
MD	Baltimore, Westinghouse Elect.	301-792-8857
MA	Boston, Westinghouse Elec.	617-237-6950
MA	Ludlow, Gerber Sls.	413-589-9837
MA	Newton Upper Falls, Gerber Sls.	617-969-2620
MI	Livonia, L & W Power, Corp.	313-525-1380
MN	Minneapolis, Comstrand	612-788-9234
MO	Independence, Dy-Tronix	816-373-6600
MO	St. Louis, Dy-Tronix	314-731-5799
NJ	Basking Ridge, Eastpower Co.	201-766-7886
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Ithaca, Bob Dean, Inc.	607-257-1111
NC	Charlotte, JWL Assocs.	704-523-3001
NC	Raleigh, JWL Assocs.	919-787-4826
OH	Cincinnati, J. R. Thornberry Co.	513-874-0236
OH	Kettering, L & W Power, Corp.	513-293-3482
OH	South Euclid, J.R. Thornberry Co.	216-321-3328
PA	Pittsburgh, Covert & Newman Co.	412-531-2002
PA	Youngwood, Westinghouse	412-925-7272
TX	Austin, NOVA Mktg.	512-835-1733
TX	Dallas, Nova Mktg.	214-750-6082
TX	Houston, Nova Mktg.	713-988-6082
UT	Salt Lake City, Lindberg Co.	801-969-2400
WI	Milwaukee, L & W Power Corp.	414-786-0260

WEST INSTRS, Gulton Inds, M. C. S. Div., Gulton Indl Pk, E. Greenwich, RI 02818, Tel: 401-884-6800, TWX: 710-387-1500; Empl.: 400; *Sls. Mgr.:* W. Hunt; *Dist. Mgr.:* W. Hunt

WESTLAKE CAPACITORS INC., 5334 Sterling Center Dr., Westlake Village, CA 91361, Tel: 818-889-4120, TWX: 910-494-4779; Empl.: 210; *Sls. Mgr.:* F. G. Edge; *Dist. Mgr.:* D. Lawrence

WESTON CONTROLS/POTS DIV., Div. Fairchild Weston Sys., Inc., Archbald, PA 18403, Tel: 717-876-1500, Telex: 83-1873, TWX: 510-656-2902; FSC No.: 94271; Empl.: 1077; *Sls. Mgr.:* J. Cousins .... **1A**•2071-2084

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AZ	Phoenix, Sanford Sls. Assoc.	602-957-3570
CA	Carlsbad, Addem/San Diego	619-729-9216
CA	Mountain View, Westmark Assocs.	415-969-1700
CA	Van Nuys, Wes-K Assocs.	213-989-3070
CO	Denver, Quorum 3 Sls. Group	303-696-8480
CT	Ridgefield, Phoenix Sls. Co.	203-438-9644
FL	Clearwater Beach, Perrott Assocs.	813-443-5214
FL	Orlando, Perrott Assocs.	305-298-7748
FL	Sunrise, Perrott Assocs.	305-792-2211
GA	Stone Mountain, DTM, Inc.	404-962-2530
IL	Skokie, Marcon Assocs.	312-675-6450
KS	Olathe, Rush & West	913-764-2700
KS	Wichita, Repco	316-263-4238
MD	Baltimore, B. White & Co.	301-484-5400
MA	Stow, Today Comp. Sls. Corp.	617-897-7500
MI	Warren, DEM Elctrn. Sls.	313-575-9444
MN	St. Paul, Repco	612-642-2828
MO	Ballwin, Rush & West Assoc., Inc.	314-394-7271

MO	Independence, Repco	816-254-3410
NJ	Fairfield, Addem Sls.	201-882-0993
NY	Albany, Reagan/Compar	518-489-4777
NY	Endwell, Reagan/Compar	607-723-8743
NY	Endwell, Reagan/Compar	607-754-8946
NY	Fairport, Reagan/Compar	716-271-2230
NY	New Hartford, Reagan/Compar	315-732-3775
OH	Dayton, J. C. Hofstetter Co.	513-296-1010
OH	Medina, J. C. Hofstetter Co.	216-241-4880
OR	Beaverton, LD Elctrns.	503-649-6177
PA	Hickory, J. C. Hofstetter Co.	412-356-2305
PA	Rydal, ESPY Sls.	215-576-0780
TX	Austin, Delta Comps.	512-458-4288
TX	Seagoville, Delta Comps.	214-287-6333
UT	Salt Lake City, Quorum 3 Sls. Grp.	801-943-9227
WA	Snohomish, LD Elctrns.	206-568-0511
WA	Spokane, LD Elctrns.	509-922-4883

Local Distributors

AZ	Phoenix, TTI	602-861-0222
AZ	Phoenix, Arizona Comps.	602-269-5655
AZ	Tempe, Circuit Specialists, Inc.	602-966-2878
CA	Belmont, Arndt	415-592-6718
CA	Chatsworth, Diplomat Elctrns.	213-700-8700
CA	Chatsworth, Integrated Elctrns.	213-998-2200
CA	Chatsworth, Shelley Elctrns.	213-998-3333
CA	Costa Mesa, Diplomat Elctrns.	714-549-8401
CA	Garden Grove, Hi Rel Distr. Sls.	213-594-9571
CA	Gardena, Bell Inds.	213-515-1800
CA	Irvine, Kelex, Inc.	714-863-1230
CA	Irvine, Integrated Elctrns.	714-540-5600
CA	San Diego, DECO	619-693-1595
CA	San Diego, Diplomat Elctrns.	619-292-5693
CA	San Diego, Park West Distrs.	619-277-8433
CA	San Diego, Bell Inds.	619-268-1277
CA	San Diego, Shelley Elctrns.	619-453-7133
CA	San Fernando, Petell Elctrns.	213-365-9841
CA	San Jose, Shelley Elctrns.	415-969-1820
CA	Santa Clara, Pyramid Elctrns.	408-727-9810
CA	Santee, Mouser Elctrns.	619-449-2222
CA	Sunnyvale, Diplomat Elctrns.	408-734-1900
CA	Van Nuys, Elctrn. Expediters	213-781-1910
CO	Denver, Ragon Elctrns.	303-744-3601
CO	Englewood, Diplomat Elctrns.	303-740-8300
CT	Danberry, Diplomat Elctrns.	203-797-9674
CT	Norwalk, Park Dist.	203-853-2011
CT	Orange, Milgray	203-795-0711
FL	Clearwater, Diplomat Elctrns.	813-443-4514
FL	Longwood, Intertec	305-834-7777
FL	Miami, Electronic Equip.	305-871-3500
FL	Orlando, TTI II	305-859-1000
FL	Tampa, Shelley Elctrns.	813-884-0946
FL	Tampa, Impala Elctrns.	813-885-4747
FL	Winter Park, Milgray	305-647-5747
GA	Norcross, Diplomat Elctrns.	404-449-4133
ID	Spirit Lake, Al Elctrns.	208-623-3111
IL	Bensenville, Diplomat Elctrns.	312-595-1000
IL	Chicago, Bell Inds.	312-982-9210
IL	Elk Grove Village, GBL/Goold Elctrns.	312-593-3220
IL	Skokie, Marcon Assocs., Inc.	312-675-6450
IN	Indianapolis, Meunier Elctrn. Supp.	317-635-3511
IN	Indianapolis, Graham Elctrns.	317-634-8202
KS	Overland Park, Milgray/Kansas City	913-236-8800
KY	Louisville, Peerless Elctrn. Equip. Co.	502-637-7674
MD	Columbia, Diplomat Elctrns.	301-995-1226
MD	Rockville, Milgray	301-468-6400
MD	Timonium, Zebra Elctrns.	301-252-6576
MA	Burlington, Milgray	617-272-6800
MA	Canton, Impact Sls.	617-821-1500
MA	N. Chelmsford, Pilgrim Elctrns.	617-251-8746
MA	Woburn, Diplomat Elctrns.	617-935-6611
MI	Grand Rapids, RM Elctrns.	616-531-9300
MN	St. Paul, Ragon Elctrns.	612-642-2828
MO	St. Louis, Olive Elctrns. Inc.	314-426-4500
NJ	Audubon, Action Elctrns.	609-858-2450
NJ	Marlton, Milgray	609-983-5010
NJ	Mountainside, Enox	201-654-7600
NJ	Nutley, Vantage Elctrns.	201-667-1840
NJ	Totowa, Diplomat	201-785-1830
NY	Bohemia, TTI	516-567-1500
NY	Bohemia, Justin Elctrns.	516-589-4000
NY	Buffalo, Summit Distr.	716-884-3450
NY	Dobbs Ferry, Gemini Elctrn. Co.	914-693-6363
NY	East Farmingdale, Tri-Start Elctrns. Inc.	516-293-0400
NY	Farmingdale, Pride Elctrns.	516-293-4020
NY	Farmingdale, Command Elctrns.	516-293-1212
NY	Farmingdale, Milgray Elctrns.	516-420-9800
NY	Hauppauge, JACO	516-273-5500
NY	Hauppauge, Fairmont Elctrn. Sls.	516-231-3313
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NY	Melville, Diplomat Elctrns.	516-454-6400
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OH	Dayton, Stotts Friedman	513-298-5555
OH	Dayton, Micro-Mil	513-434-8231
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PA	Pittsburgh, Alder-Tronics	412-821-5565
PA	Willow Grove, RESCO Elctrns.	215-659-4575
PA	York, Elctrn. Comps. for Inds.	717-843-8971
TX	Austin, Southwest Elctrns.	512-837-8971
TX	El Paso, Intl. Elctrns.	915-778-9761
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TX	Ft. Worth, Allied Elctrns.	817-336-5401
TX	Richardson, Southwest Elctrns.	214-234-3050
TX	Richardson, JACO Elctrns.	214-235-9575
TX	Stafford, Southwest Elctrns.	713-491-4900
UT	Salt Lake City, Diplomat Elctrns.	801-486-4134
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Local Sales Offices & Reps

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WIDE RANGE ELCTRNS. CORP., 2119 Schultz Rd., St. Louis, MO 63141, Tel: 314-567-5366, Telex: 44-2560; Empl.: 16; *Sls. Mgr.:* Otto Rauhut

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WRIGHT CAPACITORS, 3000 So. Orange, Santa Ana, CA 92707, Tel: 714-546-2490; Empl.: 25; *Sls. Mgr.:* Curtiss Wright

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CP INC., 8 W. Main St., Dryden, NY 13053, Tel: 607-844-9143; *Sls. Mgr.:* Mary Dove

EDAR CORP., 2500 Central Ave., Boulder, CO 80301, Tel: 303-443-6441, Telex: 910-940-2512; *Sls. Mgr.:* Carol Hill

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Xentek

ENTEK, INC., 279 S. Pacific St., San Marcos, CA 92069, Tel: 619-744-3346, TWX: 910-322-1155; FSC No.: 52360; Empl.: 430 .... 3•1810, 1811

Local Sales Offices & Reps

L	Huntsville, Conley & Assocs.	205-882-0316
Z	Scottsdale, Williams Assoc.	602-947-4297
A	Goleta, Thorson Co.	805-964-8751
A	Los Angeles, Thorson Co.	213-595-0361
A	San Diego, Robert Posten	619-744-3346
A	Sunnyvale, RDP Instr.	408-735-9040
O	Commerce City, Williams Assoc.	303-289-5647
T	Canton, Bell Controls	203-693-8926
L	Boca Raton, Conley & Assocs.	305-395-6108
L	Oveido, Conley & Assocs.	305-365-3283
L	Tampa, Conley & Assocs.	813-885-7658
A	Atlanta, Conley & Assocs.	404-447-6992
	Chicago, Berndt & Assocs.	312-283-0713
	Carmel, Berndt Assocs.	317-844-0114
D	Gaithersburg, Beacon North	703-591-1300
I	Southfield, Fred Gehrke & Assoc.	313-559-5363
N	Minneapolis, Berndt Assocs.	612-546-2021
O	Grandview, R. R. Burton	816-763-5385
H	Nashua, Bell Controls	603-882-6984
J	Haddonfield, Tritek Sls.	215-627-0149
M	Albuquerque, Williams Assoc.	505-255-1638
Y	East Syracuse, Nycom	315-437-8343
Y	Hartsdale, Spectrum Sls.	914-472-8600
C	Raleigh, Conley & Assocs.	919-876-9862
H	Cleveland, Geotronix	216-526-2535
H	Trotwood, Geotronix	513-854-5939
R	Beaverton, Huntley Assocs.	503-649-5308
X	Dallas, Allied Comps.	214-238-0408
X	Houston, Allied Comps.	713-988-1600
X	Round Rock, Allied Comps.	512-244-1166
T	Salt Lake City, Williams Assoc.	801-485-6511
A	Fairfax, Beacon North	703-591-1300
A	Everett, Huntley Assocs.	206-353-1833
I	Milwaukee, Berndt Assocs.	414-545-8400

ERCON, INC., P.O. Box 554, Portland, OR 97207, Tel: 503-641-9525; *Sls. Mgr.:* G. Osgood

ΞXICO

XICO, INC., 120 Ocean Way, Santa Monica, CA 90402, Tel: 213-454-0302, Telex: 709577; *Sls. Mgr.:* Joe Sheppard .... 3•1104

XIT ROD, PO Box 128, Beaumont, CA 92223, Tel: 714-845-3986; Empl.: 4

XSIS

XSIS ELECTRONICS, INC., 12620 W. 63rd St., Shawnee, KS 66216, Tel: 913-631-0448, Telex: 437227; FSC No.: 57051; *Sls. Mgr.:* Jerry Dehnert .... 1A•1443

Local Sales Offices & Reps

AL	Huntsville, Murcota Corp.	205-539-8476
AZ	Phoenix, Anderson Co.	602-266-2070
CA	Culver City, Westaironics Inc.	213-641-4122
CA	Sunnyvale, Loeswick's	408-745-6751
CO	Loveland, Morbak Mktg.	303-669-8900
IL	Rolling Meadows, Sieger Assoc.	312-991-6161
KY	Ft. Mitchell, G. W. Thelen Co.	606-341-8181
MD	Ellicott City, VPI Inc.	301-461-2525
MA	Norwood, MPS Elctrns.	617-769-8700
MN	Eden Prairie, Aldridge Assoc. Inc.	612-944-8433
NJ	Fairfield, Addem Sls.	201-882-0993
NY	Fayettville, R. D. Sherman	315-637-9861
TX	Houston, Repmaster	713-692-8204
TX	Sherman, Repmaster	214-247-6236
EXP	NY, Great Neck, Ad Auriema	516-487-0700

XYCOM, 750 N. Maple Rd., Saline, MI 48176, Tel: 313-429-4971, TWX: 810-223-8153; Empl.: 225; *Sls. Mgr.:* Dan Lewis; *Dist. Mgr.:* Bill Nemeth

XYLOG CORP., 150 Tillman St., Westwood, NJ 07675, Tel: 201-664-7997; Empl.: 25; *Sls. Mgr.:* Milton Frank .... 3•1813, 1922

YARDNEY BATTERY DIV., Yardney Elec. Corp., 82 Mechanic St., Pawcatuck, CT 02891, Tel: 203-599-1100, Telex: 6813114, TWX: 710-470-0260; FSC No.: 87362; Empl.: 300; *Sls. Mgr.:* Herman G. Lewis, Jr.

YELLOW SPRINGS INSTR., Box 279, Yellow Springs, OH 45387, Tel: 513-767-7241, Telex: 205437; Empl.: 375; *Sls. Mgr.:* R. Heggemann

Local Sales Offices & Reps

AZ	Tempe, Elec-Com Assoc.	602-967-8023
CA	Costa Mesa, FLW, Inc.	714-751-7512
CA	Hayward, FLW, Inc.	415-487-2222
CA	Van Nuys, FLW, Inc.	213-989-5238
CO	Boulder, Grady Moore & Assocs.	303-494-3351
GA	Atlanta, Craft Assoc.	404-256-0420
GA	Marietta, FLW, Inc.	404-424-1731
IL	Lansing, Van Meter Inst.	312-474-3580
IN	Indianapolis, RDP Corp.	317-788-4296
MA	Norwell, Bordewieck Engrg.	617-659-4915
MI	Farmington Hills, Anderson Elctrns.	313-553-7600
MN	Minneapolis, Trask Engrg.	612-537-2434
NJ	Scotch Plains, RJM Sls.	201-322-7880
NM	Albuquerque, Elec-Com Assoc.	505-898-6101
NY	Syracuse, Labtronics	315-455-7314
OH	Cleveland, RDP Assoc.	216-659-3138
OH	Dayton, RDP Assocs.	513-253-6175
PA	Pittsburgh, RDP Assoc.	412-487-5055
TX	Houston, American Analog	713-941-7265
TX	Lewisville, Milestek	214-436-1597
VA	Richmond, Advance Control Equip.	804-270-7182
WA	Bellevue, Topp Engrg Sls.	206-747-5400

Local Distributors

MN	Minneapolis, Trask Engrg.	612-537-2434
NJ	Scotch Plains, RJM Sls.	201-322-7880
NY	Syracuse, Labtronics	315-455-7314
OH	Dayton, RDP Corp.	513-253-6175
TX	Lewisville, Milestek	214-436-1597

YEW CORP., See Yokogawa Corp. of America

YOKOGAWA CORP. OF AMERICA, 2 Dart Rd., Shenandoah, GA 30265, Tel: 404-253-7000, TWX: 714-567-1256; Empl.: 70; *Sls. Mgr.:* J. V. Stegenga

YORK METAL PRODUCTS, INC., 34-20 12th St., Long Island, NY 11367, Tel: 212-932-3660; *Sls. Mgr.:* Harold Miller

ZECO, INC., 2075 H Bering Dr., San Jose, CA 95131, Tel: 408-286-8856; *Sls. Mgr.:* Conie Johnson; *Dist. Mgr.:* Conie Johnson

YORK TECHNOLOGY, INC., 1101 State Rd., Bldg. O, Princeton, NJ 08540, Tel: 609-924-7676, *Sls. Mgr.:* Geoffrey R. Gamble

BATTERY YUASA

YUASA BATTERY (AMERICA), INC., 9728 Alburtis Ave., Santa Fe Springs, CA 90670, Tel: 213-949-4266, Telex: 696272; Empl.: 5,000; *Sls. Mgr.:* Les Biggins .... 3•1437

Local Sales Offices & Reps

AZ	Tempe, Elec-Com	602-967-8644
CA	Diablo, Main Engrg. & Mktg. Assocs.	415-837-2193
CA	Garden Grove, West Elctrn Sls.	213-493-5569
CO	Englewood, Grimes Mktg.	303-740-6063
CT	Horth Haven, Kitchen & Kutchin	203-239-0212
FL	Ft. Lauderdale, QXI, Inc.	305-485-6030
FL	St. Petersburg, QXI, Inc.	813-821-2281
IL	Cary, Ellinger Sls.	312-639-1850
IA	Des Moines, Beams Co.	515-255-1148
KS	Shawnee Mission, Beams Co.	913-631-0300
MD	Baltimore, S. K. Macdonald Co.	301-254-3380
MA	Burlington, Kitchen & Kutchin	617-229-2660
MN	St. Paul, SKOR	612-426-1160
NJ	Berkeley Hgts., Cambridge Allen & Assocs.	201-464-0203
NJ	Fairfield, Yuasa Battery (Amer.) E. Reg. Off.	201-575-5848
NC	Asheville, Edco Sls.	704-253-1594
OH	Columbus, McFadden Sls.	614-459-1280
PA	Philadelphia, S. K. Macdonald Co.	215-545-1205
TX	Houston, Barry Sls.	713-784-5860
TX	Richardson, Barry Sls.	214-234-0255

ZAMBRE CO., INC., 2134 Old Middlefield Way, Mountain View, CA 94043, Tel: 415-968-9176

ZAX CORP., 2572 White Rd., Irvine, CA 92714, Tel: 714-474-1170, 800-421-0982, Telex: 183829; Empl.: 25; *Sls. Mgr.:* Hal Horrocks

ZEHNTEL, INC., 2625 Shadelands Dr., Walnut Creek, CA 94598, Tel: 415-932-6900, TWX: 910-385-6300; Empl.: 480; *Sls. Mgr.:* N. Vinson; *Dist. Mgr.:* N. Vinson

ZENDEX CORP., 6700 Sierra La., Dublin, CA 94566, Tel: 415-828-3000, TWX: 910-389-4009; *Sls. Mgr.:* James F. Bairey

ZENITH COMPONENTS & SYS. GRP., Zenith Radio Corp., 1000 Milwaukee Ave., Glenview, IL 60025, Tel: 312-391-7733; *Sls. Mgr.:* Norm Berkowitz

ZENITH CONTROLS, 830 West 40th St., Chicago, IL 60609, Tel: 312-247-6400, Telex: 25-3703; Empl.: 125; *Sls. Mgr.:* V. Helford

ZENITH TRANSFORMER CO., INC., 1728 West 130th St., Gardena, CA 90249, Tel: 213-321-4551

ZENITH CRT & COMPONENTS OPERATIONS, 1000 Milwaukee Ave., Glenview, IL 60025, Tel: 312-391-7733; *Sls. Mgr.:* Norm Berkowitz

ZENRAD CIRCUITS CO., 529 E. Gutierrez St., Santa Barbara, CA 93103, Tel: 805-963-3527; FSC No.: 33180; Empl.: 10; *Sls. Mgr.:* A. Radford

ZERO
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ZERO CORP., 777 Front St., Burbank, CA 91503, Tel: 213-846-4191, TWX: 910-498-2237; Empl.: 1400; *Sls. Mgr.:* J. J. Roderer .... 2•1070-1079

Local Sales Offices & Reps

AZ	Phoenix, Howe & Howe Sls., Inc.	602-264-7971
CA	Burbank, Zero-West Div.	213-846-4191

CA	Palo Alto, Northern Cal. Sls. Off.	415-964-7700
CA	San Diego, San Diego Sls. Off.	619-271-7221
CO	Boulder, Component Prod. Sls. Co. Inc.	303-530-2800
FL	Clearwater, Richard Straker	813-531-8991
IL	Elk Grove Village, Carlson Elctrns. Sls.	312-956-8240
IN	Indianapolis, L.M. DeVoe Co.	317-842-3245
IA	Cedar Rapids, Carlson Elctrn. Sls.	319-377-6341
LA	Metairie, Automation Supplies	504-831-2183
MD	Baltimore, R. P. Luce & Co.	301-752-8200
MA	Monson, Zero-East Div.	413-267-5561
MI	Grosse Pointe Park, Greiner Assoc. Inc.	313-499-0188
MN	Bloomington, Elctrn. Sls. Agcy.	612-884-8291
MO	Raytown, Cadon Tech. Sls.	816-356-7685
MO	St. Louis, Cadon Techn. Sls.	314-645-8670
NJ	Piscataway, R.P. Luce & Co.	201-752-8750
NM	Albuquerque, Fry-Gates	505-262-1525
NY	East Syracuse, Fountain Young & Co.	315-437-7733
NY	New Hyde Park, R.P. Luce & Co.	516-437-4550
NC	Wilson, Diemer Assoc.	919-237-8217
OH	Columbus, Tom Mulligan & Assocs.	614-457-2242
OR	Wilsonville, RTS, Inc.	503-638-5670
PA	Boswell, B.E. Gibson	814-629-6772
PA	Huntingdon Valley, Inacker Sls.	215-947-5660
SC	Greenville, Sunbelt Sls.	803-877-9088
TX	Dallas, J. Gibbs & Assocs.	817-430-1861
TX	Fort Worth, J. Gibbs & Assocs.	817-237-1455
TX	Houston, Milco Mktg.	713-946-2841
UT	Salt Lake City, Effective Sls.	801-266-9617
VA	Powhatan, R. P. Luce & Co	804-598-2095
WA	Vashon, RTS, Inc.	206-285-1316

Local Distributors

AL	Huntsville, Powell Elctrns.	205-539-2731
AZ	Phoenix, R.V. Weatherford	602-272-7144
AZ	Phoenix, Dalis Elctrn Supp.	602-275-2885
AZ	Tucson, Inland Elctrn Supp.	602-294-2628
CA	Anaheim, R. V. Weatherford Co.	714-634-9600
CA	Burlingame, Rose Elctrn. Distr.	415-348-2740
CA	Glendale, R.V. Weatherford Co.	213-849-3451
CA	Pomona, R.V. Weatherford Co.	714-623-1261
CA	San Diego, R. V. Weatherford Co.	714-695-1700
CA	Santa Barbara, Weatherford	805-965-8551
CA	Sunnyvale, R. V. Weatherford Co.	408-738-8694
CO	Denver, R. V. Weatherford Co.	303-428-6900
CT	Stratford, Utronics	203-378-4201
FL	Miami, Elctrn. Equip.	305-871-3500
IL	Addison, L-Comp	312-628-1400
IN	Indianapolis, Genesis Elctrns,	317-637-5571
LA	New Orleans, Wm. B. Allen Supp.	504-525-8222
MD	Beltsville, Treeko Sls., Inc.	301-937-8260
MD	Savage, Pyttronic Inds.	301-792-0780
MA	Westboro, Future Elctrns.	617-366-2400
MA	Winchester, Rush Inds., Inc.	617-729-5800
MI	Clawson, Empire Elect. Inc.	313-435-0460
MI	Wyoming, R.M. Elctrns.	616-531-9300
MN	Minneapolis, Indl. Comps.	612-831-2666
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MO	Maryland Hghts, L-Comp	314-291-6200
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OH	Columbus, Hughes-Peters Inc.	614-294-5351
OH	Middleburg Heights, Prehler Elect.	216-243-5510
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OR	Salem, Zepher Elctrns.	503-399-8503
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WA	Seattle, Zepher Elctrn. Sls. Corp.	206-241-1980

ZERO-EAST DIV., 288 Main St., Monson, MA 01057

ZETA LABS., 3265 Scott Blvd., Santa Clara, CA 95051, Tel: 408-727-6001, TWX: 910-338-7336; FSC No.: 31260; Empl.: 195; *Sls. Mgr.:* C. W. Frank

ZEUS INDL. PRODS. INC., P.O. Box 298, Raritan, NJ 08869, Tel: 201-526-0800, 800-526-3842, TWX: 710-480-9346; FSC No.: 32039; Empl.: 110; *Sls. Mgr.:* John Worley; *Dist. Mgr.:* Arthur M. Silverman .... **2•1871**

ZEXCO, 7661 Densmore, #8, Van Nuys, CA 91406, Tel: 818-997-7895

ZIATECH, 3433 Roberto Ct., San Luis Obispo, CA 93401, Tel: 805-541-0488, Telex: 4992316; Empl.: 25; *Sls. Mgr.:* Jim Eckford

ZIERICK MFG. CORP., 44 Radio Circle, Mt. Kisco, NY 10549, Tel: 914-666-2911, TWX: 710-571-2143; Empl.: 120; *Sls. Mgr.:* L. T. Noyes

ZIPPERTUBING CO., P.O. Box 61129, Los Angeles, CA 90061, Tel: 213-321-3901, TWX: 910-346-6713; Empl.: 120; *Sls. Mgr.:* Terry Plummer

ZI-TECH INSTR. CORP., 2151 Park Blvd., Box 60490, Palo Alto, CA 94306, Tel: 415-326-2151, Telex: 334-447; Empl.: 15; *Sls. Mgr.:* J. Ziman

ZYMOS CORP., 477 N. Mathilda Ave., Sunnyvale, CA 94086, Tel: 408-730-8800, 408-730-5400, TWX: 910-339-9530; *Sls. Mgr.:* Jeff Jacobsen

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Antennas, Ground Plane
Antennas, Helical
Antennas, Log Periodic
Antennas, Loop
Antennas, Microwave
Antennas, Multiband, UHF/VHF
Antennas, Phased Array
Antennas, Rhombic
Antennas, Spiral
Antennas, Telescopic
Antennas, Whip & Accessories (Incl. Marine & Mobile Types
Attenuators, IF
Attenuators, RF
Boards, Plug-in Processor
Bridges, Telephone/Data
Cameras, Image Converter
Cameras, Television
CATV Systems & Equipment
Coders, Telephone, Dial
Communications Systems, FM
Communications Systems, Laser
Communications Systems, Multiplex
Communications Systems, Telemetering
Communications Systems, Telephone
Concentrators, Communications
Controllers, Error
Converters, Frequency Shift Keying
Converters, Frequency to Frequency
Converters, Telemetry
Converters, UHF to VHF
Converters, VLF to HF
Couplers, Acoustic
Couplers, Antenna
Couplers, Communications, Acoustic, Telephone
Decoders, Pulse
Decoders, Tone
Decoders, Video
Demodulators
Detectors, Tone
Diplexers, Antenna
Discriminators
Duplexers, Nonmicrowave
Earth Stations, TV, Receive Only
Encoders, Tone
Equalizers, Delay
Equalizers, Phase
Facsimile Equipment, Receive Only
Facsimile Equipment, Send/Receive
Facsmile Equipment, Send Only
Filters, Telemetering
Generators, Baud Rate
Isolators, Antenna
Keyers, Tone
Modems, Communications, Eliminator/Line Driver
Modems, Communications, Line Receivers
Modems, Communications, Long Haul
Modems, Communications, Short Haul (Limited Distance)
Modulators, AM
Modulators, FM
Modulators, Phase
Modulators, RF
Monitors, Data Link
Monitors, Error Rate
Monitors, Line & Program
Monitors, Video
Mounts, Antenna
Multiplexers, Frequency Division
Multiplexers, Statistical
Multiplexers, Time Division
Multiplexers, Transmission
Multiplexers, Video
Multipliers, Crystal
Multipliers, Diode
Networks, Directional Antenna Phasing
Networks, Matching
Oscillators, Telemetry
Preselectors
Processors, Communications, Front End
Processors, Communications, Message Switching
Processors, Communications, Network Node
Processors, Communications, Standalone
Receivers, Communication
Receivers, Frequency Shift
Receivers, Loran & Omega
Receivers, Monitoring, Communications
Receivers, Telemetry
Receivers, Tone
Recorders, Video
Scanners, Crossbar
Scanners, Flying Spot
Scramblers, Speech
Strips, Ground
Teleprinters, Auto Send/Receive
Teleprinters, Keyboard Send/Receive
Teleprinters, Receive Only
Teletypewriters & Equipment
Television Systems & Equipment Closed Circuit
Terminations, VHF, Video, Pulse
Transceivers
Transmitters, Fixed Frequency
Transmitters, Telemetry
Transmitters, Tone
Transponders

2000 COMPUTER PERIPHERAL EQUIPMENT
(Volume 3)

Card Equip., Punch
Card Equip., Reader
Card Equip., Reader/Punch
Card Equipment, Mark Sense
Cards, Data Communication/Interfaces
Cards, Linear Function
Cards, Logic
Character Recognition Equip., Magnetic Ink
Character Recognition Equip., Optical
Controllers, Card Reader/Punch, Add-in
Controllers, Card Reader/Punch, Standalone
Controllers, Floppy Disk Drive, Add-in
Controllers, Floppy Disk Drive, Standalone
Controllers, Hard Disk Drive, Add-in
Controllers, Hard Disk Drive, Standalone
Controllers, Magnetic Tape Drive, Add-in
Controllers, Magnetic Tape Drive, Standalone
Controllers, Memory Device, Add-in
Controllers, Memory Device, Standalone
Controllers, Paper Tape Reader/Punch, Add-in
Controllers, Paper Tape Reader/Punch, Standalone
Controllers, Plotter, Add-in
Controllers, Plotter, Standalone
Controllers, Printer, Add-in
Controllers, Printer, Standalone
Controllers, Protocol, Communications
Controllers, Terminal, Add-in
Controllers, Terminal, Standalone
Controls, Computer Input, Joysticks, Mouse Devices, etc.
Converters, Card to Tape
Converters, CRT Display
Converters, Digital to Paper Tape
Converters, Graphic to Digital
Converters, Paper Tape to Magnetic Tape
Converters, Serial to Parallel/Parallel to Serial
Converters, Tape to Card
Data Collection Equipment, Hand Held
Data Collection Equipment, Modular
Data Collection Equipment, Portable
Data Compressors, Digital
Data Links, Optical
Digitizers, Audio
Digitizers, Pencil Follower (Incl. Coordinate & Graphic)
Digitizers, Video
Disks, Magnetic, 5¼" Flexibie
Disks, Magnetic, 8" Flexible
Disks, Magnetic, Front-loading Cartridge
Disks, Magnetic, Pack
Disks, Magnetic, Sub-4"
Disks, Magnetic, Top-loading Cartridge
Disks, Magnetic, Winchester Module
Displays, Graphic Systems
Drives, Disc, Flexible and Rigid
Drives, Subsystems, Disk, 8" Diskette
Drives/Subsystems, Core Disk Emulator
Drives/Subsystems, Disk, 14" Winchester
Drives/Subsystems, Disk, 3½ " Diskette
Drives/Subsystems, Disk, 5¼" Diskette
Drives/Subsystems, Disk, 5¼" Winchester
Drives/Subsystems, Disk, 8" Winchester
Drives/Subsystems, Disk, Fixed
Drives/Subsystems, Disk, Fixed/Removable
Drives/Subsystems, Magnetic Tape, Cassette
Drives/Subsystems, Magnetic Tape, Reel-to-Reel
Drives/Subsystems, Magnetic Tape, ¼" Cartridge
Drives/Subsystems, Semiconductor Emulator
Encoders, Proof
Generators, Time Code
Generators, Timing, Digital
Input/Output Equipment, Voice
Interfaces, Computer/Peripheral
Light Pens
Mark Recognition Equipment, Optical
Matrices, Switching-Also See Boards, Programming
Memory Devices/Controllers, Bipolar, Add-in
Memory Devices/Controllers, Bipolar, Add-on
Memory Devices/Controllers, Bubble, Add-in
Memory Devices/Controllers, Bubble, Add-on
Memory Devices/Controllers, CCD, Add-in
Memory Devices/Controllers, CCD, Add-on
Memory Devices/Controllers, Magnetic Core, Add-in
Memory Devices/Controllers, Magnetic Core, Add-on
Memory Devices/Controllers, MOS, Add-in
Memory Devices/Controllers, MOS, Add-on
Memory Systems, Bubble
Memory Systems, Core
Memory Systems, Delay Line
Memory Systems, Disk
Memory Systems, Disk, Flexible
Memory Systems, Semiconductor
Memory Systems, Tape
Microfilm, Computer Output (COM) Equipment
Modulator/Demodulators, Data
Networks, Computer, Local Area
Networks, Hybrid
Networks, RC
Paper Tape Equipment, Punch
Paper Tape Equipment, Reader
Paper Tape Equipment, Reader/Punch
Paper, Thermal
Perforators, Paper Tape (Electrically Powered)
Plotters/Hard-Copy Devices
Printer/Plotters
Printers, Daisywheel
Printers, Digital
Printers, Dot Matrix Impact
Printers, Page
Printers, Serial
Printers, Thermal
Processors, Image
Processors, Remittance
Programmers, Punched Card
Programmers, Tape
Readers, Badge
Readers, Bar Code
Readers, Character
Readers, Magnetic Card
Readers, Magnetic Stripe Card
Readers, Punched Card
Readers, Punched Tape
Readers, Static Card
Readers, Time Code
Recognition Equipment, Speech
Recorders, Computer Data
Recorders, Magnetic Tape
Recorders, Program Loading
Scanners, Bar Code
Tape Search Equipment
Tape Winders
Tapes, Magnetic, Digital Cassette
Tapes, Magnetic, ½", 2400' Reel
Tapes, Magnetic, ½", 3600' Reel
Tapes, Magnetic, ¼", 140' Cartridge
Tapes, Magnetic, ¼", 300' Cartridge
Terminal Equipment, Digital
Terminals, Credit Authorization
Terminals, Data Display (including Alphanumeric & Graphic)
Terminals, Data Entry, Multimedia
Terminals, Display
Terminals, Financial
Terminals, Intelligent/Programmable, Batch
Terminals, Intelligent/Programmable, Interactive
Terminals, Intelligent/Programmable, Multiprogramming

Terminals, Intelligent/Programmable, Multiuser
Terminals, Intelligent/Programmable, Real Time
Terminals, Intelligent/Programmable, Transaction Processing
Terminals, Point-of-Sale
Translators, Time Code
Transmission Systems, Data
Transports, Tape (all kinds)

2025 COMPUTERS (MINI/MICRO)

(Volume 3)

Array Processors
Board Computers & Subassemblies, Multibus Compatible
Board Computers & Subassemblies, Q Bus/Unibus Compatible
Board Computers & Subassemblies, S100 Bus Compatible
Board Computers & Subassemblies, STD Bus Compatible
Computers, Analog
Computers, CAD, CAM, & CAD/CAM
Computers, Digital, Micro
Computers, Digital, Mini
Computers, Hybrid, Analog/Digital
Computers, Mainframe
Computers, Micro
Computers, Mini, High End
Computers, Mini, Low End
Computers, Mini, Midrange
Computers, Personal
Computers, Small Business
Services, Computer Systems Integration
Word Processors, Shared Logic Systems
Word Processors, Standalone Systems

2050 COMPUTER SOFTWARE

(Volume 3)

Services, Computer Programming
Services, Computer Systems, Builders
Services, Computer Systems, Consulting
Services, Computer Systems, Integrators
Services, Computer Systems, Turnkey
Services, Data Processing, Consulting
Software, Applications
Software, Communications
Software, Compilers/Languages
Software, Computer Performance Measurement
Software, Data Base Management
Software, Data Base Management Dictionaries
Software, Data Base Query Language
Software, Data Communications Control
Software, Disk/Tape File Utilities
Software, Emulation/Simulation
Software, Information Storage & Retrieval
Software, Job Scheduling/Accounting
Software, Librarians
Software, Operating Systems
Software, Operating Systems Enhancement
Software, Program Translators
Software, Programming/Systems Development Aids
Software, Report Generators
Software, Security
Software, Sort/Merge
Software, Spoolers
Software, Utilities

2100 CONNECTORS, TERMINALS, & SOCKETS

(Volume 2)

Caps, Connector
Clips, Alligator
Clips, Battery
Clips, Fahnestock
Clips, Test
Connector Adapters
Connector Backshells
Connector Blocks, Mother Board
Connectors & Terminals, Push-on, Quick Disconnect
Connectors, Audio
Connectors, Battery
Connectors, Cable
Connectors, Circular, MS/AN
Connectors, D Subminiature
Connectors, DIN
Connectors, Elastomeric
Connectors, Filtered
Connectors, Flat Cable (Incl. Flexible)
Connectors, Fused
Connectors, Heavy Duty, Power
Connectors, Hermetically Sealed, Pressurized, or Waterproof
Connectors, High Voltage (1,000 Volts & Over)
Connectors, LCD
Connectors, Magnetron
Connectors, Miniature, Subminiature & Microminiature
Connectors, Plug-in, Program Board
Connectors, Printed Circuit (Other than Card Edge)
Connectors, Printed Circuit, Card Edge
Connectors, Rack & Panel
Connectors, RF, Coaxial & Triaxial
Connectors, Solderless
Connectors, Stripline
Connectors, Test
Connectors, Thermocouple
Connectors, Wirewrap (Z-3 Level)
Connectors, Zero & Low Insertion Force
Cords, Patch
Holders & Carriers, Chip (Capacitor, IC, LSI)
Jack Adapters (All Types)
Jack Covers
Jacks (All Types)
Jumpers, Bonding
Jumpers, Circuit Board
Kits, Connector
Kits, Terminal
Pads, Transistor Mounting
Panels, Jack
Pins, Electrically Conductive
Plug & Jack Sets
Plug Adapters
Plug Caps & Shells
Plugs, Electrical (All Types)
Plugs, Fused
Posts, Binding
Socket Adapters
Sockets, Capacitor
Sockets, Crystal
Sockets, Diode
Sockets, DIP and DIL
Sockets, Integrated Circuit
Sockets, Leadless Carrier
Sockets, LIF & ZIF
Sockets, Relay
Sockets, SIP
Sockets, Test
Sockets, Transistor
Sockets, Tube
Terminal Blocks (Incl. Barrier Types)
Terminal Boards
Terminal Strips (Including Barrier Types)
Terminals, Ferrule, Cable-End
Terminals, Lug (All Types)
Terminals, Miniature & Subminiature
Terminals, Printed Circuit Board
Terminals, Solderless
Terminals, Standoff
Terminals, Threaded
Terminals, Turret
Terminals, Wirewrap

2200 CONTROL SYSTEMS & COMPONENTS

(Volume 3)

Alarms & Alarm Systems
Annunciators
Bells, Buzzers, Gongs, Sirens & Aural Warning Devices
Clocks, Time Keeping — Also See Oscillators, Clock
Controllers, Energy Conservation
Controllers, Programmable
Controls, Audio System Consoles
Controls, Capacitance Operated
Controls, Counting & Sorting
Controls, Density
Controls, Fluid Conductivity
Controls, Fluid Flow
Controls, Frequency
Controls, Gas
Controls, Humidity
Controls, Ignitron Firing
Controls, Lamp Dimming, Flashing
Controls, Level, Dry Material
Controls, Level, Liquid
Controls, Machine Tool
Controls, Motor Speed
Controls, Oscillator
Controls, Photoelectric
Controls, Pressure
Controls, Proportional
Controls, Proximity-Also See Controls, Capacitance Operated
Controls, Remote
Controls, Run, Shutdown Command, Start
Controls, SCR
Controls, Sensing/Monitoring-Voltage, Phase, Frequency
Controls, Stepping Motor
Controls, Temperature
Controls, Torque, Electronic
Controls, Vibrator
Counters, Bidirectional
Counters, Coil Winding
Counters, Decade
Counters, Directional
Counters, Electromagnetic
Counters, Event
Counters, Mechanical
Counters, Photoelectric
Counters, Preset
Counters, Printing
Counters, Pulse
Counters, Revolution
Current Sensors-Also See Transducers, Volt, etc.
Demodulators, Magnetic
Energy Management Systems
Flashers
Gyros (All Types)
Indicators, Directional
Indicators, Elapsed Time
Indicators, Liquid Level
Indicators, Positioning
Integrators, Mechanical & Electromechanical
Measuring Equipment, Fiber Optic, Attenuation & Bandwidth
Meters, Fluid Flow
Modulators, Magnetic
Modules, Control & Switching
Monitors, Current
Monitors, Laser Energy
Monitors, Phase Sequence & Loss
Monitors, Power Failure
Monitors, Power, AC & DC
Multipliers, Magnetic Analog
Process Control Systems
Programmers, Cam & Drum
Sensors, Acoustic
Sensors, Chemical
Sensors, Proximity
Timers, Counting
Timers, Cycle & Reset
Timers, Delay
Timers, Electrolytic Cell
Timers, Interval
Timers, Programmed
Timers, Sequence
Timers, Solid State
Totalizers, Digital
Trackballs, XY Positioning

2300 CRYSTALS, OSCILLATORS, CRYSTAL & PIEZOELECTRIC FILTERS

(Volume 1A)

Crystal Blanks
Crystals, Frequency Control
Crystals, Microprocessor
Crystals, Piezoelectric
Crystals, Quartz
Crystals, Quartz, for Watches
Crystals, Semiconductor (Ingots & Wafers)
Crystals, YIG
Detectors, Crystal
Filters, Crystal (Incl. Monolithic Devices)
Filters, Tuning Fork
Holders, Crystal
Modules, Oscillator
Mounts, Crystal
Oscillators, Audio (Module)
Oscillators, Beat Frequency (BFO)
Oscillators, Bias
Oscillators, Cavity
Oscillators, Clock
Oscillators, Crystal Controlled (Module)
Oscillators, LC
Oscillators, Low Frequency (Module)
Oscillators, Oven
Oscillators, Power (Module)
Oscillators, Pulse (Module)
Oscillators, RC (Module)
Oscillators, Reed
Oscillators, RF (Module)
Oscillators, Sinusoidal (Module)
Oscillators, Square Wave (Module)
Oscillators, Temperature Compensated
Oscillators, Tuning Fork Controlled
Oscillators, UHF/VHF (Module)
Oscillators, Ultrasonic (Module)
Oscillators, Voltage Controlled (Module)
Ovens, Crystal & Component
Piezoelectric Ceramics
Resonators, SAW
Timing Systems, Oscillators
Tuning Forks

2325 DATA ACQUISITION/ HANDLING SYSTEMS & ACCESSORIES

(Volume 3)

Cameras, Data Recording
Cameras, Infrared
Converters, Analog to Digital
Converters, Analog to Pulse
Converters, ASCII to Baudot
Converters, ASCII to BCD
Converters, BCD to ASCII
Converters, Binary to BCD
Converters, Binary to Decimal
Converters, DC to Sine/Cosine
Converters, DC to Synchro
Converters, Digital to Analog
Converters, Digital to Resolver
Converters, Digital to Synchro
Converters, Frequency to Voltage
Converters, Multiplying, Analog to Digital & Digital to Analog
Converters, Polar to Rectangular Coordinates
Converters, Rectangular to Polar
Converters, Resolver to Digital
Converters, Synchro to Digital
Converters, Synchro to Linear DC
Converters, Synchro to Sine/Cosine
Converters, Voltage to Frequency
Data Acquisition & Reduction Systems-Also See Modules, Data Acquisition
Data Loggers
Generators, Character
Integrators, Electronic
Modules, Data Acquisition
Multiplexers, Analog
Multiplexers, Digital
Multipliers, Analog
Multipliers, Channel Electron
Scalers, Binary, Decade
Scramblers, Data
Security Systems, Data
Shift Registers
Signal Systems, Fiber Optic
Speech Compression & Synthesis Equipment
Spoolers, Printer Buffers
Switches, Data, Manual
Switches, Data, Programmable
Synthesizers, Speech
Translators, Data

2350 DELAY LINES

(Volume 1A)

Delay Lines, All Types
Delay Lines, Cable
Delay Lines, Digital
Delay Lines, Distributed, Constant (Fixed)
Delay Lines, Distributed, Constant (Variable)
Delay Lines, Glass & Quartz
Delay Lines, Liquid
Delay Lines, Lumped Constant (Electrically Variable)
Delay Lines, Lumped Constant (Fixed)
Delay Lines, Lumped Constant (Mechanically Variable)
Delay Lines, Magnetostrictive
Delay Lines, Miniature & Subminiature-Also See Specific Types Of Delay Lines
Delay Lines, Programmable
Delay Lines, Strip
Delay Lines, Trimmer
Delay Lines, Ultrasonic
Delay Lines, Waveguide
Standards, Delay Line
Surface Acoustic Wave Devices
Surface Acoustic Wave, Delay Line
Synthesizers, Delay Line

2400 PANEL HARDWARE (BEZELS, DIALS, KNOBS, ETC.)

(Volume 2)

Bezels, Shielded & Unshielded
Cords & Cable, Dial Drive
Couplings, Shaft, Rigid & Flexible
Decalcomania-Also See Labels, Pressure Sensitive
Dials, Instrument, Metal, Plastic, etc.
Dials, Turns Counting
Drives & Drive Mechanisms (Dial)
Escutcheons
Kits, Marking (Dial, Instrument, Equipment, etc.)
Knobs & Dials
Knobs, Limit Stop
Knobs, Locking, Control Shaft
Knobs, Slip Clutch
Knobs, Torque, Incremental, Ratio Drive
Labels, Pressure Sensitive, Adhesive
Locks, Dial & Shaft
Pointers, Dial
Scales, Dial

2440 MILITARY COMPONENTS

(Volume 1B)

Adapters, RF (MIL)
Antennas (MIL)
Arresters, Electrical Surge/Lightning (MIL)
Attenuators (MIL)
Attenuators (MIL), Inductive
Cable & Assemblies (MIL)
Cable (MIL), Flat
Cable (MIL), RF
Capacitors (MIL)
Caps (MIL)
Chassis (MIL), Electrical
Chokes (MIL)
Choppers (MIL)
Circuit Breakers, Boxes, Panel Boards, Enclosures (MIL)
Clamps (MIL), Cable
Clips (MIL), Electrical
Coils (MIL), RF
Connectors (MIL), Flat Cable
Connectors (MIL), Power
Connectors (MIL), Printed Circuit
Connectors (MIL), RF
Contactors (MIL)
Contacts (MIL), Assemblies & Holders
Couplers (MIL), Directional
Crystals (MIL)
Current Limiters (MIL)
Diodes (MIL)
Dummy Loads (MIL), RF
Electrostatic Discharge (MIL)
Fiber Optics (MIL)
Filters (MIL), Electrical & Networks
Flanges (MIL), Waveguide
Flashers (MIL)
Fuses, Fuseholders, Boxes & Panels (MIL)
Hardware (MIL), Connector
Headsets (MIL)
Heat Sinks (MIL)
Inductors (MIL)
Jacks (MIL)
Line Assemblies (MIL), RF Transmission
Magnets (MIL), Permanent
Meters (MIL)
Microcircuits (MIL)
Microcircuits (MIL), Linear
Microcircuits (MIL), Low Power Schottky
Microcircuits (MIL), Memories, CMOS, Hybrids
Microcircuits (MIL), TTL, Schottky, Microprocessor
Microphones (MIL)
Modules (MIL), Electronic
Modules (MIL), Standard Electronic
Oscillators (MIL), Crystal & Ovens
Oscillators (MIL), VCO, Solid State, RF
Plugs (MIL)
Potentiometers (MIL)
Printed Circuits & Printed Circuit Materials (MIL)
Reactors (MIL)
Rectifiers (MIL), Semiconductor
Relays (MIL)
Resistors (MIL)
Sockets (MIL)
Soldering (MIL)
Solenoids (MIL)
Speakers (MIL)
Switches (MIL), Non-RF
Switches (MIL), RF
Synchros & Resolvers (MIL)
Test Methods (MIL)
Thyristors (MIL)
Transformers (MIL), Audio, Power, RF
Transformers (MIL), Pulse & Variable
Transistors (MIL)
Transmission Lines (MIL), RF
Tubes (MIL), Indicator & Pickup
Tubes (MIL), Microwave
Tubes (MIL), Power & Gas, Planar
Tubes (MIL), Receiving, & Tube Shields
Waveguides (MIL)
Wire (MIL)
Wire, Airframe

2450 DISPLAYS, READOUTS, LAMPS, & LIGHTS

(Volume 1B)

Boards, Display, Graphic
Caps, Display, Indicator Light
Displays, Dot Matrix
Displays, Edge Lighted & Back Lighted
Displays, Electroluminescent
Displays, Electromagnetic
Displays, Electromechanical
Displays, Fiber Optic
Displays, Graphic
Displays, Indicator Lights
Displays, Laser
Displays, Light-emitting Diode (LED)
Displays, Lighted Segment
Displays, Liquid Crystal (LCD)
Displays, Planar Gas Discharge
Displays, Plasma
Displays, Projection Type (CRT; Electromechanical; Film; Light Valve)
Displays, Status
Displays, Touch Sensitive (Infrared & Membrane)
Displays, Vacuum Fluorescent
Drivers & Decoders For Readouts
Filters, Color, Panel Light
Filters, Display
Indicators, Circuit Condition, On, Off, etc. (Electromechanical)-Also See Indicators, Instrument, Flag, Pointer, etc.
Indicators, Instrument, Flag, Pointer, etc.
Lamp Adapters
Lamp Assembly Color Filters, Lens Mountable
Lamp Drivers
Lamps, Arc
Lamps, Edge Lighting, Panel
Lamps, Electroluminescent
Lamps, Exciter, Photographic
Lamps, Flashtube
Lamps, Fluorescent
Lamps, Incandescent
Lamps, Infrared
Lamps, Mercury Vapor
Lamps, Miniature & Subminiature
Lamps, Neon
Lamps, Oil Tight
Lamps, Press-to-Test
Lamps, Projection
Lamps, Stroboscopic Source
Lamps, Tritium (Hydrogen 3) Powered
Lamps, Tungsten Halogen
Lamps, Ultraviolet
Lamps, Xenon
Lenses, Readout & Display
Lights, Indicator
Nameplates
Panels, Back Lighted & Edge Lighted
Panels, Electroluminescent
Sockets, Lamp & Lamp Assemblies

2475 FIBER OPTIC EQUIPMENT & ACCESSORIES

(Volume 1B)

Adapters, Fiber Optic
Attenuators, Fiber Optic
Cable, Fiber Optic
Connectors, Fiber Optic
Couplers, Fiber Optic
Data Links, Fiber Optic
Emitters, Fiber Optic-Also See Diodes, Laser
Encoders, Fiber Optic
Joints, Rotary, Fiber Optic
Kits, Fiber Optic
Light Sources, Fiber Optic
Multiplexers, Fiber Optic
Receivers, Fiber Optic
Scanners, Fiber Optic
Sensors, Fiber Optic
Splicers, Fiber Optic
Switches, Fiber Optic
Terminations, Fiber Optic
Test Equipment, Fiber Optic

2500 MECHANICAL COMPONENTS (BEARINGS, CORES, MAGNETS, ETC.)

(Volume 2)

Bearings
Belts, Drive
Bobbins, Winding, Coil & Transformer-Also See Coil Assemblies & Forms
Bushings, Glass, Plastic, Metal, Rubber, etc.
Cans, Capacitor, Relay, Semiconductor, Transformer, etc
Cores, Ceramic
Cores, Magnetic, Ferrite, L, E, etc.
Cores, Magnetic, Ferrite, Pot/Cup
Cores, Magnetic, Ferrite, Slug
Cores, Magnetic, Ferrite, Toroid
Cores, Magnetic, Ferrite, Yoke Section
Cores, Magnetic, Metal Alloy (Other Than Silicon & Nickel-Iron)
Cores, Magnetic, Nickel-Iron, L, EE, F, & Ring Laminations
Cores, Magnetic, Nickel-Iron, Toroid
Cores, Magnetic, Powdered Iron, Pot/Cup
Cores, Magnetic, Powdered Iron, Slug
Cores, Magnetic, Powdered Iron, Toroid
Cores, Magnetic, Powdered Permalloy, Toroid
Cores, Magnetic, Silicon C
Cores, Magnetic, Silicon EI, EE, & F Laminations
Cores, Magnetic, Silicon, Toroid
Couplings, Quick-disconnect, Liquid or Gas
Feedthrus & Seals, Environmental
Ferrite Material & Parts
Foil, Magnetic
Gears & Gear Mechanisms (Precision)
Glass Parts
Graphite Parts
Headers, Relay & Transformer
Headers, Shrouded
Headers, Transistor & Diode
Holders, Diode
Honeycomb Sheets, Panels, etc.
Laminates, Metal Clad (Including Copper)
Laminates, Plastic Impregnated (Unclad)
Limit Stops, Mechanical
Magnets (Lab. Type)
Magnets, Permanent

Magnets, Superconducting
Materials, Shock, Noise, & Vibration Control
Mounts, CRT & Accessories
Pulleys
Quartz, Fused
Rings, Retaining
Seals, Ceramic To Metal
Seals, Glass To Metal
Seals, Hermetic-Also See Services, Hermetic Sealing
Seals, Pressure Sensitive
Silica, Fused
Springs (All Types)
Tubing, Ceramic
Tubing, Glass
Tubing, Metal
Windows, Sapphire

2550 ENVIRONMENTAL TEST EQUIPMENT

(Volume 3)

Chambers, Altitude
Chambers, Environmental
Chambers, Explosion
Chambers, Fluid Conditioner
Chambers, Humidity
Chambers, Pressure
Chambers, Radiation
Chambers, Shock
Chambers, Temperature
Chambers, Vacuum
Chambers, Vibration
Clean Room Equipment & Supplies
Controls, Environmental Test Equipment
Ovens, Aging, Burn-in, Life Test
Refrigerators, Environmental Test
Simulators, Motion
Testers, Burn-in, Aging
Testers, Heat, Manual
Testers, Life, Component
Testers, Material
Testers, Shock

2600 FANS, BLOWERS, COOLING EQUIPMENT, & HEAT EXCHANGERS

(Volume 2)

Air Cleaners & Filters (Shielded & Unshielded)
Air Conditioners (For Equipment)
Blowers, Centrifugal
Dehumidifiers (For Equipment)
Fans, Axial
Heat Exchangers & Systems
Heat Sinks, Semiconductor

2700 FILTERS (EXCL. CRYSTAL & PIEZO FILTERS)

(Volume 1A)

Filters, Active (All Types)
Filters, AF
Filters, Antenna
Filters, Band Elimination
Filters, Bandpass
Filters, Bandpass, SAW (Surface Acoustic Wave)
Filters, Ceramic
Filters, Coaxial
Filters, Comb
Filters, Continuously Variable
Filters, Digital
Filters, EMI/RFI
Filters, Equalizer
Filters, Harmonic
Filters, High Pass
Filters, Hybrid
Filters, IF
Filters, LC
Filters, Linear Phase
Filters, Low Pass
Filters, Mechanical
Filters, Miniature, Subminiature, Microminiature — Also see specific types of filters
Filters, Optical
Filters, RF
Filters, Single Sideband
Filters, Synchronous Tracking
Filters, Tone, Telegraph
Filters, UHF & VHF
Filters, Variable
Filters, Vestigial Sideband
Filters, Video
Hum Eliminators
Networks, LC
Networks, Phase
Networks, Pulse Forming
Networks, Video
Resonators, Ceramic
Suppressors, Noise
Surface Acoustic Wave, Filter

2800 HARDWARE (ELECTRONIC/ ELECTRICAL)

(Volume 2)

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Clamps & Clips, Cable-Also See Wire & Cable Ties
Clamps, Synchro & Servo
Connector Boxes & Strips, Power Outlet
Contacts, Electrical
Grommets & Bushings
Resistor Hardware
Retainers, Battery
Rods, Ground
Strain Reliefs, Cable & Wire
Substrates, Ceramic
Substrates, Flexible
Substrates, Glass
Substrates, Metallic
Substrates, Sapphire
Switch Hardware
Switch Seals, Environmental
Terminals, Feedthru
Terminations, Antenna-Also See Dummy Loads
Tubing, Fiberglass
Tubing, Heat Shrinkable-Also See Caps, Forms & Tapes, Heat Shrinkable
Tubing, Paper
Tubing, Plastic-Also See Tubing, Spaghetti
Tubing, Spaghetti
Tubing, Spiral Wrap
Wire Nuts

2825 HARDWARE (MECHANICAL)

(Volume 2)

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Bumpers
Clamps & Clips, Component
Clamps & Clips, Ground
Eyelets
Fasteners, Metal
Fasteners, Nonmetallic
Ferrules, Cable-end
Hinges
Mounts, Shock & Vibration
Nuts, Metal
Pins, Cotter, Dowel, Taper, etc.
Pins, Mechanical
Plug Buttons
Preforms, Precious Metal
Rivets
Screws, Fastening
Sound Absorbing Materials
Spacers
Washers, Lock
Washers, Plain
Wire & Cable Ties

2900 INSTRUMENTS, TEST & MEASURING

(Volume 3)

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Analyzers, Antenna Pattern
Analyzers, Digital Signal
Analyzers, Harmonic
Analyzers, Impedance
Analyzers, Interference
Analyzers, Intermodulation
Analyzers, Logic
Analyzers, Magnetic
Analyzers, Modulation
Analyzers, Network
Analyzers, Noise
Analyzers, Phase & Voltage
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Analyzers, Spectrum
Analyzers, Transfer Function
Analyzers, Transient
Analyzers, Ultrasonic
Analyzers, Vibration
Analyzers, Waveform
Analyzers, Wow & Flutter
Blackbody Radiation Sources
Bolometers, Infrared
Bolometers, Microwave
Bridges, Admittance
Bridges, Audio
Bridges, Calorimeter
Bridges, Capacitance
Bridges, Deviation
Bridges, Impedance
Bridges, Inductance
Bridges, Kelvin
Bridges, LCR
Bridges, Power, RF
Bridges, Q
Bridges, Resistance
Bridges, RF
Bridges, Strain Gauge
Bridges, Synchro & Resolver
Bridges, Temperature
Bridges, Wheatstone
Cable Fault Locators
Calibrators, Accelerometer
Calibrators, Attenuation
Calibrators, Crystal
Calibrators, Current
Calibrators, Frequency
Calibrators, LVDT
Calibrators, Magnetic Field
Calibrators, Sound Level
Calibrators, Synchro
Calibrators, Time Base
Calibrators, Transducer
Calibrators, Voltage
Calibrators, VSWR
Calorimeters, Microwave
Clips, Logic Test
Collimators
Comparators, Digital
Comparators, Frequency
Comparators, Optical
Comparators, Phase
Comparators, Voltage
Controllers, IEEE 488 (GPIB) Bus
Counter/Timers
Counters, Frequency
Counters, Particle
Counters, Universal
Decade Boxes, Capacitance
Decade Boxes, Inductance
Decade Boxes, Resistance
Decade Boxes, Transformer
Detectors, Air Flow
Detectors, AM/FM
Detectors, Coaxial
Detectors, Flaw & Defect
Detectors, Phase Sensitive
Detectors, Radiation
Detectors, RF
Detectors, Standing Wave
Detectors, Synchronous
Detectors, Ultraviolet
Detectors, Video
Detectors, Voltage
Digitizers, Transient & Waveform
Dividers, Voltage-Also See Networks, Resistance; Transformers, Voltage Dividing
Dummy Loads, Electronic
Dummy Loads, Microwave
Dummy Loads, Power
Dummy Loads, Resistive
Electrodes, High Voltage
Electrostatic Discharge Guns — Also See Generators, ESD
Emulators, RTS
Gauges, Humidity
Gauges, Ionization
Gauges, Pressure-Also See Transducers, Pressure
Gauges, Temperature
Generators, AM
Generators, AM/FM
Generators, Arbitrary Waveform
Generators, Audio
Generators, Bar, Dot & Crosshatch
Generators, Color Bar
Generators, Electrostatic Discharge — Also See Electrostatic Discharge Guns
Generators, FM
Generators, FM/Stereo
Generators, Function
Generators, Gating/Timing
Generators, Harmonic
Generators, Light Pulse
Generators, Low Frequency
Generators, Marker
Generators, Noise, Random (Electrical)
Generators, Phase
Generators, Programmable, Function
Generators, Programmable, Pulse
Generators, Programmable, Synthesizers
Generators, Pulse
Generators, Pulse, Nuclear Instrumentation Module (NIM)
Generators, RF
Generators, Signal-Also See Generators, Specific Type
Generators, Sweep
Generators, Tone
Generators, Tone Burst
Generators, UHF/VHF
Generators, Ultrasonic
Generators, White Noise
Generators, Word
Holders, Test Lead
Imagers, Thermal
Indicators, Null
Insertion Loss Measurement Systems
Instruments, Test & Measuring, GPIB (IEEE 488) Compatible
Leads, Test & Adapters
Loads, Electronic, Variable-Also See Dummy Loads
Locators, Open Short
Magnetometers
Meters, Acceleration
Meters, Admittance
Meters, Ampere Hour
Meters, Ampere, AC
Meters, Ampere, DC
Meters, Ampere, RF
Meters, Ampere, True RMS
Meters, Attenuation
Meters, Audio Level
Meters, Capacitance, Inductance
Meters, Clamp-on
Meters, Conductance
Meters, Counting Rate, Nuclear
Meters, Decibel Indicating
Meters, Deviation
Meters, Digital ESR
Meters, Distortion & Noise
Meters, Electrometer
Meters, Field Strength
Meters, Flux
Meters, FM Deviation
Meters, Frequency
Meters, Frequency Deviation
Meters, Galvanometer
Meters, Gauss
Meters, Hand Held
Meters, Humidity
Meters, Impedance
Meters, Kilovolt
Meters, Light (Nonphotographic)
Meters, Megohm
Meters, Microwave
Meters, Modulation
Meters, Multifunction (Analog)
Meters, Multifunction (Digital)
Meters, Noise & Sound Level
Meters, Ohm
Meters, Peak Power
Meters, PH
Meters, Phase
Meters, Power
Meters, Power Factor
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Meters, Q
Meters, Ratio
Meters, Reflectometer
Meters, RFI
Meters, S Unit
Meters, Standing Wave Ratio
Meters, Temperature (Contacting)
Meters, Temperature, Infrared
Meters, Thermal Transfer
Meters, Vacuum Tube Volt (VTVM)
Meters, VAR
Meters, Vibration
Meters, Volt, AC
Meters, Volt, DC
Meters, Volt, Digital
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Meters, Volt, True RMS
Meters, VU
Meters, Watt
Meters, Watt Hour
Meters, Watt, RF Directional
Meters, Wave
Microscopes, Measuring
Monitors, Frequency
Monitors, Modulation
Monitors, Phase & Phase Angle
Monitors, Power, Microwave
Monitors, Power, RF
Monitors, Response Time
Multipliers, Meter
Oscillators, Bridge (Test)
Oscillators, Decade (Test)
Prescalers
Probes, High Voltage (1,000 Volts & Over)
Probes, Logic Test
Probes, RF
Probes, Temperature
Probes, Test Lead
Pulsers, Logic Test
Pyrometers, Infrared
Pyrometers, Recording
Radiometers
Receivers, AM/FM (Incl. Precision Test)
Receivers, Fixed Frequency
Receivers, NBS
References, DC Voltage
RFI Measuring Equipment
Scanners, Infrared
Scanners, Instrument, Input/Output
Scanners, Optical
Scanners, Reed
Shunts, Meter
Signal Averagers
Simulators, Data
Simulators, Power Failure
Simulators, Powerline Disturbance
Simulators, Solar
Spectrometers
Standards, Atomic Beam
Standards, Capacitance
Standards, Current
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Standards, Inductance
Standards, Noise
Standards, Phase
Standards, Resistance
Standards, Temperature
Standards, Time
Standards, Voltage
Standards, Voltage Ratio
Switching Systems, Test & Measurement
Synthesizers, Frequency
Synthesizers, Waveform
Test Equipment, Closed Circuit TV-Also See Television Systems & Equipment, Closed-Circuit
Test Equipment, Color TV
Test Equipment, Mechanical Impedance
Test Equipment, Memory Systems, Disk
Test Equipment, Rental-Also See Services, Electrical Measurement & Test
Test Fixtures, ATC
Test Systems, Automatic DC
Test Systems, Board
Test Systems, Component
Test Systems, Computer Controlled (Automatic)
Test Systems, Functional
Test Systems, IC
Testers, Armature
Testers, Battery
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Testers, Communication Equipment (Automatic)
Testers, Component Linearity
Testers, Corona
Testers, Diode
Testers, Electrical Parameter
Testers, Encoder
Testers, Fiber Optic
Testers, Insulation Breakdown
Testers, Integrated Circuit (Automatic)
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Testers, Interface
Testers, LED & LED Arrays
Testers, Logic Card
Testers, Loopback
Testers, Magnetic Core
Testers, Magnetic Medium
Testers, Magnetron
Testers, Memory Board
Testers, Meter
Testers, Microwave
Testers, Modem
Testers, Motor
Testers, Potentiometer
Testers, Power Supply
Testers, Pulse Jitter
Testers, Relay
Testers, Resistivity
Testers, Resistor
Testers, Signal Tracing
Testers, Synchro/Resolver
Testers, Thickness (all types)
Testers, Thyristor
Testers, Tracking & Erosion Resistance (Insulation)
Testers, Transistor
Testers, Transmission & Delay
Testers, Tube
Testers, Vibration-Also See Services, Environmental Test
Testers, Voltage
Testers, Voltage Breakdown
Thermal Platforms
Thermographs
Thermometers, Resistance
Time Delays, Precision
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2950 PANEL METERS (ANALOG & DIGITAL)

(Volume 3)

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Meters, Digital, 2-wire, 4-20 mA Current Loop
Meters, Edgewise
Meters, Illuminated Scale
Meters, Moving Coil
Meters, Moving Iron
Meters, Moving Scale
Meters, Null
Meters, Panel (Analog)
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2975 OSCILLOSCOPES

(Volume 3)

Cameras, Oscilloscope
Hoods, Oscilloscope
Oscilloscope Plug-ins
Oscilloscopes, Digital
Oscilloscopes, General Purpose
Oscilloscopes, High Frequency (Above 200 MHz)
Oscilloscopes, Low Frequency (DC to 3 MHz)
Oscilloscopes, Mid Frequency (DC to 200 MHz)
Oscilloscopes, Multibeam
Oscilloscopes, Multiple Channel
Oscilloscopes, Portable, Battery Operated
Oscilloscopes, Programmable
Oscilloscopes, Sampling
Oscilloscopes, Storage
Oscilloscopes, Triggered Sweep
Probes, Oscilloscopes
Viewing Hoods, Cathode Ray Tube

3000 INSTRUMENTS, GRAPHIC RECORDING

(Volume 3)

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Oscillographs, Direct Writing
Paper, Graphic Recording
Plotters, X-Y, & Accessories
Printers, Event
Recorders, Electrostatic
Recorders, Event/Multievent
Recorders, Polar
Recorders, Strip Chart
Recorders, Transient
Recorders, Vibration

3100 INSULATORS & INSULATING MATERIALS

(Volume 2)

Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable
Coatings, Insulating
Compounds, Insulating
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Insulation Materials
Insulation Parts, Fabricated
Insulators, Antenna
Insulators, Clip, Test & Battery
Insulators, Mica
Tapes, Electrical Insulation

3130 INTEGRATED CIRCUITS, HYBRID CIRCUITS, & FUNCTION MODULES

(Volume 1A)

Circuits, Hybrid, Custom
Circuits, Hybrid, Thick Film
Circuits, Hybrid, Thin Film
Dividers, Analog
Erasing Equipment, EPROM
Generators, Sine/Cosine Function (Module)
Holders & Carriers, IC, LSI (Packaged)
Hybrid Voltage Regulators
Integrated Circuits, Custom/Semicustom
Integrated Circuits, Digital
Integrated Circuits, Interface
Integrated Circuits, Linear
Integrated Circuits, Memory
Integrated Circuits, Microprocessor
Integrated Circuits, Silicon Monolithic, Unpackaged Chips
Microcomputer Boards
Microprocessor Development Systems
Modules, Amplifier-Also See Amplifiers, Specific Types
Modules, Analog Multiplier
Modules, Analog-to-Digital Conversion
Modules, Digital-to-Analog Conversion
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Modules, I/O Relay
Modules, Logic-Also See Cards; Circuits; Networks
Modules, RMS-to-DC Conversion
Modules, Sample & Hold
Networks, Hybrid Substrates
Packages, Integrated Circuit
Programmers, PROM & Logic Array

3200 INTERCONNECTION SYSTEMS (BACKPANELS, CARD HOLDERS, & PACKAGING SYSTEMS)

(Volume 2)

Backpanel Interconnect Systems
Bars, Shorting
Boards, Plug-in
Boards, Plug-in, Extender
Boards, Plug-in, Interface
Boards, Plug-in, Memory
Boards, Prewired, High Density
Boards, Programming
Bus Bars & Systems
Integrated Circuit Interconnect Systems
Panels, Power BUS for ICs

3400 MICROWAVE SYSTEMS & EQUIPMENT

(Volume 3)

Absorbers, Microwave
Amplifiers, Klystron
Amplifiers, Microwave
Amplifiers, Parametric
Analyzers, Microwave
Coders, Transponder
Communications Systems, Microwave
Comparators, Attenuation
Detectors, Microwave
Down Converters
Duplexers, Microwave
Generators, Microwave
Impedance Converters, Microwave
Modulators, Microwave
Modulators, Pulse
Receivers, Microwave

3450 MICROWAVE COMPONENTS

(Volume 1A)

Adapters, Waveguide
Antenna Feed Systems
Attenuators, Coaxial
Attenuators, Fixed
Attenuators, Impedance Matching
Attenuators, Logarithmic
Attenuators, Microwave
Attenuators, Programmable
Attenuators, Turret
Attenuators, Variable
Attenuators, Voltage Controlled
Bends & Twists, Microwave
Cavities, Microwave
Chokes, Waveguide
Circulators, Ferrite
Couplers, Directional
Couplers, Microwave
Couplers, Rotary
Detectors, GaAs
Dividers, Frequency
Dividers, Power (LF, HF, VHF, UHF)
Dividers, Power, Microwave
Drivers, Switch
Filters, Microwave
Filters, Waveguide
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Isolators, Ferrite
Isolators, Microwave (All Types)
Joints, Rotary, Microwave
Junctions, Hybrid, Microwave
Limiters, Microwave
Line Stretchers, Microwave
Microwave Integrated Circuits (MICs)
Mixers, Microwave
Mixers, RF
Mounts, Microwave
Multipliers, Frequency
Oscillators, Microwave
Preselector-Mixers
Probes, Microwave
Radar System Components
Radomes & Windows, Microwave
Seals, Waveguide
Shifters, Phase, Microwave
Shifters, Phase, RF
Shutters, Microwave
Slotted Lines, Microwave
Strip-Line Components, Microwave
Switches, Diode
Tees, Coaxial
Tees, Waveguide
Terminations, Microwave
Tubing, Waveguide
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Waveguide-Coax Adapters
Waveguides

3475 MILITARY SYSTEMS & EQUIPMENT

(Volume 3)

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Acoustic Systems (MIL)
Analyzers (MIL), Antenna Pattern
Analyzers (MIL), Pulse
Analyzers (MIL), Spectrum
Antenna Groups (MIL)
Antenna Groups (MIL), Elint
Antenna Sets (MIL), DF
Antenna Systems (MIL)
Antenna Systems (MIL), DF
Antennas (MIL), DF
Antennas (MIL), ECM
Antennas (MIL), EW
Antennas (MIL), Multibeam
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Chaff Systems (MIL)
Chambers, Space Simulation
CM Sets (MIL), Conformal plus RWR
CM Sets (MIL), Internal
CM Sets (MIL), Mobile
Collection Systems (MIL)
Communications Intelligence (Comint) Systems (MIL)
Computer Sets (MIL), Digital Data
Computer Systems (MIL)
Connectors, Missile (Umbilicals, Interstage, Post Boost)
Consoles (MIL), ECCM
Control Systems, Air Traffic
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Converters (MIL), Frequency
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Detection & Ranging Systems (MIL)
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Detection Systems (MIL), Submarine
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Detectors (MIL), Radar
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Direction Finders (MIL), Radio
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Dispensers (MIL), Drone, Chaff/IR
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ECM Sets (MIL), Shipboard
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Electronic Support Measures (ESM) Sets (MIL)
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Emitter Location & Identification System (MIL), Automatic Ground Transportable
ESM (MIL), Digitally Controlled
ESM (MIL), Ships
ESM Suites (MIL)
ESM Systems (MIL), Automated
ESM Systems (MIL), IFM Receiver
EW Sets (MIL), Ground Multitarget
EW Sets (MIL), Portable
EW Suites (MIL), Ships
EW Systems (MIL), Advanced Airborne Multitarget
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Flare Sets (MIL), ECM
Generator Groups (MIL), Signal
Generators (MIL), Deception
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Indicators (MIL), Fault Locating
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Jammers (MIL), Advanced Self Protection
Jammers (MIL), Chaff, Flares
Jammers (MIL), Commjam, Truck Mounted
Jammers (MIL), Communications (Commjam)
Jammers (MIL), Drone Borne
Jammers (MIL), Expendable
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Jammers (MIL), Integrated Command
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Pods (MIL), Multiband Smart
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Search, Interceptor Set (MIL)
Sensors (MIL), Tactical Electronic Reconnaissance
Simulators (MIL), EW
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Simulators (MIL), Weapon
Simulators, Radar
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Space Surveillance Systems
Surveillance (MIL), EW Drone
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Surveillance Systems (MIL), Radio Frequency
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Synchronizers (MIL), Antenna
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Test Benches (MIL), ECM
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Test Sets (MIL), Flight Line
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Warning Systems (MIL), EW
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3500 MOTORS, DRIVES, & ROTATING EQUIPMENT

(Volume 1B)

Brakes, Magnetic
Brakes, Mechanical
Brushes & Brush Assemblies
Clutches, Friction
Clutches, Magnetic
Clutches, Positive
Commutators
Gearheads & Speed Reducers
Indicators, Speed
Motor & Generator Armatures, Rotors, Stators
Motors, Brushless, DC
Motors, Clock & Timing
Motors, Control
Motors, DC Timing
Motors, Drag Cup
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Motors, Squirrel Cage
Motors, Stepping
Motors, Synchronous
Motors, Torque (Incl. Torquers)
Motors, Universal, AC or DC Operation
Reducers, Speed-Also See Gears & Gear Mechanisms
Shafts & Adapters-Also See Couplings, Shaft, Rigid & Flexible
Slip Rings & Assemblies
Steppers, Indexing, Motor

3700 ELECTRO-OPTICAL EQUIPMENT (EXCLUDING FIBER OPTICS)

(Volume 1B)

Alarms, Controls, Photoelectric
Cells, Photoconductive
Cells, Photoemissive
Cells, Photovoltaic
Detectors, Fiber Optic-Also See Diodes, PIN
Detectors, Infrared
Diode Arrays (Incl. Photo)
Diodes, Light Emitting (LEDs)
Diodes, Liquid Crystal (LCDs)
Diodes, Photoelectric
Heads, Reflective
Isolators, Optoelectronic
Laser Components & Laser Accessories
Lenses, Filters, Windows, Infrared
Lenses, Optical & Camera
Light Choppers
Light Sources, Photoelectric
Light Sources, Stroboscopic
Light Sources, Ultraviolet
Microscopes
Modulator/Demodulators, Laser
Modulators, Light
Optical Component Mounts & Accessories
Photodetectors, GaAs
Sensors, Light
Switches, Photoelectric
Transistors, Photo (Incl. Arrays)
Transmitters, Fiber Optic
Transmitters, Laser

3800 PACKING, SHIPPING, & STORAGE CONTAINERS & MATERIALS

(Volume 2)

Bins, Part Storage
Carts & Dollies, Instrument & Equipment
Containers, Storage
Covers, Protective (Incl. Dustcovers)
Enclosures, Shipping, Metallic & Nonmetallic
Packaging Materials, Antistatic
Packaging Materials, Foam & Plastic
Storage Equipment, Disk
Storage Equipment, Flexible Disk
Storage Equipment, Magnetic Card
Storage Equipment, Media Transport
Storage Equipment, Microform
Storage Equipment, Multifunctional
Storage Equipment, Paper Tape
Storage Equipment, Printout
Storage Equipment, Punched Card
Storage Equipment, Reel-to-Reel Tape
Storage Euipment, Cartridge/Cassette

3900 BATTERIES

(Volume 3)

Batteries, Alkaline Manganese
Batteries, Carbon Zinc
Batteries, Gelled Electrolyte
Batteries, Lead Acid
Batteries, Lead Dioxide
Batteries, Lithium
Batteries, Lithium Manganese Dioxide
Batteries, Lithium Thionyl Chloride
Batteries, Mercury
Batteries, Mercury Oxide
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Batteries, Silver Cadmium
Batteries, Silver Oxide
Batteries, Silver Zinc
Batteries, Standard Cell
Batteries, Thermal
Batteries, Zinc Air
Batteries, Zinc Carbon
Batteries, Zinc Chloride

4000 POWER SUPPLIES, DC

(Volume 3)

Chargers, Battery
Converters, DC to DC, 30 to 300 VDC Output
Converters, DC to DC, 300 to 1,000 VDC Output
Converters, DC to DC, Greater Than 1,000 VDC Output
Converters, DC to DC, Less Than 30 VDC Output
Converters, Frequency to DC-Also See Power Supplies, AC Input, DC Output
Current Sources
Discharge Systems, Energy
Flashlights & Lanterns
Generators, Electrical Power
Motor Generator Sets
Power Supplies, AC Input, 301 to 1,000 VDC Output
Power Supplies, AC Input, 31 to 300 VDC Output
Power Supplies, AC Input, Greater than 1,000 VDC Output
Power Supplies, AC Input, Up to 30 VDC Output
Power Supplies, AC to DC Adapter
Power Supplies, Bipolar
Power Supplies, Constant Current
Power Supplies, Encapsulated
Power Supplies, Enclosed
Power Supplies, Ferroresonant
Power Supplies, Isolated
Power Supplies, Lab (Including Metered Units)
Power Supplies, Linear
Power Supplies, Multiple Output
Power Supplies, Open Frame
Power Supplies, Plug In
Power Supplies, Printed Circuit Card
Power Supplies, Programmable
Power Supplies, Standby (Emergency)
Power Supplies, Submodular
Power Supplies, Switching
Power Supplies, Switching, Battery Backup
Power Supply Interfaces & Accessories
Regulators & Stabilizers, Voltage-Also See Transformers, Voltage Regulating; Hybrid Voltage Regulators
Regulators, Current
Voltage Sources

4050 POWER SUPPLIES, AC

(Volume 3)

Alternators
Choppers-Also See Light Choppers
Converters, Frequency, Logarithmic
Converters, Phase
Converters, Power Frequency, Electronic
Converters, Power Frequency, Rotary
Isolators, Line
Line Conditioners
Power Supplies, AC Output
Power Supplies, Uninterruptable (UPS)
Regulators, Frequency
Shifters, Phase 60/400 Hz
Stabilizers, Line Impedance
Vibrators

4100 PRODUCTION EQUIPMENT & MANUFACTURING SERVICES

(Volume 3)

Antistatic Devices, Blowers, Guns, etc.
Baths, Controlled Temperature (Air & Liquid)
Cleaners, Ultrasonic
Comparators, Dimension Calibrators
Controls, Dimension
Controls, Positioning
Dehydrators
Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam
Detectors, Vacuum
Dielectric Heating Equipment
Electroplating Equipment & Supplies
Evaporation Equipment, Electron Beam
Furnaces, Electric
Furnaces, Gas (Production)
Furnaces, Vacuum
Handlers, Integrated Circuit (Automatic)
Heaters, Immersion
Holders, Circuit Board (Production Type)
Installation Equipment, Fiber Optic
Instrumentation, Fiber Optic
Jigs And Fixtures, Chassis & Circuit Board
Lamps, Magnifying, Inspection
Laser Systems
Machines & Accessories, Semiconductor Manufacturing
Machines, Cleaning & Degreasing-Also See Cleaners, Ultrasonic
Machines, Coil Winding
Machines, Component Handling, Feeding, Insertion & Sorting
Machines, Hermetic Sealing
Machines, Induction Heating (Electronic)
Machines, Lead Cutting & Forming
Machines, Marking & Numbering
Machines, Mask Alignment & Exposure
Machines, Plastic Molding
Machines, Plating
Machines, Printed Circuit Drilling, Etching & Punching
Machines, Terminal Installing
Machines, Ultrasonic Bonding
Machines, Wire Marking, Manual & Automatic
Machines, Wire Measuring & Cutting
Magnetizers
Magnifying Glasses, Inspection
Microcircuit Production Equip.
Ovens, Vacuum
Positioning Systems, Multiple Axis, Computer Guided
Probe Cards, Semiconductor Testing
Pumps, Vacuum
Scribers, Wafer-Also See Machines & Accessories, Semiconductor Manufacturing
Sealing Equipment, Metal to Glass/Ceramic
Semiconductor Wafer Fabrication, Assembling (Packaging)
Semiconductor Wafer Fabrication, Designing (Topological)
Semiconductor Wafer Fabrication, Maskmaking (Tooling)
Semiconductor Wafer Fabrication, Processing
Semiconductor Wafer Fabrication, Testing
Services, Assembly & Fabrication (Incl. R&D)
Services, Backplane Wiring
Services, Calibration & Instrument Repair
Services, Coating (All Types)
Services, Crimping
Services, Custom Molding, Plastics
Services, Decapsulation
Services, Electrical Measurement & Test
Services, EMI/RFI Testing
Services, Encapsulation
Services, Environmental Testing
Services, Hermetic Sealing
Services, High Vacuum
Services, Instrument Design (Industrial)
Services, Metal Etching, Engraving
Services, Metal Parts Fabrication
Services, Metallizing (Incl. Electroforming)
Services, Microprocessor
Services, Molding
Services, Packaging
Services, Photographic
Services, Plastics Fabrication
Services, Plating
Services, Precious Metal Refining
Services, Precious Metal Resmelting
Services, PROM & Array Programming
Services, Silk Screening
Services, Training/Education
Services, Vibration Surveys
Services, Wire Cutting & Stripping
Services, Wirewrapping-Also See Services, Backplane Wiring
Soldering Equipment, Induction Heating
Soldering Equipment, Printed Circuit
Soldering Equipment, Resistance
Soldering Equipment, Ultrasonic
Soldering Systems, Temperature Controlled
Testers, Solderability
Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet
Valves, Vacuum
Wire Strippers, Automatic
X-ray Inspection Equipment

4200 PROTOTYPE BOARDS, KITS, & DESIGN AIDS

(Volume 2)

Boards, Plug-in, Prototype
Breadboard Assemblies
Calculators, Electronic, Desk Top
Calculators, Electronic, Hand Held
Clips, Breadboard
Drafting Machines
Drafting Symbols, Dry Transfer, Pressure Sensitive, etc. (Incl. Lettering)
Integrated Circuit Design Aids

Kits, Breadboarding (For Engineers)
Kits, Programming Board
Kits, Training Aid
Services, Computer-Aided Design (CAD) Also See Computers, CAD, CAM, & CAD/CAM
Technical Books

4300 PROTECTIVE COMPONENTS (FUSES, CIRCUIT BREAKERS, ETC.)
(Volume 1B)

Circuit Breakers
Clips & Holders, Fuse-Also See Panels, Fuse
Detectors, Ground Fault
Fuse Elements
Fuses
Fuses, Failure Indicating
Fuses, Thermal
Interrupters, Ground Fault
Interrupters, Power
Interrupters, Vacuum
Limiters, Current
Limiters, Surge
Panels, Fuse
Protectors, Brownout
Protectors, Surge-Also See Suppressors, Transient Voltage
Resistors, Fuse
Spark Gaps
Suppressors, Transient Voltage (All Types)
Warning Systems, Lightning

4500 RELAYS
(Volume 1B)

Relay, Solid State
Relays, Cradle
Relays, Crystal Can, 1/2 Crystal Can
Relays, Current Sensing
Relays, Differential
Relays, Frequency Selective
Relays, General Purpose
Relays, High Voltage (500 Volts & Over)
Relays, Hybrid
Relays, Latching
Relays, Mercury-Wetted Contacts
Relays, Meter
Relays, Motor Start
Relays, Phase Sensing
Relays, Plug-in
Relays, Power
Relays, Printed Circuit Mounting (Including Transistor & DIP Case Types)
Relays, Programmable
Relays, Reed
Relays, RF (Incl. Antenna & Coaxial)
Relays, Sealed
Relays, Sensitive
Relays, Stepping
Relays, Telephone
Relays, Thermal
Relays, Time Delay
Relays, Vacuum
Relays, Voltage Sensitive
Retainers, Relay

4525 SHIELDS & SHIELDING
(Volume 2)

Chambers, Magnetic, Degaussing Coil
Conductive Elastomers
Conductive Plastic Materials & Parts
Contact Strips, Finger
Demagnetizers
Fabrics, Conductive
Gaskets, Shielding, RF-Also See Shields, RF
Kits, Shielding
Shielding Beads, Ferrite
Shielding, EMI/RFI
Shields, Cathode-Ray Tube
Shields, Coil
Shields, Corona
Shields, Indicator Light
Shields, Magnetic
Shields, Photomultiplier
Shields, RF-Also See Gaskets, Shielding, RF
Shields, Transformer
Shields, Tube
Static Eliminating Materials, Devices, & Equipment
Tapes, Films & Foils, Pressure Sensitive
Wire Shielding-Also See Braid, Cable

4550 SOLENOIDS
(Volume 1B)

Drivers, Solenoid
Solenoids, Linear
Solenoids, Proportional
Solenoids, Rotary
Valves, Solenoid

4600 SOLDERING & DESOLDERING EQUIPMENT
(Volume 2)

Flux, Brazing & Soldering Materials
Heat Sinks, Soldering
Solder (All Types)
Solder Pots & Baths
Soldering Accessories
Soldering Guns, Irons & Desoldering Tools
Torches, Soldering, Welding & Accessories

4700 RESISTORS
(Volume 1A)

Films, Resistance
Networks, Ladder
Networks, Resistance
Resistors, Adjustable-Also See Potentiometers; Rheostats
Resistors, Ballast (Incl. Tube & Solid State Devices)
Resistors, Bulk Ceramic
Resistors, Carbon Film
Resistors, Ceramic Core
Resistors, Ceramic Metal (Cermet)
Resistors, Chip (For Microcircuits)
Resistors, Composition, Carbon
Resistors, Decade
Resistors, Deposited Carbon
Resistors, Disk, Rod & Tube
Resistors, Film, Metallized & Nonmetallized
Resistors, Flame Retardant
Resistors, Flux Sensitive
Resistors, Foil, Ultraprecision
Resistors, Glass
Resistors, High Frequency
Resistors, High Megohm (Over 22 Megohms)
Resistors, High Temperature (Over 125°C)
Resistors, High Voltage (1,000 Volts & Over)
Resistors, Hot Molded
Resistors, Integral Heat Dissipator
Resistors, Low Temperature Coefficient
Resistors, Metal Glazed
Resistors, Microwave
Resistors, Negative Temperature Coefficient
Resistors, Noninductive
Resistors, Oil Filled
Resistors, Plug-in
Resistors, Positive Temperature Coefficient
Resistors, Power
Resistors, Precision
Resistors, Pressure Sensitive
Resistors, Rectilinear
Resistors, Strip
Resistors, Suppressor
Resistors, Surge
Resistors, Tapped
Resistors, Tin Oxide
Resistors, Voltage Sensitive
Resistors, Wirewound

4750 POTENTIOMETERS, TRIMMERS, CONTROLS, & RHEOSTATS
(Volume 1A)

Attenuators, Audio (T, L, LL Pads)
Kits, Potentiometer, Rheostat
Potentiometer Elements
Potentiometers, Carbon Ceramic
Potentiometers, Carbon Film
Potentiometers, Ceramic Metal (CERMET)
Potentiometers, Composition, Carbon
Potentiometers, Conductive Plastic
Potentiometers, Hot Molded
Potentiometers, Hybrid
Potentiometers, Lab Type
Potentiometers, Linear
Potentiometers, Metal Film
Potentiometers, Motorized
Potentiometers, Multiturn
Potentiometers, Nonlinear
Potentiometers, Rectilinear
Potentiometers, Servo Mount
Potentiometers, Trimmer
Potentiometers, Wirewound
Rheostats

4800 DISCRETE SEMICONDUCTORS
(Volume 1A)

Bridge Rectifiers, Silicon-Also See Rectifiers, Bridges & Assemblies
Bridges, Silicon Cell
Diacs
Diodes, Avalanche
Diodes, Backward
Diodes, Chip, Unpackaged
Diodes, Electroluminescent (Radiating)
Diodes, Frequency Multiplier
Diodes, Germanium
Diodes, Gunn
Diodes, High Voltage (1,000 Volts & Over)
Diodes, Hot Carrier
Diodes, Impatt
Diodes, Laser
Diodes, Limiting
Diodes, Matched Pairs
Diodes, Matched Quads
Diodes, Microwave Detector
Diodes, Microwave Mixer
Diodes, Noise
Diodes, PIN
Diodes, Schottky
Diodes, Silicon
Diodes, Step Recovery
Diodes, Switching
Diodes, Temperature Compensating
Diodes, Tunnel
Diodes, Varactor
Diodes, Zener & Stabistors (Forward Reference Diodes)
Doublers, Voltage-Also See Rectifiers, Bridges & Assemblies
Magnetoresistors, Hall
Multipliers, Hall
Probes, Hall
Rectifiers, Bridges & Assemblies
Rectifiers, Copper Oxide
Rectifiers, Copper Sulfide
Rectifiers, Germanium
Rectifiers, Selenium
Rectifiers, Silicon
Regulators & References, Silicon-Also See Diodes, Zener & Stabistors
Thyristors (Incl. Silicon Controlled Rectifiers)
Transistor Arrays
Transistors, Bipolar-Also See Transistors, Silicon
Transistors, Chip, Unpackaged
Transistors, Darlington
Transistors, Dual
Transistors, Field Effect
Transistors, Germanium
Transistors, Low Noise, GaAs, FETs — Also See Transistors, Microwave
Transistors, Microwave
Transistors, Power
Transistors, Power, Bipolar
Transistors, Power, FET
Transistors, Pressure Sensitive
Transistors, RF
Transistors, Silicon
Transistors, Switching
Transistors, Unijunction
Triacs

4900 SERVOMECHANISMS & ROBOTIC EQUIPMENT
(Volume 3)

Actuators, Servo, Linear
Actuators, Servo, Rotary
Amplifiers, Servo
Amplifiers, Synchro
Analyzers, Servo
Arms & Manipulators, Robotic
Control Systems, Robotics
Controls, Servo System
Dampers, Servo
Indicators, Servo
Motors, Servo
Multipliers, Servo
Repeaters, Servo
Resolvers, Synchro
Servo Systems
Synchro Transmitters, Solid State
Synchros
Tachometers, Generator
Tachometers, Pulse
Tachometers, Stroboscopic

5100 SWITCHES
(Volume 1B)

Steppers, Indexing, Switch
Switches, Backup
Switches, Cam
Switches, Coded
Switches, Decade
Switches, DIP
Switches, Foot Pedal, Mat, Ribbon, etc.
Switches, Hall Effect
Switches, High Voltage (Over 250 Volts)
Switches, Interlock
Switches, Key Lock
Switches, Lever
Switches, Limit
Switches, Matrix
Switches, Mercury Displacement
Switches, Momentary Action
Switches, Multiposition
Switches, Paddle Handle
Switches, Peripheral
Switches, Port Sharing
Switches, Power
Switches, Pressure
Switches, Program
Switches, Proximity
Switches, Pushbutton, Illuminated
Switches, Pushbutton, Nonilluminated
Switches, Reed
Switches, RF
Switches, Rocker
Switches, Rotary
Switches, Sealed
Switches, Slide
Switches, Snap Action (All Types)
Switches, Solid State
Switches, Step Type
Switches, Thumbwheel
Switches, Toggle
Switches, Touch Actuated

5150 KEYBOARDS & KEYPADS
(Volume 1B)

Keyboard Legends and Symbols
Keyboards, Address Encoded
Keyboards, Capacitive
Keyboards, Ferrite Core
Keyboards, Full Travel
Keyboards, Hall Effect
Keyboards, Hard Contact
Keyboards, Low Profile
Keyboards, Membrane
Keyboards, Modular
Keyboards, Pad
Keyboards, Photo-optical
Keyboards, Reed
Keyboards, Solid State
Keypads
Switches, Keyboard
Switches, Membrane

5300 THERMAL COMPONENTS
(Volume 1B)

Bimetals, Thermostatic
Cooling/Heating Modules, Thermoelectric
Heaters & Heating Elements (For Components & Equipment)-Also See Ovens
Heating Elements, Infrared
Indicators, Temperature (Not Meter Type)
Labels, Coatings, Crayons, Pellets, etc., Temperature Indicating
Laminates, Plastic (With Integral Heating Elements)
Monitors, Temperature-Also See Controls, Temperature
Mounts, Thermistor
Pyrometers, Optical, Noninfrared
Switches, Thermally Actuated
Thermistors
Thermocouples, Elements & Accessories
Thermostats-Also See Switches, Thermally Actuated; Controls, Temperature

5400 TOOLS (MANUAL & POWER)
(Volume 2)

Abrasive Belts, Compounds, Cords, Powders, etc.
Alloys, Brazing
Awls
Burnishers, Contact
Cutters, Wire, Manual
Drills & Accessories, Manual & Power
Drivers, Nut
Extractors, DIP, IC/& Pin Grid Array
Gauges, Displacement, Linear
Heat Guns, Production
Pliers
Pullers, Circuit Board
Pullers, Tube
Punches, Chassis
Reamers
Scissors
Screwdrivers
Scribers
Seizers
Splicers, Coaxial Cable
Splicers, Wire (Incl. Butt & Cap Types)
Splicing Equipment, Fiber Optic
Tool Kits & Sets
Tools & Kits, Contact Insertion/Removal
Tools, Alignment & Tuning
Tools, Cable Tie
Tools, Connector
Tools, Crimping & Swaging
Tools, Heat Sealing
Tools, Lead Bending & Insertion
Tools, Magnetic Pickup
Tools, Marking, Numbering, Engraving
Tools, Parts Handling, Vacuum Operated
Tools, Relay Servicing
Tools, Wire Wrapping
Tweezers, Manual & Vacuum
Vises
Welding Equipment & Accessories (Excl. Equipment for Semiconductor Devices)
Wire Strippers, Manual
Wire Strippers, Thermal
Wire Twisters, Automatic
Wire Twisters, Manual
Wrenches

5500 TRANSDUCERS & ENCODERS
(Volume 1B)

Accelerometers
Cells, Load
Encoders, Displacement, Linear
Encoders, Magnetic Strip
Encoders, Shaft Angle, Contacting
Encoders, Shaft Angle, Magnetic
Encoders, Shaft Angle, Optical
Gauges, Strain
Generators, Hall
Indicators, Angle-Also See Encoders, Shaft Position
Indicators, Azimuth
Transducer Elements
Transducers, Audio
Transducers, Ceramic
Transducers, Displacement
Transducers, Flow
Transducers, Force
Transducers, Magnetic Pickup
Transducers, Piezoelectric
Transducers, Position, Linear
Transducers, Position, Rotary
Transducers, Pressure
Transducers, Proximity
Transducers, Sonic
Transducers, Strain Gauge
Transducers, Temperature
Transducers, Torque
Transducers, Ultrasonic
Transducers, Velocity
Transducers, Vibration
Transducers, Volt, Watt, Current VAR, Power Factor, Frequency
Transmitters, Pressure & Flow

5600 TRANSFORMERS
(Volume 1A)

Reactors, Charging
Reactors, Filter
Reactors, Loading
Transformers, 400 Hz
Transformers, Audio
Transformers, Autotransformer
Transformers, Chopper
Transformers, Constant Voltage
Transformers, Converter, DC To DC
Transformers, Decade
Transformers, Differential
Transformers, Discriminator
Transformers, Driver
Transformers, Ferroresonant
Transformers, Filament
Transformers, Flyback
Transformers, High Voltage (1,000 Volts & Over)
Transformers, Horizontal Sweep
Transformers, Hybrid
Transformers, IF
Transformers, Input
Transformers, Instrument
Transformers, Interstage
Transformers, Inverter
Transformers, Isolation
Transformers, Line
Transformers, Magnetic Amplifier
Transformers, Matching
Transformers, Microminiature
Transformers, Microphone
Transformers, Mixing
Transformers, Modulation
Transformers, Output
Transformers, Plate
Transformers, Power
Transformers, Power Distribution
Transformers, Printed Circuit Mounting
Transformers, Programmable Ratio
Transformers, Pulse
Transformers, Rectifier
Transformers, Reference
Transformers, RF
Transformers, Rotary
Transformers, Scott T
Transformers, Servo
Transformers, Split Bobbin
Transformers, Synchro Control
Transformers, Telephone Coupling
Transformers, Toroidal
Transformers, Transistor
Transformers, Variable
Transformers, Voltage Dividing
Transformers, Voltage Regulating-Also See Regulators & Stabilizers, Voltage
Transformers, Wideband

5700 ELECTRON TUBES
(Volume 1A)

Displays, CRT
Intensifiers, Image
Photomultiplier Tube Housings
Pin Straighteners, Tube
Retainers, Tube
Tube Heat Dissipators
Tubes, Backward Wave
Tubes, Cathode Ray, General Purpose
Tubes, Cathode Ray, Special Purpose
Tubes, Counting
Tubes, Electrometer
Tubes, Electron Multiplier
Tubes, Flash
Tubes, Gas
Tubes, Ignitron
Tubes, Image Converter
Tubes, Microwave
Tubes, Noise Source
Tubes, Photomultiplier
Tubes, Readout (CRT, Cold-Cathode, Vacuum Fluorescent, Incandescent, etc.)
Tubes, Receiving
Tubes, Rectifying
Tubes, Switching
Tubes, Transmitting
Tubes, TV Camera Pickup
Tubes, Voltage Reference or Regulating
Tubes, X-ray

6000 WIRE & CABLE
(Volume 2)

Braid, Cable-Also See Wire Shielding
Cable Assemblies & Harnesses
Cable Assemblies, Microwave
Cable, Audio
Cable, Battery Booster
Cable, Coaxial
Cable, FEP Insulated
Cable, Flame Retardant
Cable, Flat
Cable, Heater
Cable, High Temperature (Over 125°C)
Cable, High Voltage (1,000 Volts & Over)
Cable, Instrumentation & Control
Cable, Irradiated
Cable, Low Capacitance
Cable, Microphone
Cable, Multiconductor
Cable, Plenum
Cable, Power
Cable, Security
Cable, Shielded
Cable, Telephone
Cable, TFE Insulated
Cable, Thermocouple
Cable, Transmission Line
Cable, Triaxial
Cable, TV (Incl. Camera)
Cable, Twisted Pair
Cable, Woven Conductor
Conduit, Electrical
Cords & Cord Sets, International
Cords & Tapes, Lacing
Cords, Line & Set, Extension
Cords, Line, Resistance
Cords, Retractile
Ducts, Wiring
Lead Assemblies, High Voltage-Also See Connectors; Cable Assemblies & Harnesses
Posts, Harness Board
Strips, Marker & Fanning
Tubing, Zipper
Wire Markers (All Types)-Also See Strips Marker & Fanning
Wire Ways
Wire, Antenna (All Types)
Wire, Bare, Copper
Wire, Bare, Nickel
Wire, Bare, Nickel-Chrome
Wire, Braid (Excluding Shielding)
Wire, Ceramic Insulated
Wire, Clad (All Types)
Wire, Flame Retardant
Wire, Glass Insulated
Wire, Guy
Wire, High Temperature (Over 125°C)
Wire, High Voltage (1000 Volts & Over)
Wire, Hookup (All Types)
Wire, Irradiated
Wire, Lead-in & Ground
Wire, Litz
Wire, Magnet
Wire, Plated (All Types)
Wire, Radiation Resistant
Wire, Resistance
Wire, Ribbon
Wire, Semiconductor Lead
Wire, Shielded
Wire, Strain Gauge
Wire, Test Lead
Wire, TFE Insulated
Wire, Thermocouple

NEED MORE INFORMATION?

USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

84
85 Trademark and Logofinder Directories

These Directories are presented as a service to EEM users in order to quickly identify the manufacturers of products commonly referred to by their trademark names and those who show graphic symbols as identifiers on their products. EEM assumes no liability as to the legality or ownerships of such trademarks nor to the proper use thereof. All information shown herein is based on correspondence with the various manufacturers of the products shown.

In the interests of conserving space, only the trademarks and symbols themselves are shown along with the manufacturer which claims their ownership. No attempt has been made here to use trademarks in their proper formats wherein the trademark name is followed by the common name of the product, inasmuch as these Directories are intended as a service to EEM users only.

ABLATAFLUX - Hy-Cal Engrg.
ABLE - Action Instrs.
ABLEBOND - Ablestik Laboratories
ABLECAST - Ablestik Laboratories
ABLEFILM - Ablestik Laboratories
ABLESTIK - Ablestik Laboratories
ABLETHERM - Ablestik Laboratories
ABSORBO-MOP - Clean Room Prods.
ABSORBO-WIPE - Clean Room Prods.
ACCELEREX - Sel-Rex
ACCELEREX - Sundstrand Data Control
ACCELOGRAPH - Humphrey
ACCENT I - Pyle Inds.
ACCESSOR - Applied Control
ACCESS PROCESS - Amphenol
ACCESS 100 - Amphenol
ACCUCHART - Gould
ACCU-COAT - Aremco Prods.
ACCUCOM - International Data Sciences
ACCU-CURVE - Ametek/Rodan
ACCU-CUT - Aremco Prods.
ACCUDATA - Honeywell
ACCUDEX - Aerotech
ACCU-DIALS - Rogan
ACCU-DRILL - Aremco Prods.
ACCUFILM - Bishop Graphics
ACCUFLEX - Eagle Signal Controls
ACCU-FLO - Beckman Instrs.
ACCUFORCE - Ametek
ACCU GUARD - AVX
ACCULAB - Beckman Instrs.
ACCULINE - Hollis Engrg.
ACCULITE - Cotronics
ACCULOCK - Emerson, Indl. Controls
ACCULOG - Emerson, Indl. Controls
ACCUMA - Coherent
ACCUPOWER - Emerson, Indl. Controls
ACCUSCALES - Bishop Graphics
ACCUSET - Beckman Instrs.
ACCUSONIC - Ocean Resch. Equip.
ACCUSPEDE - Emerson, Indl. Controls
ACCUSTAT - PSG Inds.
ACCU-STRATES - Accumet Engrg.
ACCU-STRIP - Ideal Industries
ACCU TONE - Magnetic Systems
ACCUTONE - Roanwell
ACCUTRACE - Beckman Instrs.
ACCUTRACK - Dennison Kube
ACCUTRIM - Vishay Resistive Sys. Grp.
AC-CUTROL - Electrol Co.
ACCUTROL - Vectrol
ACCUVEL - Bishop Graphics
ACE CAPACITORS - Corning Glass Works
ACE II - Chicago Lock Co.
ACE-O-PAX - Norton Chemplast
ACOUSTAZIP - Zippertubing Co.
ACROD - Acme Elec. Heating
ACROM - Acme Elec. Heating
ACRYLI-CAL - Meyercord
ACRYLWELD - Hardman
ACTA - Beckman Instrs.
ACTAGRADE - Beckman Instrs.
ACTIONATOR - Honeywell
ACTION PAK - Action Instrs.
ACTION PIN - AMP
ACTIVAIR - Gould
ACTIVATOR - Elcom Industries
ACTO - Systron-Donner Instr.
ACUDAT - Analogic
ACU-MIN - Moody Tools
ACU-PROBE - EDL
ACU-THERM ANALOG - EDL
ACU-THERM DIGITAL - EDL
ADAM - E & L Instruments
ADAMS RITE - Adams Rite Prods.
ADAPTABEACON - Edwards Co.
ADAPTABEL - Edwards Co.
ADAPT-A-SWITCH - Arrow Hart
ADAPTATONE - Edwards Co.
ADC PORT - Analog Devices
ADD - Wayne Kerr
ADD-A-PAK - International Rectifier
ADD 8000 - E & L Instruments
ADJUST-A-SEELS - APM-Hexseal
ADJUSTA-TORQ - General Electro-Mechanical
ADJUSTOHM - Ward Leonard Elec.
ADLC - Micom Systems
AD-MU-00 - Ad-Vance Magnetics
AD-MU-48 - Ad-Vance Magnetics
AD-MU-78 - Ad-Vance Magnetics
AD-MU-80 - Ad-Vance Magnetics
ADRE - Bently Nevada
ADS - Halmar Electronics
ADSORBOSIL - Alltech Assocs.
ADSORBOSIL-PLUS - Alltech Assocs.
ADSORBOSPHERE - Alltech Assocs.
AD/380 - Auto-trol Tech.
AEGIS - Kalglo Elctrns. Co.
AELECTRA - Ashman Industries (1966)
AEP - Applied Engrg. Prods.
AEROFOIL - RTE Aerovox
AEROGRAPH - Varian Assocs.
AEROKRAFT - RTE Aerovox
AEROMET - RTE Aerovox
AERONAUTIC BEARINGS - Raway Bearing
AEROPAK - RTE Aerovox
AEROPOLE - RTE Aerovox
AEROSAFE - RTE Aerovox
AEROSTAT - Simco Co.
AEROSTOR - RTE Aerovox
AEROVAR - RTE Aerovox
AE-16 ROSIN - Bow Solder Prods.
AE-21 NOCHAR - Bow Solder Prods.
AFIT - Fairchild Test Sys. Grp.
AFORTH - Applied Micro Technlg.
AGAIN & AGAIN - SAFT America
AGASTAT - Control Prods.
AGELESS OSCILLATOR - Spectracom
AGGREGOMETER - Chrono-log
AIMSERT - Aimsco
AIMSLOCK - Aimsco
AIR CELL - Union Carbide
AIR DOCTOR - Simco Co.
AIREX - Lance Inds.
AIRFUGE - Beckman Instrs.
AIR MAZE - Heat Systems-Ultrasonics
AIROTOR - Torin
AIROUT - Isochem Prods. Co.
AIR PAC - Hobson Bros.
AIRPAX - Airpax, Cheshire
AIRPOWER - Avionic Instrs.
AIRTRIM - Sprague-Goodman Elctrns.
AJAXOMATIC - Ajax Magnethermic
AKG - AKG Acoustics
AKROBIN - Akro-Mils
ALAUTRONEX - Sel-Rex
ALCOKNOB - Alco Elctrn. Prods.
ALCOLITE - Alco Elctrn. Prods.
ALCOSWITCH - Alco Elctrn. Prods.
ALFCO - Aluminum Filter
ALGCO - Auburn Mfg.
ALGOCLAD - Sel-Rex
ALLACAST SYSTEM - Allaco Prods.
ALLEN-HEAD - Allen Mfg.
ALLMETAL - Allmetal Screw Products
ALLOY MONITOR - Sensor
ALLROS - Alpha Metals
ALNICO 8 HE - Thomas & Skinner
ALNICO 9 NB - Thomas & Skinner
ALPA - Heitz, Karl

ALPAC - Semtech
ALPAC E - Semtech
ALPAC JR. - Semtech
ALPAC SR. - Semtech
ALPAC T - Semtech
ALPAC 3 JR - Semtech
ALPAC 3T - Semtech
ALPAC 50 - Semtech
ALPAC 50-R - Semtech
ALPHA - Ehrhorn Technological Opers.
ALPHA - Singer Co.
ALPHA I - Crystaloid Elctrns.
ALPHA-KIT - Contact East
ALPHAPLOT - Alpha Merics
ALPHA TONE - American Microsighal
ALPHATRON - Varian Assocs.
ALSIMAG - 3M Co., Tech Ceramic Resources
ALTI-CODER - Kollsman Instr.
ALUMALOY - Lab-Line Instrs.
ALUMAPAK - Sprague Elec. Co.
ALUMA-TRAK - Zero
ALUMIFOAM - Times Fiber Communications
ALUMIFOIL - Times Fiber Communications
ALUMINEX - CTS
A-LUM-O-AIRE - Carey Elctrn. Engrg. Co.
ALU-SOL - Multicore Solders
AMBIDEX - Aerotech
AMBITROL - Power Designs
AMDASM - Advanced Micro Devices
AMDOS - Advanced Micro Devices
AMLOC - Pall Trinity Micro
AMPAC - Microwave Semiconductor
AMPACT - AMP
AMPAK - Pacer Industries
AMP-BLADE - AMP
AMP-CLAMP - Simpson Elec. Co.
AMP EDGE - AMP
AMPERITE - Amperite Co.
AMP-FIT - AMP
AMP-IN - AMP
AMPIP - AMP
AMPLASTIC - AMP
AMP-LATCH - AMP Products
AMP-LEAF - AMP
AMPLI-BOND - AMP
AMPLIBRIDGE - Gould
AMPLICENTER - Harris
AMPLICOLUMN - Paso Sound Prods.
AMPLIFIED CONFERENCE COMMUNICATOR - National Telephone & Elctrns.
AMPLIFLEX - AMP
AMPLIMITE - AMP
AMPLIMITE - AMP Products
AMPLI-PRESS - AMP
AMPLISEAL - AMP
AMPLITE-END - AMP
AMPLIVAR - AMP
AMPLIVERSAL - AMP
AMPLI-VOX - Perma Power Elctrns.
AMP-LOK - AMP
AMPMODU - AMP
AMP-O-LECTRIC - AMP
AMP-O-MATIC - AMP
AMPOMATOR - AMP
AMPORTAPOWER - AMP
AMPOWER - AMP
AMP-REG - Computer Prods.
AMP-REG - Power Products
AMP-REG. - Stevens-Arnold
AMPROBE - Amprobe Instr.
AMPSEAL - AMP
AMP STACK - AMP
AMPSULATION - AMP
AMP-TAB - AMP
AMP-TAPEMATIC - AMP
AMP-TAPETRONIC - AMP
AMP TEK - Amptek
AMPTEK - AmpTek
AMPTRAN - Amprobe Instr.
AMP-TRAP - Gould
AMRAD - Amrad
AMRON - Eldre Comps.
AM SERIES - Adatek
AM SYS - Advanced Micro Devices
AM25S557/558 - Advanced Micro Devices
AM2903 - Advanced Micro Devices
ANACOMM - Analytics Communications
ANAHEIM AUTOMATION - Anaheim Automation
ANA-LED - Simpson Elec. Co.
ANALOK - Analog Devices
ANALYTICAL TITRA-KIT - Analytical Meas.
ANHYDROGUIDE - Fiberguide Industries
ANP 9 - Gulton Inds.
ANTEX - Antex
ANTEX - Newman, M. M.
ANTI-STATIC 79 - Merix Chem. Co.
ANTI-STATIC 79-QL - Merix Chem. Co.
ANY DIP - Vector Electronic Co.
APACHE - ALTEK
A. P. BONDEZE - Phelps Dodge Magnet Wire
APCO - American Plasticraft Co.
APC-7 - Amphenol
APOLANE - Alltech Assocs.
APOLLO - Kalart Victor
AP-PAK - MPI
AP-20 - Gulton Inds.
AQUADAG - Acheson Colloids
AQUAMETER - Beckman Instrs.
AQUAPAK - Electrovert USA
AQUA-SOL - Kenco Industries
AQUA-SURE - Kenco Industries
AQUA-THERM - Dolph, John C., Co.
AR - Amplifier Research
ARAX - Multicore Solders
ARCOLEC - Arcolectric
ARCOLYTICS - Arco Elctrns.
ARCO OR AE - Soshin Elec. Co.
ARC-QUENCH - Kaiser Systems
ARC-QUENCHER - Kaiser Systems
ARCUSTEP - Arc Systems
AREMCOBOND - Aremco Prods.
AREMCOLOX - Aremco Prods.
ARGENTOMERSE - Technic
ARKOMAX - Arnold Engrg.
ARMAFLEX - Armstrong World Inds.
ARMOR-DUR - Shure Bros.
ARMORED POLY-THERMALEZE 2000 - Phelps Dodge Magnet Wire
ARMORED XECON - Chomerics
ARMORTITE - Okonite
ARMORWEAVE - Antenna Specialists
ARNOX - Arnold Engrg.
AROSET - Ashland Chemical
ARTEMIS - Metier Management Sys.
ARTWORKER - Wayne Kerr
ARULAB - Arenberg Sage
ASCI - Advanced Sys. Concepts
A-SCOPE - Varian Assocs.
ASENCO - Associated Engrg. Mfg.
ASTRA - Beckman Instrs.
ASTRA - NEC Infor. Sys.
ASTRACIDE - Ultrasonics
ASTRACIDE-D - Ultrasonics
ASTRACIDE-S - Ultrasonics
ASTRAMAX - Ultrasonics
ASTRAMIXER - Ultrasonics
ASTRAPREP - Ultrasonics
ASTRASHEAR - Ultrasonics
ASTRASON - Ultrasonics
ASTRASTAT - Ultrasonics
ASTRAWELD - Ultrasonics
ASTRO-AIRE - Astro Dynamics
ASTRO BOA FLEX - Astrolab
ASTRO-COBRA-FLEX - Astrolab
ASTROFLO - Astro Dynamics
ASTROGARD - Astronautics Corp. of America
ASTRO-GRAPH - Astro-Med
ASTROLIFT - Astro Dynamics
ASTROLIGHT VIEWER - ElectroPhysics
ASTROLINE - Hollis Engrg.
ASTROLOK - Astrolab
ASTRO/348 - Amphenol
ASYMPTOTIC CALORIMETER - Hy-Cal Engrg.
ATHENA-11 - Metis
ATO - Littelfuse
ATOM - Sprague Elec. Co.
ATS*960 - Texas Instrs.
ATTACH - Lutron Elctrns.
ATTENU SMART - Stanford Applied Engrg.
AUDIODISCS BY CAPITOL - Capitol Magnetic Prods.
AUDIO HAILER - Audio Equip.
AUDIOLARM - Bell, Floyd, Assocs.
AUDIO-MASTER - Shure Bros.
AUDIOPAK BY CAPITOL - Capitol Magnetic Prods.
AUDIOTAPE BY CAPITOL - Capitol Magnetic Prods.
AUDIOVOICE - Paso Sound Prods.
AUGTENNA - Teledyne Micronetics
AURION-X - Sel-Rex
AUROBOND - Sel-Rex
AUTHENTI-KEY - Analytics Communications Sys.
AUTOBALANCE - Ballantine Labs.
AUTOCAL - Datron Instrs.
AUTOCON - Sprague Elec. Co.
AUTO-DRAFT - Auto-trol Tech.
AUTO-FLOW - Keuffel & Esser/Kratos
AUTOFUSE - Littelfuse
AUTO-GAIN - ITHACO
AUTOGRAPH - Acurex-Autodata
AUTOGRAPH - Gerber Sys. Technlgy
AUTOHET - EIP Microwave
AUTOJUMPER - Autosplice
AUTO-KLEAN - AMF
AUTO LINEAR - Jan Hardware Mfg. Co.
AUTOLUG - Autosplice
AUTOMAC - Cardinal Control Co.
AUTOMAGNETIC - RFL Inds.
AUTOMEMORY - Pacific Meas.
AUTOMET - E-Systems
AUTOMETRONIC - Ballantine Labs.
AUTOPART - Gerber Sys. Technlgy
AUTOPATH - Gerber Sys. Technlgy
AUTOPIN - Autosplice
AUTO-PLEXOR - Automation Displays
AUTOPOLAR - Teledyne Micronetics
AUTO-RANGER - Unholtz-Dickie
AUTOSAL - Guildline Instrs.
AUTO SEIS - Kinemetrics
AUTO-SNAP - Automation Displays
AUTOSPLICE - Autosplice
AUTOSTAT - Static
AUTOSWITCH - Bytex
AUTOTAB - Autosplice
AUTOTAK - Howell Instrs.
AUTOTEMP - Howell Instrs.
AUTRONEX - Sel-Rex
AVANPAK - Avantek
AVILOK - Avibank Mfg.
AX - San-O Industrial
AXIMAX - EG & G Rotron
AXIOHM - Ward Leonard Elec.
AYCAD - Aydin
AYCAD - Aydin Controls
BACK PACK - International Instrumentation
BACKPACKER - Lyon Metal Prods.
BAFCO BUFFER - Venable Industries
BAILATCH - Hartwell
BAL-CON - Eby Co.
BALDWIN - BLH Elctrns.
BALLISTRAK - Flow Techn.
BALL-LOK - Avibank Mfg.
BALPLAN MICROSCOPES - Bausch & Lomb, S.O.P.D.
BANDIT - Summit Engineering.
BANDOMATIC - Burndy
BAND-SCAN - Sequential Info. Sys.
BANSHEE - Cybersonic
BANTAM - Burndy
BANTAM ROTA-CRIMP - AMP
BARB-PREP - Alltech Assocs.
BAREBONES RECORDERS - Astro-Med
BARGUARD - Control Module
BAR-LOK - Dennison Mfg. Co.
BARRIER/CAP - American Tech. Ceramics
"BARRIER" RESINS - Sigma Plastronics
BARRYMOUNT - Barry Controls
BASE COMMANDER - Antenna Specialists
BASELINE - Warren Comms.
BASIC CONTROLLER - Action Instrs.
BASIC-M - Motorola Semiconductor
BASICPAC - Acurex-Autodata
BASIS/80 - Antona
BAT - Blatek Inds.
BATTERY*CHECK - Electronic Specialists
BAY/TRONIX - Bay Prods.
BAZOOKA - Air-Vac Engrg.
BCO/OBJCNV - Boston Systems Office
BDT - Sel-Rex
BEAMSCAND - Photon Technlg.
BEAR - Norton
BEAR PAW - Jobmaster
BEAR-TEX - Norton
BEAU - Beau Products
BEAVER - Cornell-Dubilier Electronics
BECON - Teledyne Kinetics
BEE LINE - Hughes Aircraft Co.
BEEPER BOOSTER - Antenna Specialists
BELDFOIL - Belden

BELDSOL - Belden
BELDURE - Belden
BELLCO NAMEPLATES - Bell Co.
BEL-RINGER - Bell, Floyd, Assocs.
BELT-LINE - U.S. Terminals
BEMCOIL - Bemco
BENCHMARK - Beckman Instrs.
BENCHMASTER - Advance Engrg.
BENCHMASTER - Tenney Engrg.
BENDER - Fancort Industries
BERGCON - Berg Elctrns.
BERGLANCE - Berg Elctrns.
BERGOLD - Berg Elctrns.
BERGPIN - Berg Elctrns.
BERGPOST - Berg Elctrns.
BERGSTIK - Berg Elctrns.
BERLON - National Beryllia
BERLOX - National Beryllia
BERLOX-STRATE - National Beryllia
BERYLCO - Cabot Berylco
BESPONDER - Vega Precision Labs.
BET - Motorola Semiconductor
BETA-K - Centerflex Techn.
BETA-KIT - Contact East
BEV-A-LINE - Thermoplastic Processes
BI-COMPLIANT HEAD - Shugart Assocs.
BIG BUG BOX - International Instrumentation
BIG INCH - Haydon Switch & Instr.
BIG LOOK - General Electric Co.
BIG MACK - Sencore
BIG MOMMA - Antenna Specialists
BIG PAC - New Haven Wire & Cable
BIG-7 - Holub Industries
BI-LINK - Breeze-Illinois
BIMET - Handy & Harman
BIMORPH - Vernitron Piezoelectric
BINAVERTER - Metric Sys.
BIOGAMMA - Beckman Instrs.
BI-OPTIC - Breeze-Illinois
BIOSENSOR - Beckman Instrs.
BIO-SOLV - Beckman Instrs.
BIOTRONETTE - Lab-Line Instrs.
BIO-VIAL - Beckman Instrs.
BIOX - IVEK
BIPAX - Tra-Con
BI-PRO - Breeze-Illinois
BIROX - DuPont de Nemours, E. I., & Co.
BISCUIT - EG & G Rotron
BI-SHELL - Breeze-Illinois
BI-SHIELD - Breeze-Illinois
BISIC - Trio-Tech Intl.
BISTABLE AMPLIFIER - Cross Elctrns.
BIT - TRW Inductive Products
BIT GUARD - AVX
BIT LITE - Belden
BIT LITE - Belden
BITMOS - Motorola Semiconductor
BIT-P - TRW Inductive Products
BIT PAD ONE - Summagraphics
BIT PAD TEN - Summagraphics
BITRAC - Transducer Systems
BI-TRIM - American Tech. Ceramics
BITSWITCH - Stanford Applied Engrg.
BIVAR - Waldom Elctrns.
BLACK BEAUTY - Sprague Elec. Co.
BLACK BOX - Micom Systems
BLACK MAGIC - Recoton
BLACO - Baron-Blakeslee
BLACO-TRON - Baron-Blakeslee
BLAK-RAY - UVP
BLENDMASTER - Hull
BLEND-OHM - Methode Elctrns.
BLOCK PAC - Powercube
BLO-HARD - Heat Systems-Ultrasonics
BLOW-GLOW - FIC
BLUE BIZ - Computer Terminal Sys.
BLUE DART - Emcon
BLUE DOT - GTE Sylvania Lighting Prods.
BLUE DOT - Maury Microwave
BLUE MACS - T&B/Ansley
BLUE MAX - Computer Terminal Sys.
BLUE RIBBON - Amphenol
BLUE SHOWER - Tech Spray
BLUE STREAK - Computer Terminal Sys.
BLUE STUFF - Tech Spray
BLUE WIX - Computer Terminal Sys.
BODE BOX - Venable Industries
BOKER - Cooper Group
BOMB-TAIL - AMP
BONARC - TAFA
BONDALUM - Craig Sys.
BONDEZE-M - Phelps Dodge Magnet Wire
BOOMERANG - Benthos

BORAL - KBI
BORD PAK - Buckeye Stamping Co.
BOSTFLEX - BIW Cable Sys.
BOSTGARD - BIW Cable Sys.
BOSTRAD - BIW Cable Sys.
BOUYOUCOS - Beckman Instrs.
BOXER - IMC Magnetics
BOXER - IMC Magnetics
BR - Babcock Electro-Mechanical
BRADY LITETOUCH PRODUCTS - Brady, W.H., Co.
BRADYPACK - Brady, W. H., Co.
BRADYSLEEVE MARKERS - Brady, W. H., Co.
BRAKE-PAK - Ambi-Tech Inds.
BRANDENBURG - ZI-TECH Instr.
BREWEAVE - Brew, Richard D., & Co.
BRICKWALL - Wavetek Rockland Scientific
BRIDGESENSOR - Calex Mfg. Co.
BRIFLON - Brim Elctrns.
BRIMCROM - Brim Elctrns.
BRIMFLEX - Brim Elctrns.
BRIMFLYX - Brim Elctrns.
BRIMGARD - Brim Elctrns.
BRIMLITE - Brim Elctrns.
BRIMLON - Brim Elctrns.
BRIMPRENE - Brim Elctrns.
BRISTOL - Bristol Babcock
BRITE-EYE - Shelly Associates
BRITE-LITE LEDS - National Semiconductor Optoelectronics
BRONCO 66 - Teledyne Western Wire & Cable
BROOKSMITE - Brooks Instr.
BROWN DEVIL - Ohmite Mfg. Co.
BRUDIC - Electro-Craft
BRUSH - Brush Magnetic Heads
BRYON - Brim Elctrns.
BSO/ASSEMBLE - Boston Systems Office
BSO/C - Boston Systems Office
BSO/DEBUG - Boston Systems Office
BSO/MLIB - Boston Systems Office
BSO/MLINK - Boston Systems Office
BSO/PASCAL - Boston Systems Office
BSO/TEKLD - Boston Systems Office
BSO/UMD - Boston Systems Office
BTM - True Data
BUBBL-BOARD - Bubbl-Tec
BUBBL-BOARD - PCM-PAC Cyber-Metric
BUBBL-BOX - Bubbl-Tec
BUBBL-CONTROL - Bubbl-Tec
BUBBL-MACHINE - Bubbl-Tec
BUBBL-PAC - Bubbl-Tec
BUBBL-PAC - PCM-PAC Cyber-Metric
BUBBL-TEC - Pacific Cyber/Metrix
BUBBL-TEC - PCM-PAC Cyber-Metric
BUCHANAN - Control Prods.
BUGBOOKS - E & L Instruments
BUG BOX - International Instrumentation
BUG CAGE - International Instrumentation
BUG TAG - International Instrumentation
BUG TRAY - International Instrumentation
BULK METAL - Vishay Resistive Sys. Grp.
BULL DRIVER - Vaco Prods.
BULLET - Thomas & Betts
BULLET BOND CLIP - Communications Technology
BULLET-NOSE - Sealectro
BULLS-EYE - Hughes Aircraft Co.
BULLSEYE - Motorola Semiconductor
BULPLATE - Sprague Elec. Co.
BUNTING - NL Bearings/NL Industries
BUSCOMM - Trendata/Standard Memories
BUSDAC - Advanced Micro Devices
BUSDRIVER - Micom Systems
BUSS - Bussmann
BUSTLE - NES
BUT STAKS - SGL Electronics
BUTTERFLY - ITW Switches
BUTTERFLY - Licon
BUTTONEER - Dennison Mfg. Co.
BW AUTOMATIC SCREWDRIVER - Black & Webster
BW ORBITAL RIVETER - Black & Webster
BW WELDER - Black & Webster
BYTAC - Norton Chemplast
BYTE BUCKET - Analog & Digital Peripherals (ADPI)
BYTEDAC - Precision Monolithics

BYTESAVER - Cromemco
BYTE-WIDE - Zenith Components & Sys.
B-300 - Dataproducts
B-600 - Dataproducts
CABLEMASTER - Chatsworth Data
CABLEMATIC - Ripley
CABLE-RAP - Amrad
CABLE SENTRY - Zenith CRT & Components Operations
CADCO - Cadillac Plastic & Chem.
CADNICA - Sanyo Elec.
CADRAFT - Summit CAD
CAEON 27 & 28 - Caig Labs.
CAGE KEEPER - International Instrumentation
CAI - Communication Assocs.
CALL-TAPER - Electro Physics
CAMAC - Kinetic Sys.
CAMBI-CARD - Midland-Ross., Cambion
CAMBION - Midland-Ross., Cambion
CAMCOOL - Midland-Ross., Cambion
CANCEL - ADE
CANOLITE - Manhattan Electric Cable
CANOLITE - Manhattan Elec Cable
CANOLON - Manhattan Electric Cable
CANOLON - Manhattan Elec. Cable Corp.
CAP BUS - Eldre Comps.
CAPLET - Pylon Co.
CAP-RANGER - Ohmite Mfg. Co.
CAPS - ITT Cannon
CARAVEL - EG & G Rotron
CARBOFLOW - Microwave Filter
CARB-O-LOCK - General Elec. Co.
CARBOLOY - General Elec. Co.
CARBOLUBE - Carbone Lorraine Inds.
CARBOSPHERE - Alltech Assocs.
CARDCON - TRW Connector
CARDGARD - Airpax
CARD-O-PULL - Bivar
CARTRIFILE R - Tri-Data
CARY - Varian Assocs.
CASEY CLIP - Communications Technology
C-A-S-H - Standard Logic
CATALOG 100 - Workman Elctrn. Prods.
CAT DEVICE - Union Carbide
CATFACE - Catronix
CATFEM - Catronix
CATHORAD - Judd Wire
CATSOFT - Catronix
CATSOLID - Catronix
C.A.T.T. - Gulton Inds.
CATT - Piezo Elec. Prods.
CATYLATOR - Hydrocap
CAVITENNA - Amplifier Research
CA20BSC - ICCI
CA20SNA - ICCI
C-B - Caddell-Burns Mfg.
CBE - Westinghouse Elec.
CB-MATE - Bird Elctrn.
C-BOX - IET Labs
CC ENVELOPED BY Q - Coil-Q
CC-4 - Additive Products
CC-4 - PCK Technlg/Kollmorgen
CC-80 - Auto-trol Tech.
CDM - Curtis Inds.
CDR-360 - Video Logic
CDR-660 - Video Logic
CDS 224 - Concord Data Systems
CE-CON - Eby Co.
CEEMETER - Alpha Comps.
CELANESE NYLON - Celanese Plastics
CELANEX - Celanese Plastics
CELCI - Tecknit (Eastern Facility)
CELCON - Celanese Plastics
CELL-COMPILER - VLSI Technology
CELLULINE - Belden
CELSIDOT - Solder Absorbing Technology (SAT)
CELSIMETER - Solder Absorbing Technology (SAT)
CELSIPOINT - Solder Absorbing Technology (SAT)
CELSISTRIP - Solder Absorbing Technology (SAT)
CEMOS - Integrated Device Technlg.
CENTAUR - EG & G Rotron
CENTIGRID - Teledyne Relays
CENTI-LOC - ITT Cannon
CENTOHM - Ward Leonard Elec.
CENTRA-GAP - Thomas & Skinner
CENTRICORE - Magnetic Metals Co.
CENTRISAFE - Trio-Tech Intl.
CENTRONIC - Centronic
CENTRY - Leeds & Northrup Instrs.

Add Dept. EM to address to tell them you saw it in EEM.

CENTUM - Yokogawa. of America
CENTURION (DIMMERS) - Lutron Elctrns.
CENTURY - Beckman Instrs.
CERACIRCUIT - Sprague Elec. Co.
CERADOT - CTS
CERAFIL - AVX
CERALAM - AVX
CERALOCK - Murata Mfg. Co.
CERA-LYTIC - Sprague Elec. Co.
CERAMABOND - Aremco Prods.
CERAMACAST - Aremco Prods.
CERAMACOAT - Aremco Prods.
CERAMA-DIP - Aremco Prods.
CERAMAG - Stackpole, Electronic Components
CERAMAGNET - Stackpole, Magnet
CERAMICA 3 - Mica
CERAMIKIT - Sprague Elec. Co.
CERAMIPEC - Murata Mfg. Co.
CERAMO - Thermo Elec.
CERAMOCOUPLE - Thermo Elec.
CERAMOLITHIC - Centralab
CERASEAL - AVX
CERASTAT - Murata Mfg. Co.
CERATRCLS - CTS.
CERATRIM - CTS.
CERATRON - Murata Mfg. Co.
CERCHIP - Sprague Elec. Co.
CERMAX - ICL Technology
CEROD - Sprague Elec. Co.
CEROL - AVX
CERT - Times Fiber Communications
CERTACELL - Standard Reference Labs
CERTAVOLT - Standard Reference Labs
CER-T-FIED - Berg, W. M.
CERTI-CRIMP - AMP
CERTI-LOK - AMP
CERTIMESH - Pall Trinity Micro
CERTI-SEAL - AMP
CETA - Ashman Industries (1966)
CFS - Tensolite
CHALLENGER - Equipto Elctrns.
CHAMP - AMP
CHAMP-LOK - AMP
CHAMPOMATIC - AMP
CHAN-L-WIRE - Wiremold Company
CHANNELITE - Channel Inds.
CHANNELMAX - Valtec
CHANNELTRON - Galileo Electro-Optics
CHARABAND - Dataproducts
CHARGE-MASTER - Simco Co.
CHARGE PLUS - Dattilo Electronics
CHARGE PLUS JR. - Dattilo Electronics
CHASE - Thomas & Betts
CHASSIS-TRAK - General Devices
CHECK-LITE - Adalet-PLM
CHEK-SORT - Lundy Elctrns. and Systems
CHEMFLUOR - Norton Chemplast
CHEMGRIP - Norton Chemplast
CHEMINAX - Raychem
CHEM-MATE - Beckman Instrs.
CHEMOLOGY - Chemtronics
CHEM-O-SOL - Whittaker
CHEM-O-THANE - Whittaker
CHEMTRON - COSAR
CHEMWARE - Norton Chemplast
CHEM-WIK - Chemtronics
CHIP - Forma Scientific
CHIPMUX - Barnes Engrg.
CHIPSCRETE - Motorola Semiconductor
CHIPSWITCH - Crydom
CHIRASIL-VAL - Alltech Assocs.
CHIRO-SCAN - Motorola Semiconductor
CHLOROTHENE NU - Dow Chemical Co.
CHLOROTHENE VG - Dow Chemical Co.
CHOICE - Bowmar Instrument.
CHO-NECTOR - Chomerics
CHO-SEAL - Chomerics
CHO-SHRINK - Chomerics
CHO-SIL - Chomerics
CHO-THERM - Chomerics
CHRO-BAR - VIZ Test Equipment
CHROMAFILTER - Panelgraphic
CHROMAFUSE - Panelgraphic
CHROMAGOLD - Zenith Components & Sys. Grp.
CHROMAGOLD - Zenith CRT & Components Operations
CHROMA-LINE - Simpson Elec. Co.
CHROMASCREEN - Panelgraphic
CHROMATO-VUE - UVP
CHROMA 80 - Memorex
CHROMA 90 - Memorex
CHROM-O-SCOPE - Capintec Instrs.

CHRONO-LUME - Chrono-log
CHRONO-PAR - Chrono-log Corp.
CHRONOTROL - Barber-Colman Co.
CHV - Brim Elctrns.
CI - Curtis Inds.
CIHS - Tensolite
CIMRON - Behlman, California Instrs.
CIMRON - Elin
CINCH - Inconix
CINCHNET - Inconix
CINCH PAC - Inconix
CIP - Tensolite
CIRCBORD - Vector Electronic Co.
CIRCLE "B" - Bristol Saybrook
CIRC-O-GIDE - Bivar
CIRCUITIP - AMP
CIRCUITRIM - VRN International
CIRCUIT-STRIP - A P PRODUCTS INCORPORATED
CIRKITBLOCK - Powercube
CIRTRAK - DuPont de Nemours, E. I.
CJ - Omega Engrg.
CJ BEARINGS - Dixon Inds.
CLASP - Standard Microsystems
CLASPCON - Molex
CLASSETTE - Audiotronics
CLASSIC - Carter Motor
CLASSY CHASSIS - Gimix
CLEAN CYCLE - Inmac
CLEANLINE - Controlled Envir. Equip.
CLEAN MACHINE AQUEOUS PCB CLEANER - Mann, Henry
CLEAN-N-DRI - Clean Room Prods.
CLEAN PAL - Clean Room Prods.
CLEAN SOUND - Recoton
CLEAR-ALL - Nu-Concept Computer Sys.
CLEARFLEX - Carol Cable Co.
CLEAR-PASS - Sprague Elec. Co.
CLEARSIGHT - Communications Technology
CLEAR SIGNAL - Inmac
CLETALOY - Superior Carbon Prods.
CLIMAX CAR STEREO - MG Electronics
CLINCHER - Berg Elctrns.
CLINCHER - Jamesbury
CLIP - Wonder of America
CLIP-AC - Adtech Power
CLIPLITE - Visual Communications Co.
C-LITES - Genisco Technology.
CLOCK-CHIP - MF Elctrns.
CLORINOL - Sprague Elec. Co.
CLUZ - FIC.
C-L-X - Okonite
CMC - Carter Mfg.
C-MOD-COMPANION - Lorain Prods.
CMOS - RCA Solid State
CMS 1000 - Racal-Milgo
CMS 2000 - Racal-Milgo
CMTS - Wiltron
COAXICLAMP - AMP
COAXICON - AMP
COAXICON - AMP Products.
COAXITUBE - Precision Tube
CO-AX MAGI-T - CES Elctrns.
COAXWITCH - Bird Elctrn.
COBRA - B & K Precision Prod. Grp., Dynascan
CODEBEAM - Codenoll Technology.
CODEDATA - Codenoll Technology.
CODELED - Codenoll Technology.
CODELINK - Codenoll Technology.
CODELOGIC - Codenoll Technology.
CODENET - Codenoll Technology.
CODE NO. 249 - Oak Switch Sys.
CODESTAR - Codenoll Technology.
CODISTOR I - Codi Semiconductor
COHRLASTIC - CHR Inds.
COIL-FIX - Tra-Con
COLE BOSTON - Cole Hersee
COLLARLOK - ESNA
COLLARLOK - Esna
COLLINS - Collins Avionicss
COLOR BRIGHT 85 RE - Sylvania Electronic Components
COLOR BRIGHT 85 XR - Sylvania Electronic Components
COLOR BRITE - GTE Sylvania Lighting Prods.
COLOR-BRITE - Perma Power Elctrns.
COLOR-KEYED - Thomas & Betts
COLORMASTER - Lance Inds.
COLOR PLOT - Trilog
COLOR SCREEN 85 - Sylvania Electronic Components
COLORTHERM - General Electric Co.

COLORWARE - Advanced Elctrns. Design
COL-PREP - Alltech Assocs.
COLUMBIA - Union Carbide
COMBAT - Carborundum Co.
COMBAT - Wayne Kerr
COMBO - Chomerics
COMBO - ETI Systems
COMBO POLASTRIP - Chomerics
COMBO-RAK - Fancort Industries
COMBO-SLIDE - Fancort Industries
COMBO STRIP - Chomerics
COMBO-2 - Chomerics
COMDAC - Precision Monolithics
COMET - Computer. of America
COMFORDOME - Vaco Prods.
COMFORM I - Pace
COMLINE - Piezo Technology
COMMAND LOCK - Electrol Co.
COMM/SCOPE - M/A-Com. Cable
COMPAC - Semtech
COM PAC LENS - Vicon Inds.
COMPACLINE - Vicon Inds.
COMPACT - TRW Inductive Products
COM-PAK - Lambda Electronics
COM-PAK MARK II - Lambda Electronics
COMPAK 4 - Kalart Victor.
COMPARASCOPE - Vision Engrg.
COMPARATOR BRIDGE - Cambridge Technology
COMPLIMITER - Spectra Sonics
COMPLOT - Houston Instrument
COMPOSITION EDITOR - VLSI Technology
COM-PREP 838 - Pressure Controls
COMPRESSION-STEP - Unholtz-Dickie
COMPROTENN - Tenney Engrg.
COMPUDAS - ITHACO
COMPULIFT - Litton Potentiometer
COMPULYTIC - Sprague Elec. Co.
COMPU SEIS - Kinemetrics
COMPUSTAT - PSG Inds.
COMPUTACH - Sensor.
COMPUTAMITE - Cornell-Dubilier Electronics
COMPUTER LABS - Digital Equip.
COMPUTERSCOPE - R. C. Elctrns.
COMPUTEST - Ballantine Labs.
COMPU-THERM - RdF
COMPUTROL - Advanced Techn. Sys.
COMSHEL - Sinclair Radio Labs.
COMSTOC - Keuffel & Esser/Kratos
COMTROL I - Computrol Kidde Automated Sys.
CONCENTRIKIT - CTS.
CONCEPT/32 - Gould
CONCERTMASTER - Hartley Prods.
CONCO-FOAM - Consolidated Electronic Wire & Cable.
CONDOR - IMC Magnetics.
CONDUCTING TWENTY/TWENTY - Allaco Prods.
CONDUCTO-LUBE - Cool-Amp Conducto-Lube Co.
CONDUCTROX - Ferro
CONDUCTWEEZ - Pace
CONDULON - Pervel Inds.
CONDUX - Hardman
CO-NETIC - Magnetic Shield
CONFIDENCER - Roanwell
CONFLAT - Varian Assocs.
CONFUZZ - Tecknit (Eastern Facility)
CONHEX - Sealectro
CONMAX - Tecknit (Eastern Facility)
CONNECTO-BLOK - Thomas & Betts
CONNECT WITH QUALITY - Robinson-Nugent
CONSERVER - Bailey Controls Co.
CONSIL - Handy & Harman
CONSIL-C - Tecknit (Eastern Facility)
CONSIL-II - Tecknit (Eastern Facility)
CONSIL-R - Tecknit (Eastern Facility)
CONSOCARD - Consolink
CONSOLMATIC - Hull
CONTACT KLEEN - Chemtronics
CONTACT-SERT - Hybricon.
CONTELNET - Contel Info. Sys.
CONTINENTAL - Sencore
CONTINUAC - Lortec Power Sys.
CONTINUUM - Strategic Sys. Power Sys. Operations
CONTROFLEX - Tapeswitch. of America
CONTROFLUXER - Adtech Power
CONTROLLED MAGNETIC - Shure Bros.
CONTROLPAC - Eagle Signal Controls
CONTROL PLUS - MKC Elctrns.

CONVERT-A-PAK - Teltone
CONVERT-A-UNIT - Teltone
CONVERTEMP - EDL
CONVEYOR-CURE - American Ultraviolet
CONXRITE - Visual Communications Co.
COOL-AMP - Cool-Amp Conducto-Lube
COOL GLO - Bishop Graphics
CO-ORD - CO-ORD Switch
CO-ORD - LVC Inds.
COPALUM - AMP
COPLAMOS - Standard Microsystems
COPPERBRITE - Engelhard.
COPPERPLY - National-Standard Co.
COPPER SWEAT - Bow Solder Prods.
COPPERTHERM - Keene Laminates
COPY CARV - Miller Dial.
COPYCORDER - Hecon
CORBY KEY - Corby Inds.
COREMOUNT BRACKET - Hallmark Metals
CORGUIDE OPTICAL WAVEGUIDES - Corning Glass Works
CORNER-MATE(TM) - Hardigg Inds.
CORNING - Corning Glass Works
CORONALOC GENERATOR - ENI Power
CORPORATE LINK - Shure Bros.
CORRGARD - Slecor.
CORRIB - Ohmite Mfg. Co.
CORTEM - Carbone Lorraine Inds.
CORTITE - Carbone Lorraine Inds.
CORVEL - Polymer.
COUNT MODULES - Practical Automation
COUNTOMATIC - Electromatic Comps.
COUNTROLLER - Veeder-Root
COVEROHM - Ferro
CP/M - GMR
CPPC - Clifton Precision
C-PROBE - International Instrumentation
C-PROBE II - International Instrumentation
C-PROBE V - International Instrumentation
CPX - Cuplex
CQUAM - Motorola Semiconductor
CRADLE - Gould
CRADLECLIP - Electrovert
CRAIG - Kalart Victor
CRALAB - Dimco-Gray
CRAMOLIN - Caig Labs.
CRANEGARD - Dillon, W. C., & Co.
CREDENZA - Lutron Elctrns.
CRESCENT - Cooper Group
CRESCENT - Waldes Kohinoor
CRICKET - Sencore
CRIMP-ACON - Methode Elctrns.
CRIS-PIC - Kalart Victor
CRITERIA SYSTEM - Reliability
CRL - Centralab
CRL (WITHIN A DIAMOND) - Centralab
CROMA-FLEX - Advance Wire & Cable
CROMA TWIST - Advance Wire & Cable
CROMA WEAVE - Advance Wire & Cable
CROMIX - Cromemco
CROSSFLO - Torin
CROSSOVER - Middleburg
CROSSPOINT - Crosspoint
CROSSPOINT - Dio-Rey
CROUZET - Crouzet Controls
CRT - Daburn Elctrns. & Cable
CRT - Dotronix
CRTBUG - Motorola Semiconductor
CRT-PAC - Semtech
CRYOTERM - Maury Microwave
CRYO-TORR - CTI-Cryogenics
CRYSTOGRAPH - International Instruments
CRYSTOGRAPH - Sigma Instrs.
C/SCRIPT II - Commercial Sys. Labs.
CSI - CSI Capacitors
CSI - Markem
CS3 - TransKinetic Sys.
CTC-71 - Alpha Metals
CT-FLEX - Dixon Inds.
CUBATH - Sel-Rex
CUBELITE - Visual Communications Co.
CUBIC - Memorex
CUCLAD - 3M-Electronic Products
CUE/SPLICE - Tapecon
CUPAC - Semtech
CURASTAT - Herbert Prods.
CURCUIT FIX - Datak
CURRENT GUN PLUS - Bell, F. W.
CURRENT GUN PROBE - Bell, F. W.
CURTIS INDACHRON - Curtis Instrs.
CUSIL - GTE Wesgo Technical Ceramics & Metals
CUSTOM/POWER - Trio Labs.
CUSTOM STRIPMASTER - Ideal Industries
CUTMETER - Veeder-Root
CVP TESTER - Workman Elctrn. Prods.
C-W - Caddell-Burns Mfg.
CYBERBLAST - Cybersonic
CYBERCOMMAND - Cybersonic Corp.
CYBERTONE - Cybersonic.
CYCLEASE - Ram Chemicals Whittaker
CYCLEMASTER - Midland-Ross
CYCLETROL 120/240 - Hampton Prods.
CYCL-FLEX - Eagle Signal Controls
CYCLOHM - Howard Inds.
CYCLON - Gates Energy Prods.
CYCLONAIR - EG & G Rotron
CYCLONOME - Sigma Instrs.
CYCLO-RUBBER - Hardman
CYCLOTAR - Alan Gordon Entprs
CYCOM MCG - American Cyanamid Co.
CYLINDICATOR - Namco Controls
CY232 - Cybernetic Micro Sys.
CY250 - Cybernetic Micro Sys.
CY300 - Cybernetic Micro Sys.
CY360 - Cybernetic Micro Sys.
CY480 - Cybernetic Micro Sys.
CY500 - Cybernetic Micro Sys.
CY512 - Cybernetic Micro Sys.
CY525 - Cybernetic Micro Sys.
CY600 - Cybernetic Micro Sys.
CY750 - Cybernetic Micro Sys.
C2R - General Semiconductor Inds.
C-21 - Hughes Aircraft Co.
DABIL - ITHACO
DAC PORT - Analog Devices
//0100006999"DACQ" - Ajax Magnethermic
DAFLEX - Daburn Elctrns. & Cable
DAFLON - Daburn Elctrns. & Cable
DAG - Acheson Colloids
DAGLAS - Phelps Dodge Magnet Wire
DAISY DEPOT - Inmac
DAKA WARE - Davies, Harry, Molding Co.
DALAMID - Beckman Instrs.
DALE LOGO - Dale Electronics
DALITE - Daburn Elctrns. & Cable
DANAMETER - Racal-Dana Instrs.
DANYON - Daburn Elctrns. & Cable
DAPEX - Rogers
DAPRENE - Daburn Elctrns. & Cable
DARIS - Sundstrand Data Control
DASHER - Data General
D-A-T-A - Continental Data Sys.
DATAB - Brady, W. H., Co.
D.A.T.A.BOOK - D.A.T.A.
DATA-BOY - Mimic
DATACEL - Sigma Instrs.
DATACRYPTOR - Racal-Milgo
DATA DIRECTOR - Zehntel
DATADUCT - Computer Cable & Prods.
DATAGARD - SGL Waber
DATAGUARD - Control Module
DATAGUARD - National Electric Cable
DATAKOAT - Datak
DATALIFE - Verbatim
DATA LINK CONTROL - Micom Systems
DATALITE - Dialight
DATA MANAGER - Bently Nevada
DATAMARK - Datak
DATA MARK - Memorex
DATA-MATE - Weed Instr. Co.
DATA-MONITOR - TEC
DATANETWORK - Honeywell Info. Sys.
DATA PANEL - TEC
DATA-PATCH - Atlantic Research
DATA PLOT - B-G Instruments
DATARIBBON - Dataproducts
DATASAVER - Cuesta Systems
DATA-SCREEN - TEC
DATASCRIBE - Alpha Merics
DATASEEKER - Dataprobe
DATA SEIS - Kinemetrics
DATA SENTRY - General Electric Co.
DATASTAR - Clinton Elctrns.
DATASWITCH - Wheelock Signals
DATATAB - ALTEK
DATA TECH 9600 - Atlantic Research
DATA TORK - GSE
DATA-TRAK - Research
DATA-VOICES - Datawest
DATA-VU - Clinton Elctrns.
DATAWAFER - Display Interface
DATAWAND - MSI Data
DATAWATCH - Metrix Instrument Co.
DATAX II - Data Translation
D-A-T-T - Continental Data Sys.
DAYONITE - Vicon Inds.
DB - Beckman Instrs.
DDC - ILC Data Device
DDS - Westronics of Texas
DDT - Digital Equip.
DEACTIGEL - Alltech Assocs.
DEACTIGLAS - Alltech Assocs.
DEARBORN - Sprague Elec. Co.
DEC - Digital Equip.
DECADE III - Pall Trinity Micro
DECAP - Dynaloy
DECATRAN - Amprobe Instr.
DECI-CENTER - Aries Elctrns.
DECI-FLEX - Aries Elctrns.
DECIGRID RELAY - Genicom
DECISION - Beckman Instrs.
DECITRAK - Theta Instr.
DECO - Digital Elctrns.
DECOHM - Davis Elec. Co.
DEC-RANGER - Ohmite Mfg. Co.
DECTAPE - Digital Equip.
DECUS - Digital Equip.
DEFLECTRON - CELCO
DEFOREST - Dumont Oscilloscope Labs.
DEI MOTOR GUARD -ersified Elctrns.
DEKABOX - Electro Scientific Inds.
DEKABRIDGE - Electro Scientific Inds.
DEKADIAL - Electro Scientific Inds.
DEKAPACITOR - Electro Scientific Inds.
DEKAPOT - Electro Scientific Inds.
DEKASTAT - Electro Scientific Inds.
DEKAVIDER - Electro Scientific Inds.
DEKTAK - Sloan Technology
DELINEASCOPE - Kalart Victor
DELMICA - Del Elctrns.
DELTA - Electron
DELTAFILM - Sprague Elec. Co.
DELTA-KIT - Contact East
DELTAPLY - Sprague Elec. Co.
DELTA SHEAR - Bruel & Kjaer Instrs.
DELTAVERTA - Hybrid Systems
DELTA 1000 - Honeywell
DELTRONIX - Delta Elctrns.
DEMOD - General Magnetics
DENFLEX - Dennis Chemical
DENSI-LUX - Lektra Labs.
DENSI-METER - Lektra Labs.
DENSI-TIMER - Lektra Labs.
DENSITROL - Princo Instrs.
DEPENDABLES - Pioneer Magnetics
DEPEND-A-BOND - Alpha Metals
DEPENDAC - Lortec Power Sys.
DEPENDEX - High Voltage Engrg.
DESCO - Dietz Design
DESICOTE - Beckman Instrs.
DESIGNER'S - Motorola Semiconductor
DESIGNERS CONTROL SERIES - Industrial Computer Designs
DESIGNER SERIES - IVO Inds.
DETECTAVERSE - Magnum Opus Custom Elctrn. Engrg.
DEWPROBE - Honeywell
DFA - Pall Ultrafine Filtration
DGX - Engelhard
DIAGLUTO - Beckman Instrs.
DIAL-A-GAIN - Unholtz-Dickie
DIAL-A-LIGHT - Plant Specialties
DIAL-A-LIMIT - Astrosystems
DIAL-A-SPEED - Plant Specialties
DIALATCH - Hartwell
DIAL-A-TEMP - Hexacon Elec.
DIALATROL - Honeywell
DIAL-IT - Holub Industries
DIALTEMP - Omega Engrg.
DIAMFILE - Jonard Inds.
DIAMOND GRIP - AMP
DIAZO-JET - Teledyne Rotolite
DIB - Varo Semiconductor
DI-CAP - Dielectric Labs.
DIEKUT STIK-ONS - Bishop Graphics
DIET MUFFIN - EG & G Rotron
DIF FILTERS - ESC Elctrns.
DIFILM - Sprague Elec. Co.
DIGIBEZEL - NOBEX
DIGIBRIDGE - GenRad
DIGI-CAL - Analogic
DIGICHEK - Applied Control
DIGI-CLOCK MODULE - Veeder-Root
DIGI-CON - Veeder-Root
DIGICOUNT - Itek Measurement Sys.
DIGIDECADE - Digitran Co.
DIGI DESIGNER - E & L Instruments

DIGIDIAL - Beckman Instrs.
DIGI-DRIVES - Sequential Info. Sys.
DIGIFEEDER - IVEK
DIGI-FLEX - Veeder-Root
DIGI-KLIPS - Components
DIGILEVER - Digitran Co.
DIGILINE - Itek Measurement Sys.
DIGI-LOCK - Sequential Info. Sys.
DIGILOGGER - NES
DIGILOGIC - Scientific Columbus
DIGI-MASTER - Veeder-Root
DIGIMITE - Thermo Elec.
DIGI-PLATE - Dynatronix
DIGIPOT - Digitran Co.
DIGISCALE - Itek Measurement Sys.
DIGISCAN-800 - TEKTITE CORP.
DIGISEC - Itek Measurement Sys.
DIGI SEIS - Kinemetrics
DIGI-SHAFT - Computer Conversions
DIGI-SNAP - Sperry, A. W., Instrs.
DIGISPENSE - IVEK
DIGISTROBE - Power Instrs.
DIGISWITCH - Digitran Co.
DIGITAL SURVEY FATHOMETER - Raytheon Ocean Sys. Co.
DIGITEC - Digitec
DIGITEMP - Delta Design
DIGITENN - Tenney Engrg.
DIGITRAC - Transducer Systems
DIGITRAK - EDO Western
DIGITRONIC - Despatch Inds.
DIGIVIDER - Digitran Co.
DIGS - Sundstrand Data Control
D I LINE - Ungar
DI-MIN-ODE - General Semiconductor
DIM-N-GLO - Lutron Elctrns.
D/IMUX - Coastcom
DIODE GUN - Amperex Elctrn.
DIODE-LITE - Dialight
DIO-REY - Crosspoint
DIO-REY - Dio-Rey
DIP-A-DIP - Micro Electronic Sys.
DIP ALARM - Projects Unltd.
DIPATCH - Aries Elctrns.
DIP-BIT - Midland-Ross., Cambion
DIP BITE - Minelco - A Talley Ind.
DIP-C - Grayhill
DIP FLASH - Projects Unltd.
DIP-GATE - E.P.E.
DIP GUARD - AVX
DIP/LOC - Everett/Charles Contact Prods.
DIPLOMATE - AMP
DIPLOMATE - AMP Products
DIP-PAK - Fidelity Chem. Prods.
DIPSPENSER - Techni-Tool
DIPSWITCH - Armtec Industries
DIRECT ETCH - Datak
DIRECTOR - Struthers-Dunn
DIRECTRON - Sanford-Miller Corp.
DIRECTWELD - ITT-Higbie Mfg.
DISCACHE - Motorola Semiconductor
DISCAN - Antenna Specialists
DISC MASTER 1000 - New Media Graphics
DISCO - Panduit
DISCOHM - Ward Leonard Elec.
DISKLIKE R5232 - Analog & Digital Peripherals (ADPI)
DISPOSA-PURGE - Alltech Assocs.
DISS-O-PAD - Bivar
DISTEC - Helm Instr. Co.
DISTIK - Stanford Applied Engrg.
DI-T - TRW Inductive Products
DITRONIC - Rayovac
DIVIDOHM - Ohmite Mfg. Co.
DK - Beckman Instrs.
D-LASAR - University Computing Co.
DMATIC - Digital Media
DM/PL - Houston Instrument
DOCUFAX - Alden Elctrns.
DOLFLEX - Dolph, John C., Co.
DOLPHON - Dolph, John C., Co.
DOLPH-SPRAY - Dolph, John C., Co.
DOMINO - Sprague Elec. Co.
DONNER - Systron-Donner Inertial
DOORBELL - Unitrode
DOORWAY TO MEMORY - KLC.
DOROIDAL - Midland-Ross., Cambion
DO-T - TRW Inductive Products
DOTITE - Engelhard
DOTPLOT - Integral Data Sys.
DOUBLE/BUBBLE - Hardman
DOUBLE-DIP - Grayhill
DOUBLE-SEAL - Jamesbury
DOUBL-GARD - Southco
DOW-KEY - Kilovac
DPL - Chemtronics
DPL-2 - Chemtronics
DPR - Hardman
DPT - Xanadu Controls
DRAGON - Okonite
DREEFS - Dreefs Switch
DRIFT-LOCK FLUXMETER - Walker Scientific
DRILLDIRECTOR - Humphrey
DRI-MARK - Meyercord
DRM - Catalyst Research
DRM 2 - Catalyst Research
DROSS-X - Multicore Solders
DRUMSTICK - Transamerica Delaval
DRYATROL - Pall Trinity Micro
DRYFIT - Sonnenschein Batteries
DSLK - Pall Ultrafine Filtration
D-SODR SYSTEMS - Pace
DTF - Frequency Elctrns.
DU - Beckman Instrs.
DUALATCH - AMP
DUALAY - Okonite
DUAL BUS - Microbar Sys.
DUALCON - Molex
DUAL FLEX - Standard Grigsby
DUAL-SHRINK - Zeus Indl. Prods.
DUAL THIN LINE (DTL) DISK ENCLOSURE - International Instrumentation
DUAL-TROL - Veeder-Root
DUNCO - Struthers-Dunn
DUOBOND - Belden
DUOBOND PLUS - Belden
DUO-BOND - Antenna Specialists
DUODIAL - Beckman Instrs.
DUOFOIL - Belden
DUOSTAT - Duotone
DUOTONE DIAMOND - Duotone
DUOTRONIC - Edwards Co.
DUO-TYNE - AMP
DUO-VAC - Lab-Line Instrs.
DUO-VOLT - Sigma Instrs.
DUOWATT - Motorola Semiconductor
DURACELL - Duracell Intl.
DURA CLAD - AIE Magnetics
DURACOLOR - Carol Cable Co.
DURA-CON - TRW Connector
DURA-CON - Antenna Specialists
DURAD - Champlain Cable
DURA-DRY - FTS Sys.
DURA-FLEX - Antenna Specialists
DURA FLO - Kurz Instrs.
DURAFOAM - Carol Cable Co.
DURA-LAY - International Wire Products
DURALCO - Cotronics
DURANT - Eaton
DURAPOT - Astrosystems
DURASEL - Alpha Comps.
DURA-STRAND - International Wire Products Co.
DURATHERM - BIW Cable Sys.
DUROTHERM - Hexacon Elec.
DUR-X-THANE - Whitmor Wire & Cable
DXS* - Texas Instrs.
DYAD - Clare
DYKANOL - Cornell-Dubilier Electronics
DYMA - Dyma Engrg.
DYMAC - Spectral Dynamics
DYNAC - Dynisco
DYNA-C - E² Technology
DYNACLAD - Exide
DYNA-CORE - Alpha Metals
DYNA-CRIMP - AMP
DYNAFORM - Amphenol
DYNA-JET - B & K Precision Prod. Grp., Dynascan
DYNAKROME - Beckman Instrs.
DYNALOAD - Transistor Devices
DYNAMASTER - Bristol Babcock
DYNAMAX - Alan Gordon Entprs.
DYNA-MITE - LH Research
DYN/AMP - Halmar Electronics
DYNA-PEAK - B & K Precision Prod. Grp., Dynascan
DYNAPHASE - Stanton Magnetics
DYNAPOUR - Ajax Magnethermic
DYNA-PRIME - Beckman Instrs.
DYNA-RACE - Grant Hardware Co.
DYNASCOPE - Vision Engrg.
DYNASHIELD - Computer Cable & Prods.
DYNASOAP - Heat Systems-Ultrasonics
DYNASOLVE - Dynaloy
DYNASTAT - Static
DYNA-SWITCH - Dillon, W. C., & Co.
DYNATACH - Electric Tachometer
DYNA-TEMP - EDL
DYNATIME - Electrodynamics
DYNATRAC - ITHACO
DYNATROL - Automation Prods.
DYNAYOKE - CELCO
DYNETIC - Shure Bros.
DYNOGRAPH - Beckman Instrs.
DY-NOS-STICK - Nu-Concept Computer
D3 - Frederick Elctrns.
D-50 - Dataproducts
E - Electro Switch
EAGLE A - Eagle Magnetic Company
EAGLE AA - Eagle Magnetic Company
EAGLE AAA - Eagle Magnetic Company
EARSPLITTER - Kolin Inds.
EASCO - Easco/K-D Tools
EASCO/K-D - Easco/K-D Tools
EASI II - B & B Motor & Control
EASY-FLO - Handy & Harman
EASYMATCH - Alford Mfg. Co.
EASY-METER - Sperry, A. W., Instrs.
EASY PEEL - Brand-Rex
EASY-STRIP - Holub Industries
EATON - Eaton.
EATON PRINTER PRODUCTS - Eaton
EB-CON - Eby Co.
EBR - Varo Semiconductor
ECCOBOND - Emerson & Cuming
ECCOCOAT - Emerson & Cuming
ECCOFLOAT - Emerson & Cuming
ECCOFOAM - Emerson & Cuming
ECCOL - Sprague Elec. Co.
ECCO LITE - Emerson & Cuming
ECCOSHIELD - Emerson & Cuming
ECCOSIL - Emerson & Cuming
ECCOSORB - Emerson & Cuming
ECCOSPHERES - Emerson & Cuming
ECD - Electronic Controls Design
E-CELL DEVICES - Plessey Electro-Products
ECG - Sylvania Electronic Components
ECHO GEL II - Communications Technology
ECHORDER - RIL Elctrns.
ECHORDETTE - RIL Elctrns.
ECLIPSE - Jobmaster.
ECLIPSE S100, S200, S300, M600, S/20, S/120, MV/4000, MV/6000, MV/8000 - Data General
ECL-3211 - Emulogic
ECOALUBE - E/M Lubricants
ECO FUSE - Economy Fuse
ECOM - Trendata/Standard Memories
ECOM - MSI Data
ECON FUSE - Economy Fuse
ECONOCAP - Motorola Semiconductor
ECON-O-CLAD - Engelhard
ECONOCODER - Astrosystems
ECONOCOUNTER - Veeder-Root
ECONO-CRIMP - Automatic Connector
ECONOFIRE - EMCA
ECONO-FLEX - Veeder-Root
ECONOFLUX - Alpha Metals
ECON-O-GIDE - Bivar
ECONO-HEAT - Aremco Prods.
ECONO JET - Teledyne Rotolite
ECONO-LAP - Accumet Engrg.
ECONO-LINE - Oak Switch Sys.
ECONOLINE - Sprague Elec. Co.
ECONO-MASTER - Veeder-Root
ECONOMATE - AMP
ECONO/MATE II - Power/Mate Co.
ECONOMITE - Chicago Switch
ECONOMITE - ITW Switches
ECONOPAK - Electrovert USA
ECONO-POLISH - Accumet Engrg.
ECONOPOT - New England Instr.
ECONO-SKAN - Skan-A-Matic
ECONOSPHERE - Alltech Assocs.
ECON-O-TAPE - Engelhard
ECON-O-TEMP - Barksdale Controls
ECONO ZIP - 3M-Electronic Products
ECONO ZIP - Textool Products
ECS - Environmental Container Sys.
EC - Globe Plastics
ED - Dreefs Switch
EDDYSTONE - Marconi Instrs.
EDGECON - Molex
EDGEGARD HOOD - Baker Co.
EDGE-ON - Burndy
EDGE-PAC - Elfab
EDGE-TITE - Burndy
EECOFLEX - EECO

EFG - Saphikon
E-FORM - Acme Chem. & Insulation
E-GUN - Varian Assocs.
EHVQ - TII Electronics
EIKONIXSCAN - Eikonix
EJECT-A-DIP - Aries Elctrns.
E-KOTE - Acme Chem. & Insulation
ELASTIC STOP NUTS - ESNA
ELASTIC STOP NUTS - Esna
ELASTIPAR - Times Fiber Communications
ELASTO-FLEX II - Craig Sys.
ELAST-O-FLUOR - Norton Chemplast
ELCOM - Elcom Systems
ELECPAC - Wilbrecht Elctrns.
ELECTRIC LACQUER - Dolph, John C. Co.
ELECTRICORD - Pacific Electricord
ELECTRIX - Patton-MacGuyer
ELECTRLOY - Molecu-Wire
ELECTROCOMP - Beckman Instrs.
ELECTROCRAFT - GC Elctrns.
ELECTRODAG - Acheson Colloids
ELECTRODUCT - Electrovert
ELECTROFEED - Black & Webster
ELECTRO-FLEX - Electro Space Fabricators
ELECTROFLO - Electrovert USA
ELECTROFORM - Electrovert USA
ELECTROLAB - Digiac.
ELECTRO-LAP SEAL - Okonite
ELECTROMATE - Beckman Instrs.
ELECTROMAX - Leeds & Northrup Instrs.
ELECTRO-PAC - Instrumentation & Control Sys.
ELECTROPANE R - Libby Owens-Ford
ELECTROPREP - Electrovert USA
ELECTRO-PROBE - Sperry, A. W., Instrs.
ELECTROPUNCH - Black & Webster
ELECTROSET - Black & Webster
ELECTRO-SHIELD - Estes Engrg. Co.
ELECTROTABLE - Black & Webster
ELECTRO-TAP - AMP
ELECTRO-TY - Electrovert
ELECTRO-WASH - Chemtronics
ELINCO - EDO./Elinco
ELIPTI-GRIP - Thomas & Betts
ELITES - E & L Instruments.
ELLMETER - Alpha Comps.
ELMET - Philips Elmet
ELNIKORD - Elnik Instrs.
ELPH - Thermo Elec.
ELTEX - Frederick Elctrns.
ELVOX - Paso Sound Prods.
EL-100 - Electrol Co.
EL-120 - Electrol Co.
EL-200 - Electrol Co.
EL-300 - Electrol Co.
EMCAP - Emcon
EMFLON - Pall Ultrafine Filtration.
EMI MESH STRIP - Chomerics
EMLOCK - Cablewave Sys.
EMRALON - Acheson Colloids
ENCLAD - Engelhard.
ENCLOZ - Fastex
ENCODER MIKE - Oriel Corp.
ENDUR - Rogers
ENDURA - Wonder of America
ENDURAGLAS - Beckman Instrs.
ENERCON - Control Prods.
ENERGIZED - Alpha Metals
ENERGIZER - Union Carbide
ENERGY-MISER - Kalglo Elctrns. Co.
ENERSCAN - Despatch Inds.
ENTRELEC - Cogenel/Entrelec
ENVEX - Rogers.
ENVIRO-BLOC - Siecor
ENVIRO-BOND - Siecor
ENVIROBRIDGE - Beckman Instrs.
ENVIROEAR - Beckman Instrs.
ENVIROFLOW - Beckman Instrs.
ENVIROGAUGE - Beckman Instrs.
ENVIROLINE - Beckman Instrs.
ENVIROMETER - Beckman Instrs.
ENVIRONETTE - Lab-Line Instrs.
ENVIRONOL - RTE Aerovox
ENVIRO-SKAN - Skan-A-Matic
ENVIROSTAT - Simco Co.
ENVIRO-SWITCH - Giannini Petro Marine
ENVIROTRANS - Beckman Instrs.
ENZTRATE - Beckman Instrs.
E-PAC - Instrumentation & Control Sys.
EPIBASE - Motorola Semiconductor
EPICAP - Motorola Semiconductor
EPION - Solid State Devices
EPITRAN - Solid State Devices
EPLATRONICS - Epsilon-Lambda
EPOCAP - Hardman
EPOCEL - Pall Ultrafine Filtration
EPOCRETE - Hardman
EPOCURE - Hardman
EPOLAST - Hardman
EPOMARINE - Hardman
EPOSET - Hardman
EPOSOLVE - Hardman
EPO-TEK - Epoxy Technology
EPOWELD - Hardman
EPOXER - CHEM-MIXX
EPOXYCAST - ISOREG
EPOXY GELS - Sigma Plastronics
EPOXYLITE - Epoxylite
EPSCO - Mel Tec
EPSILAM-10 - 3M-Electronic Products
EPTAK - Eagle Signal Controls
E-QUALIDYNE - Shure Bros.
EQUIPTO - Equipto Elctrns.
ERDAC MODEL 1600 - Macrodyne
ERDAC MODEL 1620 - Macrodyne
ERDAC MODEL 1700 - Macrodyne
ERDAC MODEL 1710 - Macrodyne
ERDAC MODEL 1720 - Macrodyne
ERGO KEY - Advanced Input Devices
ERICKSON - Thomas & Betts
ERMAC - Everett/Charles Automation
ERNIPRESS - Erni Comps.
ERNST DREEFS - Dreefs Switch
ERSA - Caig Labs.
ERSIN - Multicore Solders
ESC, CLIP/STRIP - Electronics Stamping.
ESCOM - Guardian California
ESLOK - ESNA
ESLOK NUTS - Esna
E-SOLDER - Acme Chem. & Insulation
ESSEX - Hamilton Std. Controls
ES§P - Augat/ES•P
ESTAR - Sprague Elec. Co.
ESTAREL - Sprague Elec. Co.
ESTERMAT - Keene Laminates
ETHAFOAM - Dow Chemical Co.
ETHOCEL - Dow Chemical Co.
EUA - Kurz Instrs.
EUC/ARDA - Electrovert USA
EVEREADY - Union Carbide
EVERFAST - Ambroid Co.
EVERLASE - Coherent
EVERLASE FAST AXIAL (EFATM) - Coherent
EVERLUBE - E/M Lubricants
EVERMARK - Coherent
EVERMARK - Laser
EVERMATIC - Coherent
EVERMIX - Coherent
EVERPULSE - Coherent
EVERPULSE - Laser
EVERSCRIBE - Coherent
EVERSHIELD - E/M Lubricants
EVERSTRIP - Coherent
EVERSTRIP - Laser
EVERTRIM - Coherent
EXAR - Champlain Cable
EXBUG - Motorola Semiconductor
EXCALIBER - Sinclair Radio Labs.
EXCELITE - Thermoplastic Processes
EXCELIX - Excel Technology Intl.
EXCEL-LINE - GTE Sylvania Lighting
EXCELON - Thermoplastic Processes
EXCELTRONIC - Scientific Columbus
EXORBUG - Motorola Semiconductor
EXORBUS - Motorola Semiconductor
EXORCISER - Motorola Semiconductor
EXORDISK - Motorola Semiconductor
EXORMACS - Motorola Semiconductor
EXORSET - Motorola Semiconductor
EXORSET 35 - Motorola Semiconductor
EXORTERM - Motorola Semiconductor
EXPAND-A-RAK - Love Controls
EXPAND-MATE - Beckman Instrs.
EXPANDOMATIC - Beckman Instrs.
EXPEEDITER - Teledyne Rotolite
EXPRESSDIALER - Rath Microtech Corp.
EXTRALYTIC - Sprague Elec. Co.
EXTRUSOL - Multicore Solders
EYECOM III - LogE/Spatial Data Sys.
EYECOM 109 PTS - LogE/Spatial Data
E-Z CIRCUIT - Bishop Graphics
E-Z-CODE - Thomas & Betts
E-Z-DUO - Wadsworth Elec.
E-Z-ENTRY - Berg, W. M.
EZE-STIK - Fitchburg Coated Prods.
E-Z-HOOK - E-Z-Hook
EZ INSERTA - Garry Mfg. Co. of Brand-Rex Co.
EZ-PRO - American Automation
EZ-PRO II - American Automation
EZ-PRO 2.1 - American Automation
E-Z-RED - Wadsworth Elec.
E-Z-TAK - Thielex Plastics.
E-Z-TRIM - Bourns
FA - Bacon Inds.
FABMIKA - Sprague Elec. Co.
FABRITEMP - Trans-Met Engrg.
FACT - Hughes Aircraft Co.
FAIRLOC - Sterling Instr.
FALLBACKER - Dataprobe
FALT TRAP - Gould
FANDIAL - Lutron Elctrns.
FAN-PAN - UNITRACK
FANTOM FLEX - Wiremold Company
FASFLEX I - Shugart Assocs.
FASFLEX II - Shugart Assocs.
FASFLEX III - Shugart Assocs.
FASFLEX IV - Shugart Assocs.
FAS'N-IT - Ambroid Co.
FAST - ABA Electromechanical Sys.
FASTAIRE - Humphrey
FASTEMP - Amprobe Instr.
FAST FIT - Cambridge Prods.
FASTIN-FASTON - AMP
FAST-MASK - E.P.E.
FASTON - AMP
FASTPAK - Teccor Elctrns.
FASTRESS - Spectro Equipment
FAST STEPPER - Grover Patent Products
FAST 5000 - American Computer Hardware
FAULT FINDER - Venable Industries
FCM-CS - FCM Plastics
FD - Tech Spray
FE, FI, FO - TRW Inductive Products
FEATHER - EG & G Rotron
FENICULOY - Molecu-Wire
FERRINOX - Thomson-CSF Comps.
FERROFLOW - Microwave Filter
FERROSORB - Microwave Filter
FERROTITE - Murata Mfg. Co.
FEURLON - Rogers.
FFA - Bacon Inds.
FIBER-CONN - Switchcraft
FIBERDATA - Valtec
FIBER FONE - Aetna Telecommunications Labs.
FIBERFRAX - Carborundum Co.
FIBERLAB - Math Assocs.
FIBERLINK - Math Assocs.
FIBER-LITE - Dolan-Jenner Inds.
FIBERLOY - Rogers.
FIBER MASTER - L & L Special Furnace
FIBERTEMP - Trans-Met Engrg.
FIBERVISION - Math Assocs.
FIBREYE - Galileo Electro-Optics.
FIDELEX - Fidelity Chem. Prods.
FIDELPLATE - Fidelity Chem. Prods.
FIELDLAB - Beckman Instrs.
FIELDMOUSE - Mouse Sys.
FILMBRID - Merrimac Inds.
FILMISTOR - Sprague Elec. Co.
FILMITE - Sprague Elec. Co.
FILMTRIM - Sprague-Goodman Elctrns.
FILTER CABLE - Vitek Elctrns.
FILTER-CLEAN - Hollis Engrg.
FILTEROL - Sprague Elec. Co.
FILTER-SOLV - Beckman Instrs.
FINAL AIR - Aluminum Filter
FINAL KOTE - Tech Spray
FINELINE - Measurements Group
FINGER-PAC - Elfab.
FINGRIP - Burndy
FIN-PAC - Semtech
FIP - NEC Elctrns. USA
FIREFLY - Dupree
FIRON - EMCA
FIT - Alpha Wire
FIVEBUG - Motorola Semiconductor
FIXMASTER - Rexnord Chemical Prods.
FLAME-EYE - Barber-Colman Co.
FLAMENOL - General Electric Co.
FLAMEOTROL - Barber-Colman Co.
FLAMON - Bailey Controls Co.
FLASHBLAST - Maxwell Labs.
FLASH FRONT - Panelgraphic
FLASH STRIPPER - Ewald Instrs.
FLASH TRACK - R. C. Elctrns.
FLATGAGE - Tencor Instr.
FLAT-HEAD - Signal Transformer
FLAT-PAK - International Instruments
FLAT PAK - Opto 22
FLAT-PAK - Sigma Instrs.

FLATSO - KDI Electronics
FLAT STACK - Microtran Co.
FLAT STORE - Standard Logic
FLEX - Advanced Elctrns. Design
FLEXAGUIDE - Airtron
FLEX'ATOR - Ametek, Inc
FLEXBRAID - Communications Technology
FLEXCON - Air-O-Tronics Prods.
FLEX-E-BELT - Berg, W. M.
FLEX-E-GEAR - Berg, W. M.
FLEX-E-GRIP - Berg, W. M.
FLEX-E-PITCH - Berg, W. M.
FLEXFOAM - Carol Cable Co.
FLEXFOIL - Carol Cable Co.
FLEXI-BLOCK - AMP
FLEXIBOX - Powerbox
FLEXIBUS - Xycom
FLEXICON - M/A-COM Omni Spectra
FLEXI-COOL - FTS Sys.
FLEXI-DRY - FTS Sys.
FLEXI FILE 21 - Tri-Data
FLEXI-GLOVE - Clean Room Prods.
FLEXILAYER - Parlex
FLEXITE - Markel
FLEXI-WEAVE - Brand-Rex
FLEXLEAD - Markel
FLEXLIFE - Carol Cable Co.
FLEX-LOCK - Namco Controls
FLEXLOK - Burndy
FLEXMAX - Sanders Assocs.
FLEXMAX CIRCUITS - Flexprint
FLEXOLON - Tensolite
FLEXOPRENE - Standard Wire & Cable
FLEXPRINT - Sanders Assocs.
FLEXRAD - Judd Wire
FLEXSTRIP - T&B/Ansley
FLEXTAC - Hypertronics.
FLEXTECH - Markel.
FLEXTENSION - Tech Spray
FLEX-TEX - Gore, W. L., & Assocs.
FLEX-THANE - Berg, W. M.
FLEXTIME - Hecon
FLEXVYN - Tensolite
FLEX-WELD - T&B/Ansley
FLEXYDISK - BASF Sys.
FLEXY-MARKER - Datak
FLIC - Augat
FLIGHTLINE - Advance Engrg.
FLIP - Mini-Systems
FLIP CHIP - Digital Equip.
FLIP-PAK - Transamerica Delaval
FLIP-RAK - Fancort Industries
FLOATING BEAM - GSE
FLOCELL - Heat Systems-Ultrasonics
FLOPPY COPPY - Applied Data Communications
FLO-RITE - Kester Solder
FLOTRAC - Hull
FLOTROL - Lorain Prods.
FLOW MODULATOR - Emerson, Indl. Controls
FLUITROL - Heat Systems-Ultrasonics
FLUOR-ADE - Beckman Instrs.
FLUORALLOY - Beckman Instrs.
FLUOROGLIDE - Norton Chemplast
FLUOROSINT - Polymer
FLUORO-XECON - Chomerics
FLUOR-X - Nuclear Resch.
FLUSH-SEAL PRESSURE PLUGS - Allen Mfg.
FLUX-OFF - Chemtronics
FLUX-OFF NR - Chemtronics
FLUX STRIPPER S - Tech Spray
FLUX STRIPPER W - Tech Spray
FLYFORWARD - Sierracin/Power Systems
FOAC - Motorola Semiconductor
FOAMCONE - Teledyne Micronetics
FOAMFLEX - Cablewave Sys.
FOAM/FOIL - Tapecon
FOCAL - Digital Equip.
FOCEST - Materials Resch.
FOMAT - Controlled Envir. Equip.
FONE-A-LERT - Bell, Floyd, Assocs.
FONO-MAGIC - R-Columbia Prods. Co.
FOOTROL - General Control Co.
FOREDOM - Foredom Elec. Co.
FORMKOTE - E/M Lubricants
FORM-TRAN - EWC
FORMULA 1 - Antenna Specialists
FORMULA 111 - Chemtronics
FORTIFIER - Inmac
FOS-FLO - Handy & Harman
FOTOCERAM - Corning Glass Works
FOTOFET - Teledyne-Crystalonics
FOTOFOIL - Miller Dial
FOTOFORM - Corning Glass Works
FOTONIC SENSORS - Mechanical Techn.
FPL - Sequential Info. Sys.
FREESPRING - Holub Industries
FREEZ-IT - Chemtronics
FREON - DuPont de Nemours, E. I., & Co.
FREON TF - Chemtronics
FRICTION-AIRE - Blue M, A Unit of General Signal
FRIGICHIP - Melcor/Materials Elctrn.
FRIGITOTE - Melcor/Materials Elctrn.
FRK - EFRATOM
FROM THE LEARNING TREE - Integrated Computer Systems
FROST-OFF - Merix Chem. Co.
FRT - EFRATOM
F-SYSTEM - Electromatic Comps.
FTM - Oak Switch Sys.
FUJI - Collmer Semiconductor
FUJI-SVEA - Fuji-Svea
FULL-VIEW - Brooks Instr.
FULMAR - IMC Magnetics.
FUNDAMENTAL DISK ENCLOSURE - International Instrumentation
FUSECOR - Whitmor Wire & Cable
FUSEPLUG - Arco Elctrns.
FUSETRON - Bussmann
FUSILON - Dixon Inds.
FUSIONBRAZED - ITT-Higbie Mfg.
FUSIONWELD - ITT-Higbie Mfg.
FUSON - Meyercord
FUTURA - Beckman Instrs.
FUTURA - Teledyne Rotolite
FUZZ BUTTONS - Tecknit (Eastern Facility)
FWACO - Aimsco
FYBRCOM - Plainview Elctrns.
GAMMA-MATE - Beckman Instrs.
GAMMATROL - Nuclear Resch.
GAP-KAP - Centralab
GARALEASE - Ram Chemicals Whittaker
GARALYST - Ram Chemicals Whittaker
GARD-A-MATIC - Shure Bros.
GARDSMAN - West Instrs
GAROX - Ram Chemicals Whittaker
GAS CHROM - Alltech Assocs.
GASK-O-SEAL - Parker Seal Grp.
GATES - Gates Energy Prods.
GATEWAY - Inconix.
GATLIN GUN LEAD FORMERS - Mann, Henry
GC/AUDIOTEX - GC Elctrns.
GC/CALECTRO - GC Elctrns.
GEFE - IVO Inds.
GEL/CELL - Johnson Controls
GELYTE - SAFT America
GEMCOR - General Electro-Mechanical
GEMINI - Temescal
GEMINI - Plastiglide Mfg.
GE-MOV - General Electric Co.
GEMTIME - Veeder-Root
GEO-MARINE - Glenair
GEOPRENE - General Electric Co.
GEOSOL - Belden
GEOVIEW - Lexidata.
GEPEG - General Elec. Co.
GEREL - General Elec. Co.
G-GG DUST MAGNET - Clean Room
GHOST - Gimix
GIANT - General Instrument.
GIANT II - General Instrument.
GIBSON GIRL - Benjamin electroproducts, Inc.
GIGA-TRIMS - Johanson Mfg.
GIVE US A FOAM CALL - United Foam Plastics
GLASGUARD - AVX
GLASPLY - Pannier
GLASS AMP - General Instr.
GLASS-K - Corning Glass Works
GLENNITE - Gulton Inds.
GLOBAR - Carborundum Co.
GLOBE DYNASTY - Johnson Controls
GLOBE STATIONARY BATTERIES - Johnson Controls
GLO-BOX - L & L Special Furnace
GLO-DOT - Industrial Devices
GLO-STAT - GTE Sylvania Lighting
GLYDER - Lutron Elctrns.
GMR/OS - GMR
GMX - Gimix
GO-ANA - General Optronics
GOAT - Craig Sys.
GO-DATALINK - General Optronics
GO-DIG - General Optronics
GO-DIP - General Optronics
GO-DIP-1300 - General Optronics
GO ECL - General Optronics
GO-HOLOSCAN PRINTER - General Optronics
GOLD DOT - Hughes Aircraft Co.
GOLD-FISH - Ideal Industries
GOLD LINE - Arnold Magnetics
GOLD LINE - Barksdale Controls
GOLDMARK - Centralab
GOLD TOP - General Electric Co.
GO-LED-1300 - General Optronics
GOLH - General Optronics
GOLS - General Optronics
GOLT - General Optronics
GOOD IMPRESSIONS - Inmac
GORDON/MORSE - Alan Gordon Entprs.
GORE-SHIELD - Gore, W. L., & Assocs.
GORE-TEX - Gore, W. L., & Assocs.
GORE-WRAP - Gore, W. L., & Assocs.
GP/DUROID - Rogers
GP-612 - Gulton Inds.
GRAB'M QUIK - Brim Elctrns.
GRADIENT-SOLV - Beckman Instrs.
GRADUATE - Elco
GRAF/BAR - Science Accessories
GRAF/PEN - Science Accessories
GRAND SLAM - Potter Instr.
GRANT - Science/Elctrns.
GRAPHALLAST - Graphite Metallizing
GRAPHALLOY - Graphite Metallizing
GRAPHILM - Graphite Metallizing
GRAPHLON - Graphite Metallizing
GRAPHMETEX - Graphite Metallizing
GRAPHOVER 9500 - New Media Graphics
GRAPHPAC - Alltech Assocs.
GRAUEL - Eastern Marking Machines
GRAVITAIN - Pall Trinity Micro
GRAYMATTER - IQ Systems
GREENIE - Ideal Industries
GREEN PEAK CELL - Sensor Techn.
GRI - Risk, George, Inds.
GRIDPAK - Andrew.
GRID ZIP - 3M-Electronic Products
GRID ZIP - Textool Products
GRIPEZE - Phelps Dodge Magnet Wire
GRIPLET - Berg Elctrns.
GRIP-O-GIDE - Bivar
GRIPRING - Waldes Kohinoor
GRIPWELL - Hartwell
(GR. LAMBDA) - Lambda Semiconductors
GRNET - GenRad
GRO-LUX - GTE Sylvania Lighting Prods.
GROMMES - Precision Elctrns.
GROMMET STRP - Electrovert
GROMSTRIP - ICO-Rally
GSAP - Alan Gordon Entprs.
GTC - Gould
GUARD-TEMP - EDL
GURU - Ann Arbor Terminals
GYROFLEX - Singer Co.
GYROSURVEYOR - Humphrey
HACKENSACK - Carolina Steel & Wire
HAILER JR - Audio Equip.
HALLOGIC - TRW Optoelectronics
HALL-PAK - Bell, F. W.
HALLTRON - Ohio Semitronics
HAM-MATE - Bird Elctrn.
HAMPTON MFG. - Mann, Henry
HAND-AID - Assem-Pro Instrs.
HAND-HOLE - Siecor.
HANDI-GRIP - Ideal Industries
HANDY ALUMIBRAZE - Handy & Harman
HANDY FLUX - Handy & Harman
HANDY HI-TEMP - Handy & Harman
HANDYPIN - Autosplice
HANDYTAB - Autosplice
HANSCOM-TIES - Hanscom, H. F., Co.
HARDKOAT - Datak.
HARD LAYER PREKOTES - Alltech Assocs.
HARDSET - Hardman
HAROSYN - Harowe Servo Controls
HART - Nu-Concept Computer Sys.
HAWK - International Data Sciences
HC HOLTZER - Eastern Air Devices Motor
HC 4027 - Trilog
HDC - Pall Ultrafine Filtration
HD DETERGENT - Clean Room Prods.
HDSDEBUG - Motorola Semiconductor

HDS-200 - Motorola Semiconductor
HDS-400 - Motorola Semiconductor
HDT - Allaco Prods.
HEART OF SYSTEM - Xentek
HEAT GUARD - Hexacon Elec.
HEATHKIT - Heath Co.
HEATH/ZENITH - Heath Co.
HEAT-LES - Pall Ultrafine Filtration
HEAT PROBER - Wahl Instruments
HEATRAM - Power Designs
HEATRAX - ICO-Rally
HEAT SPY - Wahl Instruments
HEBBAR - Melles Griot
HECO - Heinemann Elec. Co.
HEET SPREADER - Opto 22
HEI - Huntington Electric
HEINEMANN - Heinemann Elec. Co.
HEJET - Pamran
HELIAX - Andrew
HELI-CAL - Helical Prods. Co.
HELICAM - Shugart Assocs.
HELICOP HUT - Craig Sys.
HELIFLEX - Alltech Assocs.
HELIFLUX - Schonstedt Instr. Co.
HELIOTEK - Spectrolab
HELIPOT - Beckman Instrs.
HELITRIM - Beckman Instrs.
HELI TUBE - Antex
HELI-TUBE - Newman, M. M.
HELIX - National Electric Cable
HELMETER - Helm Instr. Co.
HELM-PAK - Helm Instr. Co.
HENCOL - Cole Hersee
HENSCHEL - Henschel
HERAWIT - Heraeus-Volkert
HERCULES - Union Carbide
HERGA - Pres-Air-Trol
HERGAIR - Pres-Air-Trol
HERMASEAL - Durakool
HERMEFLEX - Singer Co.
HERMETICOOL - Tenney Engrg.
HERO - Mohawk Data Sciences
HETERO-CAVITY - Security Plastics
HETROCOLOR - Television Microtime
HETRON - Ashland Chemical
HEX-A-CORN - APM-Hexseal
HEXDIPS - International Rectifier
HEXETCH - Plasma-Therm
HEXFETS - International Rectifier
HEXSEALS - APM-Hexseal
HEX WIK - Hexacon Elec.
HEYCO - Heyco Molded Products
HEYCONNECTOR - Heyco Molded Products
HGA/TRANSTECH - HGA Elctrns.
HG BRIGHT GOLD - Technic
HIATT CLIPS - Electrovert
HI-BLUE CELL - Sensor Techn.
HICAP - Bussmann
HICKORY BRAND - Siecor
HI-COAT - Murata Mfg. Co.
HI-CON - Panduit
HI-COR - Alpha Metals
HI-DAMP - Barry Controls
HI-D JAX - Switchcraft
HI-D SWITCH - Switchcraft
HI-EFF - Alltech Assocs.
HI-EX - WALTER KIDDE
HI FY - Varian Assocs.
HIGH DENSITY PLUS - Teradyne Connection Sys.
HIGH-LITE - Schott Optical Glass
HIGH-MILEAGE MOBILE CARTS - Mann, Henry
HI-GRIP - Holub Industries
HI-JUL - Sprague Elec. Co.
HI-LIFE - Sprague-Goodman Elctrns.
HI-LINE - General Electric Co.
HI LO - EG & G Rotron
HI-LUME - Lutron Elctrns.
HI-MARKS - Holub Industries
HI-MEG - Dolph, John C., Co.
HINET - Digital Microsystems
HINIL - Teledyne Semiconductor
HINJON - Thomas & Betts
HI-P - Barksdale Controls
HIPAD - Houston Instrument
HIPLOT - Houston Instrument
HIPOTRODE - Hipotronics
HIPPO-CLIP - Mueller Elec. Co.
HIRAD - Times Fiber Communications
HI-RISE SOCKETS - Wells Elctrns.
HI-SCALE - Heyco Molded Products
HI-SPEED - Holub Industries
*HIT - TRW Inductive Products

HITCHHIKER - Alan Gordon Entprs.
HITEFINDER - Teledyne Gurley
HI-THERM - Dolph, John C., Co.
HIVAC EPOXIES - Sigma Plastronics
HI-VAR - Sprague Elec. Co.
HI-Z - Ross Engrg.
HK68-A - Heurikon
HMC - American Electronic Labs.
HOBBY-WRAP - OK Industries
HOLLI-CUTTER - Hollis Engrg.
HOLLINGSWORTH - Waldom Elctrns.
HOLTITE - Augat
HOMALITE-LR - SGL Homalite
HOMETAXIAL - RCA Solid State
HOMIDOLAIN - Star Porcelain
HONEY BEE - Hurst Mfg.
HOPPER STAKER - Midland-Ross., Cambion
HOPSTRETCHER - Gabriel Elctrns.
HORIZON LINE - General Electric Co.
HORNET - Hexacon Elec.
HOT BOX - L & L Special Furnace
HOT LINE TELEPHONE - Warren Comms.
HOT LIPS - Triton Mfg. Co.
HOT-SHOT - Capintec Instrs.
HOT SHOT - Union Carbide
HOT SPOTZ - Zippertubing Co.
HOT TIP - Contact
HOT VAC 2000/4000 - Ungar
HRTMP - Meyercord
HSI - Brush Magnetic Heads
HT - Alltech Assocs.
HT-X - Alltech Assocs.
HUB-CLAMP - Sterling Instr.
HUBLOC - Stock Drive Prods.
HUB-LOCK - Sterling Instr.
HUGOLD AIR PRESS - Black & Webster
HUMI-CHEK - Beckman Instrs.
HUMISEAL - HumiSeal
HUSKY - Clean Room Prods.
HVCMOS - Supertex
HY-A-SIL - Sanford-Miller.
HYBRIDER - Sencore
HYBRIDGE - Alford Mfg. Co.
HYDENT - Burndy
HYDRAMOTOR - ITT General Controls
HYDRIVE - Infodex
HYDROFEED - Components
HYDRO-FLOW FLUID - Kenco Industries
HYDRO-PURGE - Alltech Assocs.
HYDRO-PURGE II - Alltech Assocs.
HYDROSOLV - Alpha Metals
HYDRO-X - Multicore Solders
HYFEN - Burndy
HYFLUX - Indiana General/Div. Emm.
HYGRADE - Markel
HYGROLINE - Beckman Instrs.
HYGROTEST - Testoterm
HYJOULE - Associated Research
HYLINK - Burndy
HYLOK - Burndy
HYLUG - Burndy
HYPASS - Sprague Elec. Co.
HYPERGRAF - Lundy Elctrns. and Systems
HYPERION - Lutron Elctrns.
HYPERSCAN - Lundy Elctrns. and Systems
HYPER SEL - Alpha Comps.
HYPERTAC - Hypertronics.
HYPERTAC - Industrial Elctrn Hardware.
HYPOINT - Burndy
HYPOT - Associated Research
HYPRESS - Burndy
HYRING - Burndy
HY-THERM - Hy-Cal Engrg.
H-10A - General Electric Co.
IAP - Data Translation
IBR - Varo Semiconductor
I.C. - Illinois Capacitor
ICD BUS - Industrial Computer Designs
ICECAP REPORT - Integrated Circuit Engrg. (ICE)
ICECUBE - Powercube
ICEMAN - Motorola Semiconductor
ICE PAC - Powercube Corp.
IC-KOOLER - UNITRACK
ICKYPIC II - Communications Technology
ICS - Beckman Instrs.
ICSOTIMER - Instrumentation & Control Sys.
IC-6000 - Inficon Leybold-Heraeus
ID - Summagraphics
IDEA - Harris
I-DIT - TRW Inductive Products

IDOL - SMC Software Sys.
I-DOT - TRW Inductive Products
IDT - Molex
IEE-APOLLO - Industrial Elctrn. Engrs.
IEE-ARGUS - Industrial Elctrn. Engrs.
IEE-ATLAS - Industrial Elctrn. Engrs.
IEE-AURORA - Industrial Elctrn. Engrs.
IEE-DAYSTAR - Industrial Elctrn. Engrs.
IEE-DAYSTAR NOVA - Industrial Elctrn. Engrs.
IEE-ELECTRA - Industrial Elctrn. Engrs.
IEE-FLIP - Industrial Elctrn. Engrs.
IEE-HERCULES - Industrial Elctrn. Engrs.
IEE-IRIS - Industrial Elctrn. Engrs.
IEE-JUPITER - Industrial Elctrn. Engrs.
IEE-PANELSWITCH - Industrial Elctrn. Engrs.
IEE-POLARIS - Industrial Elctrn. Engrs.
IEE-PRECI-DIP - Industrial Elctrn. Engrs.
IEE-PROSWITCH - Industrial Elctrn. Engrs.
IEE-THINPANEL - Industrial Elctrn. Engrs.
IEE-THINSWITCH - Industrial Elctrn. Engrs.
IEE-TITAN - Industrial Elctrn. Engrs.
IGNITOR - Union Carbide
IMAGESCOPE - Galileo Electro-Optics.
IMAGEVIEW - Lexidata
IMCAIR - IMC Magnetics
IMCOM - IMC Magnetics
IMCON - Andersen Labs
IMCOOL - IMC Magnetics
IMCUBE - IMC Magnetics
IMLEC - Inter-Market
IMMERSION GOLD - Sel-Rex
IMOX - Advanced Micro Devices
IMPAC - Microwave Semiconductor
IMPAC - Modular Audio Prods.
IMPAC - New Haven Wire & Cable
IMPAC - Semtech
IMPAC - Velonex, Display Prods.
IMPACT - Documation
IMPACT-O-GRAPH - Chatsworth Data
IMPAC 3 - Semtech
IMPERIAL LINE - Ungar
IMPERVITRAN - Micron Inds.
IMPLION - Frequency Sources
IMPROVED ECONO-CRIMP - Automatic Connector
IMPROVED WEDGE-LOCK - Automatic Connector
IMS - Inmos
IN-BUS-EMULATION - Antona
INCA - Kalglo Elctrns. Co.
INCHWORM - Burleigh Instrs.
INCOR - Indiana General/Div. Emm.
INCRE-LOCK - Sequential Info. Sys.
INCUSIL 10 - GTE Wesgo Technical Ceramics & Metals
INCUSIL 15 - GTE Wesgo Technical Ceramics & Metals
INDAC - Digital Equip.
INDOX - Indiana General/Div. Emm.
INDUCT-A-RING - Unholtz-Dickie
INDUCTOSYN - Del Elctrns.
INDUCTOSYN - Farrand Controls
INDUCTRIC - Keytek
INDUSTRIAL TIMER - Veeder-Root
INDUSTRIAL 24KT GOLD - Technic
INDUSTRITE - BIW Cable Sys.
INDUSTROL 812 - Research
INFINITRON - Bourns
INFINITRON - Bourns Instrs.
INFINITRON - Bourns Instrs.
INFOS - Data General
INLINE - Microwave Filter
INMAC PLUS - Inmac
INMOS - Inmos
INSET - Materials Resch.
INSTA-CODE - Panduit
INSTALINK460 - Micom Systems
INSTAMUX470 - Micom Systems
INSTAMUX470I - Micom Systems
INSTANT LETTERING - Datak
INSTANT OPTIMA - Scientific-Atlanta
INSTAR - Video Logic
INSTA-SET - Barber-Colman Co.
INSTA-TEST - Grand Transformers
INSTATHERM - Barnes Engrg.
INSTATRUNK480 - Micom Systems
INSTATRUNK480I - Micom Systems
INSUL-BOLT - Pylon Co.
INSULBOND - Permagile-Salmon
INSULCAST - Permagile-Salmon
INSULCON - Carborundum Co.

Add Dept. EM to address to tell them you saw it in EEM.

INSULCURE - Permagile-Salmon
INSULET - Pylon Co.
INSULETS - Thomas & Betts
INSULINER - Thomas & Betts
INSULINK - Burndy
INSULSPLICE - Autosplice
INSULTEK - Intl. Elctrn. Resch.
INSULTITE - Electronized Chemicals Co.
INSULUBE - Intl. Elctrn. Resch.
INSULUBE 448 - IERC
INSULUG - Burndy
INSU-SHIELD - Manhattan Electric Cable
INSU-SHIELD - Manhattan Elec Cable.
INTEGRAL SEAL - Parker Seal Grp.
INTEGRA-TEST - Varian Assocs.
INTELLIGENT DISPLAY - Siemens Comps.
INTELLIGENT 3270 - Mohawk Data Sciences
INTELLISPLAYS - National Semiconductor Optoelectronics
INTENNA - Microwave Filter
INTER-ACCESS - Elcom Industries
INTERCAP - International Comps.
INTERCEPT. - Intersil
INTERCETTE - Data Capture Technology
INTERCHECK - Guildline Instrs.
INTERCHIP - International Comps.
INTERDYNE UNIREEL - Data Capture Technology
INTERFACE 33 - Amco Engrg.
INTER-KEY - Atlantic Research
INTERKIT - International Comps.
INTERLIFE - Dixon Inds.
INTERLITE - International Comps.
INTERNATIONAL MITE - LH Research
INTERNATIONAL SERVICEMASTER - International Comps.
INTEROHM - International Comps.
INTERPACT - Dixon Inds.
INTERPIN - Interdyne Co.
INTERROSPONDER - Vega Precision Labs.
INTERSHAKE - Atlantic Research
INTERSPEC SWITCHES - Arrow Hart
INTERVIEW - Atlantic Research
INTERVOX - International Comps.
INTER-8-WEAVE - Magnetic Shield
INTEX-TALKER - Intex Micro Systems
INTRACON - Dynatech
INTRA-CONNECTOR - A P PRODUCTS
INTRALUX - American Volpi
INTRASCOPE - American Volpi
INTRASPOT - Vicon Inds.
INTRA-SWITCH - A P PRODUCTS
INTROVOICE - Voice Machine Comms.
INTUIT - Noumenon
INVERTRON - Behlman, California Instrs.
INVERTRON - California Instruments
INVERTRON - Elin
IN2 - Micro Component Technlg.
IOCHROME - Materials Resch.
I/O MODULE - Motorola Semiconductor
"ION-AIR" - Static
"ION-FLOW" - Static
IONOGRAPH - Alpha Metals
I/OS - GMR
IPAC - Instrumentation & Control Sys.
IPS - Dataroyal
IR-DETEC - Visual Communications Co.
IR EYE - IR Scientific
IRISCORDER - Hamamatsu Photonics K.K.
IRONCLAD - Exide.
IRON GRIP, V-GRIP - Equipto
ISC-108 - ERM
ISLATROL - Control Concepts.
ISOBASE - Endevco
ISOCHEM - Isochem Prods. Co.
ISOCHEMBOND - Isochem Prods. Co.
ISOCHEM STRIP - Isochem Prods. Co.
ISOCHEMTERGE - Isochem Prods. Co.
ISO-CURVE - Fenwal Elctrns.
ISODAMP - E-A-R
ISODRIVE - Zehntel
ISOFARAD - Sprague Elec. Co.
ISOFORMER - ACD-Elcor Products
ISO-GATE - Dionics
ISOGUARD - ISOREG.
ISOLENE - Hardman
ISOMUL - Isochem Prods. Co.
ISO-OHM - Ferro
ISO-PAK - Computer Prods.
ISO-PAK - Power Products
ISO-PAK - Power Products
ISO-PAK - Stevens-Arnold
ISOPLY - ACD-Elcor Products
ISOPODS - Hughes Aircraft Co
ISOPOLAR REFERENCE - Data Precision
ISOREX - ACD-Elcor Products
ISOSHEAR - Endevco
ISO-SHIELD - Belden
ISOSHIELD - ISOREG
ISOTHERM - Victory Engrg.
ISOTHERMAL - Motorola Semiconductor
ISOTRON - Endevco
ISOTRONICS - Isotronics
ISO-V-AC - VIZ Test Equipment
ISO-VERTER - Love Controls
ISO-VOLTS - Motorola Semiconductor
ISOWATT - RCA Solid State
ISO-WEAVE - International Instrumentation
I SUPPLY - Calex Mfg. Co.
I-T-E - Brown Boveri Elec.
ITECO - Industrial Test Equip.
ITRON - Noritake Elctrns.
IT-200 - Micro Component Technlg.
IVES - EECO
IXF - Piezo Technology
IXYS - IXYS
JACKEY - Allen Mfg.
JAICO - Jaidinger Mfg.
JANETTE - Eastern Air Devices Motor
JANSET - Jan Hardware Mfg. Co.
JART - Scientific Columbus
JBUG - Motorola Semiconductor
JED-1 - Scientific Columbus
JELLY BEANS - RDI/Reed Devices
JELLYCLEAN - Communications Technology
JEM - Howell Instrs.
JEM-1 - Scientific Columbus
JEM-2 - Scientific Columbus
JENSEN - Jensen Tools
JET - Scientific Columbus
JETCAL - Howell Instrs.
JET-FLECS - Molex
JETFLOW - Ajax Magnethermic
JET PLATER - Sel-Rex
JET PORT STOCK SERVICE - Bailey Controls Co.
JIF-TEMP - EDL
JOLTA - Jan Hardware Mfg. Co.
JONES - TRW Connector
JOTDRAFT - Datak
JUST-WRAP - OK Industries
KALAR - Hardman
KALENE - Hardman
KALEX - Hardman
KALOTRON - Thermosen
KARADIO - ATR Elctrns.
KARATCLAD - Sel-Rex
KARI - ZI-TECH Instr.
KARRY-ALL - Fancort Industries
K-BAR - Kurz Instrs.
K-CAPS - KDI Electronics
K CONNECTOR - Wiltron
K-D - Easco/K-D Tools
K-DET - Hurst Mfg.
KELVIN KLAMPS - Electro Scientific Inds.
KELVIN KLIPS - Electro Scientific Inds.
KEMET - Kemet, Union Carbide
KEMFUZE - Bel Fuse
KEMID - Norton Chemplast
KEPS - ICO-Rally
KEY CONNECTOR - XCP
KEYPHASOR - Bently Nevada
KEYTEK - Keytek
K-FILM - CSI Capacitors
K-FILM - Ferro
KGS-80 - Kogyosha
KIFIS - Kollsman Instr.
KILOBYTE CARD - Vertel
KILOBYTE READER - Vertel
KILO-PAC - Velonex, Instr.
KILOVOLT STAC - Semtech
KIMBAR - Schweitzer
KIMFAN - Schweitzer
KIMFOL - Schweitzer
KIMFONE - Schweitzer
KING Q - Vanguard Elctrns. Co.
KINGSPLICE - Autosplice
KINOPTIK - Heitz, Karl
KLEEN-ALL - Tech Spray
KLEEN LINE - Electronic Specialists
KLEENSTREAM - Beckman Instrs.
KLEEN-STRIP - National Wire & Cable
KLEENTROL - R-Columbia Prods. Co.
KLEER-PAK - Sprague Elec. Co.
KLINA - Beckman Instrs.
KLIP-BLOK - Vector Electronic Co.
KLIPPON - Weidmuller Terminations
KLIPRING - Waldes Kohinoor
KLIP SELS - International Rectifier
KLIPSOCKET - Chicago Switch
KLIPSOCKET - ITW Switches
KLIP STRIP - Vector Electronic Co.
KLIPTITE - Kulka Smith
KLIXON - Texas Instrs.
KNOBPOT - Bourns
KOA - KOA Speer Elctrns.
KOAOHM - KOA Speer Elctrns.
KOLEBINS - Kole Ind.
KONEKT-ALL - Jonard Inds.
KONFORM - Chemtronics
KONTACT CLEAN - Chemtronics
KONTACT RESTORER - Chemtronics
KONTACT 60 - Jonard Inds.
KOOL-CURE - UVP
KOOLER-GUIDE - UNITRACK
KOOLER-KAGE - UNITRACK
KOOLER-KROWN - UNITRACK
KOOL-TAINER - Birtcher.
KORLESS ELECTRODES - Uniform Tubes
KORONA-GUARD - Belden
KORTON - Norton Chemplast
KORVEX - Norton Chemplast
KRECO - Kreckman, Herb, Co.
KRONAGOLD - E/M Lubricants
KRONAPLATE - E/M Lubricants
KRYTERION 250 - Everett/Charles Test Equip.
KRYTERION 500 - Everett/Charles Test Equip.
KRYTERION 550 - Everett/Charles Test Equip.
K-SET - Michigan Magnetics
KSI - Hybrid Elctrns.
KSI - Kates Sci. Instrs.
KTNCASSY - Times Fiber Communications
K-TROL - Electrol Co.
KV-PAC - Semtech
KV PAC PLUS - Semtech
KVPAC SR. - Semtech
KWICK-KONNECT - Sealectro
KWIKI - Lightning Protection
KWIK-SNAP - Accurate Elctrns.
KWIK-TAB - Accurate Elctrns.
KWIK-TIE - Accurate Elctrns.
KWIK-WAY - Meyercord
KW PAC - Semtech
KYNAR - ICO-Rally
K40 - American Research & Engineering
LAB - TRW Inductive Products
LAB-DATAX - Data Translation
LA BELLE CRYSTAL - Saphikon
LAMBDA - Electrovert USA
LAMPLIGHTER - Cardinal Control Co.
LAMTAC - Hypertronics
LANCELOK - AMP
LAND - Zenith Components & Sys. Grp.
LAPFLO - Pace
LASE-A-LIGN - Laser
LASERBLADE - Penn Resch. (PRC)
LASERBLADE PROCESSOR - Penn Resch. (PRC)
LASER GEM - Laser Techn.
LASERSCAN - Penn Resch. (PRC)
LASERSCRIBE - Quantronix
LASERTRAC - Coherent
LASERTRAC - Laser
LASERTRIM - Apollo Lasers
LASTEC - Laser Techn.
LAT-CON - Panduit
LAVOLAIN - Star Porcelain
LAZARAN - Beckman Instrs.
L-BOX - IET Labs
LCA - Bacon Inds.
LC² MOS - Analog Devices
LEAD EDGE - Texas Instrs.
LEAK-PRUF - Alpha Metals
LE CARBONE - Carbone Lorraine Inds.
LECTRA-LOAD II - Power/Mate Co.
LECTR-AU-LYTE - Sel-Rex
LECTRODUCT - Lectro Magnetics
LECTROLESS - Sel-Rex
LECTRO LINE - Lectro Magnetics
LECTRO-NIC - Sel-Rex
LECTRO-PLAQUE - Simco Co.
LECTRO-QUIP - Illinois Lock Co.
LECTROSHIELD - Lectro Magnetics
LECTROVENT - Lectro Magnetics

LED - Allaco Prods.
LEDCO - Wilbrecht Elctrns.
LEDDICON - EEV
LED-EYE - Shelly Associates
LED-PAK - Dolan-Jenner Inds.
LEEBOND - Leepoxy Plastics
LEECAST - Leepoxy Plastics
LEE-STRIP - Atlee
LEKTRON - Paso Sound Prods.
LENSCOTE - Metavac
LEPAK - Lepel
LERLOY - Engineering & Elctrn. Devices
LEROY - Keuffel & Esser/Kratos
LEV CHEK - Hexacon Elec.
LEVELAIR - Electrovert USA
LEVEL-LINK - Transamerica Delaval
LEVEL-LOC - Shure Bros.
LEVEL/PAK - Square D Co.
LEVOLIER - McGill Mfg. Co.
LGH - AMP
LG-1 - Analog & Digital Peripherals (ADPI)
LIBAT - Plainview Elctrns.
LID - Amperex Elctrn.
LIFEGARD - Antenna Specialists
LIFEGARD II - Antenna Specialists
LIFELINE - Instrumentation & Control
LIGHT WATCHMAN - Ripley
LILBUG - Motorola Semiconductor
LIL ELF - Data-Design Labs.
LIMITRON - Bussmann
LINE BACKER - Antenna Specialists
LINE CHECK - Electronic Specialists
LINE ELECTRIC - Line Elec. Prods.
LINEGARD - SGL Waber
LINEMATE - Coherent Communications
LINE MISER - Gandalf Data
LINE-O-LITE - Industrial Devices
LINEPLEXER - Timeplex
LINE-SAVER - Kalglo Elctrns. Co.
LINE SWITCH 25 - TRW Connector
LINE TAMER - Shape Magnetronics
LINE 2 - Topaz Electronics
LINISTOR - Keystone Carbon
LINK - Motorola Semiconductor
LINK/CHEK - Com/Tech Systems
LINK II - Motorola Semiconductor
LINK/1 - Timeplex
LISA - Centigram.
LITE - United Foam Plastics
LITE-MIKE - EG&G
LITHIODE - Catalyst Research
LITHOCON - Princeton Elctrn. Prods.
LITTELITES - Littelfuse
LITTEL JAX - Switchcraft
LITTEL PLUG - Switchcraft
LITTEL SWITCH - Switchcraft
LITTLE CAESAR - ITT Cannon
LITTLE DEVIL - Ohmite Mfg. Co.
LITTLE DIPPER - Techni-Tool
LITTLE GEM - Equipto
LITTLE GEM - Sjoberg, C., & Son
LITTLE GRIPPER - Techni-Tool
LITTLE-MITE - LH Research
LITTLE REBEL - Ohmite Mfg. Co.
LITTLE 7 - Holub Industries
LITTL-LYTIC - Sprague Elec. Co.
LMB - LMB Heeger
LOADGARD - Helm Instr. Co.
LOAD-LEVELER - Solid State Systems
LOADMAX - Raytheon Ocean Sys. Co.
LOAD-PAK - Transamerica Delaval
LO CAP - Consolidated Electronic Wire & Cable
LOCKIT-SOCKET - U.S. Terminals
LOCK-O-SEAL - Parker Seal Grp
LOCKTITE - Thomas & Betts
LOCKWELL - Hartwell
LO-COG - Pittman
LOCO II - Motorola
LOCOST - Julie Resch. Labs.
LOC-TRAC - Alpha Wire.
LO-EX - WALTER KIDDE
LO-G - Barry Controls
LOGCELL - Fifth Dimension
LOG DAC - Analog Devices
LOGICAL CONNECTION - A P PRODUCTS
LOGICATOR - Bowmar Instrument
LOGIC II - B & B Motor & Control
LOGIC TIMER - Durgin & Browne
LOGISCOPE - Intech
LOGO-LITE - Zero
LOHMETER - Alpha Comps.
LOKON - Allen Mfg.
LOK-TAINER - Birtcher.
LO-MITE - Ohmite Mfg. Co.
LONGFELLOW - Waters Mfg.
LONGHAIR - Stanton Magnetics
LONG LIFE - Berg, W. M.
LONG RANGER - Automatic Timing & Controls Co.
LO OM METAL ELEMENT RESISTORS - Shallcross
LO-PROFILE - Aries Elctrns.
LORAIN - Lorain Prods.
LO-RISE SOCKETS - Wells Elctrns.
LO-SMOKE - BIW Cable Sys.
LOW-PEAK - Bussmann
LOW-VAR - Republic Elctrns.
LOXARMOR - Okonite
LOX THERMISTOR - Victory Engrg.
LPB - Unimax Switch
LPKF - LPKF Pacific
LPS - Holt Lloyd
LR SERIES - E & L Instruments
LSC - Saphikon
LSHV - BIW Cable Sys.
LS-900 - Video Logic
LTN & LTNM - Fenwal Elctrns.
LUBE-LOK - Electrofilm
LUBRI-BOND - Electrofilm
LUBRI-SHINE - Tech Spray
LUCALOX CERAMIC - General Electric
LUCKY LOGGER - Venable Industries
LUFKIN - Cooper Group
LUFT - Luft Instrs.
LUG-IT - Thomas & Betts
LUMAPAC - EWC
LUMI - Chrono-log
LUMIGRAPH - Sigma Instrs.
LUSTRAN ABS - Monsanto Co.
LUSTREX - Monsanto Co.
LUSTRE-ZINC - Titchener, E. H., & Co.
LUXICON - Dolan-Jenner Inds.
LVA - TRW
LX-CJ - Omega Engrg.
LXD - General Electric Co.
LYRIC - EG & G Rotron
MACO - Barber-Colman Co.
MACOR - Corning Glass Works
MACROLOADER - Macrolink
MACRO-T - Motorola Semiconductor
MACRO TMA - Step Engineering
MACRO-X - Motorola Semiconductor
MACSBUG - Motorola Semiconductor
MACSYM - Analog Devices
MAE - Lundy Elctrns. and Systems
MAGCENTRIC - Midland-Ross., Cambion
MAGIC TIP - Hunter Tools
MAGI-START - Vernitron Piezoelectric
MAG-MASTER - Magnum Elec.
MAGMOD - General Magnetics
MAGNAGUIDE - Electron
MAGN-A-PAK - International Rectifier
MAGNA Q - Vanguard Elctrns. Co.
MAGNA-SET - Princo Instrs.
MAGNASHIELD - SGL Electronics
MAGNATORC - IMC/Hansen
MAGNA-VISUAL - Jobmaster
MAGNEFORM - Maxwell Labs.
MAGNEMETRICS - Walker Scientific
MAGNEPAINT - Micro-Circuits Co.
MAGNESEARCH - RFL Inds.
MAGNE-SETTE - Temescal
MAGNESIL - Magnetics
MAGNESTIR - Lab-Line Instrs.
MAGNETIC MEDIA PRESERVERS - Magnetic Shield
MAGNETIC TWEEZER - Orbit Inds.
MAGNETOOL - Jobmaster
MAGNETREATER - RFL Inds.
MAGNETTE - Heinemann Elec. Co.
MAGNION - Walker Scientific
MAGNI-WHIRL - Blue M, A Unit of General Signal
MAGNUM - Unitrode.
MAGSTRIP - Magnum Elec.
MAGSTRIPE - American Magnetics
MAGTECH - Magnetic Technology
MAGTERM - Magnum Elec.
MAGTERM - Zierick Mfg.
MAINTAINER - IVEK
MAJOR - EG & G Rotron
MANCHEX - Exide
MANIX MFG - Mann, Henry
MANSON - Okonite
MAN-TRIX - Mantex
MANUMATIC - Varian Assocs.
MAN-U-SERT - Universal Instrs.
MARAGLAS - Acme Chem. & Insulation
MARASET - Acme Chem. & Insulation
MARCOFLEX - Oak Switch Sys.
MARELCO - Marel Instr. Co.
MARINEFAX - Alden Elctrns.
MARINE-MATE - Bird Elctrn.
MARK C - Cole Instr.
MARK-EL - Acme Model Engrg. Co.
MARKET-COM - Alphone
MARKETTE - Memorex
MARK I - Technical Devices
MARK II - Technical Devices
MARK III - Technical Devices
MARK IV - Omega Engrg.
MARK IV - Technical Devices
MARK IX - Technical Devices
MARK TEN B - Delta Prods.
MARK V - Technical Devices
MARK VI - Technical Devices
MARK X - Memorex
MARK XI - Memorex
MARK 4 - Auto-trol Tech.
MARNAV - Markat
MARZ - Materials Resch.
MAS - TRW Inductive Products
MAS-CON - Panduit
MASQ-MATIC - Sel-Rex
MASSBUS - Digital Equip.
MASTERCHIP - Master Logic
MASTERCOUNT - Master Elctrn. Controls
MASTERELAY - Master Elctrn. Controls
MASTER FLAMELESS HEAT GUN - Master Appliance
MASTERFLASH - Master Elctrn. Controls
MASTER FLOW - Master Appliance
MASTER-MITE - Master Appliance
MASTERTIME - Master Elctrn. Controls
MAT - TRW Inductive Products
MATEC - Motorola Semiconductor
MATE-N-LOK - AMP
MATE-N-LOK - AMP Products
MATHPAC - Acurex-Autodata
MATRI DOT - Practical Automation
MATRIX IV - Zero
MAXBRITE - Melles Griot
MAX-C - Sprague-Goodman Elctrns.
MAX-COAX - Skan-A-Matic
MAX-E-PITCH - Berg, W. M.
MAX I - Leeds & Northrup Instrs.
MAXI-COLOR - Belden
MAXI-DRY - FTS Sys.
MAXIPOWER - Trio Labs.
MAXI-QUBE - American Tech. Ceramics
MAXI-6 SHIELD - Computer Prods.
MAXI-6 SHIELD - Power Products
MAXI-6 SHIELD - Stevens-Arnold
MAXXI-MIXXER - CHEM-MIXX
MCI-II - Hollis Engrg.
M.C.M. - Electro-Craft
MCS -ersified Case Co.
MCSL - Electro-Craft
MCT - Micro Component Technlg.
MCT-2000 - Micro Component Technlg.
MC-20 - Excellon Automation
MC-30 - Excellon Automation
MDC - Maida Development Co.
MDOS - Motorola Semiconductor
MDS - Mohawk Data Sciences
MDTL - Motorola Semiconductor
MD-001 - Eaton., Test Sys.
MD-300 - Eaton., Test Sys.
MEA - Mechanized Electronic Assembly
MEASUROMETER - Analogic
MECL - Motorola Semiconductor
MECL II - Motorola Semiconductor
MECL III - Motorola Semiconductor
MECL 10,000 OR MECL 10KH - Motorola Semiconductor
MECL 10K - Motorola Semiconductor
MECL 10KH - Motorola Semiconductor
MEDI-SAFE - Brand-Rex
MEGALINK - Computrol Kidde Automated Sys.
MEGANET - Megatest
MEGAPLEX - Computrol Kidde Automated Sys.
MEGASORB - Varian Assocs.
MEGATROMETER - Penn Airborne Prods.
MEGAVOICE - Paso Sound Prods.
MEG-CHEK - Associated Research
MEGMETER - Ross Engrg.
MEG-O-VOLT - Sperry, A. W., Instrs.
MEGRAPHIC - Megatek.
MEKTHERM - Rogers

Add Dept. EM to address to tell them you saw it in EEM.

MEKTRON - Rogers Corp.
MELACEL - Pall Trinity Micro
MELDIN - Dixon Inds.
MEL TEC - Mel Tec
MEMBUS - Motorola Semiconductor
MEMORASE - UVP
MEM-O-REE - Mylee Digital Sciences
MEMOTRON - Hughes Aircraft Co.
MEMPAC - Varta Batteries
MET - Sprague Elec. Co.
MET - TRW Inductive Products
META-CAST - Mereco Products
META-DUCT - Mereco Products
METAL ANALYZER - Sensor
METALARC - GTE Sylvania Lighting Prods.
METALAST - Electro Physics
METALASTIC - Chomerics
METAL DEVIL - Ohmite Mfg. Co.
METALEX - Chomerics
METAL GLAZE - TRW Resistive Products
METAL-MITE - Ohmite Mfg. Co.
METALOK - Burndy
METAL SORTER - Sensor
METAL V-SEAL - Parker Seal Grp.
METAMETER - Bristol Babcock
METANET - Sprague Elec. Co.
METAPART - Mereco Products
METASIGNATURE - Bristol Babcock
METATERGE - Mereco Products
METATRONIC - Bristol Babcock
METEOR - E² Technology
METFILM - Sprague Elec. Co.
METH-PREP - Alltech Assocs.
MET-L-FLEX - Barry Controls
MET-LOC - Deutsch Fastener
METOXILITE - Semtech
METRE GRIP - Mereco Products
METRI-GAP - Lion Precision
METRISITE - Gould
METRO-COLOR - Belden
METROLOGGER - Metrosonics
METRON - Metron Optics
METRON MARKER - Metron Optics
METROREADER - Metrosonics
ME-2 - Scanbe
MG - MG Electronics
M-GAGE - Tencor Instr.
M/G ULTRA TEST - General Hardware Mfg.
MHO-GUN - Beckman Instrs.
MHTL - Motorola Semiconductor
MHW - Phoenix Wire
MICAL - Topflight
MICAMP - Avantek
MICAP - Tobe Deutschmann Labs.
MICAPAK - Mica
MICAPLY - Mica
MIC-PAC - Microwave Semiconductor
MICRICON - Research
MICRISTAR - Research
MICRO-ACOUSTIC - Frazier
MICRO-AMPSYN - CGIS, A COMSAT Co.
MICROAUTOSTAT - Static
MICRO BEAD - Victory Engrg.
MICROBUG - Motorola Semiconductor
MICROCAP - American Tech. Ceramics
MICROCELL - Kistler-Morse
MICRO CHART - Micro Logic
MICROCLAREED - Clare
MICRO-CLEAN - Hollis Engrg.
MICROCOAX - Uniform Tubes
MICRO-COMPACT - CGIS, A COMSAT
MICRO-C/PROBE - International Instrumentation
MICRODATA 1600 - Microdata
MICRODATA 32/S - Microdata
MICRODATA 3200 - Microdata
MICRODATA 400/10 - Microdata
MICRODATA 800 - Microdata
MICRO-DIP - EECO
MICRODRY - Microdry
MICROFIBRE - Balston
MICRO-FILE - Scanbe
MICRO-FILTER - RFI
MICROFLASH - EG&G
MICROFLECTOR - Microflect
MICROFLEX - Eagle Signal Controls
MICRO-FOIL - RdF
MICROFORK - Murata Mfg. Co.
MICROFUGE - Beckman Instrs.
MICRO-GATOR - Mueller Elec. Co.
MICRO HANDLER - Bulova Sys. & Instr.
MICROHEX - Sealectro
MICRO I - Delevan
MICRO-J - Johnson, E. F., Co.
MICRO-JAX - Switchcraft
MICROJOULE - Scientific Columbus
MICROKEY - Advanced Input Devices
MICRO-KLEAN II - AMF
MICROLAB - Beckman Instrs.
MICRO-LINE - Thermoplastic Processes
MICRO-LOC - Motion Sys. Co.
MICROLOSS - Coax Devices
MICROMASTER - Inmac
MICRO-MASTER - Keuffel & Esser/Kratos
MICROMATE - Personal Micro Computers
MICRO MATRIX - Digital Labs.
MICRO MELT - Ajax Magnethermic.
MICRO-MINAC - Singer Co.
MICROMINIM - Standard Wire & Cable
MICRO-MITE - Vibra-Metrics
MICROMODULE - Motorola Semiconductor
MICRONET - Sidereal.
MICRONIK 100 - Honeywell
MICRONOVA - Data General
MICRONOX - Caddock Electronics
MICRO-OPTIC - Dolan-Jenner Inds.
MICRO-PAC - Semtech
MICROPAC - Xycom
MICROPAINT - Micro-Circuits Co.
MICROPAN - Vicon Inds.
MICROPIN - ITT Cannon
MICRO PLAS - Micro Plastics
MICROPLEXER - Timeplex
MICRO-PLUG - Switchcraft
MICROPORT 8 - Telesis Laboratory
MICROPOWER - Nova Elec.
MICRO POWER - Rayovac
MICROPROBE - Huntron Instrs.
MICROPROCESS - University Computing
MICRO-PROFESSOR-MPF - Multitech Elctrns.
MICROPROX - Bently Nevada.
MICROPUCK CIRCULATORS AND ISOLATORS - TRAK Microwave
MICRORANGER - Sencore
MICROREG - Sierracin/Power Systems
MICROSCAN - Vicon Inds.
MICROSCANNER - Photo Resch.
MICRO-SCREEN - AMF
MICROSCRIBE - Houston Instrument
MICROSEAL - E/M Lubricants
MICROSERIES - Datak.
MICROSERIES - Itek Measurement Sys.
MICRO-SLIDE - Grant Hardware Co.
MICROSOCKET - ITT Cannon
MICROSOL - ITT General Controls
MICROSPOOLER - Consolink
MICRO SPRINT - Qume
MICRO-STAC - Semtech
MICRO-STEDI - Hexacon Elec.
MICROSTEPPER - Mesur-Matic Elctrns.
MICROSTREAMER - Cipher Data Prods.
MICRO-SYNCLAMPS - Timber-Top
MICROSYSTEM 2 - Applied Micro Technlg.
MICROSYSTEM 3 - Applied Micro Technlg.
MICROSYSTEM 4 - Applied Micro Technlg.
MICROSYSTEM 6/10 - Honeywell Info. Sys.
MICRO-T - Johnson, E. F., Co.
MICRO-T - Motorola Semiconductor
MICRO TECH - Sprague Elec. Co.
MICROTEMP - Micro Devices Product Group
MICROTENN - Tenney Engrg.
MICROTESTER - Microtest Systems
MICROTIP - Heat Systems-Ultrasonics
MICROTOUCH KNOBS - Microavionics
MICROTOX - Beckman Instrs.
MICRO UPOWER-DIP - Integrated Circuits
MICRO UPOWER-MINI - Integrated Circuits
MICRO-UPS - Cuesta Systems
MICRO-VECTORBORD - Vector Electronic Co.
MICRO VIEW - Micro Logic.
MICROWAFER - Stanton Magnetics
MICROWAVE RESINS - Sigma Plastronics
MICROWIPE - Clean Room Prods.
MICROWIRE - PCK Technlg./Kollmorgen
MICRO WYND II - AMF
MICROYRE - Tensolite
MICROZONE - Beckman Instrs.
MICRO ZOOM MICROSCOPES - Bausch & Lomb, S.O.P.D.
MICRO 9 - Penn Resch. (PRC)
MIDA - Motorola Semiconductor
MIDAS TOUCH - International Instrumentation
MIDAX - Data Translation
MIDGET - Midget Louver
MIDGET - Sprague Elec. Co.
MIDGI-DIAL - Theta Instr.
MIDGIE - Aptronics
MID-RISE SOCKETS - Wells Elctrns.
MID-TEMP. - Fenwal Elctrns.
MIGHTY-MITE - LH Research
MIGHTY MITE - Sencore
MIKBUG - Motorola Semiconductor
MIL-ENE - Gore, W. L., & Assocs.
MIL-ENE 783551 - Gore, W. L., & Assocs.
MILLIKEN - Teledyne Camera Sys.
MILLITORR - Varian Assocs.
MIL-LOC - Deutsch Fastener
MILMASTER - Electron-Machine
MIL-ON 941877 - Gore, W. L., & Assocs.
MIL POWER - Trio Labs.
MILROS - Alpha Metals
MIL-SPEC COMPUTERS - Rolm
MINA - MPB
MINAPAR - MPB
MINAPURE - MPB
MIND - Contel Info. Sys.
MINEAC - Barnes Engrg.
MIN-E-PITCH - Berg, W. M.
MINERALIGHT - UVP
MINI-AKTOR - Alltech Assocs.
MINIATURE - DAN-L
MINI BEE - Hurst Mfg.
MINI BITE - Minelco - A Talley Ind.
MINIBLOC - Motorola Semiconductor
MINI-BLOK - Bivar
MINIBOX - Westlake Capacitors
MINI-BREAKER - Mechanical Products
MINIBRIDGE - Elctrn. Devices
MINIBUG OR MINIBUG - Motorola Semiconductor
MINI-BULK - Baron-Blakeslee
MINI/BUS - Rogers.
MINIBUTTON - Digitran Co.
MINICAM - Alan Gordon Entprs.
MINI-CATOR - Industrial Devices
MINICHINE - Pace
MINI-CONSOLE - Techmar
MINICOUNTER - Veeder-Root
MINI-CUBE - American Tech. Ceramics
MINI-DATA RECORDER - Raymond Engrg.
MINI-DEK - Braemar Computer.
MINI-DIAL - Theta Instr.
MINIDIP - Corning Glass Works
MINI-DIP - EECO
MINIDISC PACKAGE - Hughes Aircraft
MINIDISKETTE - Shugart Assocs.
MINI-DOT - Industrial Devices
MINIDUCTOR - TRW Inductive Products
MINIFAX - Alden Elctrns.
MINIFILE® - Computer Devices
MINIFLOPPY - Shugart Assocs.
MINIFLYX - Brim Elctrns.
MINI-GATOR - Mueller Elec. Co.
MINIGRAPH - Esterline Angus
MINIGUN - Raychem.
MINI HANDLER - Bulova Sys. & Instr.
MINIKEY - Digitran Co.
MINILEVER - Digitran Co.
MINILOAD - Bird Elctrn.
MINILOK - Burndy
MINILYTIC - Sprague Elec. Co.
MINI/MATE - Power/Mate Co.
MINI-MATE - Stanford Applied Engrg.
MINIMATHPAC - Acurex-Autodata
MINI-MAX - Union Carbide
MINIMAX/LSI - Teradyne Connection Sys.
MINI-METER - Sperry, A. W., Instrs.
MINI-METOXILITE - Semtech
MINI-METRIC - Allen-Bradley Co.
MINI MICROTEMP - Micro Devices Product Group
MINI-MIKE - Chicago Switch
MINI-MIKE - ITW Switches
MINI MITE - Thermo Elec.
MINI-MIX - Switchcraft
MINI MODEM - Cermetek Microelectronics

MINI-MONITOR - Bird Elctrn.
MINI-MOUNTS - Christiansen Radio
MINI-NET - Centralab
MINI-PAL - Sundstrand Data Control
MINI-PRINT - Veeder-Root
MINIPROBE - Sperry, A. W., Instrs.
MINIPROGRAMMER - Cole Instr.
MINI-RAYCORDER - Raymond Engrg.
MINISAT - Powertech
MINISEAL - Raychem.
MINI-SENSOR - Ametek/Rodan
MINISERT - Berg Elctrns.
MINISERVO - Esterline Angus
MINI-SLIDE - Industrial Devices
MINISPLICE - Autosplice
MINISTAC - Semtech
MINISTAC FAST - Semtech
MINISTEPPING - Metis
MINISTIC - Semtech
MIN-ISTOR - Quality Thermistor
MINI-STUD - Semtech
MINISWITCH - Digitran Co.
MINI-SYNCLAMPS - Timber-Top
MINI-T - Motorola Semiconductor
MINITAC - Hypertronics
MINITAN - Corning Glass Works
MINIT-CURE - Allaco Prods.
MINI-TECH - International Data Sciences
MINITERM - Computer Devices
MINI-TEST - International Data Sciences
MINITHIN - Thermax Wire
MINITRIEVE MH - Lyon Metal Prods.
MINI TRIM - Kappa Networks
MINNI E - Amphenol
MINNISCRUBBERS - Tech Spray
MINOS - Beckman Instrs.
MINPAC - Watkins-Johnson Co.
MIN-TAUR - Nova Elec.
MIPS - Tasker Systems
MIRA-BRITE - International Wire Products Co.
MIRROPANE - Libby Owens-Ford
MISER - Teradyne Connection Sys.
MIXER MASTER - Veeder-Root
MIX-KIT - Hardman
MKS - Centralab
MKS BARATRON - MKS Instrs.
MKS PROTEC-TORR - MKS Instrs.
MK 280 - Yardney Battery
MK-60 - Yardney Battery
MK-95 - Yardney Battery
MLP - American Tech. Ceramics
MLZ-DAQ - Heurikon
MLZ-VDC - Heurikon
MLZ-90 - Heurikon
MLZ-91 - Heurikon
MLZ-92 - Heurikon
MLZ-93 - Heurikon
MMD-1 - E & L Instruments
MMMOST - TeleVideo Sys.
MM200 - TransKinetic Sys.
MOBUSORB - Motorola Semiconductor
MODBUS - Gould
MODCOM-C - Virginia Plastics Co.
MODCON - Stanford Applied Engrg.
MODEL T - Hurst Mfg.
MODEL 204 - Computer. of America
MODEMULATOR - Com/Tech Systems
MOD-FIELD - Dataprobe
MODICON - Gould
MOD POT - Allen-Bradley Co.
MOD-U-BOX - CTS Metal Prods.
MODUCAL - Pannier.
MODU/FLEX - Industrial Fabricating Co.
MODULAIR - EG & G Rotron
MODULAR CASE SYSTEM -Diversified Case
MODULAR SOFTWARE - Applied Micro Technlg.
MODULASONE - Adaptive Science
MODULE-MASQ - Sel-Rex
MODULE-MATIC - Sel-Rex
MODULENS - Pannier
MODULE-X - Sel-Rex
MOD-U-LINE - CTS Metal Prods.
MODULINE - Oak Switch Sys.
MODULITE - Pannier
MODUL/MATIC PTM-11 - Lektra Labs.
MODULOAD - Bird Elctrn.
MODULOK - Burndy
MODULYNX - Superior Elec. Co.
MODUPAC - Analogic
MODUPERF - Data Specialties
MODUPULSE - Vicon Inds.
MODU-RAY - Kalglo Elctrns. Co.
MOD-U-SERT - Universal Instrs.
MODUTRIM - Sprague-Goodman Elctrns.
MODVUE - Gould
MODWAY - Gould
MOHAWK - EG & G Rotron
MOISTURPUMP - Electro Impulse
MOKEP - Motorola Semiconductor
MOLAN - Harrel
MOLD-EASE CONC. PCR - Merix Chem.
MOLDED HEAT - Sierracin/Thermal Sys.
MOLECULOY I, II, III - Molecu-Wire
MOLEX - Waldom Elctrns.
MOLGARD - Ram Chemicals Whittaker
MOLINDICATOR - Alltech Assocs.
MOLYDAG - Acheson Colloids
MOLYKOTE - Dow Corning
MONARCH - Carter Motor
MONITOR SYSTEM - Beckman Instrs.
MONITROLLER - Analogic
MONITRON - Dennison Kube
MONITRONIX - TransKinetic Sys.
MONOBRID - ILC Data Device
MONOCERAM - SFE Technologies
MONOCHIP - Interdesign
MONOCHIP - Master Logic
MONO-GLASS - Centralab
MONO-KAP - Centralab
MONOLYTHIC - Sprague Elec. Co.
MONO-PAK - Centralab
MONOPANEL - Centralab
MONOPAX - Tra-Con
MONOPLEX - Shure Bros.
MONOPOXY - Hardman
MONTAC - Monsanto Co.
MON-X - Monsanto Co.
MOPS - Codi Semiconductor
MOPS - Trio Labs.
MORNICK - COSAR
MOR-PAC - Semtech
MOS - Baker, J. T., Chemical Co.
MOS - Microwave/Sys.
MOSAIC I - Motorola Semiconductor
MOSAIC II - Motorola Semiconductor
MOSP - Microwave/Sys.
MOTEST - Motorola Semiconductor
MOTOCHIP - Motorola Semiconductor
MOTOGARD - Power Control
MOTOMATIC - Electro-Craft
MOTOR MIKE - Oriel.
MOUSEWINDOW - Mouse Sys.
MOVIE MASTER - Di/An Controls
MP - Tech Spray
MPC - Maury Microwave
MPC MULTI-PROCESSOR CONTROL - Delta Design
MPF - Maury Microwave
MP-30 - Alan Gordon Entprs.
MP 44 - Gulton Inds.
MP 80 - Gulton Inds.
MR. BATTERY - N.C.E.
MR. BATTERY - Power Group International
MRC - Milwaukee Resistor.
MR. CLEAN - Chicago Switch
MR. CLEAN - ITW Switches
M/R THERMALEZE - Phelps Dodge Magnet Wire
MSI - Magnetic Systems
MSP - Joslyn Elctrn. Sys.
MS-111 - Miller-Stephenson Chem. Co.
MS-122 - Miller-Stephenson Chem. Co.
MS-160 FREON - Miller-Stephenson Chem. Co.
MS-170 1,1,1 - Miller-Stephenson Chem. Co.
MS-175 FREON - Miller-Stephenson Chem. Co.
MS-180 FREON - Miller-Stephenson Chem. Co.
MS-185 FREON - Miller-Stephenson Chem. Co.
MS-190/MS-190 HD - Miller-Stephenson Chem. Co.
MS-200 - Miller-Stephenson Chem. Co.
MS-220 AERO-DUSTER - Miller-Stephenson Chem. Co.
MS-226 COBRA - Miller-Stephenson Chem. Co.
MS-230 CONTACT RE-NU - Miller-Stephenson Chem. Co.
MS-238 CONTACT RE-NU & LUBE - Miller-Stephenson Chem. Co.
MS-240 QUIK-FREEZE - Miller-Stephenson Chem. Co.
MS-260 - Miller-Stephenson Chem. Co.
MS-266 EN-STAT - Miller-Stephenson Chem. Co.
MS-450 - Miller-Stephenson Chem. Co.
MS-460 - Miller-Stephenson Chem. Co.
MS-465 - Miller-Stephenson Chem. Co.
MS-470 - Miller-Stephenson Chem. Co.
MTM - Raymond Engrg.
MTNS - General Instrument
MTOS - General Instrument
MTTL - Motorola Semiconductor
MU-ATHENA - Metis
MU-CAPS - Republic Elctrns. Corp.
MUCON - Republic Elctrns.
MUFFIN - EG & G Rotron
MULILINK - Davong Systems
MULTI-BEAM - Banner Engrg.
MULTI-CAGE - Electronic Solutions
MULTI-CJ - Omega Engrg.
MULTI-COMP - Sprague Elec. Co.
MULTI-CONN - Vector Electronic Co.
MULTI-COOL - FTS Sys.
MULTICORE - Multicore Solders
MULTI/COUNT - HH Controls Co.
MULTIDEX - Oak Switch Sys.
MULTIDIAL - Spectrol Elctrns.
MULTIDUCTOR - Ajax Magnethermic
MULTIFIRE - Ferro
MULTIFLASH - EG&G
MULTIFLEX - Gordon, Claud S., Co.
MULTIFLEX - National Electric Cable
MULTIFORM - Corning Glass Works
MULTIGARD - Helm Instr. Co.
MULTIMAX - Sanders Assocs.
MULTI MITE - Thermo Elec.
MULTIMOD - Powertec
MULTI-MODE TONOTRON - Hughes Aircraft Co.
MULTI-MODULE - Universal Instrs.
MULTI-OS - Davong Systems
MULTI-PAC - Elfab.
MULTI PAK - Data-Design Labs.
MULTIPAK - Gordon, Claud S., Co.
MULTI-PAK - Motorola Semiconductor
MULTIPAK - PTX-Pentronix
MULTI PICTURE SYSTEM - Evans & Sutherland Computer
MULTIPLE MICROFLASH - EG&G
MULTIPLIER - Hollingsworth Solderless Terminal Co.
MULTI-POINT - EDL
MULTIPOWER - Trio Labs.
MULTI-PRODUCT WAFER - VLSI Technology
MULTI-PURE - Multicore Solders
MULTI-PURGE - Alltech Assocs.
MULTIREED - Thermosen
MULTISPOOL - Digital Labs.
MULTI-STATION - Spectragraphics.
MULTISTRIKE - Qume
MULTI-STRIP - Gore, W. L., & Assocs.
MULTI-STRIP 834484 - Gore, W. L., & Assocs.
MULTI-SWAGE - Bead Elctrns.
MULTI-SWITCH - Switchcraft
MULTISYN - Del Elctrns.
MULTITERM - A & B Technical Services
MULTI-TERM - Stanford Applied Engrg.
MULTI-TET - Gore, W. L., & Assocs.
MULTI TOOL - Grover Patent Products
MULTI-TOTE - Veeder-Root
MULTI-TRAN - Sperry, A. W., Instrs.
MULTITUBES - Casso-Solar
MULTIWIRE - Multiwire
MULTIWIRE - PCK Technlg./Kollmorgen
MUSIC LOVERS - Shure Bros.
MU-STAT - Princo Instrs.
MV EZ KLEEN - Research Prods.
MXM-100 - TransKinetic Sys.
MX2503 - Meterex
MX2570 - Meterex
MX2572 - Meterex
MX2575 - Meterex
MX2578 - Meterex
MX3501 - Meterex
MX3505 - Meterex
MX7107D - Meterex
MYSTAIRE - Heat Systems-Ultrasonics
MYSTR - Waters Mfg.
M100 - Brelonix
M2 PATCH - International Instrumentation
M-200 - Dataproducts
M9 - Penn Resch. (PRC)
NAFOAM - National Wire & Cable
NAFOIL - National Wire & Cable
NANALINE - Bel Fuse
NANOHEX - Sealectro

NANO-SKAN - Skan-A-Matic
NANOTIP - Heat Systems-Ultrasonics
NANOTRAN - Computer Prods.
NANOTRAN - Stevens-Arnold
NARRATOR - General Instrument
NARROW-CAPS - Republic Elctrns.
NATIONAL - Union Carbide
NAVITAR - D. O. Industries
NAVLINE - Veeder-Root
NAVTRAK - EDO Western
NCE - Alan Gordon Entprs.
NCS 100 - Atlantic Research
NEG'ATOR - Ametek, Inc
NELCO - Whittaker.
NELSON - Nelson Stud Welding TRW
NELSON-ROSS - Polarad Elctrns.
NEPTUNE - SFE Technologies
NETIC - Magnetic Shield
NETPAC - Acurex-Autodata
NETRIM - Weston Controls/Pots
NETWORK 90 - Bailey Controls Co.
NEUTRICON - Neutrik Products
NEUTRIK - Neutrik Products
NEUTROLOY - Molecu-Wire
NEUTROLOY NSX - Molecu-Wire
NEUTRONEX - Sel-Rex
NEUTRO-STAT - Simco Co.
NEWDAMP - Bacon Inds.
NGK - NTK Technical Ceramics
NICAD - SAFT America
NICHOLSON - Cooper Group
NICKEL-PLUS - International Wire Products Co.
NICKELPLY - National-Standard Co.
NICKEL SWITCH - CTS Fabri-Tek
NICORO - GTE Wesgo Technical Ceramics & Metals
NICORO 80 - GTE Wesgo Technical Ceramics & Metals
NICUSIL 3 - GTE Wesgo Technical Ceramics & Metals
NIGHTSUN - Spectrolab
NIGUARD - AVX
N II - Genisco Memory Prods.
NIORO - GTE Wesgo Technical Ceramics & Metals
NISENSOR 35 - Molecu-Wire
NITROPHYL - Rogers
NOALOX - Ideal Industries
NOBRUSH - Georator
NO-FRILLS - Micom Systems
NOHKEN - ZI-TECH Instr.
NO-MAR - PIC Design
NO-NIK - Clauss Cutlery Co.
NONTACT - Trans-Met Engrg.
NONTACT VISITEMP - Trans-Met Engrg.
NORAC - BIW Cable Sys.
NORBATHERM - Cross Elctrns.
NORDBAK - Rexnord Chemical Prods.
NORELCO - North American Philips Lighting
NORFA - Elnik Instrs.
NORPAK LOGIC MODULES - Square D
NORSMAN - Viking Connectors
NORTH SEEKER - Humphrey
NO-SLIP - PIC Design
NOVA- - Data General
NOVA CONTROLS - B & B Motor & Control
NOVA (DIMMERS) - Lutron Elctrns.
NOVADISC - Data General
NOVIMIDE - Isochem Prods. Co.
NOXIDE - Solder Absorbing Technology (SAT)
NP-7 - Gulton Inds.
N-S ROCKET WIRE - National-Standard
NTK - NTK Technical Ceramics
NTKK - NTK Technical Ceramics
NU-BLAC - Star Porcelain
NUCLESTAT - NRD
NUCON - TRW Cylindrical Connector
NU DATA - Nu Data
NULL-KOTE - Princo Instrs.
NU-LOK - TRW Cylindrical Connector
NUMERIPATH - Giddings & Lewis Elctrns.
NUMERIPOINT - Giddings & Lewis Elctrns.
NURL-LOC - Elctrn Molding.
NUSYN - Mesur-Matic Elctrns.
NUTSERT - Avibank Mfg.
NVRM - Catalyst Research
NVRM 2 - Catalyst Research
NYEBAR - Nye, William F.
NYETACT - Nye, William F.
NYGRIP - Weckesser Co.
NYLAFLOW - Polymer
NYLASINT - Polymer
NYLATCH - Hartwell
NYLATRON - Polymer
NYLEZE - Phelps Dodge Magnet Wire
NYLOCLIP - Burndy
NYLOX - Hardman
NYMPH - SaRonix
NYTYE - Heyco Molded Products
NYZIN - Yardney Battery
N-ZEMS - Corning Glass Works
OAK TIP - Oak Switch Sys.
OCS - Pall Trinity Micro
OCTA-SCAN - EDL
OCTRON - GTE Sylvania Lighting Prods.
ODS - Wiremold Company
OFFICE SYSTEMS PRINTERS - Florida Data
OHMEX-AG - Transene
OHMICONE - Ohmite Mfg. Co.
OHMITRAN - Ohmite Mfg. Co.
OHMITROL - Ohmite Mfg. Co.
OHM-RANGER - Ohmite Mfg. Co.
OILDAG - Acheson Colloids
OILON PV - Polymer
OILOSTATIC - Okonite
OKOCLAD - Okonite
OKOCORD - Okonite
OKOGUARD - Okonite
OKOLENE - Okonite
OKOMETAL - Okonite
OKOPRENE - Okonite
OKOSEAL - Okonite
OKOSHEATH - Okonite
OKOTHERM - Okonite
OMEGA - Compucorp
OMEGA C-J - Omega Engrg.
OMEGACLAD - Omega Engrg.
OMEGAFILM - Omega Engrg.
OMEGALABELS - Omega Engrg.
OMEGALAQ - Omega Engrg.
OMEGALINE - Omega Engrg.
OMEGALOK - Omega Engrg.
OMEGA METER - Kenco Industries
OMEGANET - Compucorp
OMEGAPAD - Omega Engrg.
OMEGAPELLETS - Omega Engrg.
OMEGASCOPE - Omega Engrg.
OMEGASTIKS - Omega Engrg.
OMEGATEMP - Omega Engrg.
OMEGATITE - Omega Engrg.
OMEGATITE 450, 350, 200 - Omega Engrg.
OMEGA TWELVE PAK - Omega Engrg.
OMMI-COAT - Nuclear Resch.
OMNEPHASE - Omnetics
OMNETIME - Omnetics
OMNEYE - Hughes Aircraft Co.
OMNI-AMP - Omega Engrg.
OMNIBUS - Topaz Electronics
OMNI CELL - Chomerics
OMNICLOSURE - Techmar
OMNICON - Bausch & Lomb
OMNIFAX - Telautograph
OMNIFEROUS - Wavetek Rockland Sci.
OMNIFLO - Flow Techn.
OMNI-GLOW - Industrial Devices
OMNIGRAPHIC - Houston Instrument
OMNIGUARD - Alpha Wire
OMNI III - Sloan Technology
OMNIMARK - Scientific Technlg.
OMNIMUX - Racal-Milgo
OMNIPROX - Scientific Technlg.
OMNISCAN - Vicon Inds.
OMNISCRIBE - Houston Instrument
OMNI-SPRA - Tech Spray
OMNI-660 - Sloan Technology
OMNI 800* - Texas Instrs.
OMNY-BUS - Methode Elctrns.
OMNY-PAC - Methode Elctrns.
OMQ - M/A-COM Omni Spectra
ONEBUG - Motorola Semiconductor
ONSERTER - Universal Instrs.
OPCOA - Refac Elctrns.
OPSYCA - Pirelli Cable
OPTACH - HH Controls Co.
OPTALIGN - TRW Connector
OPTASPLICE - TRW Connector
OPTAXIAL - Scientific Technlg.
OPTEC - Auto-trol Tech.
OP-TEC - Opto Technlg.
OPTEL - Refac Elctrns.
OPTEMP - Beede Electrical Instr. Co.
OPTI-CODER - Sequential Info. Sys.
OPTIMA - Optima Enclosures
OPTIMA - Scientific-Atlanta
OPTIMA SERIES - Verbatim
OPTIMATION - Julie Resch. Labs.
OPTIMAX - Solid State Systems
OPTIPROM - Photobell
OPTI-SCAN - Sequential Info. Sys.
OPTI-SENSOR - Sequential Info. Sys.
OPTITHERM - Barnes Engrg.
OPTI-TRACK - Auto-trol Tech.
OPTI 900* - Texas Instrs.
OPTODATA - Scientific Radiation
OPTOFLEX - Scientific Technlg.
OPTOLITE - Oak Switch Sys.
*OPTOMETER - United Detector Tech.
OPTOMUX - Opto 22
OPTO PACK - Sensor Techn.
OPTORELAY - Scientific Technlg.
OPTOSAFE - Scientific Technlg.
OPTOSWITCH - Applied Electro Technlg.
OPTOSWITCH - Scientific Technlg.
OPTOVAM - Bently Nevada
OPTOWARE - Opto 22
ORANGEBOX - Micom Systems
ORANGE DROP - Sprague Elec. Co.
ORASORB - Sel-Rex
ORCON - Switchcraft
ORIGINAL BRIGHT GOLD - Sel-Rex
OROCLAD - Technic
OROMERSE - Technic
OROMERSE BR - Technic
OROSENE 999 - Technic
OROSENE 999 GOLD - Technic
OROTEMP 24 GOLD - Technic
OROTHERM HT - Technic
ORTHONOL - Magnetics
ORTHOSIL - Thomas & Skinner
ORTHOSTAR - TRW Microwave
OSCC - M/A-COM Omni Spectra
OSHINO LAMP - Oshino Electric Lamp Works
OSM - M/A-COM Omni Spectra
OSP - M/A-COM Omni Spectra
OSQ - M/A-COM Omni Spectra
OSSM - M/A-COM Omni Spectra
OTA - RCA Solid State
OVERLAY - RCA Solid State
OXIFIRE - Ferro
OXSIL - Sprague Elec. Co.
OXY-PURGE - Alltech Assocs.
OXYTRON - Sel-Rex
O-30 - General Elec. Co.
PACE - A & D Elec. Instrs.
PACENTER - Pace
PACE/PAK - International Rectifier
PACER - Sprague Elec. Co.
PACHYDYNE - Ajax Magnethermic.
PACPOLE - Electrovert
PACX - Gandalf Data
PACXNET - Gandalf Data
PADLA - Macrolink
PAD LOAD - Allen Datagraph
PAESAR - Lutron Elctrns.
PAGEPAC - Harris
PAK-DRIVES - Sequential Info. Sys.
PAK-RAK - UNITRACK
PAK-X-TRAC - Nu-Concept Computer Sys.
PALCO - GTE Wesgo Technical Ceramics & Metals
PALL - Pall Trinity Micro
PALLABAR - Technic
PALLADEX - Sel-Rex
PALLADIUM RT - Technic
PALLAMERSE - Technic
PALL CELL - Pall Trinity Micro
PALLCELL - Pall Ultrafine Filtration
PALL-FLO - Pall Trinity Micro
PALLMATIC - Pall Trinity Micro
PALLNIC - Engelhard
PALORO - GTE Wesgo Technical Ceramics & Metals
PAMUX I - Opto 22
PAMUX II - Opto 22
PANALYZER - Panametrics
PANAPRESS - PanaVise Prods.
PANCAKE - Wiremold Company
PANDUCT - Panduit.
PANELCODER - Disc Instrs.
PANELGRAPHIC 901 - Panelgraphic
PANELKEY - Advanced Input Devices
PANEL MITE - Tech Labs.
PANELTONE 87D - Panelgraphic
PAN-L-CLAD - Photo Chem. Prods. Cal.
PAN-L-SCREW - Dupree
PAN-L-TEMP - EDL

PAN-TERM - Panduit
PANTHER - Okonite
PANTHER CABLE - Computer Cable & Prods.
PAN-TY - Panduit
PARABESTOS 4500 - Paramount Tube
PARABOLIX-100 - Merix Chem. Co.
PARACONVERTER - LNR Communications
PARAFORMER - Adtech Power
PARAMEDROP - M/A-Com. Cable
PARAMETER I - M/A-Com. Cable
PARAMETER III - M/A-Com. Cable
PARA-QUIN - Paramount Tube
PARARECEIVER - LNR Communications
PARATHERM - Paramount Tube
PARBAK BACK-UP RING - Parker Seal Grp.
PARTGARD - Helm Instr. Co.
PARTILOK - Ferro
PASCO - Motorola
PASS-THRU - Universal Instrs.
PATCHMASTER - TRW Connector
PATCHMATE - ADC Magnetic Controls
PATCH-OHM - Midland-Ross., Cambion
PATHE ELECTRONIC - Heitz, Karl
PATHFINDER - Astro-Med
PATHFINDER - Astronautics. of America
PATHFINDER - Brady, W. H., Co.
PATHFINDER - Summit CAD
PATHFINDER - Teledyne Gurley
PATRIOT - Aydin
PATRIOT - Aydin Controls
PATRIOT - EG & G Rotron
PATTON-MACGUYER - Patton-MacGuyer
PAYMAX - ICL Technology
P & B - Potter & Brumfield
PCA - Judd Wire
PCB IMPAC - Semtech
PCB TAINER - Birtcher
PC DAX - Data Translation
PC-EYE - Chorus Data Systems
PC LAB - Data Translation
P-C-LITE - Visual Communications Co.
PC THERM - Data Translation
PC-6 - Princeton Elctrn. Prods.
PDP - Digital Equip.
PDQ - Stanford Applied Engrg.
PEAC - Barnes Engrg.
PEAKLITE - Penn Keystone
PED-A-VAC - Pace
PEEL-A-WAY - Advanced Interconnections
PEE-WEE - Mueller Elec. Co.
PEGI - Adalet-PLM
PELASPAN PAC - Dow Chemical Co.
PELCOLOY - Molecu-Wire
PEM - Penn Engrg. & Mfg.
PEMFLEX - Penn Engrg. & Mfg.
PEMHEX - Penn Engrg. & Mfg.
PEMSERT - Penn Engrg. & Mfg.
PEM-SERTER - Penn Engrg. & Mfg.
PEN-ENTRY 4000/8000 - Wire Graphics
PENFILE - Jonard Inds.
PENNLON - Dixon Inds.
PENNTUBE - Dixon Inds.
PEN-RAY - UVP
PENTAFLOW - Pamotor
PENTAPLUG - Communications Technology
PEP-500 - Princeton Elctrn. Prods.
PERI-APOLLAR - Heitz, Karl
PERMACOTE - Miller Dial
PERMAFOAM - Carol Cable Co.
PERMALINE - Carol Cable Co.
PERMANODE - Sel-Rex
PERMA-PROBE - Beckman Instrs.
PERMA-PROBE - Varian Assocs.
PERMA-RESIN - Photo Chem. Prods. Cal.
PERMA-SHIELD - Brady, W. H., Co.
PERMA-SLIK - E/M Lubricants
PERMA-TORQ - Midland-Ross., Cambion
PERMOHM - Belden
PERM-O-PAD - Bivar
PETCAT - Catronix
PETKITTEN - Catronix
PETROSORB - Pall Trinity Micro
PHASE - Beckman Instrs.
PHASE/AMP - Halmar Electronics
PHASOR - Ajax Magnethermic
PHAZOR - Industrial Test Equip.
PHENOWELD - Hardman
PHI-DECK - PHI Technologies
PHILIPS - AKG Acoustics
PHISTOL - Beckman Instrs.
PHONE/SCRIBER - Alpha Comps.
PHOTACT - Keuffel & Esser/Kratos
PHOTOCOMP - Macro Electronics
PHOTO ETCH - Datak.
PHOTOLOGIC - TRW Optoelectronics
PHOTO-LUX - Photo Chem. Prods. Cal.
PHOTOMOD - Clairex Elctrns.
PHOTONICS SPECTRA OPTICAL SPECTRA - Optical Publishing Co.
PHOTO-OPTIC - Dolan-Jenner Inds.
*PHOTOPS - United Detector Tech.
PIANO-DIP - Grayhill
PICABOND - AMP
PIC-A-DIP - Micro Electronic Sys.
PICK-A-BACK - Flow Techn.
PICO - Remex
PICOCLAREED - Clare
PICOMIN - Endevco
PICO-PAC - Velonex, Instr.
PICOPROBE - GGB Industries
PICOREED - Clare
PICO-SKAN - Skan-A-Matic
PICOTRIAX - Endevco
PICOTRIM - Voltronics
PICTURE SYSTEM 2 - Evans & Sutherland Computer
PIDCOM - Beckman Instrs.
PIDG - AMP
PIELEFORK - Murata Mfg. Co.
PIELEOSCILATOR - Murata Mfg. Co.
PIEZITE - Endevco
PIEZOFET - Wilcoxon Resch.
PIEZOTITE - Murata Mfg. Co.
PIGGY - Thomas & Betts
PIGMY-HIPPO - Mueller Elec. Co.
PIL - TRW Inductive Products
PILL - EMC Technology Inc
PIN - Gandalf Data
PIN BAR - Lear Siegler
PINCOMM - Trendata/Standard Memories
PINHEAD - Sprague Elec. Co.
PINLITES - Refac Elctrns.
PINNED DRIVE - Berg, W. M.
PINSETTER - Molex
PIP - TRW Inductive Products
PIPEWRITER - Telesis Laboratory
PISTONCAP - Sprague-Goodman Elctrns.
PITMO - Pittman
PITRAN - Stow Labs.
PIXIE - Endevco
PIXIEPOT - Duncan Electronics
PLANETGEAR - Haydon Switch & Instr.
PLAN-VU - Alan Gordon Entprs.
PLAQOHM - Ward Leonard Elec.
PLASMAFLUX - Walker Scientific
PLASMA-LUX - Cherry Electrical Prods.
PLASMA-POWER - Crestronics
PLASMASCOPE - SAI Technlg. Co.
PLASMA-SETTE - Temescal
PLASMLOC GENERATOR - ENI Power
PLASTI-BOND - AMP
PLASTI-CAL - Meyercord
PLASTIFLEX - Auburn Mfg.
PLASTIFORM - Jobmaster
PLASTI-GRIP - AMP
PLASTILEASE - Ram Chemicals Whittaker
PLASTINITE - Fastex
PLAST-N-GLASS - Chemtronics
PLAST'O'WIRE - Electronic Controls
PLATANEX - Sel-Rex
PLATANIUM ANODES - Sel-Rex
PLATINUM N - Technic
PLATINUM TP - Technic
PLD*PLUS - Data Plus
PLID - Linear Technlg.
PLIDAX - Norton Chemplast
PLIKE - Hunter Tools
PLOTAMATIC - Allen Datagraph
PLS - Microwave/Sys.
PLUGBORD - Vector Electronic Co.
PLUGGEM - Kel-Am
PLUG-IN OUTLET CENTER - Wiremold Company
PLUGMOLD - Wiremold Company
PLUG STAT - Control Products
PLUMB - Cooper Group
PLUMBICON - Amperex Elctrn.
PLUS-C - Sprague-Goodman Elctrns.
PLUS 80 - Mohawk Data Sciences
PLYCON - Methode Elctrns.
PLYO-DUCT - Methode Elctrns.
PMA - Automatic Connector
PMMA - Automatic Connector
POCKET-PROBE - EDL
POGO CONTACT - Pylon Co.
POGO LAMP - Dupree
POINTFINDER - Teledyne Gurley
POINT OF DATA TERMINALS - MSI Data
POKE-HOME - Amphenol
POLAFRAME - Chomerics
POLA-H - Chomerics
POLARHEX - Hughes Aircraft Co.
POLARING - Chomerics
POLASHEET - Chomerics
POLASTICK - Chomerics
POLASTRIP - Chomerics
POLY A - Alltech Assocs.
POLY-CLEAN - Hollis Engrg.
POLYCOHR - CHR Inds.
POLY-DIMENSIONAL - Amco Engrg.
POLYDIP - Communications Technology
POLYDOME - Dorman Bogdonoff
POLYFLEX - Judd Wire
POLYGARD - Ferro
POLYHAL - Judd Wire
POLY I - Alltech Assocs.
POLY-LOK - Siecor
POLYMER SEALANT GUN - Hardman
POLYMET - Polymer
POLY-META-SYMBOLICS - Step Engineering
POLYPENCO - Polymer
POLYPLANAR - Advanced Micro Devices
POLY-PLANAR - ERA Poly-Planar
POLYRAD - Brand-Rex
POLY S - Alltech Assocs.
POLY-SEAL RESINS - Sigma Plastronics
POLYSWITCH - Raychem
POLYTWIST - Poly-Scientific
POP RIVETS - POP Fasteners
PORCUPINE - Chomerics
PORCUPINE METALISTIC - Chomerics
PORO-KLEAN - AMF
PORON - Rogers
PORTA-CURE - American Ultraviolet
PORTAMETRIC - Electro Scientific Inds.
PORTANIM - Berkeley Nucleonics Corp.
PORTA-PACK - Brady, W. H., Co.
PORTA-PEAK - Helm Instr. Co.
PORTA-PROCESSOR - Teledyne Micronetics
PORTASENSRM - Scientific Technlg.
PORTATEMP - Trans-Met Engrg.
PORTA-TEST - Varian Assocs.
PORTION-AIRE - Glenmarc Mfg.
PORTIONATOR - Glenmarc Mfg.
POSI-CRIMP - Teledyne Ansonia
POSI-GROUND - Hexacon Elec.
POSI-LOCK - Sealectro
POSISTOR - Murata Mfg. Co.
POSITRAK - Delta Design
POS-NEG - Datak.
POWERACE - A P PRODUCTS
POWERBASE - Motorola Semiconductor
POWERBLOCK - Powertech
POWER BUS - UNITRACK
POWERCENTER - Topaz Electronics
POWER COMMANDER - RIL Elctrns.
POWER CONTROL 1000 - Power Controls
POWER CONTROL 360 - Power Controls
POWER CONTROL 600 - Power Controls
POWERDIAL - Lutron Elctrns.
POWER DIRECTOR - Antenna Specialists
"POWER DRIVE" - Recoton.
POWER-DYNE - Raymond Engrg.
POWERED BY BOSCHERT - Boschert
POWERFET - Teledyne-Crystalonics
POWERFLEX - Ajax Magnethermic
POWERFLEX - Sigma Instrs.
POWER GREMLIN - Atlas Energy Sys.
POWER GROUP - N.C.E.
POWER GROUP - Power Group International
POWER GUN PROBE - Bell, F. W.
POWERITE - Sencore
POWER LINE DISTURBANCE MONITOR - Liebert
"POWER LINE EMULATOR" - Ratelco
POWERLOGIC - Topaz Electronics
POWERLYTIC - Sprague Elec. Co.
POWERMAKER - Topaz Electronics
POWER MASTER - Shure Bros.
POWER MEG - Pacer Industries
POWEROHM - Ferro
POWER-O-MATIC 70 - Blue M, A Unit of General Signal

POWER-O-MATIC 80 - Blue M, A Unit of General Signal
POWER-O-MATIC 90 - Blue M, A Unit of General Signal
POWERPAC - Microwave Semiconductor
POWER PROCESSOR - Powercube
POWERSTAT - Superior Elec. Co.
POWER-STRIPMASTER - Ideal Industries
POWER-STYLE SWITCHBOARDS - Square D Co.
POWERTAP - Motorola Semiconductor
POWERTHERM - Gentron
POWER TO SPARE - Union Carbide
POWER TRANSFORMER - Transduktor
POWERTRON - Industrial Test Equip.
POWER VERTER - Alpha Comps.
POW-R-DISC - Westinghouse Elec.
POW'R ETCH - Datak
POWR-RIB - Ohmite Mfg. Co.
POW-R-TOW - Berg, W. M.
POWR-TRAK - Adatek
POW-R-VEE - Berg, W. M.
POXYLUBE - General Devices
PRACTIGUIDE - Fiberguide Industries
PRAM - Harris Semiconductor
PRECISION DUSTER - Tech Spray
PRECISION-MASTER - Ideal Industries
PREKOTE - Alltech Assocs.
PREKOTE - Tech Spray
P/REL - Standard Grigsby
PREM - Prem Magnetics
PRE-MET FILTER - Sel-Rex
PRE-PACK - Lutron Elctrns.
PRE-SAT - Alltech Assocs.
PRES-BOND - Press-On Prods.
PRES-LOC - Deutsch Fastener
PRES-MOUNT - Press-On Prods.
PRES-PAK - Press-On Prods.
PRESSERTS - Precision Metal Prods. Co.
PRESS-FIT - Sealectro
PRESSLITE - Oak Switch Sys.
PRESS-SURE-MATE - Molex
PRESSURETROL - Honeywell
PRES-TO-HEAT - Triton Mfg. Co.
PRE-VENT - GNB Batteries
PRIMELINE - PrimeLine-Soltec Distbn.
PRIMO - Primo
PRINCESS LINE - Ungar
PRINCETON 8500M - Princeton Elctrn. Prods.
PRINTMATE - MPI
PRINTOHM - Sprague Elec. Co.
PRINT STIX - Topflight
PRISM COLOR - Integral Data Sys.
PRISM PRINT - Integral Data Sys.
PRISM PRINTER - Integral Data Sys.
PRITCHARD PHOTOMETER - Photo Resch.
PROB-A-LARM - Princo Instrs.
PROBE-IT - A P PRODUCTS
PROBEYE - Hughes Aircraft Co.
PRO-CALC - Macro Electronics.
PROCESS 5375 - SermeTel
PROCESS 87-D - Panelgraphic
PRO/COMM - ETI Electronics
PRODUCER - Zehntel
PROFESSIONAL - Components
PROGRAMMER'S TOOLBOX - Pacific Microcomputers
PRO-GRIP - Weckesser Co.
PROLOID - Teledyne Micronetics
PRO-MASTER - Blue M, A Unit of General Signal
PROMAX 500 - General Elec. Co.
PRONET - Proteon
PRONG-LOCK - Waldes Kohinoor
PRONTO - Sperry Univac
PRONTO - Thermo Elec.
PROPIMAX - EG & G Rotron
PROSE 2000 - Telesensory Speech Sys.
PROTECTOCOATS - Alpha Metals
PROTECTOGLOVE - Clean Room Prods.
PROTECTOMATIC - Schott Optical Glass
PROTECTOSWITCH - Black & Webster
PROTECTOX - Technic
PROTISTOR - Carbone Lorraine Inds.
PROTO-BOARD - Global Specialties
PROTO-CLIP - Global Specialties
PROTOLOY - Molecu-Wire
PROTONEX - Sel-Rex
PROTO-PAK - International Instrumentation
PRO-TRONIX - Blue M, A Unit of General Signal
PROVICTOR - Victor Elec. Wire & Cable
PROXIMITOR - Bently Nevada
PRO-ZIF SOCKETS - Wells Elctrns.
PRO8 - Proteon
PRO88 - Proteon
PSM - Adatek
PSS - Pall Trinity Micro
PSS - Pall Ultrafine Filtration
PSS - Paso Sound Prods.
PS 300 - Evans & Sutherland Computer
PTC - Pacific Transducer
PTM-66 - Lektra Labs.
PUL-A-DIP - Micro Electronic Sys.
PULL-THRU - Hughes Aircraft Co.
PULSAR - Heat Systems-Ultrasonics
PULSAR II - E^2 Technology
PULSERAD - Pulsar Products
PULSISTOR - Victory Engrg.
PUPPETS - Bishop Graphics
PUR-A-GOLD - Sel-Rex
PURE CORE - Alpha Metals
PURE-LINE - Dixon Inds.
PURITAN - Tansitor Elctrns.
PURSE LOCK - Fastex
PUSH BITE - Minelco - A Talley Ind.
PUSH-PENNY - Thomas & Betts
PV - Berg Elctrns.
PVB - Electro Scientific Inds.
PVCA - Brand-Rex
PWR-PAC - Elfab
PYLE DRIVER - Pyle Inds.
PYRAD 1000 - Champlain Cable
PYR-AU-BOND - Sel-Rex
PYROBOND-PT-1300 - Ultra Carbon
PYROMARK - Tempil
PYRO PANEL - Research
PYRO-SCOPE - Capintec Instrs.
PYRO-TECH - Ultra Carbon
PYROTERM - Testoterm
PYROTEST - West Instrs
PYROTRON - Bailey Controls Co.
PYROVIEWER - ElectroPhysics.
PZT - Vernitron Piezoelectric
QALTA - Macrolink
QCC - Alpha Wire
Q-CEPT - Interconnect Devices
Q COMPOUND - Communications Technology
Q-FLEX - Sundstrand Data Control
QIKLATCH - Burndy
QIKSTACK - Burndy
QL/77 - Sperry Univac
QO CIRCUIT BREAKERS - Square D Co.
Q/PAC - Rogers.
Q-RING - Parker Seal Grp.
Q-S - Q-S Products Co.
QS^2 - Gore, W. L., & Assocs.
QUAD - CVC Prods.
QUAD-LED - Dialight
QUAD PAK - Opto 22
QUADRADAR - ITT Gilfillan
QUADRAPHASIC CONVERSION - Data Precision
QUADRA-POWR - Jamesbury
QUADRA-TONE - Audiosone
QUAD-SPRING - Garry Mfg. Co. of Brand-Rex Co.
QUALIMETRIC - BASF Sys.
QUALITROL - Motorola Semiconductor
QUANTACHRON - Matrix
QUANTITATE - Beckman Instrs.
QUANTUM ASSEMBLY SYSTEMS - Mann, Henry
QUANTUM L - Memorex
QUANTUM REACH - M/A-Com. Cable
QUAT 2 - Clean Room Prods.
QUICK CONNECT - Warren Comms.
QUICK DRAW - L & L Special Furnace
QUICKDRAW - Summit Engineering
QUICK-E-POLES - Wiremold Company
QUICK FIRE - General Electric Co.
QUICK GRIP - Antenna Specialists
QUICKIE - Berg Elctrns.
QUICK-TRACER - VIZ Test Equipment
QUICK-WEDGE - Kedman Co.
QUICK-2-LOCK - Berg, W. M.
QUIK/BUS - Rogers
QUIK KLIPS - Brim Elctrns.
QUIK/PIK - Akro-Mils
QUIK-WRAP - Jonard Inds.
QUIL - Motorola Semiconductor
QUINSTEP - Berger-Lahr
QUIN-TONE - Audiosone
QUINTRONIC - Berger-Lahr
QUME TRAK - Qume
QVT - Qume
QVT-102 - Qume
QVT-103 - Qume
QVT-108 - Qume
QVT-2116 - Qume
QWIK-GARD GFI CIRCUIT BREAKERS - Square D Co.
QWIK STRIP - Spectra-Strip
QWIK-TY - Glenair
QWINT SYSTEMS - Qwint Systems
Q-1012 - Megatest
Q2/22 - Megatest
Q2/42 - Megatest
Q2/62 - Megatest
Q-8000 - Megatest
RABBIT - Advanced Micro Devices
RACK-ALL - Fancort Industries
RA-CON - Eby Co.
RADIAX - Andrew.
RADI-FLUX - Hy-Cal Engrg.
RAHAM - General Microwave
RAILITE - Tensolite
RAINBOW - Oak Switch Sys.
RAINBOW RECORDER - CELCO
RAISEDLAY - Engelhard
RALLY - Wonder of America
RALLY RAP - ICO-Rally
RAMANEL - Ram Chemicals Whittaker
RAMASET - Ram Chemicals Whittaker
RAM PART - Ram Chemicals Whittaker
RANCHO - Teledyne Western Wire & Cable
RANCHOPRENE - Teledyne Western Wire & Cable
RANGE RIDER - International Data Sciences
RAPID RACK - Scanbe
RAPID-SET - Mereco Products
RAPID-SYN - Rapidsyn
RAP-TIGHT - All-States
RATAC II - Raytheon Ocean Sys. Co.
RATE/CON - Com/Tech Systems
RATIOHMIC RESISTANCE - Data Precision
RATIO-PROBE - Capintec Instrs.
RATIO-SCOPE - Capintec Instrs.
RAYCHRON - Bristol Saybrook
RAYCORDER - Raymond Engrg.
RAYFOAM - Raychem.
RAYMASTER - Gates, Geo. W., & Co.
RAYMER - Cetec Raymer
RAYOTUBE - Leeds & Northrup Instrs.
RAYSISTOR - Raytheon Co.
R.B.M. - Hamilton Std. Controls
R-BOX - IET Labs
RC-BOX - IET Labs
RC5PLUS - Stanton Magnetics
REACTALLOY - EMCA
READY SEAL - Norton Chemplast
READY-SOLV - Beckman Instrs.
REAL-AL - Acme Chem. & Insulation
REALITY - Microdata.
REBAM - Bently Nevada.
RE-CIRK-IT - Heinemann Elec. Co.
RE-COIL - Miller, L.C., Co.
RECON MICA - Micap Elctrns.
RECORD-A-TEMP - EDL
RECTIGRAPH - Esterline Angus
RECTODYNE - Christie Elec.
RED ARROW SERV. - Savoy Elctrns.
REDDI-BLENDER - Tra-Con
REDDY - Thomas & Betts
RED-EYE - Capintec Instrs.
REDI-BAR - Hoffman, P. R., Co., Materials Processing
REDI-TROL - Electrol Co.
RED LIGHTNING - Superior Flux & Mfg.
RED LINE - Warren Comms.
RED MARVEL - Superior Flux & Mfg. Co.
RED TOP - Sprague Elec. Co.
REEDAC - Gordos Arkansas
REEDLAYS - Computer Components
REEL-QUIK - Alpha Wire.
REEVELEC - Reeve Elctrns.
REF BLOC - Hy-Cal Engrg.
REF CEL - Hy-Cal Engrg.
REFERENCE - Hartley Prods.
REFERENCE CABLE - Hartley Prods.
REFLEX - Christie Elec.
REFORMATTER - MicroTech Exports
REFRACTOSYN - HH Controls Co.
REGAL - Commercial Elec. Heating Devices & Mfg.
REGATRAN - Electronic Measurements
REGATRON - Electronic Measurements
REGENT - Applied Digital Data Systems
REGENT - Carter Motor

REGULYTIC - Sprague Elec. Co.
RELIABRAZE - Alpha Metals
RELI-ACON - Methode Elctrns.
RELIACOR - Alpha Metals
RELIAFOAM - Alpha Metals
RELIALAB - Tenney Engrg.
RELI-ALOK - Methode Elctrns.
RELI-APAC - Methode Elctrns.
RELI-APLANE - Methode Elctrns.
RELI-APLUG - Methode Elctrns.
RELIAROS - Alpha Metals
RELIASOLV - Alpha Metals
RELIA-TEMP - EDL
RELIATEMP - Tenney Engrg.
RELIFLEX - Berg Elctrns.
RELPAC - Reliability
RELY-OHM - Engelhard
REMDACS - Intersil
REMEX - Remex
REMOBS - Teltone
REMOVE-A-PAD - Dynaloy
REMOV-IC - Solder Removal
REMRAD - Nuclear Resch.
REPLENISHER - IVEK
RESCU - Antenna Specialists
RESIDUMETER - Jobmaster
RESISTWEEZ - Pace
RES-LOK - Sinclair Radio Labs.
RESOLON - Duncan Electronics
RESOMICS - Murata Mfg. Co.
RETIP - Solder Removal
RETRACTO - Times Fiber Communications
REVER-SYNCLAMPS - Timber-Top
REV-TROL - Electrol Co.
RFBUMACRO - Motorola Semiconductor
RF POWER ANALYST - Bird Elctrn.
RGA - UTI Instruments Co.
RHENEX - Sel-Rex
RHENIUM A - Technic
RHEOMET - Kester Solder
RHINO-HIDE - Pacific Electricord
RHODEX - Sel-Rex
RHODIUM SULPHATE TP - Technic
RHYMAS - Universal Instrs.
RIA-SET - Beckman Instrs.
RIBBON WRAP - Gore, W. L., & Assocs.
RIBBON WRAP - Gore, W. L., & Assocs.
RIB-CAGE - Berg Elctrns.
RIBFLEX - Ward Leonard Elec.
RIB LOCK - Genisco Technology.
RIGEL II - Androtek/dmi
RIGIDAMP - Barry Controls
RIGIMESH - Pall Ultrafine Filtration
RIMBUG - Motorola Semiconductor
RING ALERT - Potter & Brumfield
RINGER - Sencore
RING-GUN - Waldes Kohinoor
RING-JECTOR - Waldes Kohinoor
RING-MOUNT - Waldes Kohinoor
RING-O-MAT - Waldes Kohinoor
RIPPLE ROUND - Alpha Metals
RISTON - DuPont de Nemours, E. I.
RITEOHM - Ohmite Mfg. Co.
RIVETLESS NUT PLATE - Deutsch Fastener
RIVET-LOC - Sealectro
RKC - Syscon Intl.
R-LITES - Genisco Technology
R/M PREDICTOR - University Computing
RMS09 - Motorola Semiconductor
RMS68K - Motorola Semiconductor
ROBO-MITE Mann, Henry
ROBOT - Heitz, Karl
ROBOTEC - Power Designs
ROBOT MONITOR - Schneider Instr.
ROCK-WIPE SWITCH - Cherry Electrical Prods.
ROLCOM - Coors Porcelain
ROLI - Transamerica Delaval
ROLLAWAY - Fancort Industries
ROLL-MARK - Meyercord
ROLLPIN - ESNA
ROLLPIN - Esna
ROLLTEMP - Trans-Met Engrg.
ROLM CBX - Rolm.
ROLOX - Hardman
ROL-PAK - Waldes Kohinoor
ROMHOGLAS - Lundy Elctrns. and Systems
ROSITE 3250 & 3550 - Rostone
ROSITE 3450 - Rostone
ROSITE 3550FM - Rostone
ROTA-CRIMP - AMP
ROTA-SLIDE - C & K Components
ROTOCODE - Cherry Electrical Prods.
ROTO-DROSS - Atlantic Magnetics
ROTOLITE MARK III - Teledyne Rotolite
ROTOPULSER - Dynapar
ROTO-TELLITE - MSC Prods./Eaton.
ROTO-TRACK - Barnes Engrg.
ROTRAN - Inland Motor Specialty Prods.
ROW-L-ER - Berg, W. M.
ROYALITIC - Industrial Midwec Capacitors
ROYTRON - Westrex
RP32 - Adatek
R-SYSTEM - Electromatic Comps.
RT/DUROID - Rogers.
RT FILE - Contel Info. Sys.
RTI - Reproduction Technologies
RTM - Catalyst Research
RTM 2 - Catalyst Research
RTM 3 - Catalyst Research
RTS/EMULATOR - Com/Tech Systems
RUBICON - Penn Airborne Prods.
RUBRGLAS - APM-Hexseal
RUF-NEK - Hughes Aircraft Co.
RULON - Dixon Inds.
RUSH - Eraser Co.
RUSTRAK - Gulton Inds.
RUTHENEX - Sel-Rex
RUTHENIUM TP - Technic
RX GEARS - Instru-Lec
SABRE TOOTH - Thomas & Betts
SAFE-ALARM - Thermax Wire
SAFE ALARM CABLES - Thermax Wire
SAFELINE - GTE Sylvania Lighting Prods.
SAFE-PAK - Transamerica Delaval
SAFESCAN - Dolan-Jenner Inds.
SAFE-T-GRIP - Ideal Industries
SAFE-T-KLIP - Industrial Devices
SAFETY-SPEC - Cadillac Plastic & Chem.
SALI - Adalet-PLM
SAL-MET - LMB Heeger
SAMP - Control Elctrns. Co.
SAMR - Brelonix
SAM-100 - Brelonix
SAM-2 - Photodyne
SANS-A-FUSE - Workman Elctrn. Prods.
SANTOPRENE - Monsanto Co.
SANTOTRAC - Monsanto Co.
SATINTONE 87D - Panelgraphic
SATS - BMS Data Handling
SAUCER - EG & G Rotron
SAV-CON - Glenair
SCA - Semicoa
SCAMP - Control Elctrns. Co.
SCAMP - EG & G Rotron
SCAN - GenRad
SCAN-X - Del Elctrns.
SCAT - C-COR Elctrns.
SC-CONSIL - Tecknit (Eastern Facility)
SCOPE--MOBILE - Tektronix
SCOTCH - Magnetic Audio/Video Products
SCOTCHFLEX - 3M-Electronic Products
SCULPTURED CIRCUITS - Advanced Circuit Technlg.
SDOS - Software Dynamics
SEALECTROBOARD - Sealectro
SEALECTROCARD - Sealectro
SEALECTROSWITCH - Sealectro
SEALECTROSWITCH - Techniques
SEALINK - Burndy
SEALKLEEN - Pall Ultrafine Filtration
SEALOX - National Beryllia
SEALPAK - American Zettler
SEAL-TRIMS - Johanson Mfg.
SEASPACE - Exide.
SECRECY RESIN - Sigma Plastronics
SECRE/DATA - Com/Tech Systems
SECS - EMM/SESCO
SECUR-A-TACH - Dennison Mfg. Co.
SECUR-A-TIE - Dennison Mfg. Co.
SECURE-COPY VIDEO CASSETTE - Video Automation Systems
SE-CUR-IT - Ambroid Co.
SECURSTRIP - Control Module
SE/DUROID - Rogers
SEED - Belden
SEELBOLTS - APM-Hexseal
SEELRIVITS - APM-Hexseal
SEELSKREWS - APM-Hexseal
SE EYELETS - POP Fasteners
SEICO - Syscon Intl.
SEISGRAF - Aydin Controls
SEISMOPROBE - Bently Nevada
SELCO - Selco Products Co.
SELECTASHAFT - Centralab
SELECTION - Beckman Instrs.
SELECT-MATE - Beckman Instrs.
SELECT-O-TEMP - Hexacon Elec.
SELECTROL - Thermo Elec.
SELF-LOC-K - AirBorn
SELF SCAN - PlasmaGraphics
SELISTOR - Eastern Delta Corp.
SEL-MASQ - Sel-Rex
SEMI+ - Advanced Circuitry
SEMIAC - Alpha Comps.
SEMI/DYNE - LogiMetrics
SEMINAR PROGRAM - E & L Instruments
SEMIPACK - SemiKron Intl.
SEMISTACK - SemiKron Intl.
SEMITRON - Bussmann
"SE" MONOGRAM - Sprague Elec. Co.
SEMPAC - Semtech
SEMS - EMM/SESCO
SENSABLE - Hy-Cal Engrg.
SENSALL - National Sonics/Xertex
SENSA-TOUCH - Miller Dial
SENSCOR - Sensor
SENSIMETER - Hy-Cal Engrg.
SENSISTOR - Unitrode
SENSOHM - Ferro
SENS-O-MATIC - RMS Electronics
SENSOR-MATE - Weed Instr. Co.
SENTARA 324 - Honeywell
SENTINEL - WALTER KIDDE
SENTRILINE - Bird Elctrn.
SENTRY - Sentry Mfg.
SEO-GRIP - Weckesser Co.
SEQUENTORR - Sloan Technology
SERDEX MODULES - Analog Devices
SERENDIP - Teledyne Relays
SERIES 1000 -Diversified Case Co.
SERIES 2000 -Diversified Case Co.
SERIES 21 - Mohawk Data Sciences
SERIES 3000 -Diversified Case Co.
SERIES 4000 - Diversified Case Co.
SERIES 6000 - Microdata
SERIES 72 - Advanced Automation Concepts
SERIES 8000 - Microdata
SERMABOND - SermeTel
SERMALOY - SermeTel
SERMALUBE - SermeTel
SERMASEAL - SermeTel
SERVA-BENCH - Barry Controls
SERVA-LEVL - Barry Controls
SERVODISC - PMI Motors, Kollmorgen
SERV-RITE - Gordon, Claud S., Co.
SES - Transene
SETS-1 - EMM/SESCO
SF/DUROID - Rogers
SF2600 - Santa Fe Textiles
SGL POWER MASTER - SGL Waber
SHAWMUT - Gould
SHAWNEE - Automatic Timing & Controls
SHEAR-SEAL - Barksdale Controls
SHERLOCK - Analytics Communications
SHIELD CELL - Chomerics
SHIELDFLEX - Magnetic Metals Co.
SHIELD-KON - Thomas & Betts
SHIELDMESH - Chomerics
SHIELDMU - Magnetic Metals Co.
SHIELDSCREEN - Chomerics
SHIELD TAPE - Chomerics
SHIELD-VU - Chomerics
SHIELD WRAP - Chomerics
SHOCKWATCH - Media Recovery
SHOOTING STAR - Wilson Electronics
SHO RATE - Brooks Instr.
SHORT STOP - Ambi-Tech Inds.
SHRINKDOWN - Markel
SHURE SQUEEZER - Thomas & Betts
SHURE STAKE - Thomas & Betts
SHURITE - Shurite Meters
SHX - Andrew
SIERRACORE - Sierracin/Thermal Sys.
SIGMASIAN - Tencor Instr.
SIGNAFAX - Alden Elctrns.
SIGNAGUARD - Signatron
SIGNALEX - Staver Co.
SIGNALOCK - LogiMetrics
SIGNATURE - Bristol Babcock
SIGNET - Siecor
SILASTIC - Dow Corning.
SILCAD - Yardney Battery
SILCAN - Bow Solder Prods.
SILCORO 60 - GTE Wesgo Technical Ceramics & Metals
SILENT PARTNER - Industrial Computer Designs
SILENT 700* - Texas Instrs.

SILFARED - Metavac
SIL-FOS - Handy & Harman
SILGAR - Alpha Comps.
SILICA-SEAL - Ferro
SILIC-O-NETIC - Heinemann Elec. Co.
SILICON EXPRESS - VLSI Technology
SILICON GENERAL - Silicon General
SILIC-O-RINGS - APM-Hexseal
SILIKROMES - APM-Hexseal
SILKON 35 - Chemtronics
SILOHM - Carbone Lorraine Inds.
SIL-PAD SHIELD - Bergquist
SIL-PADS 400 - Bergquist
SIL-PREP - Alltech Assocs.
SILVAINT - Murata Mfg. Co.
SILVALOY - Engelhard
SILVERCAP - Del Elctrns.
SILVERCEL - Yardney Battery
SILVERFILM - Industrial Midwec Capacitors
SILVER-GRIP - PIC Design
SILVER II - Rayovac
SILVER-SHIELD - International Wire Products Co.
SILVERWELD - Bourns
SILVREX - Sel-Rex
SIMCO-STAT - Simco Co.
SIMICRO - Boston Systems Office
SIMON - Harris Semiconductor
SIMPLIFIER - Compucorp
SIMPSON 260 - Simpson Elec. Co.
SIMULINE - Comstron
SINGLE-BRITE - Perma Power Elctrns.
SIOV - Siemens
S.I.R. - Engd. Prod.
S.I.R. GASKET - Norton Chemplast
SIVICON - Amperex Elctrn.
SKAN-COAX - Skan-A-Matic
SKID-MATE(TM) - Hardigg Inds.
SKINI-DIP MODULE - MERET
SKINNY DIP - SFE Technologies
SKINNY MINNIE - Antenna Specialists
SKIPPER - EG & G Rotron
SKY CAP - AVX
SKYLARK - Lutron Elctrns.
SKYPHONES - Astronautics. of America
SKY-TIE - Adalet-PLM
SLC - Tusonix
SLEEPATRON - Gardiner Elctrns.
SLEEV-SCRU - Pylon Co.
SLENDYNE - Shure Bros.
SLIDELINE - Duncan Electronics
SLIDE LITE - Leecraft Mfg.
SLIM-CAPS - Republic Elctrns.
SLIM JIM - Michigan Magnetics
SLIM JR. - Hexacon Elec.
SLIMLIME - Remex
SLIMLINE - Hartwell
SLIMLINE - Micro Peripherals
SLIMLINE - NES
SLIMLINE - Potter & Brumfield
SLIMLINE - Pyle Inds.
SLIMPAC - Semtech
SLIMPAC JR. - Semtech
SLIMPAC SR. - Semtech
SLIMPAK - American Zettler
SLIM-SNAP - Sperry, A. W., Instrs.
SLIM SR. - Hexacon Elec.
SLIMSWITCH - Digitran Co.
SLIM-TRACK - Barnes Engrg.
SLIP-LOCK - U.S. Terminals
SLIP-SYNC - Chadwick-Helmuth
SLIT-N-WRAP - Vector Electronic Co.
SLO-BLO - Littelfuse
SLO-SYN - Superior Elec. Co.
SLYD-PAK - Thielex Plastics.
SMART - Standard Microsystems
SMART ASCII - ECD.
SMART BITE - Minelco - A Talley Ind.
SMARTBUFFER - Data-Match.
SMART COUNTERS - Nu-Metrics
SMART MONITOR - Bently Nevada
SMARTPOWER - Motorola Semiconductor
SMARTPOWER II, III - Motorola Semiconductor
SMARTSCOPE - Branden, T. G.
SMARTSWITCH - Motorola Semiconductor
SMART TELEPHONE SYSTEMS - Solid State Systems
SMART 1 - Aerotech
SMITTY - Hunter Tools
SMS - Microwave/Sys.
SNAIL - Pylon Co.
SNAPAK - Airpax
SNAPBLOCKS - Kulka Smith
SNAPLITE - Leecraft Mfg.
SNAP-LOCK - Namco Controls
SNAP-ON - Vibra-Metrics
SNAP-PAK - Waldes Kohinoor
SNAPPER - General Electric Co.
SNAPSEELS - APM-Hexseal
SNAP SINK - Thermal Prods. Group
SNAP STAT - Control Products
SNAP-TACT - Tran-Trol Co.
SNAPTRACK - RDI/Reed Devices
SNAPTROL - CTS.
SNAPTUBE - Zeus Indl. Prods.
SNAP-WRAP - Amphenol
SNIPE - Oak Switch Sys.
SOC - San-O Industrial.
SOCKET-SERT - Hybricon.
SOCKETS-PLUS - Perma Power Elctrns.
SOCKS - Thomas & Betts
SOC-PAC - Elfab Corp.
SODEREZE - Phelps Dodge Magnet Wire
SODER-MASK - Solder Removal
SODER-WICK - Solder Removal
SODR-X-TRACTOR - Pace
SOF SWABS - Clean Room Prods.
SOFT LAYER PREKOTES - Alltech Assocs.
SOFTPULSE - Penn Resch. (PRC)
SOFT SWITCHING - C-E Elgin Elctrns.
SOFTY - Clauss Cutlery Co.
SOIC - Motorola Semiconductor
SOLAR - E² Technology.
SOLAR INFRARED HEATER - Casso-Solar
SOLAR UNITUBE HEATER - Casso-Solar
SOLATRON/ACUVOLT - Sola Elec.
SOLAVOLT INTERNATIONAL - Motorola Semiconductor
SOLDAPAK - Electrovert USA
SOLDER COATER-LEVELER - Hollis Engrg.
SOLDERCON - Molex
SOLDEREX - Sel-Rex
SOLDER FORMS - Kester Solder
SOLDER MASTER - Hexacon Elec.
SOLDER-OFF - Kester Solder
SOLDER-QUIK - Assem-Pro Instrs.
SOLDERQUIK - Raychem
SOLDERSLEEVE - Raychem
SOLDERTACTS - Raychem.
SOLDER-WRAP - United Solder Wrap
SOLDR-MITE - Wall Lenk
SOLID-TUBES - Elctrn. Devices
SOLIDVIEW - Lexidata
SOLISTRAND - AMP
SOLOK - Berg Elctrns.
SOLO-PHONE - Shure Bros.
SOLU ALARM - Beckman Instrs.
SOLU BRIDGE - Beckman Instrs.
SOLU CHEK - Beckman Instrs.
SOLU CHEK - Beckman Instrs.
SOLU CORDER - Beckman Instrs.
SOLU METER - Beckman Instrs.
SOL-U-SALT - Sel-Rex
SOLU SWITCH - Beckman Instrs.
SOLUTION 555 - Beckman Instrs.
SONABOX - Ultrasonics
SONA GRAPH - Kay Elemetrics
SONALERT - Mallory Capacitor Co.
SON-CASTER - Techsonics
SONICATOR - Ultrasonics
SONIC SENTRY - Delta Prods.
SONIMIST - Ultrasonics
SONOBAR - Shure Bros.
SONODYNE - Shure Bros.
SONOGAGE - Tencor Instr.
SONOSOLDER - Sonobond
SONOSORT - Tencor Instr.
SONOWELD - Sonobond
SON-TECTOR - Techsonics
SOOPERSPOOLER - Consolink
SOUNDCASTER - Paso Sound Prods.
SOUND DIRECTOR - Argos Prods.
SOUND MASTER - SPECO
SOUND OF THE PROFESSIONALS - Shure Bros.
SOUND POWER - Vidaire Elctrns.
SOUND SCENE - Shure Bros.
SOUND SCOPE - Shure Bros.
SOURCE 2 - Topaz Electronics
SPACE MISER - Mepco/Electra
SPADE-LOK - AMP
SPARK GUN - Vernitron Piezoelectric
SPASAVER - Chicago Switch
SPASAVER - ITW Switches
SPASYN - Advanced Techn. Sys.
SPEC - Associated Spring, Barnes Grp.
SPECO - SPECO
SPECTRA - Photo Resch.
SPECTRA-BOND - Spectra-Strip
SPECTRACOM - Spectracom
SPECTRA-FLEX - Spectra-Strip
SPECTRA-GP - Spectra-Strip
SPECTRA-GUARD - Spectra-Strip
SPECTRAGUIDE - SpecTran
SPECTRALMASTER - Barnes Engrg.
SPECTRA SCAN - Photo Resch.
SPECTRASCOPE - Spectral Dynamics
SPECTRA-TWIST - Spectra-Strip
SPECTRA-ZIP - Spectra-Strip
SPECTROLINE - Spectronics
SPECTRONIC - Bausch & Lomb
SPECTROSIL - Thermal Amer. Fused Quartz
SPECTROSUN - Spectrolab
SPECTRUM MONITOR - Cushman Elctrns.
SPEC 55 - Raychem
SPEECH DIRECTOR - Argos Prods.
SPEECHMAKER - Cognitronics
SPEECH 1000 - Telesensory Speech Sys.
SPEEDFEED - Qume
SPEEDFOIL - Armstrong World Inds.
SPEEDIAL - Lutron Elctrns.
SPEEDOMAX - Leeds & Northrup Instrs.
SPEED SERVO - Esterline Angus
SPEED-WRAP - OK Industries
SPEEDY-TYS - Waldom Elctrns.
SPEMCO - SPEMCO Switches
SPHERE - Infosphere
SPHER-O-DYNE - Shure Bros.
SPHINCTER - Pylon Co.
SPIKE-SPIKER - Kalglo Elctrns. Co.
SPINGUARD - AVX
SPINKOTE - Beckman Instrs.
SPINWRITER - NEC Infor. Sys.
SPIRADEL - Allen Avionics
SPIRAFIL - Cablewave Sys.
SPIRAL - EG & G Rotron
SPIRALTRON - Galileo Electro-Optics
SPIRAL WRAP HEATERS - Sierracin/Thermal Sys.
SPIRAP - AMP
SPIRA-SHIELD - Magnetic Shield
SPIR'ATOR - Ametek, Inc
SPIRFLAME - Solder Absorbing Technology (SAT)
SPIROBAND - Electrovert
SPLIT - MPB.
SPLITFORM - Microtran Co.
SPLIT/TRAN - Signal Transformer
SPOOLX - Algo
SPORTSMAN - Rayovac
SPOT CHECK - Pacific Transducer
SPOT-LOK - Allen Mfg.
SPOT-MASK - E.P.E.
SPOTMATIC - Auric.
SPOTMETER - Photo Resch.
SPOT-ON - Multicore Solders
SPRAGUE - Sprague Elec. Co.
SPRING LOC - Garry Mfg. Co. of Brand-Rex Co.
SPRINGTER - Pylon Co.
SPRING-THING - Southco
SPRINT - DuPont de Nemours, E. I., & Co.
SPRINT - EG & G Rotron
SPRINT 11 PLUS - Qume
SPRITE - EG & G Rotron
SPUTTER-RING - Temescal
SPUTTERSPHERE - Materials Resch.
SQUINT-SKAN - Skan-A-Matic
SRBOND - SRS Industries
S.R.M. - Sealectro
S-R-4 - BLH Elctrns.
SSS-SOLVENT SOLUBLE HOLDER - Tech Spray
S-SYSTEM - Electromatic Comps.
STABELEX - Industrial Midwec Capacitors
STABILARC - ISOREG
STABILENE - Keuffel & Esser/Kratos
STABIL-GLOW - Blue M, A Unit of General Signal
STABILINE - Superior Elec. Co.
STABILIZER 100 - Hollis Engrg.
STABILIZER 150 - Hollis Engrg.
STABIL-THERM - Blue M, A Unit of General Signal
STAB-L - Sprague-Goodman Elctrns.

STABLE-K - Republic Elctrns.
STABL-LEVL - Barry Controls
STABON - Stackpole, Magnet
STACER - Ametek, Inc
STACKRACK - Stackbin
STACPAC - Semtech
STA-FLUX - Hollis Engrg.
STAKE FASTENER - Dupree
STAKELOCK - Middleburg
STAK'M QUIK - Brim Elctrns.
STA-KON - Thomas & Betts
STAK PAK - Zippertubing Co.
STAK RAK - Zippertubing Co.
STANCOTE - Standard Wire & Cable Co.
STANDARD ENCLOSURES - Ango Electronics.
STANDARD LINE - Ungar
STAND-IN - Beckman Instrs.
STANFLEX - Standard Wire & Cable Co.
STANOMERSE - Technic
STANTRON - Stantron
STAPLE-PRUF - Carol Cable Co.
STAR - Star Micronics
STAR ALARM - Star Micronics
STARDUSTER - Antenna Specialists
STARTROL - Vectrol
STARWHEEL SOLAR CELL - Applied Solar Energy
STA-STRAP - Panduit
STATHAM - Gould
STATI-BAN - Thielex Plastics
STATIC-FREE - Chemtronics
STATIC WATCH - Nu-Concept Computer
STATI-EX - Solder Absorbing Technology (SAT)
STATI-KOTE - Thielex Plastics
STATI-PRO - Thielex Plastics Corp.
STAT-O-SEAL - Parker Seal Grp.
STATUS-INDICATOR - Industrial Elctrn. Engrs.
STATUS SEEKER - Dataprobe
STAT VAC - Data-Design Labs.
STAVOLT - Christie Elec.
STEDI-HEAT - Hexacon Elec.
STEEL-TOUGH - Ideal Industries
STEMCO - Hamilton Std. Controls
STENAFAX - Fitchburg Coated Prods.
STEP-CCI - Step Engineering
STEPPER MIKE - Oriel
STEP-27 DEVELOPMENT STATION - Step Engineering
STEP-4/CCI - Step Engineering
STEP-4 INSTRUMENT - Step Engineering
STEP-7 DEVELOPMENT STATION - Step Engineering
STEREOHEDRON - Stanton Magnetics
STEREOWAFER - Stanton Magnetics
STEREOZOOM MICROSCOPES - Bausch & Lomb, S.O.P.D.
STETTNER-TRUSH - Stettner Elctrns.
STI - Scientific Technlg.
STICKY FINGERS - Instrument Specialties Co.
STICKY MAT - Controlled Envir. Equip.
STICPAC - Semtech
STIKI-BAK - Acme Chem. & Insulation
STIK KLIPS - Daburn Elctrns. & Cable
STIKON - RdF
STIK-ON HEATERS - Sierracin/Thermal
STOPSLIP - Solder Absorbing Technology (SAT)
STOREDARC - Nelson Stud Welding TRW
STORTZ TEMP-O-LARM - PSG Inds.
STRAIGHTSHOOTER - Motorola Semiconductor
STRAINRITE - Star Porcelain
STRAPON - RdF
STRAPPING - Electrovert
STRATE-BREAKS - Coors Porcelain
STRATO-THERM - AMP
STRIPAC - Microwave Semiconductor
STRIPALL - Teledyne Kinetics
STRIPETTE - Lundy Elctrns. and Systems
STRIP-E-ZEE - Engineering & Elctrn. Devices
STRIPMASTER - Ideal Industries
STRIP MIX - Alltech Assocs.
STRIP-MOUNTS - Bivar
STRIP-N-STICK - CHR Inds.
STRIP-PAK - Stanford Applied Engrg.
STRIPSWITCH - EECO
STRIPTROL - CTS
STRIPTWEEZ - Pace
STROBEACON - Kemlite Labs.
STROBETTE - Power Instrs.
STROBEX - Chadwick-Helmuth
STROBRITE - U.S. Scientific Instrs.
STRONGHOLD - Teradyne Connection
STUK - Ambroid Co.
STURDI-STAND - Hexacon Elec.
STYCAST - Emerson & Cuming
STYLINE - Vicon Inds.
STYRACON - Sprague Elec. Co.
STYROFOAM - Dow Chemical Co.
STYRON - Dow Chemical Co.
ST 60 - Gulton Inds.
SUB-LITE-WALL - Zeus Indl. Prods.
SUB-MINAX - Amphenol
SUB-OUNCER - TRW Inductive Products
SUBSTITUTER - Sencore
SUB-SUB-OUNCER - TRW Inductive Products
SUCROSE-SOLV - Beckman Instrs.
SUEFSCAN - Tencor Instr.
SULFAMEX - Sel-Rex
SUMMAGRID - Summagraphics.
SUMMIT - Plastiglide Mfg.
SUN-FLEX - Sun-Flex Co.
SUN GUN - GTE Sylvania Lighting Prods.
SUN STICK - GTE Sylvania Lighting Prods.
SUNSWITCH - Ripley
SUNVERTER - Abacus Controls
SUN WIPE - Clean Room Prods.
SUPER - Kenyon Magnetics
SUPER ADD 3 - TRW Connector
SUPERBRIDGE - Motorola Semiconductor
SUPERBUG - Motorola Semiconductor
SUPER CAESAR - ITT Cannon
SUPER CHAMP - AMP
SUPERCHIPS - American Tech. Ceramics
SUPER-COMPACT - CGIS, A COMSAT
SUPERCON - Superior Elec. Co.
SUPERCORDER - Astro-Med
SUPER-D - TRW Connector
SUPER-DISK - ALTEK.
SUPERDISK IC LIBRARY - Fairchild Test Sys. Grp.
SUPERDISK 1500 - Fairchild Test Sys.
SUPERDISK 3000 - Fairchild Test Sys.
SUPERDISK 4000 - Fairchild Test Sys.
SUPERECTIFIER - General Instr.
SUPER EZ KLEEN - Research Prods.
SUPERFAST - Semtech
SUPERFAST - TRW Connector
SUPER-FLEX - Berg, W. M.
SUPERFLEX - Carol Cable Co.
SUPERFLOOD - GTE Sylvania Lighting Prods.
SUPER-GRAPH - Aremco Prods.
SUPERGUIDE - Fiberguide Industries
SUPERHAND ROBOTIC PICK/PLACE - Mann, Henry
SUPERIBBON - TRW Connector
SUPERIO - Motorola Semiconductor
SUPERIOR CONNECTION - Superior Flux & Mfg. Co.
SUPER-K - Republic Elctrns.
SUPERLEAD - Motorola Semiconductor
SUPERLINK - Motorola Semiconductor
SUPERLITE - United Foam Plastics
SUPERLOAD - Motorola Semiconductor
SUPER MACK - Sencore
SUPER MAX-C - Sprague-Goodman Elctrns.
SUPER-MITE - LH Research
SUPER MOD I - TRW Connector
SUPER-MOD 25 - TRW Connector
SUPER-MOD 5 - TRW Connector
SUPER MOD 6 - TRW Connector
SUPERMON - Motorola Semiconductor
SUPEROX - Alltech Assocs.
SUPERPAC - Xycom
SUPER-PLAST - Stock Drive Prods.
SUPERPOT - Consolidated Resistance Co. America
SUPERPOWER - Marathon Battery Co.
SUPERPOWER - Motorola Semiconductor
SUPER PUNCH - Shure Bros.
SUPER Q - Alltech Assocs.
SUPER Q - MSI Electronics
SUPERREEL - Memorex
SUPER/REG - Trio Labs.
SUPERSAFE - Superior Flux & Mfg. Co.
SUPERSAVER - GTE Sylvania Lighting Prods.
SUPER SCANNER - Antenna Specialists
SUPER SCORPION - Antenna Specialists
SUPER-SHEAR - E.P.E.
SUPER SLICE - Advanced Microcomputers
SUPERSLICE - Advanced Micro Devices
SUPER SNA - Mohawk Data Sciences
SUPER SOFT PULSE - Penn Resch.
SUPER-SOURCE - Temescal
SUPERSTAR - Brush Magnetic Heads
SUPERSTRATE - Materials Resch.
SUPER-STRIP - A P PRODUCTS
SUPER-SUN - Pacific Microcomputers
SUPERSWITCH - ITW
SUPERSWITCH - Thomson-CSF Comps.
SUPER SWITCHER - Powertec
SUPER-SYNCLAMPS - Timber-Top
SUPER-TORQUE - Beede Electrical Instr.
SUPER-TWISTAGUIDE - Airtron
SUPER/UNI - Power/Mate Co.
SUPERUTIL - Motorola Semiconductor
SUPER 17 - Kalart Victor
SUPER 21 - Mohawk Data Sciences
SUPER-40 - Airtron
SUPER 48 - Coherent
SUPPLYST - VIZ Test Equipment
SUPRAMESH - Pall Ultrafine Filtration
SUPRASHIELD - Alpha Wire
SURE-LOCK - Pacific Electricord
SURE SITE - Transamerica Delaval
SURFAMAX - Pall Ultrafine Filtration
SURGE GARD - Ametek/Rodan
SURGER - Associated Research
SURGESTOPPER - Brooks Mfg. Co.
SURGITRON - Joslyn Elctrn. Sys.
SURMETIC - Motorola Semiconductor
SURVEYOR DL - Bently Nevada
SUS-TENSION - Lektra Labs
SVP - Siemens
SWEEP CHANALYST - VIZ Test Equipment
SWEMAR - Leader Instrs.
SWIFTACHMENTS - Dennison Mfg. Co.
SWIFT SERVICE - RCD Components
SWING-SEAL - Jamesbury
SWITCH-A-ROO 232 - International Instrumentation
SWITCHER-100 - International Instrumentation
SWITCHGUARD - Qualidyne Sys.
SWITCHMATE - ADC Magnetic Controls
SWITCHMODE OR SWITCHMODE II, III, IV - Motorola Semiconductor
SWITCH-PAK - Computer Prods.
SWIVEL-BLADE - Ideal Industries
SWIVLTOP - Moody Tools
SWR AUTOTESTER - Wiltron
SY-BONDEZE - Phelps Dodge Magnet Wire
SY-LENT - Berg, W. M.
SYLGARD - Dow Corning.
SYLVANIA - GTE Sylvania Lighting Prods.
SY/MAX PROGRAMMABLE CONTROLLERS - Square D Co.
SYMBUG - Motorola Semiconductor
SYNAMP - CML MACARR
SYNCH-LOCK - Sequential Info. Sys.
SYNCHROMATIC - Schott Optical Glass
SYNCHRON - IMC/Hansen
SYNCHROSTEP - PMI Motors, Kollmorgen
SYNCHROTEL - Kollsman Instr.
SYNCHROVERTER - Bristol Babcock
SYNCHROVISION - Schott Optical Glass
SYNCLAMPS - Timber-Top
SYNC-LOC - Bristol Saybrook
SYNDEXER - A. S. R. Servotron
SYNTAX - Ultra Carbon
SYNTHAR - Industrial Midwec Capacitors
SYNTHINOL - Consolidated Electronic Wire & Cable
SYNTHITE - Dolph, John C., Co.
SYSTEM V/68 - Motorola Semiconductor
SYSTEM-10-FABRITEMP - Trans-Met Engrg.
SYSTEM 128 - Electromatic Comps.
SYSTEM 3000 - Motorola Semiconductor
SYSTEM 4000 - Motorola Semiconductor
SYSTRAC - Systron-Donner Inertial
SYSTRON - Systron-Donner Inertial
S-42 ALLOY - Sel-Rex
T - Ideal Industries
TABLOCK - Torin
TABL-TOP - Sel-Rex
TAB-WELD RESISTORS - Square D Co.
TACHLITE - Power Instrs.

TACH-PAK - Airpax/NA Philips Controls
TACH-TROL - Airpax/NA Philips Controls
TAFALOY - TAFA
TAG-RING - Glenair
TAIL/EXTENDER - Com/Tech Systems
TAK-ETTE - Power Instrs.
TAK-YANK - Thielex Plastics
TALAR - Singer Co.
TAMELOX - Ohmtek
TANFILM - TRW Resistive Products
TANITE - Sprague Elec. Co.
TANKARD - Automatic Timing & Controls
TANOX - Sprague Elec. Co.
TANTALEX - Sprague Elec. Co.
TANTAPAK - Sprague Elec. Co.
TANTIN - TRW Resistive Products
TANTOROID - Sprague Elec. Co.
TAPE CABLE - Brand-Rex
TAPE/FOIL - Tapecon
TAPEMASTER - Holub Industries
TAPE PAK - Ideal Industries
TAPERLOCK - Cablewave Sys.
TAPER-TITE - Norton Chemplast
TAPESWITCH - Tapeswitch. of America
TAPIT - Chicago Switch
TAPIT - ITW Switches
TAPOLENE - Tappan Wire & Cable
TA'POT - Howell Instrs.
TAPTONE - Benthos
TARGET - Ashland Chemical
TARNIBAN - Technic
TARZAN - EG & G Rotron
TASCORE - Thomas & Skinner
TASKMASTER - Summit Engineering.
TATTLETHERM - Everest Interscience
TAURUS - Nova Elec.
TAZ - Siemens
TC - Gould
TC-3 - ComDesign
TC-4 - ComDesign
TC-5 - ComDesign
TC-500 - ComDesign
TC-8 - ComDesign
TC850 - Wall Lenk
TDL - Hollis Engrg.
TDM - Transistor Devices
TDMD - Transistor Devices
T-DOT - Anaren Microwave
T-DOT - Westemp
TDQ - Phoenix Wire
TDR - Transistor Devices
TDRD - Transistor Devices
TDRS - Transistor Devices
TEACHWARE - Digiac
TEAM SYSTEMS - Test & Measurement Systems
TEC-CUT - Techni-Tool
TECH - Altek Co.
TECHCLEAN - Tech Spray
TECH-CRAFT - Lear Siegler
TECHNACELL - Elpower
TECHNIC CASH REGISTER - Technic
TECHNIC CY(-)LESS COPPER - Technic
TECHNIC CY(-)LESS GOLD - Technic
TECHNIC GOLD SAVER - Technic
TECHNI-GOLD HS - Technic
TECHNI-GOLD 25 - Technic
TECHNI-PLATINUM - Technic
TECHNI-RHODIUM - Technic
TECHNI-RITE - Gulton Inds.
TECHNI SILVER CY(-)LESS - Technic
TECHNISTRIP AU - Technic
TECHNI-TOOL - Techni-Tool
TECHNOTERM - Testoterm
TECHNOVENT - Testoterm
TECH-TIN - Technic
TECKSHIELD - Tecknit (Eastern Facility)
TECKSTIK - Tecknit (Eastern Facility)
TECKSTRIP - Tecknit (Eastern Facility)
TEC-LITE - TEC
TEC-TAC - Techni-Tool
TEC-TUFF - Techni-Tool
TEE-LOCK - General Elec. Co.
TEENY-TINY-MITE - LH Research
TEFLON - ICO-Rally
TEGLAR - Andrew
TEK - Tektronix
TEKS - ICO-Rally
TEL-A-TONE - Bell, Floyd, Assocs.
TELCO - GC Elctrns.
TELCON - Inter-Technical Grp.
TELE-BEAM II - Kalart Victor
TELECAP - Sprague Elec. Co.
TELE-CONNECT - SYT
TELEFILTER - Sprague Elec. Co.
TELE HEADPHONE - R-Columbia Prods.
TELEMAX - Thermax Wire
TELE-PAC - Elfab
TELE-POWER POLES - Wiremold Company
TELEPRODUCTS - Atlantic Research
TELEQUIPMENT - Tektronix
TELESOLUTIONS - TeleVideo Sys.
TELESPONDER - Vega Precision Labs.
TELETERM - Computer Devices
TELE-TEST - Bytex
TELETICKTER - A & B Technical Services
TELEVAC - Fredericks Co.
TELEVISION TUBE CADDY - Argos Prods.
TELEWORD - Telesensory Speech Sys.
TELEWRITER - Telautograph
TELFLEX - Chemtronics
TELFLEX-R - Chemtronics
TELTRON T-1000 - Lundy Elctrns. and Systems
TEM/GUIDE - UTE Microwave
TEMPCAL - Howell Instrs.
TEMPERATURE ON THE SPOT - Temptronic
TEMPEREX - Sel-Rex
TEMPGARD - Tenney Engrg.
TEMPILABELS - Tempil
TEMPILAQ - Tempil
TEMPIL PELLETS - Tempil
TEMPILSTIK - Tempil
TEMPLATE (R) - Megatek
TEMP-MASTER - Blue M, A Unit of General Signal
TEMP-METER - Alpha Comps.
TEMP-O-GIDE - Bivar
TEMPOSONICS - Temposonics
TEMP-PLATE - Wahl Instruments
TEMP-R-GLAS - CHR Inds.
TEMP-R-TAPE - CHR Inds.
TEMPSISTOR - Midwest Comps.
TEMP-TEX - Gore, W. L., & Assocs.
TEMPTRIM - Beckman Instrs.
TENBUG - Motorola Semiconductor
TENNA/FLEX - Cablewave Sys.
TENSILE-FLEX - International Wire Products Co.
TENSOL-THERM - Tensolite
TENTYPE - Tencor Instr.
TENULINE - Bird Elctrn.
TERM-ACON - Methode Elctrns.
TERMALINE - Bird Elctrn.
TERMALUM - AMP
TERMAPOST - Raychem Corp.
TERMASHIELD AMP
TERMI-BLOK - AMP
TERMI-FOIL - AMP
TERMI-GRID - AMP
TERMINAL-MASTER 1 - A & B Technical Services
TERMINUS - Poly-Scientific
TERMINYL - AMP
TERMI-PLATE - AMP
TERMI-POINT - AMP
TERMI-TWIST - AMP
TEST-GLO - Ideal Industries
TESTO - Testoterm
TESTOVENT - Testoterm
TETCO - Electric Tachometer
TETRA-ETCH - Gore, W. L., & Assocs.
TETRA ETCH - Gore, W. L., & Assocs.
TETRA-THIN - Gore, W. L., & Assocs.
TETRINOX - Caddock Electronics
TETTEX - Tettex Instruments
TEXBUG - Motorola Semiconductor
TEXTOOL - 3M-Electronic Products
TEXTOOL - Textool Products
TEXTUR TOUCH - C.A.M. Graphics Co.
TFR - Warren Comms.
T HEAD - AMP
THE BLACK HOLE - International Instrumentation
THE DIPPER - Midland-Ross.
THE FERRET - General Electric Co.
THE GREAT PROTECTORS - United Foam Plastics
"THE HOUSING AUTHORITY" - International Instrumentation
THE INTELLIGENT CABLE - Contel Info. Sys.
THE LINK - Matrix
"THE MOTHER OF INVENTION" - International Instrumentation
THERMAC - Research
THERMACON - Dexter Research Ctr.
THERMAIR - Thermo Elec.
THERM-AL - Acme Chem. & Insulation
THERMALEZE - Phelps Dodge Magnet Wire
THERMASPLICE - AMP
THERMATRACE - Barnes Engrg.
THERMAZIP - Zippertubing Co.
THERMCOAT CC - Omega Engrg.
THERMCOAT CO & COL - Omega Engrg.
THERMCOAT KIT - Omega Engrg.
THERMCOAT SL - Omega Engrg.
THERMILINEAR - Yellow Springs Instr.
THERMIVOLT - Yellow Springs Instr.
THERMO-CABLE - Thermo Elec.
THERMOCHUCK - Temptronic
THERMOFIT - Raychem.
THERMOFLAG - Staver Co.
THERMO-GRIP - Ideal Industries
THERMOGUN - Raychem
THERMOHM - Leeds & Northrup Instrs.
THERMOLAIN - Star Porcelain
THERMOLIMIT - Raychem
THERMOMATIC - Teledyne Rotolite
THERMOPAD - Motorola Semiconductor
THERMOPAD II - Motorola Semiconductor
THERMOPART - Pace
THERMO PRO - L & L Special Furnace
THERM-O-SCOPE - Capintec Instrs.
THERMO-SHRINK - Ideal Industries
THERMO SPOTTER - Heath Co.
THERMOSTREAM - Temptronic
THERMO-STRIP - Ideal Industries
THERMOTAB - Teccor Elctrns.
THERMOTERM - Maury Microwave
THERM-O-TRAC - Hexacon Elec.
THERMOTRAK - Westemp
THERMOVANE - Staver Co.
THERMOWATT - Motorola Semiconductor
THE SOURCE - Pyle Inds.
THE SWITCHER SOURCE - Trio Labs.
THE TERMINATOR - Optical Fiber Technologies
THIN-HEET - Safeway Products
THINISTOR - Victory Engrg.
THINKING CAP - Global Specialties.
THINLAY - Handy & Harman Elctrn. Matls.
THINLINE - Republic Elctrns.
THINPAK - American Zettler
THIN THREE DISK ENCLOSURE - International Instrumentation
THIN-TRIMS - Johanson Mfg.
THINVERTER - Arnold Magnetics
THIN-WALL - Berg, W. M.
THIRSTY WIPE - Clean Room Prods.
THORKOM - Viking Connectors
THOROUGHBRED - SMC Software Sys.
THREDS - Southco
THREDSEAL - Parker Seal Grp.
THREE-D - Berg, W. M.
THRIFT/MATE - GTE Sylvania Lighting Prods.
THRULINE - Bird Elctrn.
THRU-PASS - Sprague Elec. Co.
THUMB MITE - Tech Labs.
THUM-PLUGS - Thielex Plastics
THUM-TAK - Thielex Plastics
THYRISTROL - Cross Elctrns.
TI-BALL - Varian Assocs.
TIBOR - KBI
TI GOLD - Ulvac North America
TIGRAPH 100* - Texas Instrs.
TI HARD - Ulvac North America
TII - TII Electronics
TIMATCH - Times Fiber Communications
TIMECHECK - Vicon Inds.
TIME ELECTRONICS - ZI-TECH Instr.
TIMEFAX - Fitchburg Coated Prods.
TIMEMARK - Fitchburg Coated Prods.
TIME-O-LITE - Veeder-Root
TIMEPLEXER - Timeplex
TIMEPRINT - Fitchburg Coated Prods.
TINEON - Leecraft Mfg.
TINI-JAX - Switchcraft
TINI-PLUG - Switchcraft
TINITRON - Bussmann
TINNIT - Datak.
TINSIL - Bow Solder Prods.
TINY-GLOW - Industrial Devices
TINY L - AIE Magnetics
TINYMAX - Torwico Elctrns.
TINY-MITE - Industrial Devices
TINY-MITE - LH Research

TINYMITE - Renbrandt
TINY-PAK - Mini-Systems
TINY TRIM - Kappa Networks
TISSUMIZER - Heat Systems-Ultrasonics
TITAL - KBI
TITE-BITE - Thomas & Betts
TI-TITE - Daburn Elctrns. & Cable
TKASSY - Times Fiber Communications
TKC - Teledyne Kinetics
TLC - Berg Elctrns.
TLC STICK - Alltech Assocs.
T-LITE - Sylvania Miniature Lighting
TMA - Step Engineering
TMOS - Motorola Semiconductor
TMS - Raychem.
TM-1200 - ComDesign
TM-2400 - ComDesign
TM-4800 - ComDesign
TM-9600 - ComDesign
TOBOL - Tobe Deutschmann Labs.
TOEI - SEKAI Elctrns. of Amer.
TOGGLE-DIP - Grayhill
TOG-L-DIM-R - Power Controls
TOKEN/NET - Concord Data Systems
TOKIN - Tohoku Metal Inds.
TONG TEST - Columbia Elec. Mfg.
TONOTRON - Hughes Aircraft Co.
TOOLHEAD - Southco
TOP-SLOT - Aries Elctrns.
TORK PAK - Raymond Engrg.
TORMAX - IMC Magnetics.
TOROYD - Universal Mfg. Co.
TORQLINER - Midland-Ross., Cambion
TORQ SWITCH - Torq
TORQSYN REMOTE POSITIONER - Vernitron
TORQUE PACK - Raymond Engrg.
TORQUE-PEAK - Standard Pneumatic Motor
TORQUE WATCH - Waters Mfg.
TOUCH DRY - Markem
TOUCH-MASTER - Blue M, A Unit of General Signal
TOUCH-PEN - Sun-Flex Co.
TOUCHSCREEN - Dorman Bogdonoff
TPM - Macro Electronics
T-PROBE - Westemp
TRA-BOND - Tra-Con
TRA-CAST - Tra-Con
TRACE - Beckman Instrs.
TRACER-FLO - Trio-Tech Intl.
TRACKER - Huntron Instrs.
TRACS - GenRad
TRACTORADIO - ATR Elctrns.
TRA-DUCT - Tra-Con
TRAKFET - Analog Devices
TRANCELL - Standard Reference Labs
TRANQUIL-ARC - Nelson Stud Welding
TRANSACTIVE DPIS - Analogic
TRANSACTOR - Computerwise
TRANSCAP - Tusonix
TRANSDUKTOR TOROIDAL - Transduktor
TRANSENE-100 - Transene
TRANS-EYE - Shelly Associates
TRANSFILTER - Vernitron Piezoelectric
TRANSHEAT - BTU Engrg.
TRANSIL - Thomson-CSF Comps.
TRANSKON - Molex
TRANSLEX - ECD
TRANSMET K-102 HE - Transmet
TRANSMUX - Granger Assocs.
TRANSPAC - ERA Transpac
TRANSTERM - Computerwise
TRANSVOLT - Guildline Instrs.
TRANSZORB - General Semiconductor
TRA-PAX - Tra-Con
TRA-PRIME - Tra-Con
TRASAR - Andrew
TRA-SEAL - Tra-Con
TRA-STRIP - Tra-Con
TRC ICE POINT - Omega Engrg.
TREASURETRON - Gardiner Elctrns.
TREPOSLIDE - Beckman Instrs.
TRI - Data Precision
TRIAC KOOLER - UNITRACK
TRIC-NUT - Avibank Mfg.
TRICOLOR - Photo Resch.
TRIDAK - Tridak
TRIDUNDANT - LNR Communications
TRIFURON - Molex
TRIGAC - Singer Co.
TRIGARD - Joslyn Elctrn. Sys.
TRIGGER LOCK - Hartwell
TRIG-R-HEAT - Wall Lenk
TRILOG-150 - Trilog
TRILOG-300 - Trilog
TRIMET - Handy & Harman
TRIMFET - Motorola Semiconductor
TRIMIT - Bourns
TRIM KIT - American Tech. Ceramics
TRIMLINE - ESC Elctrns.
TRIMLINER - NEC Infor. Sys.
TRIMPOT - Bourns
TRIM-STEP - Datametrics • Dresser Inds.
TRIMSTRIPS - Southco
TRI-ONIC - Gould
TRIPLATE - Alpha Inds.
TRIPLE FLEX - Shure Bros.
TRIPLEGARD - Joslyn Elctrn. Sys.
TRIPLEMATIC - Hardman
TRI-ROUNDULAR - Fastex
TRI-STATE BOX - Electro Standards Lab.
TRITON I - Teledyne Rotolite
TROL-A-TEMP - EWC
TROLEX - CTS
TRON - Bussmann
TRONOX - Gould
TR-SERIES - Paso Sound Prods.
TRUARC - Waldes Kohinoor
TRU/BLU - Timeplex
TRU-CAL - EDL
TRUE ANGLE - Stock Drive Prods.
TRUE BLUE - PIC Design
TRUE METRIC - Stock Drive Prods.
TRUFLEX - Texas Instrs.
TRU-GLIDE - Jonathan Mfg.
TRU-MITE - Datametrics • Dresser Inds.
TRU-ROTA - Datametrics • Dresser Inds.
TRU-SPEC - Macom Inds.
TRU-TAC - Datametrics • Dresser Inds.
T-SCREEN - Siecor.
TSU-SR - Tri-Data
TTE - TTE
TT-JAX - Switchcraft
TT-PLUG - Switchcraft
TUBE-PAC - Semtech
TUFCON - Gore, W. L., & Assocs.
TUFFCOTE - Tensolite
TUF-FLEX - Pacific Electricord
TUFFLITE - Tensolite
TUF STUF - Clean Room Prods.
TUF-TIES - Amrad
TULOX - Blum, Julius & Co.
TUNER RUNU - Chemtronics
TUN-O-POWER - Chemtronics
TUN-O-WASH - Chemtronics
TURBO - Brand-Rex
TURBOCRYL - Brand-Rex
TURBOGLAS - Brand-Rex
TURBOLEX - Brand-Rex
TURBO-PROBE - Flow Techn.
TURBOSIL - Brand-Rex
TURBO-SLOT - IMC Magnetics
TURBOSOL - Brand-Rex
TURBOTHERM - Brand-Rex
TURBOTUF - Brand-Rex
TURBOZONE - Brand-Rex
TURBO 117 - Brand-Rex
TURBULA - Impandex
TURN-LOC - Deutsch Fastener
TURN-ON - Heyco Molded Products
TUTOR - Motorola Semiconductor
TUTORETTE - Audiotronics
TU-WIRE - Lutron Elctrns.
TV BUG - Motorola Semiconductor
TV-PAC - Semtech
TWENTY/TWENTY - Allaco Prods.
TWENTY/TWENTY - Bacon Inds.
TWIN-CAP - American Tech. Ceramics
TWIN LIGHT - Sylvania Miniature Lighting
TWINTRACK - Qume
TWISTAGUIDE - Airtron
TWISTER - Micro Component Technlg.
TWIST-LITE - MSC Prods./Eaton
TWIST-LOK - Sprague Elec. Co.
TWIST N FLAT - Spectra-Strip
TWIST-PROTECT - Electronic Specialists
TWIST TIES - Brim Elctrns.
TWO BUS - Eldre Comps.
TWYSTRON - Varian Associates
TYGON - Blum, Julius & Co.
TYKON - TRW Connector
TYPESET-8 - Digital Equip.
TYPOTRON - Hughes Aircraft Co.
TY-RAP - Thomas & Betts
TYTEX - Exide
TY-WRAPS - Brim Elctrns.
T-1 MILITARY INDICATOR LIGHT - Sylvania Miniature Lighting
UAR/T - General Instrument
UBIQUITOUS - Wavetek Rockland Sci.
UCAR - Union Carbide
UCCAP - University Computing Co.
U C-PROBE - International Instrumentation
UGLY - Elpac Power Sys.
UGX - Andrew
UHX - Andrew
UIC-600 - Princeton Elctrn. Prods.
ULTAMIN - Wavetek Indiana
ULTI-MATE - Victor Elec. Wire & Cable
ULTIPOR - Pall Ultrafine Filtration
ULTRA CELL - Sensor Techn.
ULTRA-CLEAN - Hollis Engrg.
ULTRA-CLEAN - Lab-Line Instrs.
ULTRA COMPACT - TRW Inductive Products
ULTRA F - Ultra Carbon
ULTRAFLEX - National Electric Cable
ULTRA-FLUX - Engelhard.
ULTRA-GLOW - AMF/Electro Comps.
ULTRA-GOG 300 - American Ultraviolet
ULTRAGRAF - Lundy Elctrns. and Systems
ULTRA-GROUND - Topaz Electronics
ULTRA-HI Q - Rutherford Resch. Prods.
ULTRA-ISOLATOR - Topaz Electronics
ULTRA-KAP - Centralab
ULTRALINE - National Electric Cable
ULTRA-LITE - Wonder of America
ULTRALLOY - Arco Elctrns
ULTRA-LOC - Motion Sys. Co.
ULTRA-PAK - Alltech Assocs.
ULTRAPAK - Electrovert USA
ULTRAPURE - Kester Solder
ULTRA-SEAL - Kenco Industries
ULTRA-SOL - Kenco Industries
ULTRA-SPEC 100 - American Ultraviolet
ULTRA-STRATES - Accumet Engrg.
ULTRA-TEMP - Aremco Prods.
ULTRATHIN - Champlain Cable
ULTRAVOX - Paso Sound Prods.
ULTREX - Baker, J. T., Chemical Co.
ULTROL - Brand-Rex
UMB - TransKinetic Sys.
UMD - Boston Systems Office
UNIBLOC - Motorola Semiconductor
UNIBUS - Digital Equip.
UNICIRCUIT - Sprague Elec. Co.
UNICOAT - Bacon Inds.
UNI-CORE - Alpha Metals
UNICORN - Motorola Semiconductor
UNI-CURVE - Fenwal Elctrns.
UNIDEX - Aerotech
UNIDEX - Oak Switch Sys.
UNIDIALER - Rath Microtech
UNIDOS - Motorola Semiconductor
UNIDYNE - Shure Bros.
UNI-LOCK - Veeder-Root
UNIMEC - MEC A/S
UNI-MODULE - Universal Instrs.
UNIMORPH - Vernitron Piezoelectric
UNI-PAC - Methode Elctrns.
UNIPAK SHOCK MOUNT - United Foam Plastics
UNIPLY - Power Designs
UNIPROX - Applied Electro Technlg., Int.
UNIRAY - MCE Semiconductor
UNIREEL - Interdyne Co.
UNIRING - Burndy
UNI-RON - Shure Bros.
UNI-ROTOR - Astro Dynamics
UNISERT - Unicorp
UNISET - Amicon
UNISPHERE - Shure Bros.
UNI-STRAND - Belden
UNISYSTEM - Pacific Microcomputers
UNIT - Avantek
UNI-TERM - American Tech. Ceramics
UNITRACK - UNITRACK
UNITWIST - Jan Hardware Mfg. Co.
UNIVERSAL - Mueller Elec. Co.
UNIVERSAL DISK ENCLOSURE (UDE) - International Instrumentation
UNIVERSAL PH DOSER - Analytical Meas.
UNIVERSAL PILOT HOUSING - Sylvania Miniature Lighting
UNIWATT - Motorola Semiconductor
UNIWELD - Endicott Coil
UNREEL - Belden
UPC - Atlas Energy Sys.
UPOWER - Integrated Circuits
UPOWER-DIP - Integrated Circuits

UP-TIMER - Xanadu Controls
URESOLVE - Amicon
URESOLVE - Dynaloy
USER-DESIGNED - VLSI Technology
US-2 - Scanbe
U-TILE-MU - Amuneal Mfg.
UTILI-TAP - AMP
UTILI-TENSHUN - AMP
UVTRON - Hamamatsu Photonics K.K.
VACION - Varian Assocs.
VACOIL - Transene
VACOMATIC - Vaco Prods.
VACPAC - Hull
VACREL - DuPont de Nemours, E. I.
VACSORB - Varian Assocs.
VACTROL - EG & G Vactec
VACULOY - Alpha Metals
VACU-SEALED - Benthos
VACUUM, TRANSDUCER PUMP - Air-Vac Engrg.
VADAC - E-Systems
VAGABOND - Shure Bros.
VAL-AN - Zero
VALUEMASTER - Advance Engrg.
VALU SWITCHER - Powertec
VAM - Bently Nevada
VAN DE GRAAFF - High Voltage Engrg.
VANTAGE - Teledyne Rotolite
VANTAGE POINT COMPUTER - Industrial Computer Designs
VANTAGE POINT ROSE - Industrial Computer Designs
VAPOPAK - Electrovert USA
VAPORFLO - Tenney Engrg.
VARA-TEMP - Hexacon Elec.,
VARAX - Adtech Power
VARIAC - Technipower, A Penril Co.
VARICON - Elco
VARICOUNTER - Veeder-Root
VARIDAC - Perkin-Elmer
VARISOURCE - Spectro Equipment
VARITEMP - Master Appliance
VARITRIM - Voltronics
VARI-VAC - Vactronic Lab. Equip.
VARY-TALLY - Veeder-Root
VAST - Harris
V BALL - Vernay Laboratories
VCAP - Video Automation Systems
VDAC - Standard Microsystems
VECOR - Vidaire Elctrns.
VECO VAMP - Victory Engrg.
VECTORBORD - Vector Electronic Co.
VECTOR-PAK - Vector Electronic Co.
VEE CAL - Vitramon N.A.
VEEDER-DECADE - Veeder-Root
VEEDERLINE - Veeder-Root
VEEDOMETER - Veeder-Root
VEE JEM - Vitramon N.A.
VEKTON - Norton Chemplast
VELCOR - Television Microtime
VELOSTAT BRAND - 3M Co., Static Control Sys.
VELVET TOUCH - Chartpak
VENDACARD - XCP
VENDACODER - XCP
VENT-RAK - General Devices
VENT-RAK - Vent-Rak
VERAFLEX - Shure Bros.
VEREX - Verbatim Corp.
VERICARD - Honeywell
VERI-DRIVE - Todd Prods.
VERIGRAPH - International Instruments
VERINET - VLSI Technology
VERNISTAT - Perkin-Elmer.
VERNITORQ - Vernitron
VEROBLOC - BICC-Vero Elctrns.
VEROBOARD - BICC-Vero Elctrns.
VEROBOX - BICC-Vero Elctrns.
VEROCASE - BICC-Vero Elctrns.
VEROLOCK - BICC-Vero Elctrns.
VERORACK - BICC-Vero Elctrns.
VEROWIRE - BICC-Vero Elctrns.
VERSABUG - Motorola Semiconductor
VERSABUS - Motorola Semiconductor
VERSACAGE - UNITRACK
VERSACON - Teradyne Connection Sys.
VERSA-CRIMP COMPRESSION CONNECTORS & TOOLS - Square D
VERSADOS - Motorola Semiconductor
VERSAMODULE - Motorola Semiconductor
VERSAMOUNT BRACKETS - UNITRACK
VERSANET - Motorola Semiconductor
VERSAPLEX - Lutron Elctrns.
VERSA-PROBE - EDL
VERSA-RANGE - Blue M, A Unit of General Signal
VERSA-TEMP - EDL
VERSA-TRAN - Honeywell
VERSAWATT - RCA Solid State
VERTI-GO STACKABLE - Middleburg.
VERTI-LYTIC - Sprague Elec. Co.
VERTISOCKETS - Aries Elctrns.
VERT-O-GIDE - Bivar
VIBRALARM - Vibra-Metrics
VIBRALERT - Metrix Instrument Co.
VIBRA LOK - TRW Cylindrical Connector
VIBRAMIKE - Alpha-M
VIBRAMITE - Vibra-Metrics
VIBRASCOPE - Spectral Dynamics
VIBREX - Chadwick-Helmuth
VIBROGROUND - Associated Research
VICOAX - Vicon Inds.
VIDAIRE - Vidaire Elctrns.
VIDEO/FILTER - Panelgraphic
VIDEOLINK - Vicon Inds.
VIDEOMASTER - Lance Inds.
VIDEO STICKS - Chemtronics
VIDOMET - Penn Video
VII - Vicon Inds.
VII - Visual Info. Institute
VINYLINK - Burndy
VINYL STIX - Topflight
VINYLUG - Burndy
VIP - Struthers-Dunn
VIP - Zero
VIP SOCKETS - Wells Elctrns.
VIRTRONICS - VirTis Co.
VISCOFILM - Industrial Midwec Capacitors
VISHAY - Vishay Resistive Sys. Grp.
VISHAY TO BE PRECISE - Vishay Resistive Sys. Grp.
VISICORDER - Honeywell
VISICOUNTER - Veeder-Root
VISI-DIAL - Theta Instr.
VISIGRAPH - Trans-Met Engrg.
VISI-GUARD - Joslyn Elctrn. Sys.
VISI-PITCH - Kay Elemetrics
VISOMET - ZI-TECH Instr.
VISTAL - Coors Porcelain
VITACOTE - ESICO
VITAMIN Q - Sprague Elec. Co.
VITEL - Viking Connectors
VITR-AU-LESS - Ferro
VITREOSIL - Thermal Amer. Fused Quartz
VITROHM - Ward Leonard Elec.
VITROLAIN - Star Porcelain
VIVISUN 20/20 - Aerospace Optics
VK - Vitramon N.A.
VLC-360 - Video Logic
V-LINE - GSE
VLSI - Baker, J. T., Chemical Co.
VMC 68/2 - Motorola Semiconductor
VMEASY CAGE - Electronic Solutions
VMEBUG - Motorola Semiconductor
VME MODULE - Motorola Semiconductor
VME/SYSTEM I - Motorola Semiconductor
VME/10 - Motorola Semiconductor
VN-TC - Brand-Rex
VOCAL MASTER - Shure Bros.
VOICE DIRECTOR - Argos Prods.
VOICEGATE - Shure Bros.
VOICE WARE - Centigram
VOL-CON - Ideal Industries
VOLPI TRONIC - American Volpi
VOLTECTOR - Heat Systems-Ultrasonics
VOLTECTOR - Sperry, A. W., Instrs.
VOLTOHMYST - VIZ Test Equipment
VOLTPROBE - Amprobe Instr.
VOLTRONICS - Voltronics
VOLTSENSOR - Calex Mfg. Co.
VOL-U-METER - Brooks Instr.
VOPAC - Centigram
VORTEX & VORTEX II - Sperry Univac
VOXCOM - Tapecon
VP - Vitramon N.A.
V-PAC POWER SOURCES - Reliability
VPR - Vermont Precision Resistor
VPS - Vicon Inds.
VPS-RF - Vicon Inds.
VTAC - Standard Microsystems
VTAM - Sperry Univac
VTI - VLSI Technology
VTICOMPOSE - VLSI Technology
VTIDRC - VLSI Technology
VTIEXTRACT - VLSI Technology
VTIHELP - VLSI Technology
VTILAYOUT - VLSI Technology
VTILIBRARY - VLSI Technology
VTINET - VLSI Technology
VTINETCOMPARE - VLSI Technology
VTINETLIST - VLSI Technology
VTINEWS - VLSI Technology
V TIP - Vernay Laboratories
VTIPLOT - VLSI Technology
VTISCHEMATIC - VLSI Technology
VTISIM - VLSI Technology
VTISTICKS - VLSI Technology
VTITERMINAL - VLSI Technology
VTITEST - VLSI Technology
VTITEXT - VLSI Technology
VTITOOLS - VLSI Technology
VTIUTILITIES - VLSI Technology
VTIVIP - VLSI Technology
VUE GUARD - Panelgraphic.
VUE POINT - General Digital
VULCAN - Contact
VULCAN - Harris.
VULCANEX - Electrical Plastics
VULCANIZED XECON - Chomerics
VULKAFLEX - General Electric Co.
VULKENE - General Electric Co.
VUMATIK - Honeywell
VUTRONIK - Honeywell
V V C - Codi Semiconductor
VX SUPER REFRACTORY - GTE Wesgo Technical Ceramics & Metals
VY - Vitramon N.A.
VYCOR - Corning Glass Works
VYLINK - Brand-Rex
VYNA-KOTE - Spectra-Strip
V-53 - Vishay Resistive Sys. Grp.
V77-200, V77-400, V77-500, V77-600, V77-700, V77-800 - Sperry Univac
WAFER-BATCHER - Plasma-Therm
WAFERCON - Molex
WAFERLINE - Materials Resch.
WAFER-SPHERE - Jamesbury
WAIT-A-BIT - AIE Magnetics
WALSCO - GC Elctrns.
WAMCO - Miller, W. A., Co.
WAND (TM) - Megatek.
WATCHDOG ENERGY MGMT. SYSTEMS - Square D Co.
WATER-BLOC - Siecor.
WATERTITE - Okonite
WATERWEB - Heat Systems-Ultrasonics
WATER WELDER - Henes Prods.
WATTCHER - Bird Elctrn.
WATT-MISER - Watt-Clock.
WATTSHAVER - Solid State Systems
WATTS-ON - Tech Labs.
WAVEDIPPER - Electrovert USA.
WAVEGUARD - Krohn-Hite
WAVELABS - Systron-Donner Inertial
WAVEMETER - Burleigh Instrs.
WEDGE-EZE - Automatic Connector
WEDGE-EZE, WEDGE-LOCK, ECONOCRIMP - Arco Elctrns.
WEDGE-LOCK - Automatic Connector
WEDGELOCK - Standard Grigsby
WEECOIL - Syscon Intl.
WEECON - Tusonix
WEIGHLITE - Kistler-Morse
WELCON - Wells Elctrns.
WELDOHM - Belden
WELDOX - Hardman
WELLER - Cooper Group
WELLFLEX - Cablewave Sys.
WELTEK - Weltek Intl.
WELTEK SCREEN QUALITY - Weltek Intl.
WELTEK SPECIAL TURNAROUND SERVICE - Weltek Intl.
WE'RE WARNING YOU.. - Projects Unltd.
WESCO - West Coast Elec. Mfg.
WESTACH - Westberg Mfg.
WESTAT - Wescorp Antistatic Prods.
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WESTON NETRIM - Weston Controls/Pots
WET-SPEC - Electrol Co.
WHEELER - Varian Assocs.
WHISPER - EG & G Rotron
WHISPERCABLE - Thermax Wire
WHITE BOX - Omega Engrg.
WHIZZARD (R) - Megatek
WHYTE BOX - Omega Engrg.
WIBA - Electrovert
WIDEBETA - Beckman Instrs.
WIDETRACK - Qume
WILBRAZ - Wilkinson
WILD ROVER - Refac Elctrns.

WILTRON - Wiltron
WIMA - Inter-Technical Grp.
WINC - Advanced Elctrns. Design
WINCHESTER REPEATER - Raymond Engrg.
WING-NUT - Ideal Industries
WIRE-LUBE - Ideal Industries
WIRE NUT - Ideal Industries
WIREPLIER - Vaco Prods.
WIRE PREPPER - Ideal Industries
WIRETEMP - Trans-Met Engrg.
WIRE-WRAP - Hollis Engrg./Wire-Wrap
WIRE WRAP SOCKETS - Midland-Ross
WISS - Cooper Group
WISSH - Workman Elctrn. Prods.
WITE BOX - Omega Engrg.
WONDER MASK - Tech Spray
WONDER WIPE - Clean Room Prods.
WOOD ELECTRIC - Potter & Brumfield
WORD SLICE - Analog Devices
WORDSMITH - Documation
WORKHORSE - Rayovac
WORLD-CHIP - Advanced Micro Devices
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WRAP-CAP - Ideal Industries
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WSM - Tech Spray
WX SERIES - Wall Lenk
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WYTE BOX - Omega Engrg.
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YEWFLO - Yokogawa. of America
YIELD MAX - Monsanto Co.
YODAC - Yokogawa. of America
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ZEBRA - Tecknit (Eastern Facility)
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ZIP DIP - 3M-Electronic Products
ZIP DIP - Textool Products
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ZYP - ZyMOS
Z80 SMART CARD - VersaLogic
0-CON - Wavetek Rockland Scientific
1500 - Photodyne
1800 - Photodyne
22XL - Photodyne
2-4-1 - Signal Transformer
3C - Spectra-Strip
3S-WICK - Solder Absorbing Technology
3-WIRE LINE - Ungar
33XL - Photodyne
4100 PRINTER - Ramtek
44 RESIN - Kester Solder
44XL - Photodyne
5-WAY - Superior Elec. Co.
6000 SERIES - Ramtek
66XL - Photodyne
7MAG - Merix Chem. Co.
7X, SEVEN-X - ECD
70 PSI - Chemtronics
7000 SERIES - Applied Engrg. Prods.
7500 - Photodyne
800 DIPSERT IC BASE - Solder Removal
88XL - Photodyne
880 INSERTIC TOOL - Solder Removal
885 PUL-N-SERTIC TOOL - Solder Removal
90° SWEEP - Astrolab
9000 SERIES - Ramtek
9050 SERIES - Ramtek
9400 SERIES - Ramtek
99XL - Photodyne

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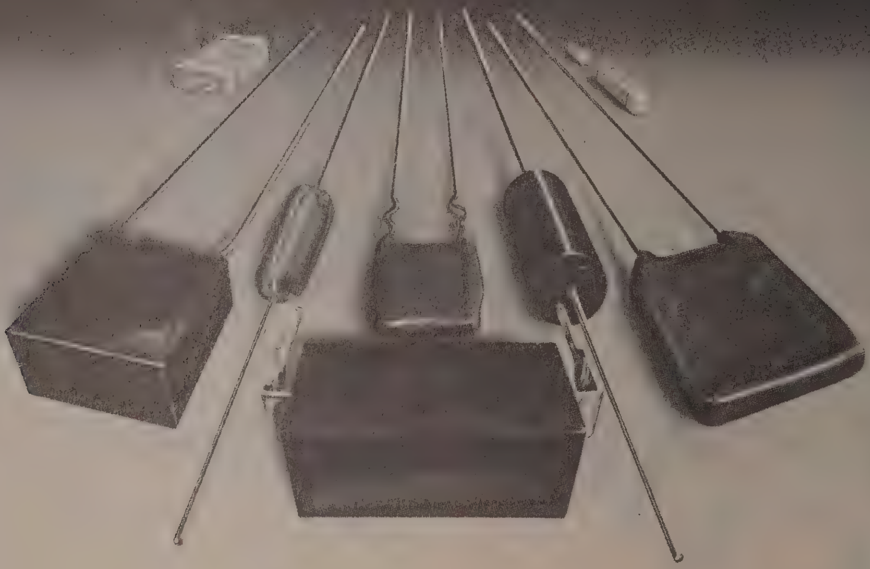

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MIL-A6752 FSC 6625
Ammeters, Voltmeters, and Loadmeters; DC

Bach-Simpson Ltd.
General Electric Co.,
  Cincinnati, OH
Hickok Electrical Inst. Co.
Ideal Precision Meter Co.
International Instruments Div.,
  Sigma Instruments

MIL-B-81757 FSC 6140
Batteries and Cells, Storage Nickel-Cadmium

General Electric Co.,
  Gainesville, FL
Marathon Battery Co.
Rebling Plastics Co.
SAFT America, Inc.

MIL-B-23071 FSC 4140
Blowers, Miniature, for cooling electronic equipment (10 to 500 CFM)

Eastern Air Devices, Inc.
EG&G Rotron, Inc.
IMC Magnetics Corp.,
  Westbury, NY
TRW Motor Div.

MIL-B-5423 FSC 5930
Boots, Dust and Water Seal (for toggle and pushbutton switches and rotary-actuated parts)

APM Hexseal Division
Multi-Flex Seals, Inc.

MIL-C-19978 FSC 5910
Capacitors, Fixed, Plastic (or Paper-Plastic), Dielectric (Hermetically sealed in metal, ceramic, or glass cases)

Chicago Condenser Corp.
Sprague Electric Co.
Stone City Products Co.
TRW Capacitor Div.
West-Cap Arizona

MIL-C-915 FSC 6145
Cable and Cord, Electrical

Anaconda-Ericsson, Inc.,
  Continental Wire & Cable
BIW Cable Systems, Inc.
Brand-Rex Company
Carol Cable Co. West
Cerro Wire & Cable Co.
Chester Cable Corp.
Collyer Insulated Wire Co.
Consolidated Products Corp.
General Cable Corp.
ITT Surprenant Div.
Marine Industrial Cable Corp.
Mohawk Wire & Cable Corp.
Monroe Wire & Cable Corp.
The Okonite Co.
Phalo Corp.
Pirelli Cable Corp.
Plastoid Corporation
Rome Cable Corporation
Times Wire & Cable Co.
Vector Cable Co.

MIL-C-7974 FSC 5935
Cable Assemblies and Attachable Plugs, external electrical power, aircraft

Anderson Power Products
Burton Electrical Engineering
FKC Engineering Co.
General Cable Co.,
  Cornish Products Div.

MIL-C-17 FSC 6145
Cables, Radio Frequency: Flexible & Semirigid

Belden Electronic Wire & Cable
Cablewave Systems, Inc.
Champlain Cable Corp.
ITT Surprenant
Phalo Corp.
Plastoid Corp.
Precision Tube Co., Inc.
Saxton Products, Inc.
Storm Products Co.
Teledyne Thermatics
Tensolite Co.
Thermax Wire Corp.
Times Fiber Communications, Inc.
Uniform Tubes, Inc.

MIL-C-22442 FSC 5965
Cable Assembly, Aircraft Audio

Astrocom Electronics, Inc.
Hiltronics Corp.
Telephonics

MIL-C-13777 FSC 6145
Cable, Special Purpose

BIW Cable Systems, Inc.
Brand-Rex Company
Rome Cable Corp.
ITT Surprenant

MIL-C-55681 FSC 5910
Capacitors, Chip, Multiple Layer, Unencapsulated, Ceramic Dielectric

American Technical Ceramics
AVX Ceramics Corp.
Monolithic Components Corp
Republic Electronics Corp.
San Fernando Electric Mfg. Co.
Sprague Electric Co.
Union Carbide Corp., Greenville, SC
Unitrode Corp.
U.S. Microtek Components
Vitramon Inc.

MIL-C-83439 FSC 5910
Capacitors, Fixed, Feedthrough, EMI Suppression, (AC, DC, and AC-DC, Hermetically Sealed in Metal Cases)

Murata Erie, Canada
Sprague Electric Co.

MIL-C-27287 FSC 5910
Capacitors, Fixed, Plastic Dielectric, DC (Nonmetallic Cases)

Mepco/Electra Inc., Columbia, SC
Midwec Corp.
San Fernando Electric Mfg. Co.
TRW Capacitor Div.

MIL-C-55514 FSC 5910
Capacitors, Fixed, Plastic (or Metallized Plastic) Dielectric, in Nonmetal Cases

Electronic Concepts, Inc.
Sprague Electric Co.
Union Carbide Corp., Greenville, SC

MIL-C-39022 FSC 5910
Capacitors, Fixed, Metallized, Paper-Plastic Film, or Plastic Film Dielectric, DC and AC (Hermetically Sealed in Metal Cases)

Acushnet Capacitor Co., Inc.
Alissa Manufacturing Co.
Components Research Co., Inc.
Sprague Electric Co.
TRW Capacitors
Union Carbide Corp., Greenville, SC
West-Cap Arizona

MIL-C-39018 FSC 5910
Capacitors, Fixed, Electrolytic (Aluminum Oxide)

Cornell-Dubilier Electronics,
  Sanford, NC

Mepco/Electra, Inc., Columbia, SC
Sangamo Capacitor Div.
Sprague Electric Co.

MIL-C-39003 FSC 5910
Capacitors, Fixed, Electrolytic, Tantalum, Solid-Electrolyted

Acushnet Electronics Co.
Mallory Capacitor Co.
Mepco/Electra, Inc., West Palm Beach, FL
Sprague Electric Co.
Union Carbide Corp., Greenville, SC

MIL-C-3965 FSC 5910
Capacitors, Fixed, Electrolytic, (Nonsolid Electrolyte), Tantalum

Cornell-Dubilier Electronics, Sanford, NC
Hunter-Stanley Electronics, Inc.
Mallory Capacitor Co.
Mepco/Electra, Inc., West Palm Beach, FL
Mepco/Electra, Inc., Columbia, SC
Sprague Electric Co.
Tansitor Electronics, Inc.

MIL-C-19978 FSC 5910
Capacitors, Fixed, Plastic (or Paper-Plastic), Dielectric (Hermetically sealed in Metal, Ceramic, or Glass Cases)

Chicago Condenser Corp.
Sprague Electric Co.
Stone City Products Co.
TRW Capacitor Div.
West-Cap Arizona

MIL-C-11272 FSC 5910
Capacitors, Fixed, Glass-Dielectric

American Technical Ceramics Div.
Corning Glass Works, Raleigh, NC
Republic Electronics Corp.
Vitramon Inc.

MIL-C-11015 FSC 5910
Capacitors, Fixed, Ceramic-Dielectric (General Purpose)

Automation Components Inc.
AVX Ceramics Corp.
Centralab, Los Angeles, CA
Cera-Mite Corp.
Corning Glass Works, Raleigh, NC
Republic Electronics Corp.
San Fernando Electric Mfg. Co.
Sprague Electric Co.
Tusonix, Inc.
Union Carbide Corp., Greenville, SC
Vitramon, Inc.

MIL-C-123 FSC 5910
Capacitors, Fixed, Ceramic Dielectric, (Temperature Stable & General Purpose)

San Fernando Electric Mfg. Co.

MIL-C-62 FSC 5910
Capacitors, Fixed, Electrolytic (DC, Aluminum, Dry Electrolyte, Polarized)

Sprague Electric Co.

MIL-C-5 FSC 5910
Capacitors, Fixed, Mica-Dielectric

Acushnet Capacitor Co., Inc.
ADI Electronics, Inc.
Cornell-Dubilier Electronics, New Bedford, MA
Sangamo Capacitor Co.
Silvered Electronic Mica Co., Inc. (SEMCO)
Soshin Electric Ltd. (Distr. by Multi Products Intl.)

MIL-C-23269 FSC 5910
Capacitors, Fixed, Glass Dielectric

Corning Glass Works, Raleigh, NC
Vitramon, Inc.

MIL-C-14409 FSC 5910
Capacitors, Variable, (Piston-Type, Tubular Trimmer)

Johanson Mfg. Corp.
Murata Erie, Erie, PA
Sprague-Goodman Electronics, Inc.
Voltronics Corp.

MIL-C-81 FSC 5910
Capacitors, Variable, Ceramic Dielectric

Tusonix, Inc.

MIL-C-7079 FSC 5925
Circuit Breakers, Non Trip-Free

Potter & Brumfield Div., AMF Inc., Gainesville, GA

MIL-C-55629 FSC 5925
Circuit Breakers, Magnetic, Unsealed or Panel Seal, Trip Free

Airpax Corp., Cambridge, MD
Heinemann Electric Co., Lawrenceville, NJ

MIL-C-15306 FSC 5950
Coils, Fixed and Variable, Radio Frequency

Cambridge Thermionic Corp.
Dale Electronics, Inc., Columbus Div.
Delevan, Div. of American Precision Inds. Inc.
Jeffers Electronics, Inc.
Nytronics Components Group Inc.
Piconics, Inc.
Torotel Products, Inc.
TRW Inductive Products Div.
Vanguard Electronic Co., Inglewood, CA
West-Cap Arizona

MIL-C-22992 FSC 5935
Connectors, Electrical Waterproof, Quick Disconnect, Heavy Duty Type & Accessories

Amphenol, Broadview, IL
Bendix Corp. Electrical Components Div.
Burndy/Berco
ITT Cannon Electric

MIL-C-21097 FSC 5935
Connectors, Electrical, Printed Wiring Board

AMP Incorporated
Amphenol, Broadview, IL
EDAC, Incorporated
Elco Corp., Connector Div.
TRW Connector Div., Elk Grove Village, IL
Winchester Electronic Div., Litton Industries

MIL-C-24308 FSC 5935
Connectors, Electric Rectangular, Miniature Polarized Shell, Rack Panel

ADI Electronics, Inc.
AMP, Inc.
General Connector Corp.
ITT Cannon Electric, Fountain Valley, CA
Matrix Science Corp.
Positronic Industries, Inc.
Souriau, Inc., Valencia, CA
TRW Connectors Div., Elk Grove Village, IL

MIL-C-81703 FSC 5935
Connectors, Electric, Circular, Miniature, Rack & Panel or Push-Pull Coupling

Deutsch Elec., Component Div.
Sealtron, Inc.

MIL-C-25516 FSC 5935
Connector, Electrical, Miniature

TRW Electronic Components, Minneapolis, MN

MIL-C-26500 FSC 5935
Connectors, General Purpose, Electrical, Miniature, Circular

Amphenol, Broadview, IL
Glenair, Inc.
Hermetic Seal Corp.
Pyle-National Co.
TRW Connectors, Minneapolis, MN

MIL-C-28748 FSC 5935
Connectors, Electrical, Rectangular, Rack & Panel, Solder Type & Crimp Type Contacts

Continental Connector Corp.
Dale Electronics, Inc., Columbus, NE
Hughes Aircraft Co., Connecting Devices Div., Irvine, CA
Positronic Industries, Inc.

U.S. Components, Inc.
Winchester Electronics, Div. Litton Industries, Inc.

MIL-C-28804 FSC 5935
Connectors, Electric, Rectangular, High Density, Polarized Center Jackscrew

Hughes Aircraft Co., Connecting Device Div., Irvine, CA

MIL-C-3912 FSC 5935
Connectors, Coaxial, Radio Frequency

AMP, Inc.
Amphenol RF Operations, Danbury, CT
Automatic Connector, Inc.
Bendix Corp., Electrical Components Div.
Cablewave Miniature Products
Delta Electronics Mfg. Corp.
ITT Cannon Electric, Phoenix, AZ
Kings Electronics Co., Inc.
OMNI Spectra, Inc., Microwave Connector Div.
Sealectro Corp.
Solitron/Microwave
Specialty Connector Co.

MIL-D-3954 FSC 5985
Dummy Load, Electrical, Waveguide

Struthers Electronics Corp.

MIL-E-1 FSC 5960
Electron Tubes

Amperex Electronic Corp., Hicksville Div.
Beam Tube Corp.
Cetron Electronics
EG & G, Inc., Electro-Optics Div.
GEC Technology Corp.
General Atronics Corp.
General Electric Co., Microwave Tube Operation
General Electric Co., MIDPS
ITT Electron Tube Div.
Litton Industries, Electron Tube Div., Williamsport, PA
LND, Inc.
Machlett Labs., Inc.
Microwave Assoc., Inc., Burlington, MA
M. U. Incorporated
National Electronics, Inc.
OMNI-Wave Electronics Corp.
Philips ECG, Inc., Altoona, PA
Raytheon Co., Quincy, MA
Raytheon, Waltham, MA
RCA Corp., Lancaster, PA
TGM Detectors, Inc.
Thomas Electronics, Inc.
Thomson-CSF Comps. Corp., Dover, NJ
Varian Assoc., Palo Alto, CA
Varian Canada, Inc., Georgetown, Ont.
Varo Electron Devices, Inc.
Watkins-Johnson Co., Stewart Div.
Western Electric Co., Inc.
Westinghouse Electric Corp., Electronic Tube Div.

MIL-F-15733 FSC 5915
Filters, Radio Interference

Captor Corp.
Centre Engineering, Inc.
Fil-Coil Co., Inc.
Murata Erie, Canada
RFI Corporation
San Fernando Electric Mfg. Co.
Spectrum Control, Inc.
Sprague Electric Co. Filter Div., North Adams, MA

MIL-F-18327 FSC 5915
Filters: High Pass, Low Pass, Band Suppression, & Dual Functioning

ADC Products
Conolog Corp.
OPT Industries, Inc.
TRW Inductive Products Div.

MIL-F-23419 FSC 5920
Fuses, Instrument Type

Bussmann Mfg. Div., McGraw-Edison Co.
Littelfuse, Inc.

MIL-I-1361 FSC 6625
Instrument Auxiliaries, Electrical Measuring: Shunts, Resistors, & Transformers

Brown Boveri Electric, Inc., West Columbia, SC
Electromagnetic Industries, Inc.

MIL-I-27273 FSC 6130
Inverter, Power, Static

Hamilton Standard Div., United Technologies Corp.
Magnetika, Inc.

MIL-J-641 FSC 5935
Jacks, Telephone

ADC Products
Kings Electronics Co., Inc.
Switchcraft, Inc.

MIL-L-3661 FSC 6210, 6250
Lampholders, Indicator Lights, Indicator-Light Housings, & Indicator Light Lenses

Cutler Hammer Grp., Eaton Corp., Aerospace Controls/Systems Div.
Dialight
General Instrument Corp., Lamp Div.
Littelfuse, Inc.
Oak Switch Systems

MIL-M-10304 FSC 6625
Meters, Electrical Indicating, Panel Type, Ruggedized

A & M Instrument, Inc.
Bach-Simpson, Ltd.
Ideal Precision Meter Co., Inc.
International Instruments
Phaostron Instrument & Electronic Co.
Simpson Electric Co.
Triplett Corp.

MIL-0-55310 FSC 5955
Oscillators, Crystal

McCoy Electronics Co.
Oscillatek Corp.
Q-TECH Corp.
Spectrum Technology, Inc.
Vectron Labs., Inc.
Xsis Electronics, Inc.

MIL-P-26517 FSC 6130
Power Supply, Transformer-Rectifier, Aircraft

Wagner Electric Corp., Tung-Sol Div.
Westinghouse Electric Corp., Aerospace Electrical Div.

MIL-R-28803 FSC 6240
Readouts, Segmented

Master Specialties

MIL-R-19648 FSC 5945
Relays, Time Delay, Thermal

Warren Communications

MIL-R-83726 FSC 5945
Relays, Time Delay, Electric & Electronic

Deutsch Relays, Inc.
Hi-G Co., Inc., Windsor Locks, CT
Leach Corp., Control Products Div.
Struthers-Dunn, Inc.
Tempo Instrument, Plainview, NY

MIL-R-83407 FSC 5945
Relays, Reed (Mercury Wetted)

Struthers-Dunn, Inc.

MIL-R-39016 FSC 5945
Relays, Electromagnetic

Branson Corp.
Communications Instruments, Inc.
Deutsch Relays, Inc.
Electronic Specialty Div.
GENICOM Corp. (General Electric Co.), Waynesboro, VA
Gould, Inc., Allied Control Div., Plantsville, CT
Hi-G Co., Inc., Windsor Locks, CT
Teledyne Relays

MIL-R-28750 FSC 5945
Relays, Solid State

Hi-G Co., Inc., Windsor Locks, CT
Teledyne Relays

MIL-R-94 FSC 5905
Resistors, Variable, Composition

Allen-Bradley Co.
Clarostat Mfg. Co., Inc.

Precision Electronic Components, (1971), Ltd.

MIL-R-26
Resistors, Fixed, Wire-Wound (Power Type)

CAL-R, Inc.
Dale Electronics, Inc., Columbus, NE
E-Systems, Inc., Memcor, Div.
Ohmite Mfg. Co.
Pacific Resistor Co.
RCL Electronics, Inc.
Shallcross, Inc.
TEL-Labs, Inc.
Tepro of Florida, Inc.
Ultronix, Inc.
Ward Leonard Electric Co.

MIL-R-22 FSC 5905
Resistors, Variable (Wirewound, Power Type)

E-Systems, Inc., Memcor Div.
Ohmite Mfg. Co.

MIL-R-55342 FSC 5905
Resistors, Fixed, Film, Chip

Dale Electronics, Inc., Columbus, NE
Mepco/Electra, Inc., Morristown, NJ
Mini-Systems, Inc.
State of the Art, Inc.

MIL-R-83401 FSC 5905
Resistor Networks, Fixed Film

Allen-Bradley Co.
Dale Electronics, Inc., Columbus, NE
California Micro Devices, Inc.
KDI Pyrofilm Corp.
Mepco/Electra, Inc., Morristown, NJ
Sprague Electric Co.
Techno-Comps. Corp.
TRW Resistors
Vishay Resistive Systems

MIL-R-39008 FSC 5905
Resistors, Fixed, Composition (Insulated)

Allen-Bradley Co.

MIL-S-22432/9 FSC 6105
Servomotor, Type 18SM4c

Tachtronic Instruments, Inc.

MIL-S-12883 FSC 5935
Sockets & Accessories for Plug-in Electronic Components

Augat, Inc.
Deutsch Relays, Inc.
Eby Company

MIL-S-3928 FSC 5985
Switches (Coaxial), RF Transmission Line

Amphenol, RF Operations

Transco Products, Inc.

MIL-S-6807 FSC 5930
Switch, Rotary, Selector

Electro Switch Corp.

MIL-S-8805 FSC 5930
Switches & Switch Assemblies, Sensitive & Push (Snap Action)

Eaton Corp. Aerospace Controls/ Systems Div.
Haydon Switch & Instrument, Inc.
Licon Div.
Master Specialties Co.
Micro Switch
Nexus
Otto Engineering
Saint Switch, Inc.
Stacoswitch
Texas Instruments, Inc., Matls. & Controls Grp.
Unimax Switch Corp.
VIZ Mfg. Co., Inc.

MIL-S-9395 FSC 5930
Switches, Pressure, (Absolute, Gauge & Differential)

Consolidated Controls Corp.
Electro-National Corp.
Hydra-Electric Co.
Scott Aviation
Sigma-Netics, Inc.

MIL-S-22885 FSC 5930
Switch, Pushbutton, Illuminated

Aerospace Optics, Inc.
APM Hexseal Div.
Eaton Corp., Aerospace/ Commercial Controls Div.
Jay-El Products, Inc.
Korry Mfg. Co.
Licon Div.
Master Dynamics Corp.
Master Specialties Co.
Micro Switch
Precision Molded Products
Stacoswitch
Unimax Switch Corp.

MIL-S-22710 FSC 5930
Switches, Rotary (Printed Circuit), (Thumbwheel, Inline, & Pushbutton)

Digitran Co.
EECO, Inc.
Janco Corp.

MIL-T-23648 FSC 5905
Thermistor, (Thermally Sensitive, Resistor) Insulated

Ametick, Inc., Rodan Div.
Quality Thermister, Inc.
Unitrode Corp.
Victory Engineering Corp.

MIL-T-27 FSC 5950
Transformers & Inductors (Audio, Power, & High-Power Pulse)

ADC Products
Adec, Inc.
AEL-EMTECH Corp., Lansdale, PA
AMI/Coast Magnetics
Berkshire Transformer Corp.
Beta Transformer Technology Corp.
B.G. Laboratories, Inc.
Dytek Laboratories, Inc.
Electronic Transformer Corp.
Epsey Mfg. & Electronics Corp.
Fernwood Transformer Co.
Freed Transformer Co., Inc.
Hadley, Robert M., Co., Inc.
Microtran Co., Inc.
Midland-Ross Corp., Grimes Div.
OPT Industries, Inc.
Pico Electronics, Inc.
Sigmapower, Inc.
Titan Transformer Co.
Torwico Electronics, Inc.
Transformer Design, Inc.
TRW Inductive Products
Vanguard Electronics Co., Inc.
Zenith Transformer Co., Inc.

MIL-T-27535 FSC 5950
Transformer, Power, Isolation, Series Circuit

Amerace Corp., Elastimold Div.
Crouse Hinds/Sepco Corp.

MIL-T-21038 FSC 5950
Transformers, Pulse, Low Power

Epsey Mfg. & Electronics Corp.
JB Electronic Transformers Inc.
TRW Inductive Products

MIL-V-9999 FSC 6625
Voltmeters, Electronic

Hewlett-Packard Co., Loveland, CO
Ballantine Laboratories

MIL-W-25038 FSC 6145
Wire, Electrical, High Temperature & Fire Resistant

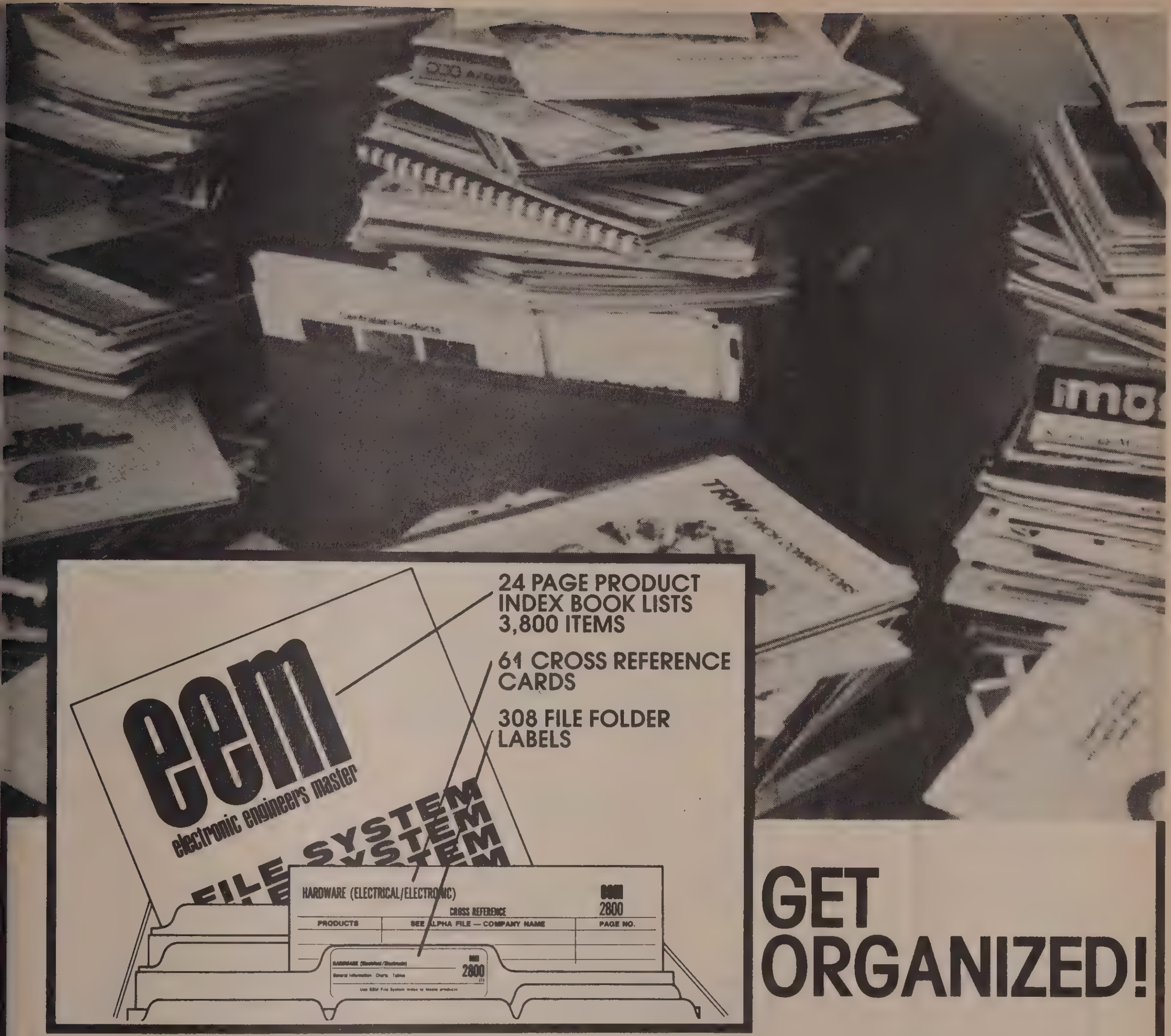
Champlain Cable Corp.
Pirelli Cable Corp.
Rockbestos Co.

MIL-W-5086 FSC 6145
Wire, Electric, Polyvinyl Chloride Insulated, Copper of Copper Alloy

Barcel Wire & Cable Corp.
Independent Cable, Inc.
ITT Surprenant Div.
Philadelphia Insulated Wire Co.
Plastoid Corp.
Prestolite Wire Div.
Teledyne Thermatics

MIL-W-81381 FSC 6145
Wire, Electric, Polymide-Insulated, Copper or Copper Alloy

Barcel Wire & Cable Corp.
Champlain Cable Corp.
Independent Cable Corp.
Teledyne Thermatics, Inc.
Tensolite Co.
Thermax Wire Corp.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The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

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645 stewart ave., garden city, ny 11530

Military Multilayer Ceramic Capacitors

MILITARY CROSS REFERENCE GUIDE DIMENSIONS

RADIAL

FIG. 1

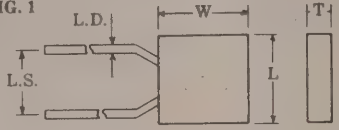
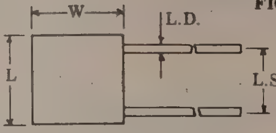


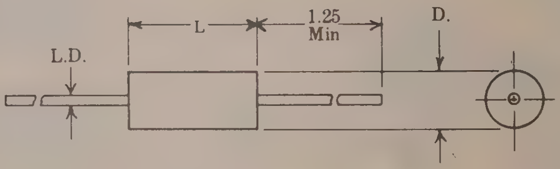
FIG. 2



		Per Mil-Spec			Case Size				
Figure	AVX Style	MIL-C-11015	MIL-C-39014	MIL-C-20	Length (L)	Width (W)	Thickness (T)	Lead Spacing (LS)	Lead Diameter (LD)
1	MR05	CK05	CKR05	CCR05/CC05	.190 ± .010 (4.83 ± .25)	.190 ± .010 (4.83 ± .25)	.090 ± .010 (2.29 ± .25)	.200 ± .015 (5.08 ± .38)	.025 ± .002 (.64 ± .05)
2	MR06	CK06	CKR06	CCR06/CC06	.290 ± .010 (7.37 ± .25)	.290 ± .010 (.37 ± .25)	.090 ± .010 (2.29 ± .25)	.200 ± .015 (5.08 ± .38)	.025 ± .002 (.64 ± .05)
2	CR08	— —	CKR08	— —	.290 ± .010 (7.37 ± .25)	.290 ± .010 (7.37 ± .25)	.145 ± .015 (3.68 ± .38)	.200 ± .015 (5.08 ± .38)	.025 ± .002 (.64 ± .05)
2	MR07	— —	— —	CCR07/CC07	.480 ± .020 (12.19 ± .51)	.480 ± .020 (12.19 ± .51)	.140 ± .010 (3.56 ± .25)	.400 ± .020 (10.16 ± .51)	.025 ± .002 (.64 ± .05)
2	MR08	— —	— —	CCR08/CC08	.480 ± .020 (12.19 ± .51)	.480 ± .020 (12.19 ± .51)	.240 ± .010 (6.1 ± .25)	.400 ± .020 (10.16 ± .51)	.025 ± .002 (.64 ± .051)

Dimensions: Inches (Millimeters)

AXIAL



	Per Mil-Spec			Case Size		
AVX Style	MIL-C-11015	MIL-C-39014	MIL-C-20	Length (L)	Diameter (D)	Lead Diameter (LD)
MA10	CK12	CKR11	CCR75/CC75	.160 ± .010 (4.07 ± .25)	.090 ± .010 (2.29 ± .25)	.019 ± .002 (.48 ± .05)
MA20	CK13	CKR12	CCR76/CC76	.250 ± .010 (6.35 ± .25)	.090 ± .010 (2.29 ± .25)	.019 ± .002 (.48 ± .05)
MA40	CK14	CKR14	CCR77/CC77	.390 ± .010 (9.91 ± .25)	.140 ± .010 (3.36 ± .25)	.025 ± .002 (.63 ± .05)
MA50	CK15	CKR15	CCR78/CC78	.500 ± .020 (12.7 ± .51)	.250 ± .015 (6.35 ± .38)	.025 ± .002 (.63 ± .05)
MA60	CK16	CKR16	CCR79/CC79	.690 ± .020 (17.53 ± .51)	.350 ± .015 (8.89 ± .51)	.025 ± .002 (.63 ± .05)

Dimensions: Inches (Millimeters)

RADIAL PART NUMBER EXAMPLE

CKR05 BX 104 K S

Style
Volt/Temp. Limits
Capacitance Code
Capacitance Tolerance
Military Failure Rate

AXIAL PART NUMBER EXAMPLE

CKR11 BX 103 K S

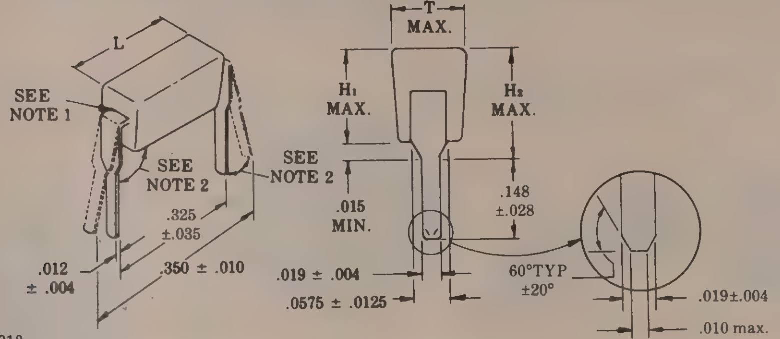
Style
Volt/Temp. Limits
Capacitance Code
Capacitance Tolerance
Military Failure Rate

WHERE TO ORDER

AVX Corporation, Myrtle Beach, SC 29577 Tel: (803) 448-9411 TWX: 810-661-2252
AVX Corporation, Olean, NY 14760 Tel: (716) 372-6611 TWX: 510-245-2815
AVX Limited, Aldershot, England Tel: (0252) 312131 Telex:858473
AVX K.K., Tokyo, Japan Tel: 03-490-6501 Telex: AVXTYO 246 8091

AVX

DIPGUARD



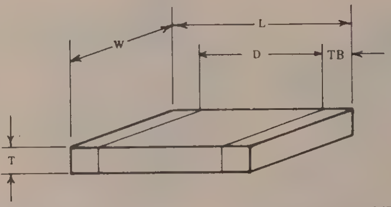
Note 1: Leads centered within ±.010
Note 2: The angle shall be 95°, +10°, −5°

AVX Style	MIL-C-39014	Length (L)	Height (H_1)	Height (H_2)	Thickness
MD01	CKR22	.260 ±.020 (6.60)	.128 max. (3.25)	.165 max. (4.19)	.098 max. ±.006
MD02	CKR23*	.260 ±.020 (6.60)	.155 max. (3.94)	.185 max. (4.70)	.098 max. ±.006

*Contact factory for CKR23 availability

Dimensions: Inches (Millimeters)

CHIPS



AVX Style	MIL-C-55681	Length (L)	Width (W)	Thickness (T)		D		Termination Band (TB)	
				Max.	Min.	Max.	Min.	Max.	Min.
0805	CDR01	.080±.015	.050±.015	.055	.020	—	.030	—	.010
1805	CDR02	.180±.015	.050±.015	.055	.020	—	—	.030	.010
1808	CDR03	.180±.015	.080±.015	.080	.020	—	—	.030	.010
1812	CDR04	.180±.015	.125±.015	.080	.020	—	—	.030	.010
1825	CDR05	$.180^{+.020}_{-.015}$	$.250^{+.020}_{-.015}$	.080	.020	—	—	.030	.010
2225	CDR06	$.225^{+.020}_{-.015}$	$.250^{+.020}_{-.015}$	.080	.020	—	—	.030	.010

Dimensions: Inches (Milimeters)

DIPGUARD PART NUMBER EXAMPLE

CKR22 BX 104 K S

Style — CKR22
Volt/Temp. Limits — BX
Capacitance Code — 104
Capacitance Tolerance — K
Military Failure Rate — S

CHIPS PART NUMBER EXAMPLE

CDR01 BX 101 A K S M

Military Style — CDR01
Volt/Temp. Limits — BX
Capacitance Code — 101
Rated Voltage — A
Capacitance Tolerance — K
Termination Finish — S
Military Failure Rate — M

WHERE TO ORDER

AVX Corporation, Myrtle Beach, SC 29577 Tel: (803) 448-9411 TWX: 810-661-2252
AVX Corporation, Olean, NY 14760 Tel: (716) 372-6611 TWX: 510-245-2815
AVX Limited, Aldershot, England Tel: (0252) 312131 Telex:858473
AVX K.K., Tokyo, Japan Tel: 03-490-6501 Telex: AVXTYO 246 8091

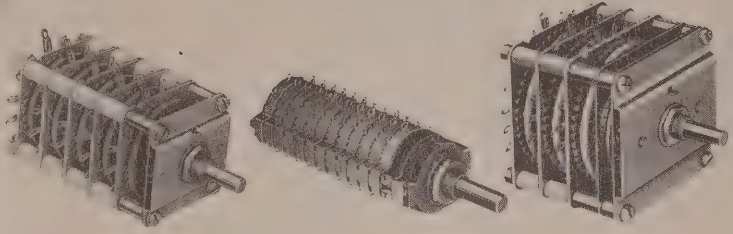
rotary switches

ELECTROSWITCH

for military applications

MIL-S-3786

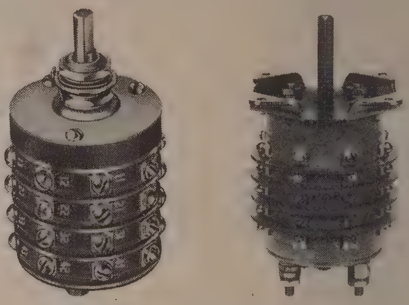
Styles SR15, SR28, SR40



½ AND 1 AMPERE ROTARY SWITCHES

MIL-S-6807

Type AF and Style JR



ROTARY & SELECTOR POWER SWITCHES

MIL-S-15291

Classes 1SR, 1SRN, 3SR, 6SR, 20SR

SNAP-ACTION ROTARY POWER SWITCHES

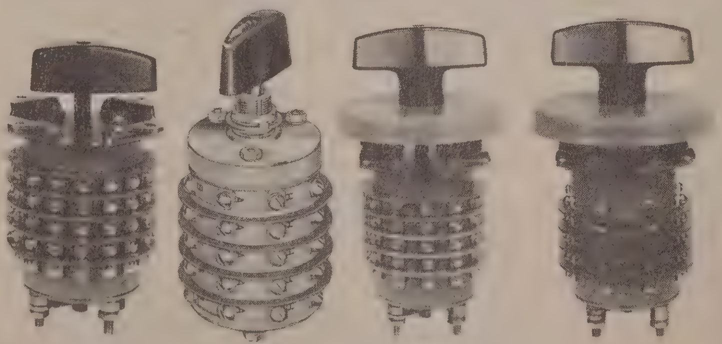
MIL-S-18396

Series 24G

METER & CONTROL SWITCHES

MIL-S-21604

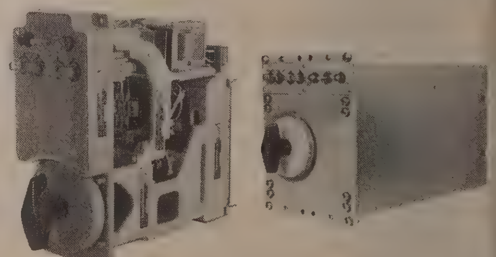
Types JK, JL, JM, JR. RJR. RJRA, JR304, JRM300



ROTARY MULTIPOLE & SELECTOR SWITCHES

MIL-S-24187

Styles LS, BLS, CLS, DLS, JLS, KLS



LINEAR MOVEMENT SWITCHES

For complete QPL Listings, request our QPL Bulletin

ELECTROSWITCH

ELECTRO SWITCH CORP. • Weymouth, Massachusetts 02188 • Tel: 617/335/5200 • TWX: 710/388/0377

Judd Wire

HIGH VOLTAGE ENGINEERING

Turnpike Road, Turners Falls, MA 01376
Tel. (413) 863-4357 • TWX 510-290-2147
870 Los Vallecitos Blvd., San Marcos, CA 92069
Tel. (619) 744-7720 • TWX 910-322-1149

MIL-W-22759

JUDD WIRE ZELRAD™

ZELRAD™ by Judd Wire is an irradiation cross-linked modified ethylenetetrafluoroethylene (ETFE) insulation that meets or exceeds the stringent requirements of the hook-up and airframe wire specification Mil-W-22759.

Light weight in construction, reliable in applications, ZELRAD is an ideal product for industries involved with general aviation, commercial aviation, military aviation, military vehicles, or black box equipment.

ZELRAD is available as hook-up wire in single extrusion constructions rated at 150° C, 30-12 AWG. The double extrusion airframe styles are rated at either 150° C or 200° C, depending on style, in 26-4 AWG.

PRODUCT ADVANTAGES

WIDE TEMPERATURE OPERATING RANGE — ZELRAD is rated by the military for continuous operating temperatures of from -65° C to 150° C or 200° C, depending on style. This wire is also required to be tested at 300° C for seven hours to demonstrate accelerated aging of the wire and assure crosslinking of the insulation.

RESISTANCE TO HEAT AND SOLDER IRONS — The irradiation crosslinking of the wire insulations create a surface that will not melt or flow when in direct contact with a solder iron. This process also substantially improves the abilities of the wire to withstand drastic changes in surrounding temperature conditions.

CHEMICAL RESISTANCE — ZELRAD's ability to withstand degradation when in contact with all aircraft fluids, fuels, lubricants, and solvents is demonstrated by the testing required within specification Mil-W-22759, paragraph 4.7.5.17.

ABRASION AND FLAME RESISTANCE — ZELRAD routinely excels in the cut through and abrasion tests to present its users with a durable, tough, high temperature wire. All wire styles manufactured by Judd Wire have shown spectacular results in testing for the flame retardancy required by this specification.

SIZE AND WEIGHT ADVANTAGES — The irradiation processing allows superior results with insulation thicknesses as small as .006" and corresponding space and weight savings through reduced diameters.

MARKING AND HANDLING — ZELRAD combines its durability with ease in handling as it can be paid off from reels or drums into automated cut and strip machinery, or prepared by hand. ZELRAD can be extruded in all basic colors, or custom marked and striped.

ZELRAD STYLE GUIDE

STYLE NUMBER	TEMP. RATING	VOLTAGE RATING	AWG WIRE SIZES	CONDUCTOR MATERIAL	NOMINAL INSULATION (Inches) PRIMARY	SECONDARY
ML-W-22759/32	150° C	600	30-12	Tinned Copper	.006-.008	
MIL-W-22759/33	150° C	600	30-20	Silver Coated High Strength Copper Alloy	.006	
MIL-W-22759/34	150° C	600	24-4	Tinned Copper	.005-.007	.005-.007
MIL-W-22759/35	200° C	600	26-20	Silver Coated High Strength Copper Alloy	.005	.005
MIL-W-22759/41	200° C	600	26-8	Nickel Coated Copper	.005-.007	.005-.007
MIL-W-22759/42	200° C	600	26-20	Nickel Coated High Strength Copper Alloy	.005	.005
MIL-W-22759/43	200° C	600	26-8	Silver Coated Copper	.005-.007	.005-.007

For a complete Product Bulletin or Technical Assistance Contact either Factory Office

Mepco//Electra
A NORTH AMERICAN PHILIPS COMPANY

Reliability across the board™

STANDARD RESISTOR MIL SPECIFICATION APPROVALS

RESISTORS:	RL standard military: 2% and 5% metal film resistor —RL07 (¼ watt) and RL20 (½ watt) —temperature coefficient: ±100 ppm/°C	MIL-R-22684
	RN standard military: 0.1% to 1% metal film resistor —RN50, RN55, RN60, RN65 styles	MIL-R-10509
	RLR established reliability: 1% and 2% metal film resistor —RLR05, RLR07 and RLR20 —temperature coefficient: ±100 ppm/°C —failure rate S (.001%)	MIL-R-39017
	RNC established reliability: 0.1% to 1% metal film resistor —RNC50, RNC55, RNC60, RNC65 —resistance tolerance: ±0.1%, 0.5%, 1.0% —failure rate: S (.001%) —temperature coefficient: K (±100 ppm/°C), H (±50 ppm/°C), J (±25 ppm/°C) —non-hermetic seal	MIL-R-55182
	RNR established reliability: 0.1% to 1% metal film resistor —RNR55, RNR60, RNR65, RNR70 —resistance tolerance: ±0.1%, 0.5%, 1.0% —failure rate: S (.001%) —temperature coefficient: C (±50 ppm/°C), E (±25 ppm/°C) —hermetic seal	MIL-R-55182
NETWORKS:	Single-In-Line (S.I.P.'s) —RZ040 and RZ050 —resistance tolerance: ±1.0%, 2.0%, 5.0% —temperature coefficient: ±100 ppm and ±300 ppm/°C —resistance range: 47.5 ohm — 1M —6 pin and 8 pin	MIL-R-83401/04/0
	Flat Packs —RZ030 —resistance tolerance: ±1.0%, 2.0%, 5.0% —temperature coefficient: ±100 ppm and ±300 ppm/°C —resistance range: 100 ohm — 100K —14 pin	MIL-R-83401/0
CHIP RESISTORS:	SMD™ established reliability (chip) resistor —RM0505, RM1005, RM1505, RM0705 —resistance tolerance: ±1%, 5%, 10% —temperature coefficient: K (±100 ppm/°C), M (±300 ppm/°C) —resistance range: 1 ohm — 1M	MIL-R-5534
TRIMMER RESISTORS:	RJ24/RJR24 cermet trimmer —multiturn, ⅜″ square —resistance range: 10 ohm — 5M —resistance tolerance: ±10% —temperature coefficient: ±100 ppm/°C (standard) ±50 ppm/°C (RJR) available RJ24—approved to Failure Rate P RJR24—approved to Failure Rate R	MIL-R-22097/MIL-R-3903
	RJ26/RJR26 cermet trimmer —multiturn, ¼″ square —resistance range: 10 ohm — 5M —resistance tolerance: ±10% —temperature coefficient: ±100 ppm/°C (standard) ±50 ppm/°C (RJR) available RJ26—approved to Failure Rate P RJR26—approved to Failure Rate R	MIL-R-22097/MIL-R-3903
	RJ50 cermet trimmer —single turn, ¼″ diameter round —resistance range: 10 ohm — 5M —resistance tolerance: ±10% (5% available) —temperature coefficient: ±100 ppm/°C (standard)	MIL-R-2209

Mepco//Electra
A NORTH AMERICAN PHILIPS COMPANY

Reliability across the board™

STANDARD CAPACITOR MIL SPECIFICATION APPROVALS

ALUMINUM ELECTROLYTIC: Computer Grade (screw terminal type)
MIL-C-39018/04: CU71 (M/E Style 3126)

TANTALUM:

Wet Slug — MIL-C-3965

CL14/CL16	hermetic seal, screw mount, cylindrical case
CL17/CL18	hermetic seal, stud mount, cylindrical case
CL55	hermetic seal, rectangular module
CL64/CL65	elastomer seal, axial lead, tubular case
CL66/CL67	hermetic seal, axial lead, tubular case

Wet Slug, established reliability — MIL-C-39006

CLR10	extended range, axial lead, tubular case
CLR14	extended range, cylindrical case, solder lug terminal
CLR17	extended range, cylindrical case, solder lug terminal
CLR65-8000 Series	glass-to-tantalum hermetic seal, axial lead, tubular case
CLR79	hermetic seal, non-silver case, axial lead, tubular case

Wet Foil — MIL-C-3965

CL20/CL21	polar, etched foil, tubular case, axial lead
CL22/CL23	non-polar, etched foil, tubular case, axial lead
CL30/CL31	polar, plain foil, tubular case, axial lead
CL32/CL33	non-polar, plain foil, tubular case, axial lead
CL51	polar, plain foil, KSR, hermetic rectangular module
CL52	non-polar, plain foil, KSR, hermetic rectangular module
CL53	polar, etched foil, KSR, hermetic rectangular module
CL54	non-polar, etched foil, KSR, hermetic rectangular module
CL70/CL71	polar, high etched foil, tubular case, axial lead
CL72/CL73	non-polar, high etched foil, tubular case, axial lead

Wet Foil, established reliability — MIL-C-39006

CLR25	polar, etched foil, hermetic and non-hermetic, axial lead
CLR27	non-polar, etched foil, hermetic and non-hermetic, axial lead
CLR35	polar, plain foil, hermetic and non-hermetic, axial lead
CLR37	non-polar, plain foil, hermetic and non-hermetic, axial lead
CLR71	polar, high etched foil, hermetic and non-hermetic, axial lead
CLR73	non-polar, high etched foil, hermetic and non-hermetic, axial lead

Solid Slug — MIL-C-26655

CS12/CS13	hermetic seal, axial lead, tubular case

Solid Slug — MIL-C-49137

CX05	polar, molded, non-hermetic, axial lead

Solid Slug, established reliability — MIL-C-39003

CSR09	polar, miniature, hermetic seal, axial lead, tubular case
CSR13	polar, hermetic seal, axial lead, tubular case
CSR23	polar, extended range, hermetic seal, axial lead, tubular case
CSR33	polar, extended range, hermetic seal, for low impedance application
CSR91	non-polar, hermetic seal, axial lead, tubular case

Solid Chip, established reliability — MIL-C-55365

CWR06	polar hybrid tantalum chip

For information on Mepco/Electra's RESISTORS/CAPACITORS/POTENTIOMETERS, see pages **1A•1134-1136**, **1A•1890-1891** and **1A•2046**.

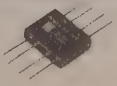
TECHNICAL RESEARCH and MANUFACTURING, INC.
Grenier Field RFD. #10, Manchester, N.H. 03103
Tel. 603-627-6000 Cable: TRAM Manchester, N.H., USA
TWX 710-220-6765

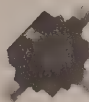
MICROWAVE COMPONENTS 1.8KHz to 26GHz

POWER DIVIDER/COMBINER

FERRITE

DL SERIES
2,3,4,6,8 & 12 Ways





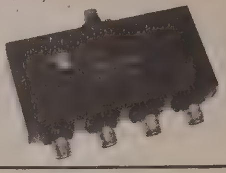
FREQ. BANDS
.02 - 20 MHz
0.1 - 100
20 - 200
100 - 400
0.2 - 200
5.0 - 500
10 - 1,000

TYP. SPEC.	
Loss	0.5dB
Isolation	30dB
VSWR	1.3:1
Input Power	2.5W

Impedance
Avail. 50 or 75Ω

COAXIAL

DM SERIES
2,3,4,6 & 8 Ways
F Center 100 to 1,500 MHz
Bandwidths = ±20%, ±30%
INPUT POWER
DM = 60w CW
1 Kw Peak



TYP. SPEC.	
Loss	0.3dB
Isol.	30dB
VSWR	1.3:1

DMS 285 (2 way)
Freq. 1-20 GHz

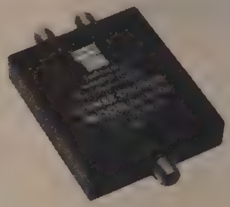
	Low end	High end
Loss(TYP.)	0.2dB	0.6dB
Iso. (TYP.)	25dB	19dB

STRIPLINE

DMS SERIES
2,4 & 8 Ways

FREQ. BANDS
OCTAVE
.125 - 12.4 GHz
MULTI-OCTAVE
1.0 - 12.4 GHz
7 - 18 GHz
2 - 18 GHz

TYP. SPEC.	
Loss	0.5dB
Isolation	20dB
VSWR	1.3:1
Phase	0°



INPUT POWER
50 watts CW
1 K watt Peak

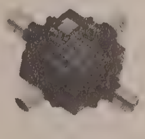
BROADBAND 0, 90, 180° HYBRIDS OCTAVE; MULTI-OCTAVE 0, 90, 180°

FERRITE

HS 150 SERIES 0/180°

MODEL	FREQ. (MHz)
HS 151	.02 - 20
HS 152	0.1 - 100
HS 153	20 - 200
HS 154	100 - 400
HS 155	.2 - 200
HS 156	5 - 500

TYP. SPEC.	
Loss	1.0dB
Isolation	30dB
VSWR	1.5:1
Phase Bal.	3°
Amp. Bal.	0.3dB
Input Power	2.5w

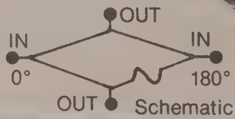


IMPEDANCE
Avail. 50 or 75Ω

COAXIAL

HS 100 SERIES 0/180°
Center Frequency 100 - 1,500 MHz
Bandwidth ± 10,20,30%

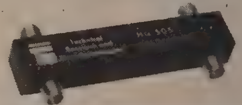
TYP. SPEC.	
Loss	.3dB
Isolation	30dB
VSWR	1.3:1
Phase Bal.	2°
Amp. Bal.	.2dB
In Power	60 w



Schematic

STRIPLINE

HQ 500 SERIES 90°		HS 500 SERIES 180°	
FREQ. BAND			
.125 - 18 GHz OCTAVE		.5 - 12 GHz	
TYP. SPEC.			
Loss	0.2dB	Loss	0.5dB
Isolation	20dB	Isolation	20dB
VSWR	1.2:1	VWSR	1.5:1
Phase Bal.	1.5°	Phase Bal.	5.0°



AMPLIFIERS

AD SERIES HIGH DYNAMIC RANGE

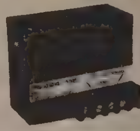
FREQ. BANDS
0.5 - 100 MHz
1 - 100
10 - 300

Avail. Gain 10, 20, 30dB
1dB Comp. Point +20dBM
Noise Fig. 5dB Typical

Freq. 5 - 400 MHz
Avail. Gain 6, 9, 13dB
1 dB Comp. Point +20dBM
Noise Fig. 7dB typ.

POWER SUPPLIES

For AD Series Amplifiers
Input 115 or 220 VAC
Ripple & Noise 20 mv P-P



MIXERS

DOUBLE BALANCED-SINGLE BALANCED
MD SERIES

FREQ. BANDS	TYP. SPEC.
.2 - 200 5 - 500 10 - 1,000	Conv. Loss 7dB Isolations 25dB

COUPLERS

STRIPLINE

WIDE BAND DIRECTIONAL
BI-DIRECTIONAL - DIRECTIONAL
AVAILABLE COUPLING
6, 10, 20, 30dB

MULTI-OCTAVE
& OCTAVE BANDS
.125 - 18 GHz

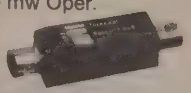
TYP. SPEC.	
Loss	0.25dB
Directivity	25dB
VSWR	1.3:1

FERRITE

DB Series
Coupling
20.5 ± 0.5dB
Freq. 1-2000MHz
VSWR 1.2 Max.
Input 1.5 watts
max.

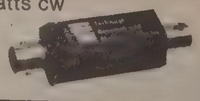
FREQUENCY DOUBLERS

Freq. 0.1 - 2100 MHz
Input power 10 to 20 mw Oper.
1 w max.
Impedance 50 ohms



TRANSFORMERS

Freq. 0.02 - 1000 MHz
Input Power 2.5 watts cw
VSWR 1.3 max.



All TRM products are designed to meet the applicable specifications of:
MIL-E-16400 Class 1
MIL-E- 5400 Class 3
MIL-C-15370
MIL-C-39012
and manufactured in accordance with:
MIL-I- 45208 and MIL-C-45662

Technitrol, Inc.

TOTAL TRANSFORMER CAPABILITIES

A FULL LINE OF TRANSFORMERS

- Audio
- Autotransformer
- Chopper
- Constant Voltage
- DC to DC Converter
- Decode
- Differential
- Discriminator
- Driver
- Ferroresonant
- Filament
- 400 Hz
- High Voltage
- Input
- Instrument
- Interstage
- Inverter
- Isolation
- Line
- Magnetic Amplifier
- Matching
- Microminiature
- Microphone
- Mixing
- Modulation
- Output
- Plate
- Power
- Printer Circuit Mounting
- Pulse
- RF
- Rectifier
- Reference
- Rotary
- Scott
- Servo
- Synchro Control
- Telephone Coupling
- Toroidal
- Transistor
- Voltage Dividing
- Voltage Regulating
- Wideband
- MIL RF Audio Power
- MIL Pulse

MIL SPECS

- MIL-STD-1553
- MIL-T-27
- MIL-T-21038
- MIL-T-16315
- MIL-C-15305

NOW...1st in Sophisticated Transformers and Inductors

WHY TECHNITROL?

SIZE — Large enough to handle your high quantity requirements. Small enough to respond to your special applications.

FLEXIBILITY — (3) manufacturing plants to accommodate a wide variety of transformer types and order quantities.

STABILITY — Over 30 successful years in a highly competitive marketplace and now stronger than ever.

EXPERTISE — Competent, innovative engineers and technicians assisted by computer using our own design programs.

QUALITY — Not just 30 years in the business, but 30 years of being the **best** in the business.

Technitrol, Inc.
DEPT. EM, 1952 E. Allegheny Avenue
Philadelphia, Pa. 19134 • (215) 426-9105 • TELEX 834245

Technitrol, Inc.

CHIP CARRIER DELAY LINE PASSIVE

MEETS MIL SPEC M-D-23859

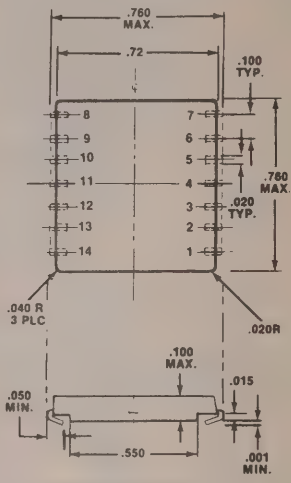
Part No.	Total Delay T_D (NS)	Rise Time T_R (NS)	RDC (ohms)
CF10D1	10.0	2.2	1.0
CF10F1	20.0	4.0	2.0
CF10G1	25.0	5.0	3.0
CF10K1	50.0	10.0	5.0
CF10M1	100.0	20.0	8.0
CF10N1	125.0	25.0	9.0
CF10P1	150.0	30.0	10.0
CF10Q1	200.0	40.0	12.0

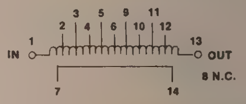
FEATURES

- Compact module .10″ high
- Ten tap line provides delays from 10 NS to 200 NS
- Designed to use with TTL logic
- Can be mounted in standard chip carrier socket
- Designed for surface mounting using reflow soldering
- Military temperature range −55°C to +125°C

ELECTRICAL CHARACTERISTICS

- Impedance (Z_O): 100 ohms ±10%
- Tap Delay: Every 10% of total delay
- Distortion: ±10%
- Temperature Coefficient (T_D): 100 PPM/°C
- Delay Tolerance: ±1.0 NS or 5% W.I.G.
- Input Pulse Width: Minimum 3 times output rise time
- Input Rise Time: 2 NS maximum
- Also available: 50 ohm and 200 ohm impedance


.760 MAX.
.72
.100 TYP.
8
9
10
11
12
13
14
7
6
5
4
3
2
1
.760 MAX.
.020 TYP.
.040 R 3 PLC
.020R
.100 MAX.
.015
.050 MIN.
.550
.001 MIN.


IN
1
2
3
4
5
6
9
10
11
12
13
OUT
8 N.C.
7
14

Also available in ½ sq. x .175 MAX

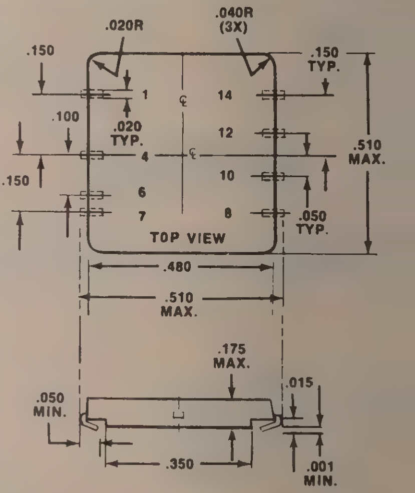
CHIP CARRIER TTL DELAY MODULE

CHIP CARRIER TTL DELAY MODULE CHARACTERISTICS

Part No.	NANOSECONDS					All Taps (Max.)	
	T_D1	T_D2	T_D3	T_D4	T_D5	T_R+	T_R-
BTTLDL020	10.0	12.5	15.0	17.5	20.0	2.0	2.0
BTTLDL025	5.0	10.0	15.0	20.0	25.0	2.0	2.0
BTTLDL050	10.0	20.0	30.0	40.0	50.0	2.0	2.0
BTTLDL075	15.0	30.0	45.0	60.0	75.0	2.0	2.0
BTTLDL100	20.0	40.0	60.0	80.0	100.0	2.0	2.0
BTTLDL125	25.0	50.0	75.0	100.0	125.0	2.0	2.0
BTTLDL150	30.0	60.0	90.0	120.0	150.0	2.0	5.0
BTTLDL200	40.0	80.0	120.0	160.0	200.0	2.0	5.0

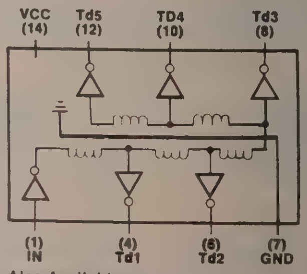
Delay Characteristics @ V_{cc} = 5.0V, 25°C no load
Delay Tolerance ±2 NS or 5% whichever is greater

Recommended Operating Conditions	Min.	Typ.	Max.	Unit
Supply Voltage V_{CC}	4.5	5.0	5.5	Volts
Operating Free Air Temperature Range	0	25	70	°C


.020R
.040R (3X)
.150
.150 TYP.
1
14
.100
.020 TYP.
12
4
.510 MAX.
.150
10
6
7
8
.050 TYP.
TOP VIEW
.480
.510 MAX.
.175 MAX.
.015
.050 MIN.
.350
.001 MIN.

OTHER AVAILABLE MODULES

- **Standard commercial** — (listed) Commercial grade IC's (plastic package), temperature range 0° to +70°C.
- **Commercial with additional testing** — Per customer specification; add suffix "MY" to part number.
- **Military** — Temperature range −55°C to +125°C, ceramic package IC to meet MIL-STD-883 but not screened to that specification. Add suffix "M" to part number.
- **Military Hi-Rel** — Temperature range −55°C to +125°C, ceramic package IC meeting MIL-STD-883 and 38510/Mach IV program screened and burned in; add suffix "MX" to part number.
- **Low power Schottky** — LS hex inverters used.
- **Single output versions** — No taps.
- **Multiple (up to 3) individual lines per module** — Can be same or different delays.
- **Unequal taps** — Within a single line.
- **Programmable delay modules**


VCC (14)
Td5 (12)
TD4 (10)
Td3 (8)
(1) IN
(4) Td1
(6) Td2
(7) GND

Also Available ¾ sq. x .100 MAX

Technitrol, Inc.

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Technitrol, Inc.

ULTRA STABLE TTL DELAY LINE

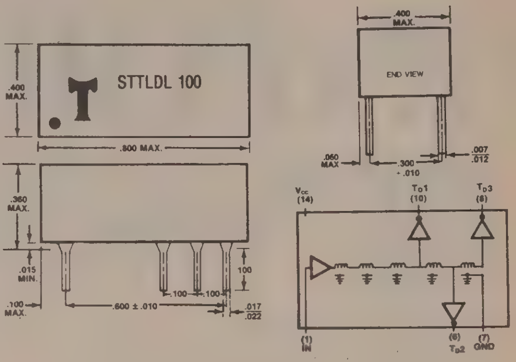
MEETS MIL SPEC M-D-23859

Part No.	NANOSECONDS T_D1	T_D2	T_D3	All Taps (Max.) T_R+	T_R-
STTLDL025	15.0	20.0	25.0	2.0	2.0
STTLDL050	30.0	40.0	50.0	2.0	2.0
STTLDL075	45.0	60.0	75.0	2.0	2.0
STTLDL100	60.0	80.0	100.0	2.0	2.0
STTLDL125	75.0	100.0	125.0	2.0	2.0
STTLDL150	90.0	120.0	150.0	2.0	5.0
STTLDL200	120.0	160.0	200.0	2.0	5.0
STTLDL250	150.0	200.0	250.0	2.0	5.0
STTLDL500	200.0	400.0	500.0	2.0	9.0

Delay Characteristics @ V_{cc} = 4.5V to 5.5V, T_R = 0-70°C
Delay Tolerance ±1.5 ns or 5% whichever is greater

Recommended Operating Conditions	MIN.	TYP.	MAX.	UNIT
Supply Voltage V_{cc}	4.5	5.0	5.5	Volts
Operating Free Air Temp. Range	0	25	70	°C.

ULTRA STABLE MODULE STTDL	
Pulse Width	20%
Temp. Coefficient (@ max. delay)	100 ppm/°C



.400 MAX.
END VIEW
STTLDL 100
.400 MAX.
.800 MAX.
.360 MAX.
.015 MIN.
.100 MAX.
.600 ± .010
.100
.100
.017 .022
.060 MAX
.300 ± .010
.007 .012
Vcc (14)
TD1 (10)
TD3 (8)
(1) IN
(6) TD2
(7) GND

HIGH PERFORMANCE TTL DELAY MODULE

STANDARD 5 TAP

MEETS MIL SPEC M-D-23859

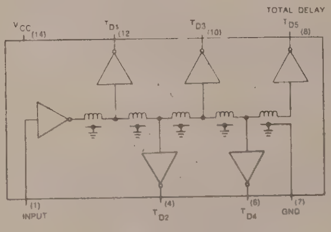
DELAY CHARACTERISTICS

Part No.	NANOSECONDS T_D1	T_D2	T_D3	T_D4	T_D5	All Taps T_R + & T_R −
TTLDL020	10.0 ±1.5	12.5 ±1.5	15.0 ±1.5	17.5 ±1.5	20.0 ±1.5	≤2.0 ≤2.0 nsec.
TTLDL025	5.0 ±1.5	10.0 ±1.5	15.0 ±1.5	20.0 ±1.5	25.0 ±1.5	≤2.0 ≤2.0 nsec.
TTLDL050	10.0 ±1.5	20.0 ±1.5	30.0 ±1.5	40.0 ±2.0	50.0 ±2.5	≤2.0 ≤2.0 nsec.
TTLDL075	15.0 ±1.5	30.0 ±1.5	4.50 ±2.25	60.0 ±3.0	75.0 ±3.75	≤2.0 ≤2.0 nsec.
TTLDL100	20.0 ±1.5	40.0 ±2.0	60.0 ±3.0	80.0 ±4.0	100.0 ±5.0	≤2.0 ≤2.0 nsec.
TTLDL125	25.0 ±1.5	50.0 ±2.5	75.0 ±3.75	100.0 ±5.0	125.0 ±6.25	≤2.0 ≤2.0 nsec.
TTLDL150	30.0 ±1.5	60.0 ±3.0	90.0 ±4.5	120.0 ±6.0	150.0 ±9.0	≤2.0 ≤5.0 nsec.
TTLDL200	40.0 ±2.0	80.0 ±4.0	120.0 ±6.0	160.0 ±8.0	200.0 ±10.0	≤2.0 ≤5.0 nsec.
TTLDL250	50.0 ±2.5	100.0 ±5.0	150.0 ±7.5	200.0 ±10.0	250.0 ±12.5	≤2.0 ≤5.0 nsec.
TTLDL500	100.0 ±5.0	200.0 ±10.0	200.0 ±15.0	400.0 ±20.0	500.0 ±25.0	≤2.0 ≤9.0 nsec.

Delay Characteristics @ V_{cc} = 5.0V, 25°C no load

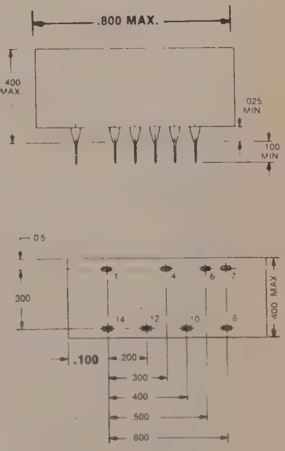
HIGH PERFORMANCE TTLDL	
Pulse Width	20%
Temp. Coefficient	±2%

Recommended Operating Conditions	Min.	Typ.	Max.	Unit
Supply Voltage V_{cc}	4.5	5.0	5.5	Volts
Operating Free Air Temp. Range	0	25	75	°C



VCC (14)
TD1 (12)
TD3 (10)
TOTAL DELAY
TD5 (8)
(1) INPUT
(4) TD2
(6) TD4
(7) GND

CONNECTION DIAGRAM
5 TAP VERSION



.800 MAX.
400 MAX
025 MIN
100 MIN
05
300
1
4
6
7
14
12
10
8
400 MAX
.100
200
300
400
500
600

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MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1**•**B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

POTENTIOMETERS

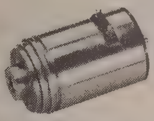
employing Vernitech's unique conductive film and precious metal wipers...respond to wiper motions as small as .000005″.

Rotary Single Turn
Linear, non-linear, sine/cosine available.
Sizes 0.5″, L 0.5″ to Dia 5.0″, L 1.880″.
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to −250KΩ.

Rotary Multi-Turn
10 to 100 turns available.
Sizes Dia 0.5″, L 1.5″ to Dia 2.0″, L 2.625″.
Linearity or conformity ±0.5% to 0.015%.
Resistance range 1KΩ to 500KΩ.

Linear Motion
Electrical stroke lengths 1″ to 60″.
Linearity or conformity ±0.2% to 0.01%.
Resistance range 250Ω/in to 250KΩ/in.

CLUTCHES AND BRAKES



(electromagnetic)

hundreds of models and sizes available from stock.

Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

PRESSURE TRANSDUCERS

potentiometer type,

featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types. Also available with high overpressure capability.

Linearity to ±0.3%. Air speed, altitude and low cost types available.

VERNITECH

MOTORS

Over 1500 Standard Designs or Custom Designed to your requirements.

Synchronous — for laser scanning
Sizes 5, 8, 11, 15, 18, 20, 25, 35.
Speeds 100 to 48,000 rpm.
5 through 1600 Hz. 2, 4, 8, 12 poles.

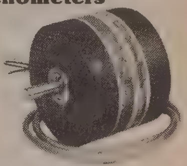
Servo
Viscous damped — sizes 8, 10, 11, 15, 18.
Speeds 3000 to 10,000 rpm.
Inertially damped — sizes 8, 11, 15, 18.
Speeds 3000 to 9500 rpm.

Stepper
Sizes 5, 8, 11, 15. Stepping angles 7.5°, 15°, 45°, 90°.
Stepping rates 100, 110, 125, 130, 175, 180, 225, 240, 260, 400, 725, 800, 1000 pps.

Precision Motor Generators Sizes 8, 10, 11, 15, 18, 23.

Integrating and Computer Motor Tachometers
Sizes 8, 10, 11, 15, 18, 23.

SHAFT ANGLE ENCODERS



featuring precision chrome on glass discs for highest accuracy.

Optical Incremental
VOE 005 — Dia. 0.500″, 0.510″ L. To 256 pulses (modular)
VOE 05 — Dia. 0.500″, 0.820″ L. To 256 pulses
VOE 11 — Dia. 1.062″, L. 1.80″. To 1024 pulses
VOE 015 — Dia. 1.510″, L. 0.88″. To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500″ dia., L. 1.08″ 127-256 pulses
VOE 023 — Dia. 2.25″, L. 80″. To 1250 pulses (modular)
VOE 23 — Dia. 2.250″, L. 1.875″. To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250″ L. 1.875″. To 600 pulses
VOE 25 — Dia. 2.500″, L. 2.500″. To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

SYNCHRO CONVERTER MODULES

Tracking Synchro-to-Digital and Resolver-to-Digital Converters
Economy Series VSD/VRD. Precision Series VSDH/VRDH Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

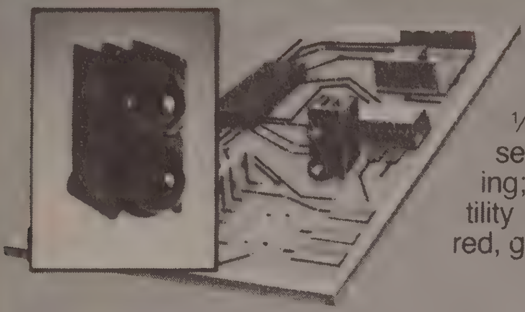
Digital-to-Synchro and Digital-to-Resolver Converters Series VDS/VDR: Accept shaft angle data in digital form for conversion to analog at accuracies up to ±4′.

Tracking Synchro-to-Linear DC Converter Module
Series VSDCH/VRDCH: Accept 3-wire synchro or 4-wire resolver input data, convert it to DC analog voltage proportional to synchro angle of input. Accuracy ±6′ (typ.).

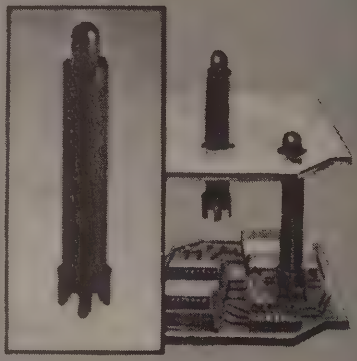
Tracking Angle Position Indicator
VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8″ red LED display. Display accuracy ±6′ arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output. Self contained line operated power supply.

Custom designs available to your specifications.

VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089



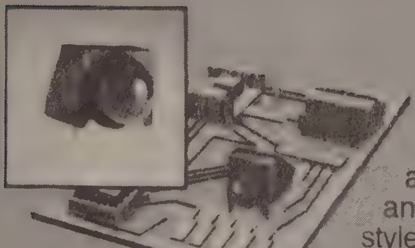
New Piggy-Back Series
Innovative, compact design puts two LEDs in the space of one. they're only ½ in. high, by ¼ in. wide. Snap-fit holds secure right through final board processing; leads spaced 0.1 in. apart. For versatility mix them in any color combination—red, green, or yellow.



1-in. Tall 5311 Series
This Super-Brite LED allows more space between panel and PC Board—simplifies and speeds your production. Precise positioning with secure fit; long leads connect directly to the board. Works equally well with lenses. Maximum visibility for pilot lights, logic, function and fault indicators.

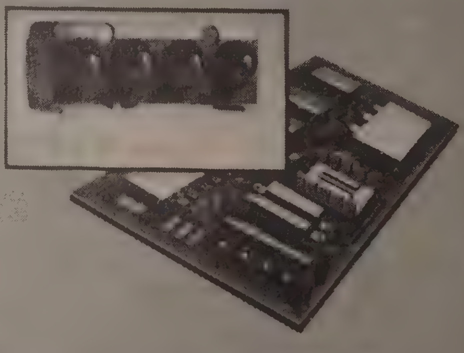
IDI SAVES YOU MONEY ACROSS THE BOARD

IDI now offers you more cost-cutting, assembly-time saving advantages. Packaged LEDs for through-the-panel and PC board mounting in a full range of highly economical styles. All available right off the shelf.



Economical "E" Series
Cost-efficient board telltale indicators, ideal for trouble shooting and service. T-1 3/4 bare LEDs provide typical 2mcd output at 20mA current. For fast mounting at right angles, use our black nylon economy block style.

Compact, Quad-Block 5360F Series
Space-saving, fast, direct mounting. Less than ¾″ long, sits only ¼″ high. Solid-state; combines 4 T-1 LEDs, at right angles to assembly leads. Wide-angle red, yellow, green or combination available. Nylon housing with molded polarity indications; built-in standoffs.



IDI has lots of creative solutions to LED packaging. Ask for our catalog and engineering guide or call direct for assistance. Start saving time, space and money today.

Industrial Devices, Inc.
Edgewater, N.J. 07020
(201) 224-4700

INDICATOR LIGHTS

Manufacturer	Incan-descent	LED	Neon	Fluores-cent	Accessories/Hardware: Sockets/Holders/Clips	Accessories/Hardware: Caps & Lenses	Features: Panel Mount	Features: PC Mount	Features: Relamp-able Assem-blies	Features: Rectan-gular	Features: Water-proof
Alcoswitch		1B•1029					●				
AND		1B•1025				●	●				
Arcolectric			1B•1026			●	●			●	
	1B•1027	1B•1027			●		●				
	1B•1028					●	●		●	●	
Dialight	1B•1038	1B•1038	1B•1038				●	●	●	●	
		1B•1039			●	●					
Dio-Rey		1B•1046					●		●		
General Instrument	1B•1056	1B•1056	1B•1056				●	●	●	●	●
Gilway	1B•1057	1B•1057	1B•1057		●						
Golden Pacific		1B•1058					●				
GTE/Sylvania			1B•1059				●	●			
			1B•1060			●	●		●		
			1B•1061		●	●					
Industrial Devices		1B•1064					●				
		1B•1065					●				
		1B•1066					●	●			
		1B•1067- 1B•1069						●			
		1B•1070			●	●		●			
		1B•1071			●	●				●	
		1B•1072 1B•1073									
			1B•1074								
	1B•1075- 1B•1082		1B•1075- 1B•1082		●					●	
Industrial Electronic Engineers	1B•1084	1B•1084			●	●	●				
Inter-Market	1B•1088	1B•1088	1B•1088			●					
Leecraft		1B•1089	1B•1089	1B•1089	●		●				
Littelfuse	1B•1062	1B•1062	1B•1062		●	●	●		●	●	
Mura Corp.	1B•1090		1B•1090	1B•1090							
Oak Switch	1B•1092	1B•1092	1B•1092				●				●
Oshino	1B•1093						●	●			
REFAC		1B•1094									
Shelly Assocs.	1B•1096	1B•1096	1B•1096				●				
Shogyo	1B•1097			1B•1097							
Sloan	1B•1098- 1B•1101	1B•1098- 1B•1101	1B•1098- 1B•1101		●	●	●		●		
Sorenson	1B•1102 1B•1103	1B•1102 1B•1103	1B•1102 1B•1103				●				
Visual Communications	1B•1107				1B•1106- 1B•1108	1B•1106- 1B•1108	●			●	

DISPLAYS

Manufacturer	Single Character	Multicharacter	Multiline	Height: ½ in. or less	Height: >½ in. <1 in.	Height: 1 in. or larger	Segmented	Dot Matrix	Graphics	Light Type: Electromagnetic	Light Type: Incandescent	Light Type: LED	Light Type: LCD	Light Type: Plasma/Planar Gas Discharge	Light Type: Vacuum Fluorescent	Custom Design	Panels, Back, Edge Lighted
AND		●	●	●	●	●		1B•1023	1B•1023				●				
							1B•1024	1B•1024	1B•1024				●				
	●	●		●	●		1B•1025					●					
Canyon		●		●	●		1B•1030					●		●		●	
Crystaloid		●		●	●	●		1B•1031	1B•1031				●			●	
Dale		●	●	●		●	1B•1032	1B•1032						●			
		●		●			1B•1033	1B•1033						●			
		●	●	●				1B•1034						●			
Densitron		●	●	●	●	●	1B•1036	1B•1036	1B•1036	●				●			
		●	●	●	●	●	1B•1037	1B•1037					●				
Dialight	●	●		●	●		1B•1039					●					
Dio-Rey		●				●	1B•1040	1B•1040				●					
		●				●	1B•1042	1B•1042				●					
		●				●	1B•1044					●					
									1B•1046			●					1B•1046
									1B•1047		●	●					1B•1047
Excel Technology		●		●	●	●	1B•1053- 1B•1055						●				
General Instrument	●	●		●	●		1B•1056					●					
Golden Pacific	●	●							1B•1058			●					
Hamlin		●			●	●	1B•1063	1B•1063	1B•1063				●				
Industrial Electronic Engineers		●		●	●	●	1B•1084				●	●	●				
		●	●	●	●		1B•1084	1B•1085					●	●	●		
Infodex																1B•1086 CRT	
NES, Inc.		●				●	1B•1091				●	●	●				
REFAC							1B•1094	1B•1094			●	●	●				
Seiko Instruments		●	●	●	●	●		1B•1095	1B•1095				●			●	
Shelly Assocs.		●					1B•1096					●	●				1B•1096
Staver	●					●	1B•1105	1B•1105		●							

LCD Dot Matrix Modules Alphanumeric (5x7) and Graphics

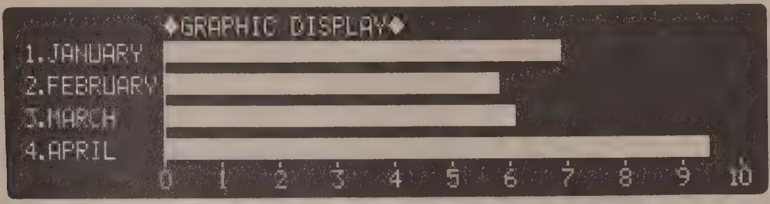
ONE OF THE PURDY GROUP OF COMPANIES

AND

FEATURES:

- Wide Viewing Angle
- High Contrast Ratio
- Wide Operating Temperature Range
- Exceptional Readability
- Single 5 VDC Supply
- Low Power Consumption
- CMOS and TTL Compatible
- Compact Packaging

Model AND012-A - 64 x 320 Pixel Graphics Display (Continuous Dot)


◆GRAPHIC DISPLAY◆
1.JANUARY
2.FEBRUARY
3.MARCH
4.APRIL
0
1
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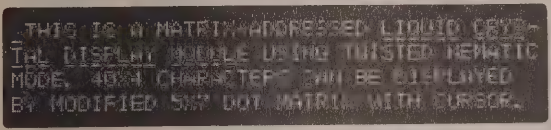
7
8
9
10

- Ideal for Personal Computers, Word Processors, POS Terminals, Business Machine Terminals, Message Display of Test Instruments and Medical Equipment.
- Compact Package 246 (L) x 79 (H) x 25.8 (D).
- LCD Module, incorporating a Dot Matrix LCD Panel and On-Board Driving Electronics.
- Input Data is Serial, similar to CRT Display.
- 250 mW Power Consumption.

Model AND651 - 160 Character (4 x 40)


THIS IS A MATRIX-ADDRESSED LIQUID CRYS-
TAL DISPLAY MODULE USING TWISTED NEMATIC
MODE. 40×4 CHARACTER CAN BE DISPLAYED
BY MODIFIED 5×7 DOT MATRIX WITH CURSOR.

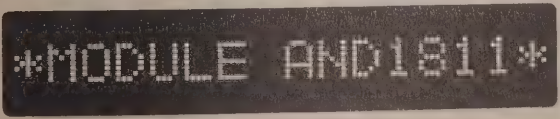
- Ideal for Microcomputer Terminals, Word Processors, POS Terminals, Business Machine Terminals, and Message Displays of Test Instruments.
- 160 Characters, 4 Rows of 40 Characters.
- 5 x 7 Dot Matrix with Cursor.
- 3.85 (W) x 5.45 (H) Characters.
- Compact Package 221 (L) x 44 (H) x 22 (D).
- LCD Drivers, RAM (refresh memory), ROM (character generator), Power Source Circuit, and Cursor Control Circuitry included in Module. CMOS Circuitry.

Model AND021 - 80 Character (2 x 40)

**** THE AND021 2X40 LCD DMX FEATURES ON
BOARD DRIVERS, CHAR. GEN. & REFRESH RAM

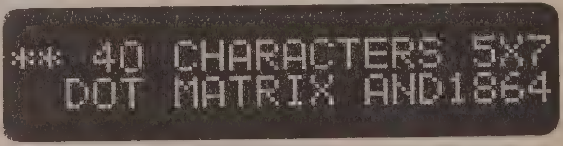
- Excellent in POS Equipment, Card Readers, Small Hand-held Equipment, Phone Sets.
- Package Size: 253 (L) x 51 (H) x 17 (D).
- On-Board RAM (refersh) and ROM (character generator).
- ASCII Interface.
- Large 5.45 high characters.
- CMOS LSI circuitry.
- Single 5 VRMS power supply.

Model AND1811 - 16 Character (1 x 16)


MODULE AND1811

- Ideal for Phone Set, Hand-held and Small Instrument Applications.
- 4.28 (H) x 3.02 (W) characters.
- AND1811 module includes on-board drivers. User to furnish character generator and refresh memory.
- Package size: 93 (L) x 38 (H) x 14.5 (D).
- CMOS LSI Circuitry

Models AND1861 & 1864 - 40 Character (2 x 20)


** 40 CHARACTERS 5X7
DOT MATRIX AND1864

- Ideal for PBX and Small Instrument Applications.
- 5.85 (H) x 3.85 (W) characters.
- AND1861 module includes on-board drivers. User to select character generator and refresh memory.
- Package size: 142 (L) x 47 (H) x 14.5 (D)
- AND1864 module includes on-board drivers, RAM (refresh) and ROM (character gen). Interface is ASCII. Package size: 142 (L) x 47 (H) x 14.5 (D)

Part Number	Pixel Format	Character Format	Overall Dimensions (mm)	Power Required
AND1811	5 x 7	1 Row / 16 Characters	92 x 38 x 14	30 mW
AND1861	5 x 7	2 Rows/ 40 Characters	142 x 47 x 14.5	30 mW
AND1864	5 x 7	2 Rows/ 40 Characters (RAM/ROM)	142 x 47 x 14.5	30 mW
AND021	5 x 7	2 Rows/ 80 Characters (RAM/ROM)	253 x 51 x 17	80 mW
AND654	5 x 7	4 Rows/160 Characters (RAM/ROM)	222 x 67 x 26	80 mW
AND012A	320 x 64 Full Panel	8 Rows/320 Characters or Graphics	228 x 79 x 25.8	250 mW

Note: All dimensions shown are in mm. Pictures of dot matrix modules are not to scale.

770 AIRPORT BOULEVARD, BURLINGAME, CALIFORNIA 94010 • TEL (415) 347-9916 • TWX 910-374-2353

Liquid Crystal Displays Numeric and Alphanumeric

ONE OF THE **PURDY** GROUP OF COMPANIES

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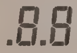
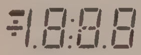
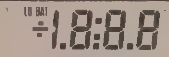
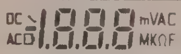
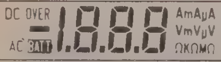
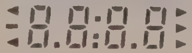
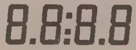
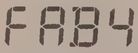
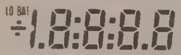
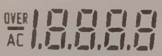
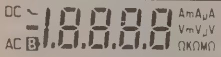
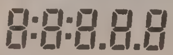
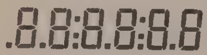
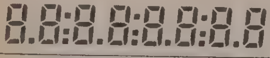
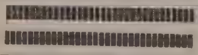
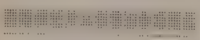
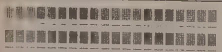
Quick Reference Guide

Display	Digit Height (inches)	Part Number	Package Dimensions (inches) (L) (W)
	0.5	FE1901	1.2 × 1.2
	0.2 0.5 0.7 1.0	FE2201 FE0201 FE0501 FE0701	1.6 × 0.7 2.0 × 1.2 2.75 × 1.5 3.7 × 1.8
	0.5	FE0203	2.0 × 1.2
	0.4	FE0801	2.0 × 0.95
	0.5	FE0402	2.75 × 1.2
	0.3	FE0101	1.57 × 0.7
	0.35 0.5 0.5 0.7 1.0	FE0804 FE0202 FE0204 FE0502 FE0703	2.0 × 0.95 2.0 × 1.2 2.0 × 1.2 2.75 × 1.5 3.7 × 1.8
	0.5	FE0205	2.0 × 1.2
	0.4	FE0206	2.0 × 1.2
	0.4	FE0802	2.0 × 0.95
	0.4	FE0403	2.75 × 1.2
	0.4 0.7	FE0208 FE1202	2.0 × 1.2 3.2 × 1.5
	0.3 0.5 0.7	FE0803 FE0401 FE0601	2.0 × 0.95 2.75 × 1.2 3.7 × 1.5
	0.5	FE1001	3.7 × 1.2
 (1)	0.15	FE0405	2.75 × 1.2
 (2)	0.17	FE0404	2.75 × 1.2
 (3)	0.17	FE0602	3.7 × 1.5

(1) Bar Graph (2) & (3) Dot Matrix

FEATURES

- **Ultra-Low Power Consumption**
- **High Contrast Ratio**
- **Wide Viewing Angle**
- **Rapid Response Time**
- **Thermally-Set Plastic Epoxy Seal**

Available Configurations

After selecting the desired display, determine which options you require.

Viewing Mode	Pinned	Elastomer
Transmissive	A	F
No Polarizers	B	G
Reflective Silver Bead	C	H
Reflective Aluminum Foil	D	I
Transflective	E	J

Absolute Maximum Ratings (Polarizers Attached)

Parameter	Standard Temperature	"A" High Temperature	"W" Wide Temperature	Unit
Applied Voltage	10	10	10	VRMS
DC Drive Component Allowable	25	25	50	mV
Operating Temp. Range	−20 to +60	−20 to +80	−30 to +85	° C
Storage Temp. Range	−40 to +60	−40 to +85	−40 to +85	° C
Operating Frequency Range	+30 to +100	+30 to +100	+30 to +100	Hz
Recom. Operating Voltage Range	3.0 to 6.0	3.5 to 6.0	3.5 to 6.0	VRMS

PLEASE CALL OR WRITE FOR COMPLETE TECHNICAL DATA SHEETS AND APPLICATION NOTES

Light Emitting Diodes Discrete Lamps and Displays

ONE OF THE **PURDY** GROUP OF COMPANIES

AND

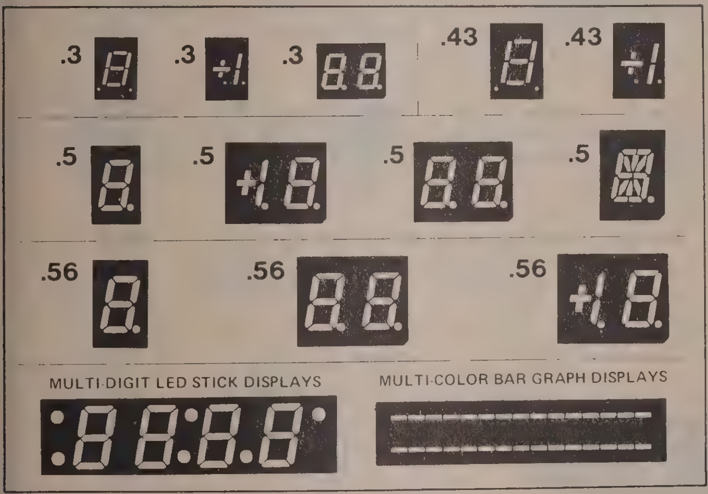
770 AIRPORT BOULEVARD, BURLINGAME, CALIFORNIA 94010 • TEL (415) 347-9916 • TWX 910-374-2353

FEATURES

- Low Cost
- High Contrast
- High Efficiency
- Long Life
- Wide Applications
- Low Power Requirements
- Solid State Reliability
- Suitable for Pulse Operation

Displays

The **A.N.D.** LED displays are available in the 7-segment, numeric unit and in the 16-segment, alpha-numeric unit. The standard sizes 0.3", 0.43", 0.5" and 0.56" come in the colors RED, HIGH EFFICIENCY RED, GREEN, YELLOW and ORANGE. The displays are available in single and dual digits, with a choice of common anode or common cathode. Also available are multi-digit stick displays and multi-color bargraph displays which come in 5, 10 and 20 elements.


.3
.3
.3
.43
.43
.5
.5
.5
.5
.56
.56
.56
MULTI-DIGIT LED STICK DISPLAYS
MULTI-COLOR BAR GRAPH DISPLAYS

Discrete Lamps

The **A.N.D.** LED lamps are offered in three intensity ranges. The standard bright, the super bright and the ultra bright.

Standard Bright Lamps

These lamps are intended for use in a wide variety of high volume, high quality, low cost applications. The all-plastic molded lens provides a light-weight and compact unit suitable for use under the most adverse conditions.

Super Bright Lamps

These lamps offer high intensity light output in four colors (RED, GREEN, YELLOW and ORANGE) and three sizes (T1, T1¾ and T1¾ Low Dome). With the wide range of radiation patterns available, these lamps are suitable for an equally broad range of applications including front panel indicators, sign boards and fault indicators.

Ultra Bright Lamps

These lamps are the result of extensive improvements in material formulations and modified lens design. The effect of these improvements is vastly improved light output, yet current and voltage levels remain consistent with conventional LEDs.

Quick Reference Guide — Super Bright Lamps

Luminous Intensity at 15mA, 25°C				
Part Number	Size	Lens Type	Color	Typ.
AND113S	T1¾	Clear	Red	15
AND114S	T1¾	Diffused	Red	7
AND123S	T1¾	Clear	Red	7
AND124S	T1¾	Diffused	Red	4
AND143S AND143G AND143Y AND143O	T1¾ Low Dome	Clear	Red Green Yellow Orange	50 40 40 40
AND144S AND144G AND144Y AND144O	T1¾ Low Dome	Diffused	Red Green Yellow Orange	25 20 20 20
Luminous Intensity at 20mA, 25°C				
AND153S AND153G AND153Y AND153O	T1¾	Clear	Red Green Yellow Orange	100 60 60 60
AND154S AND154G AND154Y AND154O	T1¾	Diffused	Red Green Yellow Orange	50 30 30 30
AND163S AND163G AND163Y AND163O	T1	Clear	Red Green Yellow Orange	20 20 20 20
AND164S AND164G AND164Y AND164O	T1	Diffused	Red Green Yellow Orange	10 10 10 10

Quick Reference Guide — Ultra Bright Lamps

Luminous Intensity at 20mA, 25°C				
Part Number	Size	Lens Type	Color	Typ.
AND143UR AND143UG AND143UY	T1¾ Low Dome	Clear	Red Green Yellow	100 60 60
AND144UR AND144UG AND144UY	T1¾ Low Dome	Diffused	Red Green Yellow	50 30 30
AND153UR AND153UG AND153UY	T1¾	Clear	Red Green Yellow	200 120 120
AND154UR AND154UG AND154UY	T1¾	Diffused	Red Green Yellow	100 60 60
AND163UR AND163UG AND163UY	T1	Clear	Red Green Yellow	40 40 40
AND164UR AND164UG AND164UY	T1	Diffused	Red Green Yellow	20 20 20

PLEASE CALL OR WRITE FOR COMPLETE TECHNICAL DATA SHEETS AND APPLICATION NOTES

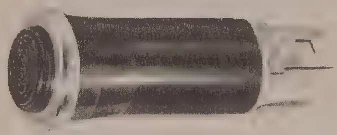
ARCOLECTRIC CORPORATION

NEON INDICATOR LIGHTS

UL FILE E78783/C.S.A. FILE LR47253

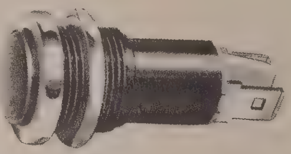
All indicators have built in resistors for 100/125 volt operation. Polycarbonate transparent lenses; amber, clear, green and red. Wire leads or tab style terminals available on most styles. U.L., C.S.A. and international electrical approvals available on most models. All dimensions are in millimeters. 250V and 380V types can be ordered.

Model NL67 12.7 MTG.



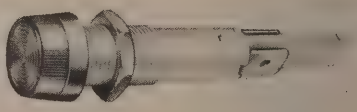
Panel Thk. 1.1
Overall Size
15.9 x 43.2

Model NL69 17.5 MTG.



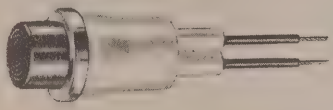
Panel Thk. 10.0
Overall Size
20.0 x 43.2

Model NL177 12.7 MTG.



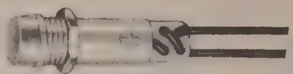
Panel Thk. 12.5
Overall Size
14.6 x 50.8

Model NL193 12.7 MTG.



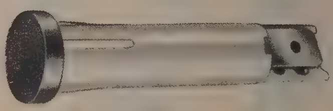
Panel Thk. 1.1
Overall Size
15.8 x 37.5

Model NL244 7.1 MTG.
Model NL244C 8.0 MTG.



Panel Thk. 6.3
Overall Size
7.4 x 26.7

Model NL273 9.0 MTG.

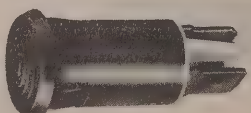


Panel Thk. 2.0
Overall Size
12.2 x 46.5

Model NL579 14.0 MTG.

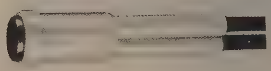
Panel Thk. 2.5
Overall Size
15.9 x 38.6

Model NL589 12.7 MTG.



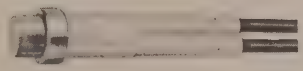
Panel Thk. 1.14
Overall Size
15.9 x 35.3

Model NL2950 8.0 MTG.



Panel Thk. 1.16
Overall Size
9.0 x 36.5

Model 2951 8.0 Mtg.



Panel Thk. 1.16
Overall Size
9.8 x 41.1

Model NL430

Panel Thk. 2.5

430A	12.2 x 27.2 MTG.
430M	11.0 x 30.0 MTG.
430Q	11.5 x 28.2 MTG.
430R	14.0 x 28.5 MTG.

Model NL481

Panel Thk. 3.3

481A 22.3 x 27.2 MTG.

SEE OTHER "EEM" PAGES **1B•1538 - 1B•1542** FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 65-1349

ARCOLECTRIC CORPORATION

FL SERIES INDICATOR LIGHTS

Built in filament lamps. Normally supplied with 5″ insulated leads.
Polycarbonate transparent lenses: A = amber, B = blue, C = clear, G = green, R = red.
VOLTAGES: 6V, 12V AND 28V.

All dimensions in mm.

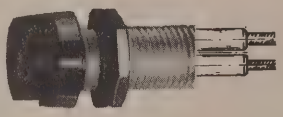
FL40 6.3 MTG.

FL67 12.7 MTG.

FL69 17.5 MTG.

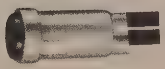
FL244, 244C 7.1 MTG. 8.0 MTG.

FL177 12.7 MTG.



8.0 MTG.

FL2950



FL2951

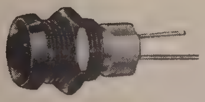
L.E.D. INDICATOR LIGHTS

LED LAMPS COMPLETE WITH HOLDERS

T1 SIZE

LH43V1301
LH43V1401
LH43V1503

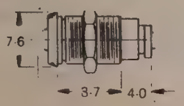
T1¾ SIZE



LH483300
LH483400
LH483502

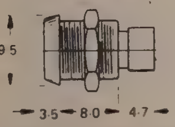
LED HOLDERS ONLY

T1 SIZE LH43V



Chrome Plated brass.
Nylon insert, 6.3mm dia. mtg. hole. Max. panel thickness 6.3mm.

T1¾ SIZE

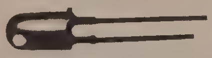


LH48 Chrome
LH48B Black

Chrome plated brass.
Nylon insert. 8.0mm dia. mtg. hole. Max. panel thickness 5.5mm.

LED LAMPS ONLY

T.1 SIZE		Forward Voltage	Power Diss.	Lum. Intensity	View Angle
1301	RED	2.2 25MA	135MW	2.5MCD	60°
1401	YEL	2.2 20MA	85MW	3.0MCD	60°
1503	GRN	2.3 25MA	135MW	5.0MCD	60°



T.1¾ SIZE		Forward Voltage	Power Diss.	Lum. Intensity	View Angle
3300	RED	2.2 25MA	135MW	3.5MCD	90°
3400	YEL	2.2 20MA	85MW	4.0MCD	90°
3502	GRN	2.3 25MA	135MW	6.0MCD	75°

INTEGRAL CURRENT LIMITING RESISTOR

Requires no External Current Limiter with 12 Volt Supply.

T.1¾ SIZE		Operating Voltage	Typ. MCD	View Angle
3601	RED	12V 13mA	4.0	65°
3651	YEL	12V 13mA	4.0	75°
3681	GRN	12V 13mA	4.0	75°

LED's to be used with a D.C. power source

SEE OTHER "EEM" PAGES 1B•1538 - 1B•1542 FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 65-1349

ARCOLECTRIC CORPORATION

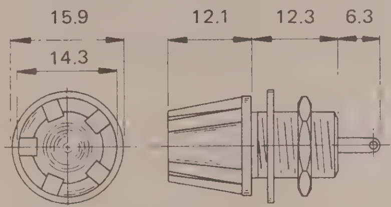
PANEL LAMP ASSEMBLIES

Polycarbonate lenses: transparent red, amber, green, blue or clear.
All items can be supplied without lamps or with lamps installed.

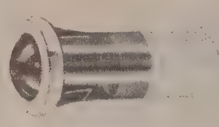
Dimensions in mm

Model LH60 9.53 MTG.

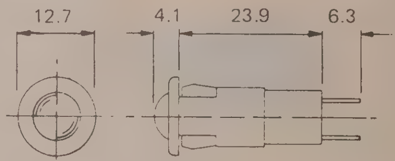
Midget
Screw Base
LES-6 Volt
LES-12 Volt
LES-28 Volt


15.9
14.3
12.1
12.3
6.3

Model LH61 9.53 MTG.

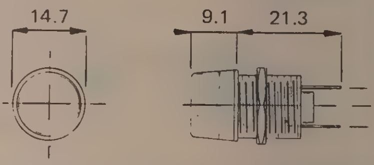


Midget
Screw Base
LES-6 Volt
LES-12 Volt
LES-28 Volt

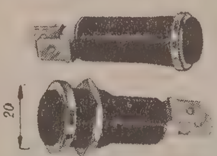

12.7
4.1
23.9
6.3

Model LHM62 12.7 MTG.

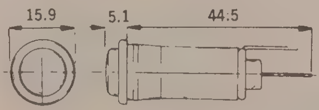
Single
Contact
Midget
Flanged
381-6 Volt
382-14 Volt
387-28 Volt



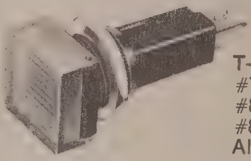
Model LH67 12.7 MTG.
Model LH69 17.5 MTG.



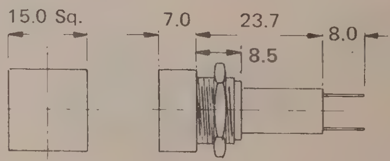
BA7-12 Volt



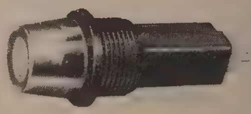
Model LH115 12.7 MTG.

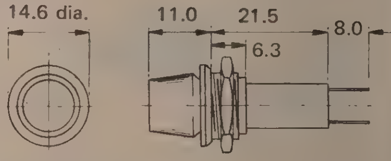


T-1¾ (6mm)
#73 12 Volt
#84 6.3 Volt
#85 28 Volt
All glass,
wedge shape
bulb

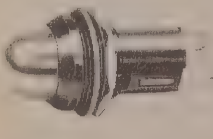

15.0 Sq.
7.0
23.7
8.0
8.5

Model LH116 12.7 MTG.

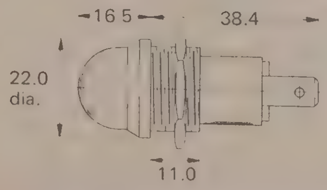



14.6 dia.
11.0
21.5
8.0
6.3

Model LH138 19.0 MTG.

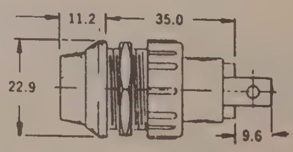


T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts

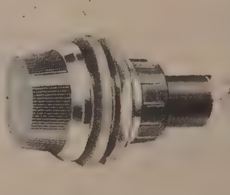

16 5
38.4
22.0 dia.
11.0

Model LH392 19.0 MTG.

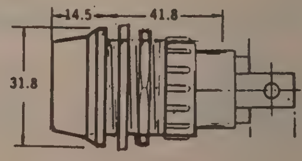
T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts


11.2
35.0
22.9
9.6

Model LH692 25.4 MTG.



T-3¼ Bulb
Miniature
Bayonet Base
47-6 Volts
1891-14 Volts
1829-28 Volts



SEE OTHER "EEM" PAGES **1B•1538 - 1B•1542** FOR SWITCH PRODUCTS.

9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 65-1349

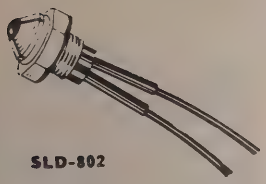
AUGAT® ALCOSWITCH® LED Indicators

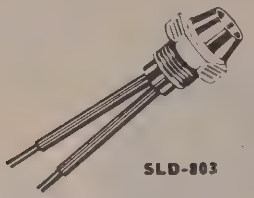
Quality and Innovation

SLD SERIES BRITE-LITE LED INDICATORS

High quality LED indicators for panel mounting. Two basic styles; extended and recessed. Extended LED provides 90° viewing angle. Recessed LED for high ambient light locations. High brightness LED's are GaAsP for red models; GaP for green and two-color red/green types.

LED'S FOR 7/32" DIAMETER MOUNTING HOLE


SLD-802

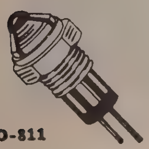

SLD-803

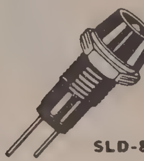
RATINGS AND SPECIFICATIONS

Parameters @ 25° C	Red LED	Green LED	Red/Green LED
Max. Dissipation, mW	100	75	75
Max. Fwd. Current, mA	50	30	30
Max. Rev. Voltage, VDC	4	5	5
Max. Fwd. Voltage, VDC	2 @ 30 mA	3 @ 20 mA	3 @ 20 mA
Max. Rev. Current, μA	100 @ 3 VDC	10 @ 4 VDC	10 @ 4 VDC
Peak Wavelength, nm	655	555	695/555
Storage Temp. Range, °C	−25 to +100	−25 to +100	−25 to +100

Alco Model No.	LED Color	Luminous Intensity (mcd)	Body/Lens	Anode Ident.	Termination	Net Each, Lots of 1-24	26-49	50-99	100-499
SLD-800R	Red	.7	Nickel/Extended	Base mark	LED leads	**$1.45**	**$1.28**	**$1.16**	**$1.04**
SLD-800G	Green	.48	Nickel/Extended	Base mark	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-801R	Red	.7	Nickel/Recessed	Base mark	LED leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-801G	Green	.48	Nickel/Recessed	Base mark	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-802R	Red	.7	Nickel/Extended	Red wire	Insul. leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-802G	Green	.48	Nickel/Extended	Red wire	Insul. leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-803R	Red	.7	Nickel/Recessed	Red wire	Insul. leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-803G	Green	.48	Nickel/Recessed	Red wire	Insul. leads	**1.80**	**1.58**	**1.44**	**1.30**

LED'S FOR 1/4" DIAMETER MOUNTING HOLE


SLD-811


SLD-815

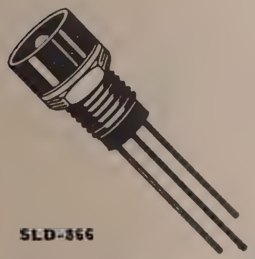
RATINGS AND SPECIFICATIONS

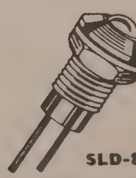
Parameters @ 25 °C	Red LED	Green LED	Red/Green LED
Max. Dissipation, mW	80	75	75
Max. Fwd. Current, mA	40	30	30
Max. Rev. Voltage, VDC	4	5	5
Max. Fwd. Voltage, VDC	2 @ 20 mA	3 @ 20 mA	3 @ 20 mA
Max. Rev. Current, μA	100 @ 3 VDC	10 @ 4 VDC	5 @ 4 VDC
Peak Wavelength, nm	655	555	695/555
Storage Temp. Range, °C	−20 to +80	−20 to +80	−25 to +100

Alco Model No.	LED Color	Luminous Intensity (mcd)	Body/Lens	Anode Ident.	Termination	Net Each, Lots of 1-24	26-49	50-99	100-499
SLD-811R	Red	2.1	Nickel/Extended	Red dot	LED leads	**$1.45**	**$1.28**	**$1.16**	**$1.04**
SLD-811G	Green	1.4	Nickel/Extended	Red dot	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-812R	Red	2.1	Nickel/Recessed	Red dot	LED leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-812G	Green	1.4	Nickel/Recessed	Red dot	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-815R	Red	2.1	Black/Recessed	Red dot	LED leads	**1.15**	**1.01**	**.92**	**.83**
SLD-815G	Green	1.4	Black/Recessed	Red dot	LED leads	**1.55**	**1.36**	**1.24**	**1.12**
SLD-818RG	Red/Grn.	1.0/.7	Nickel/Recessed	*	LED leads	**3.65**	**3.21**	**2.92**	**2.63**
SLD-820RG	Red/Grn.	1.0/.7	Nickel/Extended	*	LED leads	**3.65**	**3.21**	**2.92**	**2.63**
SLD-821R	Red	2.1	Nickel/Extended	Red wire	Insul. leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-821G	Green	1.4	Nickel/Extended	Red wire	Insul. leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-822R	Red	2.1	Nickel/Recessed	Red wire	Insul. leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-822G	Green	1.4	Nickel/Recessed	Red wire	Insul. leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-828RG	Red/Grn.	1.0/.7	Nickel/Extended	Wire color	Insul. leads	**3.65**	**3.21**	**2.92**	**2.63**
SLD-830RG	Red/Grn.	1.0/.7	Nickel/Recessed	Wire color	Insul. leads	**3.65**	**3.21**	**2.92**	**2.63**

*Lead identification.

LED'S FOR 5/16" DIAMETER MOUNTING HOLE


SLD-866


SLD-856

RATINGS AND SPECIFICATIONS

Parameters @ 25° C	Red LED	Green LED	Red/Green LED
Max. Dissipation, mW	100	75	35/75
Max. Fwd. Current, mA	50	30	15/30
Max. Rev. Voltage, VDC	4	5	5
Max. Fwd. Voltage, VDC	2 @ 30 mA	3 @ 20 mA	R: 2.3 @ 10mA G: 3 @ 20 mA
Max. Rev. Current, μA	100 @ 3 VDC	10 @ 4 VDC	10 @ 3 VDC
Peak Wavelength, nm	655	555	695/666
Storage Temp. Range, °C	−25 to +100	−25 to +100	−25 to +100

Alco Model No.	LED Color	Luminous Intensity (mcd)	Body/Lens	Anode Ident.	Termination	Net Each, Lots of 1-24	26-49	50-99	100-499
SLD-851R	Red	3.0	Nickel/Extended	Base mark	LED leads	**$1.45**	**$1.28**	**$1.16**	**$1.04**
SLD-851G	Green	1.5	Nickel/Extended	Base mark	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-852R	Red	3.0	Nickel/Recessed	Base mark	LED leads	**1.45**	**1.28**	**1.16**	**1.04**
SLD-852G	Green	1.5	Nickel/Recessed	Base mark	LED leads	**1.80**	**1.58**	**1.44**	**1.30**
SLD-853R	Red	3.0	Black/Extended	Red dot	LED leads	**1.15**	**1.01**	**.92**	**.83**
SLD-853G	Green	1.5	Black/Extended	Red dot	LED leads	**1.55**	**1.36**	**1.24**	**1.12**
SLD-855R	Red	3.0	Black/Recessed	Red dot	LED leads	**1.15**	**1.01**	**.92**	**.83**
SLD-855G	Green	1.5	Black/Recessed	Red dot	LED leads	**1.55**	**1.36**	**1.24**	**1.12**
SLD-856R	Red	3.0	Chrome/Extended	Red dot	LED leads	**1.20**	**1.06**	**.96**	**.86**
SLD-856G	Green	1.5	Chrome/Extended	Red dot	LED leads	**1.60**	**1.41**	**1.28**	**1.15**
SLD-857R	Red	3.0	Chrome/Recessed	Red dot	LED leads	**1.20**	**1.06**	**.96**	**.86**
SLD-857G	Green	1.5	Chrome/Recessed	Red dot	LED leads	**1.60**	**1.41**	**1.28**	**1.15**
SLD-865RG	Red/Grn.	1.5	Black/Extended	#	LED leads	**2.80**	**2.46**	**2.24**	**2.02**
SLD-866RG	Red/Grn.	1.5	Black/Recessed	#	LED leads	**2.80**	**2.46**	**2.24**	**2.02**

#Common cathode has longest (center) lead; green LED anode has shortest lead; red LED anode has intermediate lead.

Dept. EEM, 1551 Osgood St., No. Andover, MA 01845 USA Tel: (617) 685-4371/TWX: 710 342-0552

CANYON electronics

READOUT ASSEMBLIES

MINI-PAK DISPLAY ASSEMBLIES

The MINI-PAK^{R} series are gas discharge or LED readout modules, specifically designed for use on low-to-medium volume industrial or commercial instruments. The display and associated electronic drive are packaged in a black thermoplastic case available in two styles; a rear panel mount and a front panel mount. The modules are available in 1½-, 2-, 2½ and 3-digit configuration that can be mounted individually or stacked horizontally to form any number of digits. The MINI-PAK^{R} series are designed for direct interface compatibility with TTL or LSI integrated circuits with 4 line output information in the 8-4-2-1 BCD code format.

GAS DISCHARGE SERIES CE-1000/CE-2000

The MINI-PAK^{R} series CE-1000/CE-2000 include a 0.55" high character gas discharge display and the BCD to seven segments Decoder/Driver. The interface terminals are brought out to 14 pin dual-in-line header or socket. All components are soldered to the P.C. Board.

GAS DISCHARGE SERIES CE-3000/CE-4000

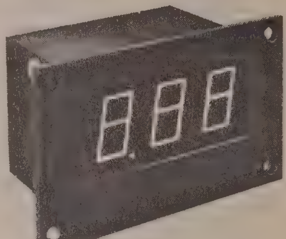
The MINI-PAK^{R} series CE-3000/CE-4000 include a 0.55" high character gas discharge display and socket mounted BCD to seven segments Decoder/Driver. The interface terminals are brought out to wire wrap pins. The gas discharge display can be very easily and efficiently replaced, thereby, minimizing down time.

LED SERIES CE-5000/CE-6000

The MINI-PAK^{R} series CE-5000/CE-6000 include a socket mounted 0.43", 0.625" or 0.8" character high LED display, a socket mounted BCD to seven segments Decoder/Driver and current limiting resistors, whenever applicable. The interface terminals are brought out to wire wrap pins. The series is available with or without latch or in 5 mA, 15 mA or 20 mA per segment.

FOR CUSTOM MADE ASSEMBLIES, LARGER CHARACTERS OR OTHER REQUIREMENTS, CONSULT FACTORY

DOUBLES YOUR OPTION TO YOUR PANEL DESIGN WITH THE MINI-PAK^{R} LED AND GAS DISCHARGE DISPLAYS.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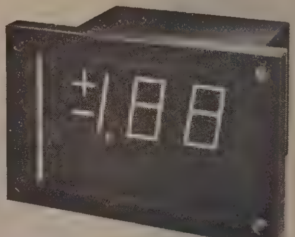
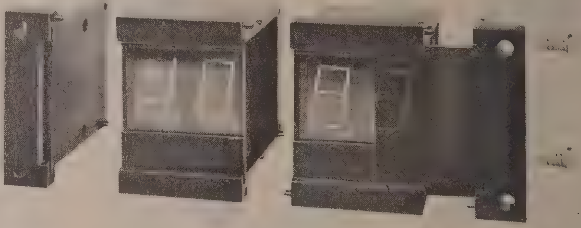
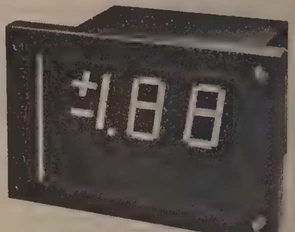

CE-1034


INSTALLATION DRAWING

CE-6037


CE-5034

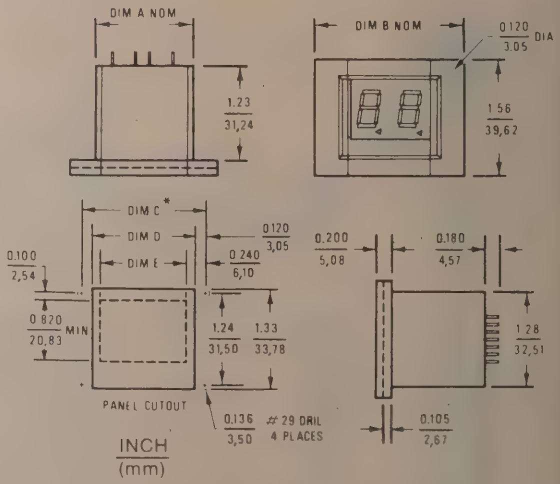
MECHANICAL SPECIFICATIONS

NO DIGITS	BEZEL WIDTH DIM. B NOM.		PANEL CUTOUT † DIM. D		PANEL CUTOUT †† DIM. E	
2	1.94	49,28	1.38	35,1	1.14	28,96
3	2.48	62,99	1.92	48,8	1.68	42,68
4	3.04	77,22	2.48	63,0	2.24	56,90
5	3.58	90,93	3.02	76,70	2.78	70,62
▲ 6	4.12	104,65	3.56	90,42	3.32	84,33
7	4.68	118,87	4.12	104,7	3.88	98,56
▲ 8	5.22	132,59	4.66	118,4	4.42	112,27

▲ Assumes maximum 3 digits modules per assembly.

† D Dimension applies to CE-1000/3000/5000 series.

†† E Dimension applies to CE-2000/4000/6000 series.



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CRYSTALOID ELECTRONICS CO.
LIQUID CRYSTAL DISPLAYS

- **A STANDARD LINE** consisting of over 70 LCDs available for use in a variety of digital, alphanumeric, dot matrix, graphic and bar graph formats.
- **CUSTOM CAPABILITIES** include a professional staff willing to assist you in your design, a special prototype department for quick turnaround and an in-house laboratory for liquid crystal research and development.
- **CRYSTALOID's LCDs** are offered with multiplex or direct drive capabilities, commercial or hi-grade properties, in a variety of modes and configurations and now *Crystaloid* offers dichroics in a variety of color and mode combinations. LCD test equipment is also available.

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ELECTRONICS

CHOOSE FROM ONE OF THE WIDEST LCD STANDARD LINES AROUND:

DIGITS ∓8.8
DIGIT HEIGHT — .300" to 3.000"
NUMBER OF DIGITS — ONE THRU TEN
ANNUNCIATORS — DECIMAL POINTS, COLONS,
PLUS/MINUS, "LO BAT", "AM/PM"
DIRECT MODE — DIRECT DRIVE OR MULTIPLEX

ALPHANUMERICS ▨▨
CHARACTER HEIGHT — .300" TO 3.000"
NUMBER OF CHARACTERS — ONE THRU TWELVE
ANNUNCIATORS — DECIMAL POINTS
DRIVE MODE — DIRECT DRIVE OR MULTIPLEX

DOT MATRIX ▦▦ **(5 x 7 FORMAT)**
CHARACTER HEIGHT — .250", 2.000" OR 3.000"
NUMBER OF CHARACTERS — ONE THRU DUAL THIRTY-TWO
DRIVE MODE — MULTIPLEX

▦ **(CONTINUOUS)**
CHARACTER HEIGHT — .250" OR .820"
NUMBER OF CHARACTERS — EIGHT THRU FORTY
(W/2 BLANK COLS. BETWEEN CHAR.)
ANNUNCIATORS — NONE
DRIVE MODE — MULTIPLEX

■ **(SQUARE)**
IMAGE AREA — 1.400" SQUARE
MATRIX SIZE — 16 x 16 OR 32 x 32
ANNUNCIATORS — NONE
DRIVE MODE — MULTIPLEX

BAR GRAPHS ▬
BAR GRAPH LENGTH — 2.000" TO 4.000"
BAR GRAPH SEGMENTS — DUAL 20 THRU SINGLE 100
ANNUNCIATORS — SCALE (0 THRU 20)
DRIVE MODE — DIRECT DRIVE

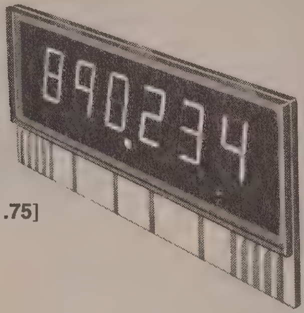
NOTE: THIS GENERAL OUTLINE DOES NOT IMPLY THAT ALL
VARIATIONS ARE AVAILABLE ON A STANDARD BASIS.

YOUR SOURCE FOR LIQUID CRYSTAL DISPLAYS:

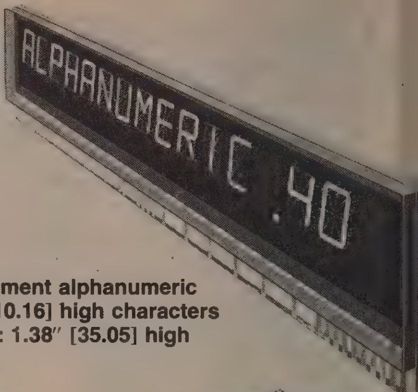
CRYSTALOID ELECTRONICS
P.O. BOX 628 / 5282 HUDSON DRIVE, HUDSON, OHIO 44236 / PHONE: (216) 655-2429 / TELEX: 241244

DALE®

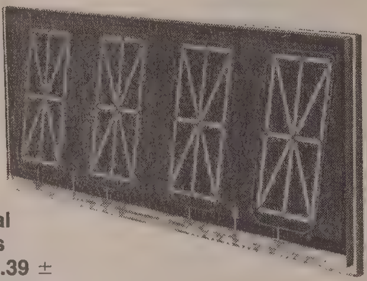
FLAT PANEL DISPLAYS
Gas Discharge Type



PD-06D040
Six character, seven segment digital display with .400″ [10.16] high characters (overall dimensions: 1.250″ [31.75] high x 3.00″ [76.2] long)



PD-16A040
16 character, 16 segment alphanumeric display with .400″ [10.16] high characters (overall dimensions: 1.38″ [35.05] high x 7.00″ [177.8] long)



PD-04A200
Four character, 16 segment alphanumeric display with 2″ [50.8] high characters (overall dimensions: 2.85″ ±.04″ [72.39 ± 1.02] high x 7.2″ ± .04″ [182.88 ± 1.02] long)

PD-04D200
Four character, seven segment digital display with 2″ [50.8] high characters (overall dimensions: 2.85″ ± .04″ [72.39 ± 1.02] high x 7.2″ ± .04″ [182.88 ± 1.02] long)

32 CHARACTER 25
PLASMA DISPLAY

PD-32A02
32 character, 16 segme
alphanumeric display wit
.250″ [6.35] high characte
(overall dimension
1.56″ [39.62] wide x 5.00″ [127.00] lon

BASIC FEATURES

Bright, Uniform Characters provide a major advantage…particularly when the display is to be viewed at a distance.

Easily Driven—Uncomplicated drive circuits minimize overall cost. Dale can provide the "intelligence" including drive circuits required for various display packages.

Easily Customized—The special and/or personalized informative formats you wish to present can be provided at reasonable cost.

Aesthetically Superior—Soft neon glow provides exceptional contrast and reduces segmented appearance of characters.

COMMON CHARACTERISTICS

- Low Power Consumption
- Designed for Multiplexed Operation
- Edgeboard or Integral Termination
- Brightness:
  - PD-06D040 60 foot lamberts
  - PD-16A040 50 foot lamberts
  - PD-32A025 80 foot lamberts
  - PD-04A200 200 foot lamberts
  - PD-04D200 200 foot lamberts
- Viewing Angle 130 degrees
- Neon Orange Color Filterable from red to yellow

ELECTRICAL CHARACTERISTICS AT 25°C

CHARACTERISTIC	MINIMUM	TYPICAL	MAXIMUM
Panel Voltage Drop	130 VDC	145 VDC	170 VDC
Initial Ionization Time (peak cathode voltage — 180)	—	—	5 sec.
Source Voltage*	−180 VDC	−200 VDC	−220 VDC
Anode Off Voltage*	−35 VDC	−100 VDC	−120 VDC
Cathode Off Voltage*	−35 VDC	−100 VDC	−120 VDC

*Voltage referenced to anode on voltage.

MAXIMUM RATINGS (Values beyond which the life of the device may be reduced.)

Peak Applied Voltage: 250 volts

Operating Temperature: 0 to +55°C

Storage Temperature: −55 to +70°C

Altitude: 70,000 feet

For complete information, write or phone
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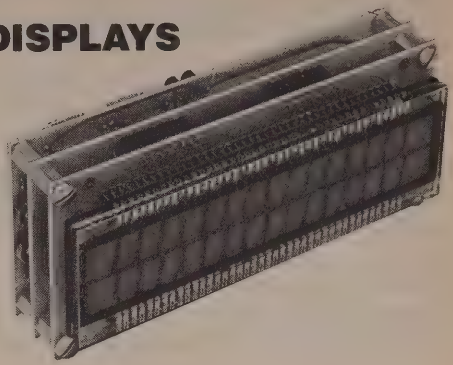
DALE® INTELLIGENT PLASMA PANEL DISPLAYS



TYPE APD-32A025

The Dale APD-32A025 microprocessor based display system gives the superior aesthetics of a plasma display without the need to design the drive electronics, interface circuitry and voltage converter, and in a package that conserves valuable front panel area.

FEATURES

- 32 alphanumeric characters
- 64 ASCII character set
- Refresh memory
- 8 bit, three state, bi-directional data base
- Decodes and debounces up to 64 key keyboards
- Operates from single 5V power supply
- User enabled blinking, cursor/display
- Cursor addressable or auto incremented/decremented
- Scroll (left or right)
- Compact size
- Neon orange (filterable from red to yellow)
- 60 ft./lamberts light output (typical)
- Standby (low power) mode

MAXIMUM RATINGS

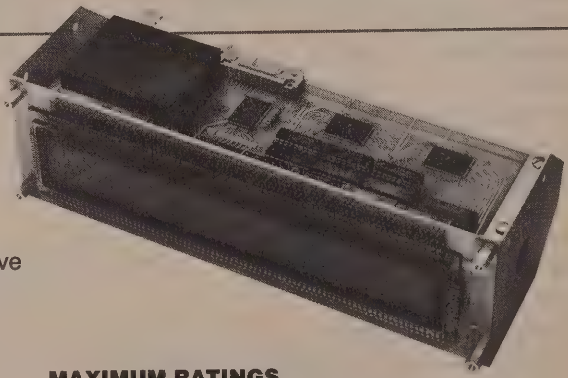
Operating Temperature: 0°C to +55°C
Storage Temperature: −55°C to +70°C
Voltage on any Pin vs. Ground: −0.5V to +7V
Power Dissipation: 5W

SPECIFICATIONS

Character Design: 14 segment starburst
Character Set: ASCII (upper case)
Character Height: .25 inches
Viewing Area: 4.45″ x .7″
Viewing Angle: 130°
Dimensions: 5.25″L x 2.35″H x 2.00″D
Supply Voltage: +5V ±5%
Supply Current: 750mA (typical)

MATING CONNECTORS

Power: Molex P/N08-50-0106 (terminals) 09-50-3031 (housing) or equivalent
Data: 3M P/N 3399-000 or equivalent



TYPE APD-064M026

The Dale APD-064M026 dot matrix system gives the superior aesthetics of a plasma display without the need to design the drive electronics, interface circuitry, and voltage converter. All this, plus a package that conserves valuable front panel area.

FEATURES

- 64 (2 x 32) alphanumeric characters (5 x 7 dot matrix)
- 160 character set including ASCII and Katakana characters
- Custom character set possible
- User enabled cursor
- Cursor addressable or auto incremented
- Neon orange (filterable from red to yellow)
- Very bright (190 ft./lamberts typical)
- Wide view angle (150°)
- Compact size
- Low input voltage
- TTL and CMOS compatible

MAXIMUM RATINGS

Operating Temperature: 0°C to +50°C
Storage Temperature: −40°C to +70°C
Logic Voltage: −.3V to +7V
Display Voltage: 10V to 15V
Power Dissipation: 15W

SPECIFICATIONS

Character Design: 5 x 7 dot matrix plus cursor
Character Set: ASCII plus Katakana
Character Height: .26 inches
Viewing Area: 7.6″ x .76″
Viewing Angle: 150°C
Dimensions: 10.0″L x 3.0″H x 4.1″D
Logic Voltage: 5V ±5%
Display Voltage: 12V ±5%

For complete information, write or phone
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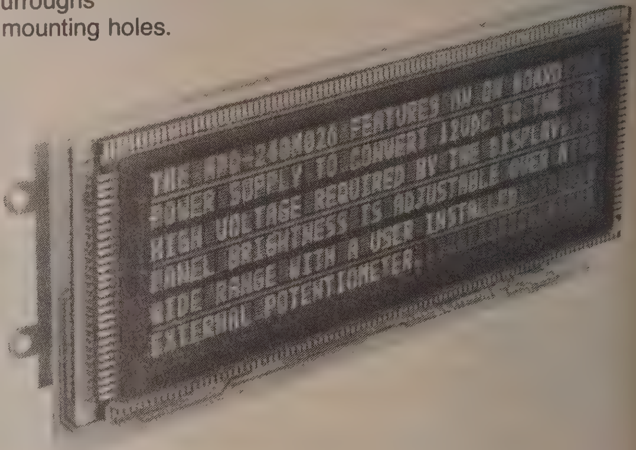
DALE® INTELLIGENT PLASMA PANEL DISPLAYS

TYPE APD-24M026

240 character display with drive electronics

The APD-240M026 display module displays up to 240 alphanumeric 5 x 7 dot matrix characters arranged in 6 lines of 40 characters each. The module includes drive electronics and a DC to DC converter to develop the necessary panel voltage. Data interface is equivalent to the Burroughs SII-0640-PD2 as are character dimensions, viewing area and mounting holes.


THE APD-240M026 FEATURES ITS OWN ONBOARD
POWER SUPPLY TO CONVERT 12VDC TO THE
HIGH VOLTAGE REQUIRED BY THE DISPLAY.
PANEL BRIGHTNESS IS ADJUSTABLE OVER A
WIDE RANGE WITH A USER INSTALLED
EXTERNAL POTENTIOMETER.

FEATURES

- 240 (6x40) alphanumeric characters (5x7 dot matrix)
- .14W x .26H character size
- Data interface compatible with Burroughs SII-0640-PD2
- Controller Board available similar to Burroughs SII-0640-200
- Wide viewing angle (150°)
- Low input voltage (+5 and +12)
- Compact size
- Dimmable with external potentiometer

SPECIFICATIONS

OPTICAL

Viewing area: 2.26″ [57.40] W x 8.33″ [211.66] L

Number of Characters: 240

Character Size: .14″ [3.56] W x .26″ [6.60] H

Dot Size: .020″ [.51] Dia.

Dot Pitch, Vertical: .040″ [1.016]

Dot Pitch, Horizontal: .030″ [.762]

Character Spacing: 2 blank columns of dots between successive characters

Scanning Rate: 75 Hz

Brightness: 30 foot lamberts

Color: neon orange

Viewing Angle: 150° cone

Panel Dimming: fixed or variable from nominal to less than 50% of nominal

ENVIRONMENTAL

Operating Temperature: 0°C to 50°C

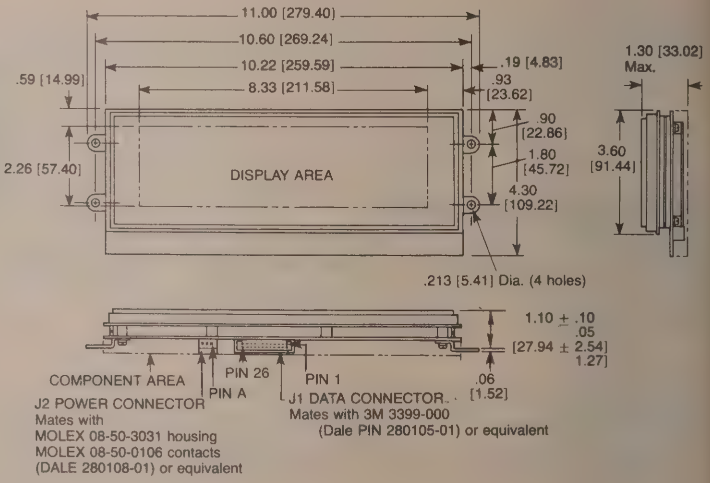
Storage Temperature: −20°C to 70°C

Relative Humidity: 10-90% non-condensing

Mechanical Shock: 50G½ Sine Wave, 11 ms duration, 5 shocks in each of 6 directions

Vibration: .018″ displacement amplitude from 10 to 50 Hz, 2G acceleration from 50 to 2000 Hz logarithmic sweep rate. 30 min. duration along each side of the 3 major axes.

[Numbers in brackets indicate millimeters.]


11.00 [279.40]
10.60 [269.24]
10.22 [259.59]
8.33 [211.58]
.59 [14.99]
.19 [4.83]
.93 [23.62]
1.30 [33.02] Max.
.90 [22.86]
1.80 [45.72]
4.30 [109.22]
3.60 [91.44]
2.26 [57.40]
DISPLAY AREA
.213 [5.41] Dia. (4 holes)
1.10 ± .10 .05 [27.94 ± 2.54 1.27]
.06 [1.52]
COMPONENT AREA
PIN 26
PIN A
PIN 1
J2 POWER CONNECTOR
Mates with
MOLEX 08-50-3031 housing
MOLEX 08-50-0106 contacts
(DALE 280108-01) or equivalent
J1 DATA CONNECTOR
Mates with 3M 3399-000
(Dale PIN 280105-01) or equivalent

ELECTRICAL

	MIN.	TYP.	MAX.	UNITS
Logic Supply Voltage	+4.75	5.0	+5.25	V
Logic Supply Current	200	210	230	mA
Panel Supply Voltage	11.4	12.0	12.6	V
Panel Supply Current	.85	1.0	1.2	A

NOTE: SII-0640-PD2 and SII-0640-200 are registered trademarks of the Burroughs Corp.

For complete information, write or phone
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COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

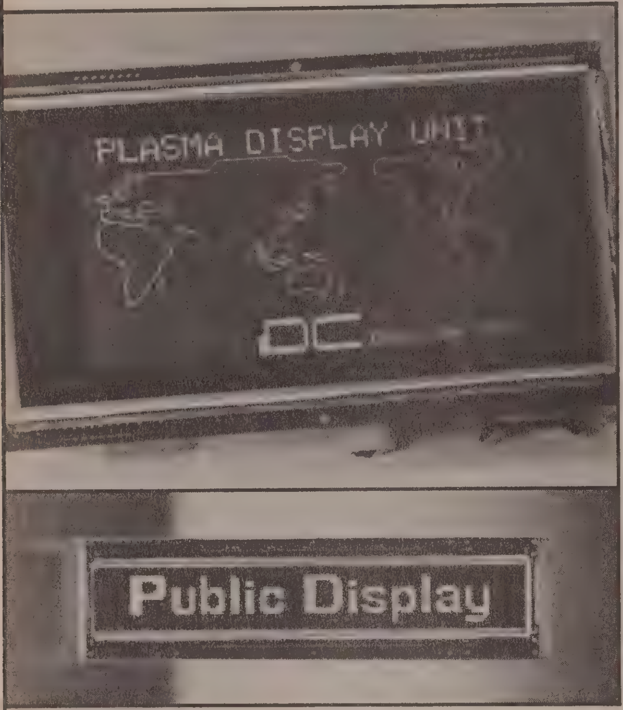
WPS word processing software

Y

YIG yttrium iron garnet

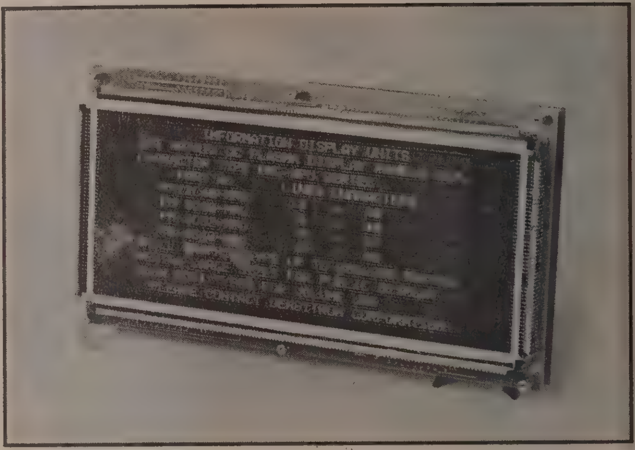
DISPLAYS FROM

PLASMA DISPLAY MODULES


PLASMA DISPLAY UNIT
Public Display

Graphic Dot Matrix

- Pixels: 16x101, 16x135, 64x192, 64x256, 96x240, 128x256, 200x640, 400x640
- With drivers and controllers
- Bright neon orange color

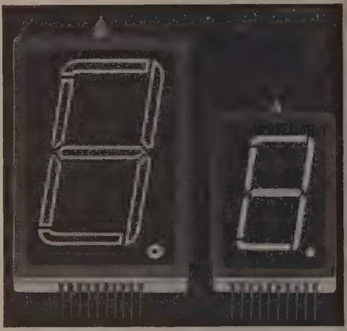

INFORMATION DISPLAY UNITS

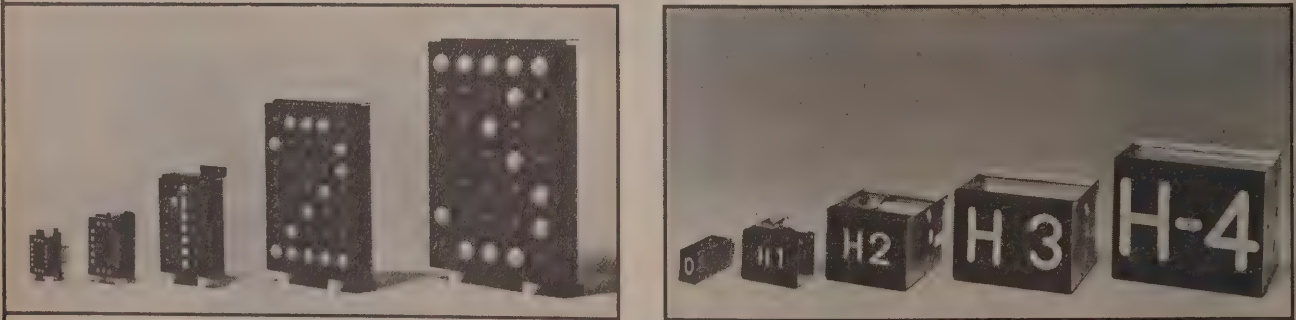
Alphanumeric Dot Matrix

- Lines/Characters: 1x16, 1x22, 2x16, 4x16, 6x40, 8x32, 8x40, 12x40
- With drivers and controllers
- Bright neon orange color

Segmented Numeric

.5, .7, 1.0, 2.0 and 3.4″ sizes



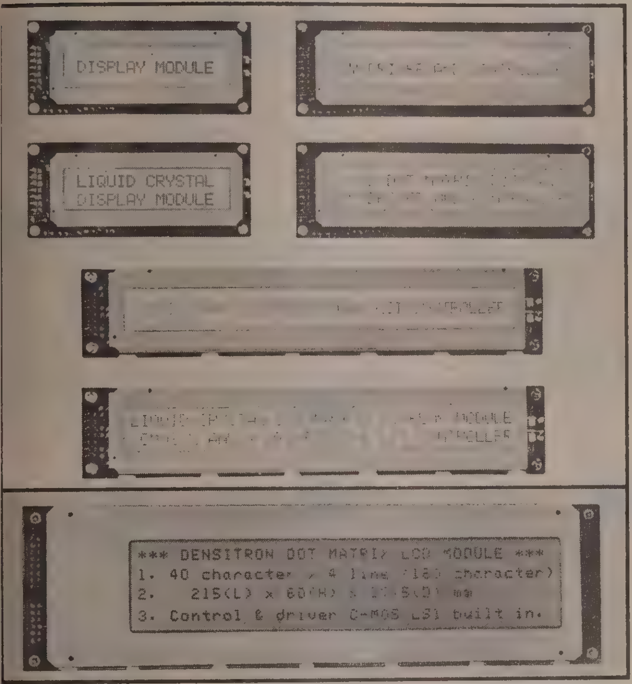


ELECTRO-MAGNETIC DISPLAYS

For public information displays requiring large character heights
Types: dot matrix, segmented and message plate

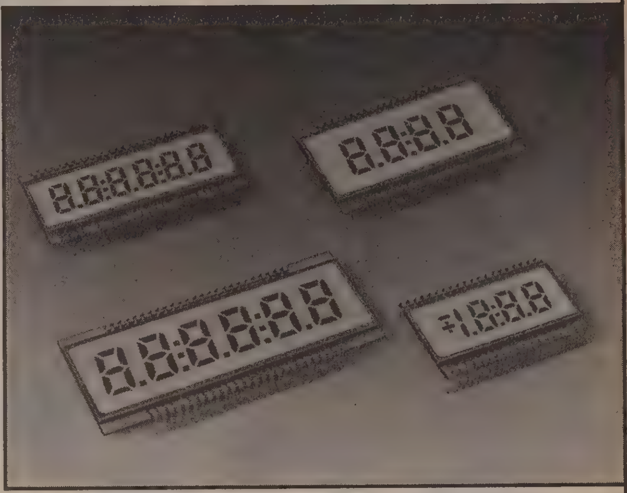
DENSITRON!

LCD MODULES


DISPLAY MODULE
LIQUID CRYSTAL DISPLAY MODULE
*** DENSITRON DOT MATRIX LCD MODULE ***
1. 40 character x 4 line (160 character)
2. 215(L) x 60(H) x 13.5(D) mm
3. Control & driver C-MOS LSI built in.

Alphanumeric Dot Matrix

Integral E-L backlight (standard) ■ Operating Temperature: −20° to +70°C or 0° to +50°C ■ Built-in CMOS RAM and ROM ■ Wide viewing angle (top or bottom) ■ Sizes: 1x8, 1x16, 1x20, 1x24, 1x40, 1x80, 2x8, 2x16, 2x20, 2x24, 2x40, 2x80, 3x40, 4x16, 4x20, 4x40, 4x80, 8x20, 8x40, 8x80, 16x40, 16x80, 25x80 (CRT)



Segmented Numeric

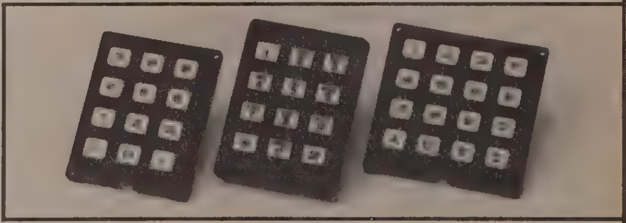
Package Type: DIL pins or rubber connector
Standard Sizes: 2, 3½, 4, 5, 6, and 8 digits in .5, .7 and 1.0″ heights
Operating Temperature: −20 to +60°C (Commercial) −30 to +85°C (Industrial)
Negative guest-host (dichroic) type available—white characters on a dark background
Integral E-L and LED backlights
Reflective, transflective or transmissive polarizers

Graphic Dot Matrix

Drivers only type configuration (CMOS) ■ Separate 8-bit input controller (RAM & ROM) ■ Thin package ■ Pixels: 32x120, 64x120, 64x240, 64x480, 128x256, 200x640 (CRT)

KEYBOARDS

Full travel membrane ■ Double shot keytops ■ Low profile ■ Ultra-low cost



KEYPADS

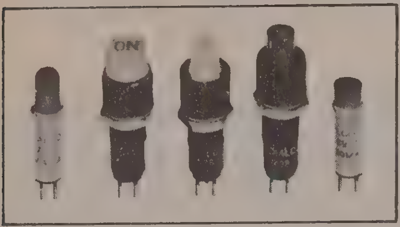
12-16-25 key standard ■ Mechanical or elastomeric contacts ■ Electrostatic shielding

DENSITRON CORPORATION
Information Device Division

20775 S. Western Avenue
Torrance, California 90501
Phone: (213) 618-9647
FAX: G2/G3: 213-618-1658
Telex II: 910-349-6200

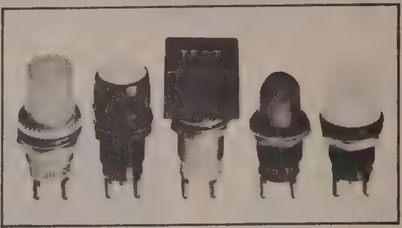
DESIGN IN DIALIGHT

INDICATOR LIGHTS



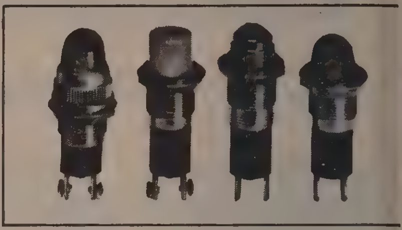
ULTRA-MINIATURE LED, INCANDESCENT OR NEON INDICATORS — DATALITES®

Replaceable plug-in cartridges for 1.35-125V operation. UL listed and CSA approved. Indicators mount in 9/32″ to 17/32″ clearance holes. Meet or exceed MIL-L-3661. Available with red, green, amber, blue, white translucent, light yellow or colorless lenses. Wide range of lens shapes. Custom legends.



SUB-MINIATURE INCANDESCENT OR NEON INDICATORS

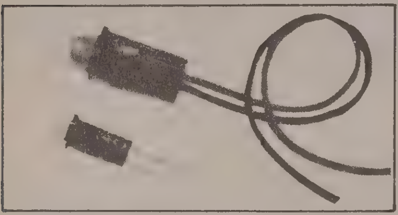
Meet or exceed MIL-L-3661. Mount in 15/32″, 1/2″, or 17/32″ clearance holes. Incandescent for 1.35 to 28V; neon has built-in current limiting resistor. Choice of cylindrical, faceted, convex, flat, square and round lens shapes. Custom legends.



MINIATURE INCANDESCENT OR NEON INDICATORS

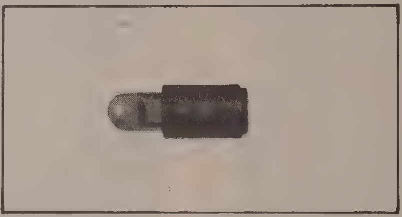
UL listed and CSA approved. Mount in 9/16″ and 11/16″ clearance holes. Voltages range from 2 to 120V. Meet or exceed MIL-L-3661. Available in red, green, amber, blue, white, yellow or colorless lenses. Full range of finishes.

LED INDICATORS



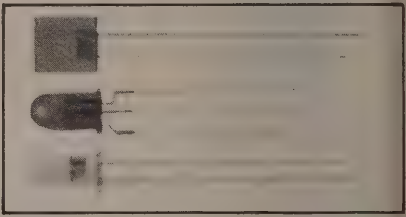
SNAP-IN LED INDICATORS

These low cost snap-in LED indicators are available with standard or high efficiency red, green or yellow LEDs (559 series also with red/green bicolor). With or without integral resistor. Straight terminals or wire leads. Low power requirements (10 to 20mA). Design permits high density packaging. Series 559 T 1-3/4 LED 250″ mounting hole. Series 558 T 1 LED .156″ mounting hole.



LED BI-PIN LAMPS

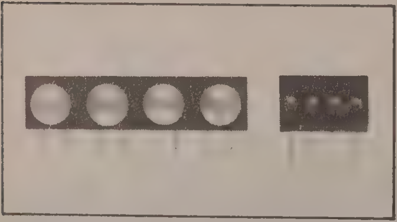
Series 560 are high brightness LED Bi-Pin indicator lamps that come in a choice of 7 operating voltages (3.6V to 28V) with integral current limiting resistors. Available with red, green or yellow LEDs, these high intensity indicator lights are suitable as incandescent lamp replacements, for high brightness backlighting and PCB applications.



LED LAMPS

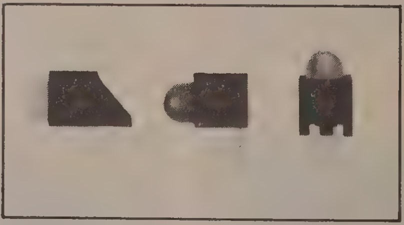
Series 521 are low cost, long life, standard and high efficiency LEDs in choice of red, green, yellow and red/green bicolor. Choose low profile or rectangular shape for flush mounted light emitting surface. Space saving, suitable for high density applications.

CIRCUIT BOARD INDICATORS



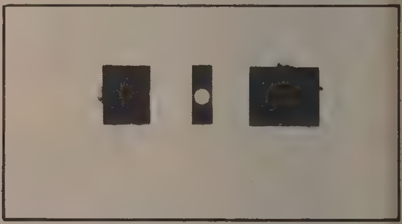
QUAD-LED CIRCUIT BOARD INDICATORS

Series 550 and 555 QUAD-LED™ are 4-element LED arrays. Single packages provide 4-line logic status indication. TTL compatible; separately accessible leads for each element; facilitates PCB mounting and wave soldering. Compatible with respective 550 and 555-2000 series individual units.



LED CIRCUIT BOARD INDICATORS

Series 550 are LED circuit board indicators with green, yellow, red or bicolor LEDs. Available with or without intergral resistor. In standard and high efficiency T 1-3/4 LEDs in choice of 3 configurations to meet all designs and space requirements.



LED CIRCUIT BOARD INDICATORS

Series 555-2000 and 555-3000 are available in red, yellow, green in a range of voltages and currents. Suitable for dense packaging on PC boards, these low cost indicators have applications in logic status troubleshooting, binary display or as circuit board indicators.

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(212) 497-7600

DIALIGHT MEETS YOUR NEEDS

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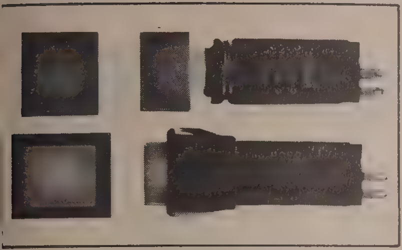
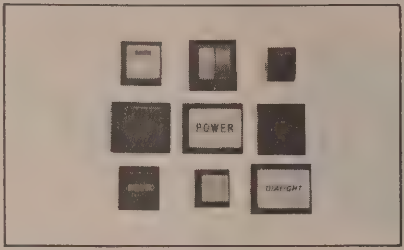
DESIGN IN DIALIGHT

ILLUMINATED PUSH BUTTON SWITCHES



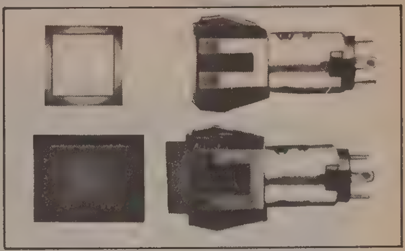
ILLUMINATED PUSH BUTTON SWITCHES

Computer grade. Snap action with gold or silver contacts, wiping action with gold contacts and solid state Hall-effect switches. Front snap-in bezel and rear panel mounting. Listed by Underwriters Laboratories and CSA approved.



ILLUMINATED PUSH BUTTON CAPS

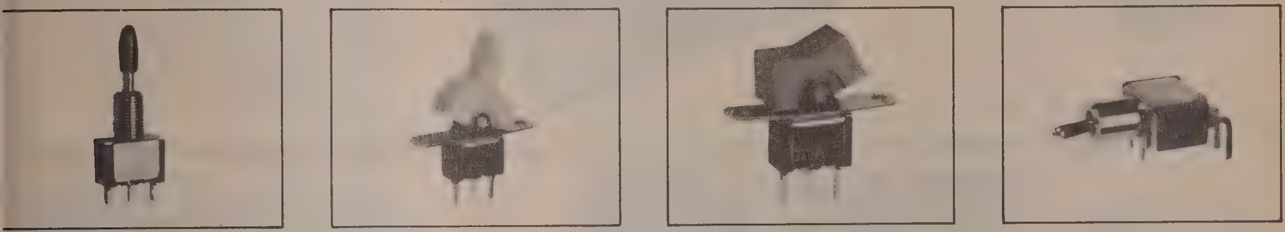
Over 500 shapes, sizes and colors to choose from: LED illuminated, split screens, barriers, Kap-Guard™, engraved, film and do it yourself legends.



ILLUMINATED PUSH BUTTON SWITCHES WITH MATCHING INDICATORS

Rugged construction, low profile, snap-in and sub panel mount. Momentary snap, non-snap or alternate action. Rated up to 5 amps. Listed by Underwriters Laboratories and CSA approved.

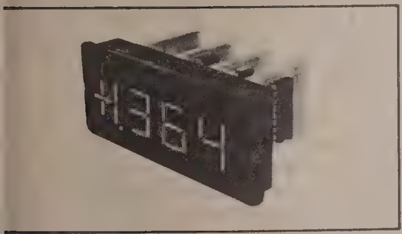
ROCKERS & TOGGLES



ROCKER AND TOGGLE SWITCHES FOR ALL APPLICATIONS

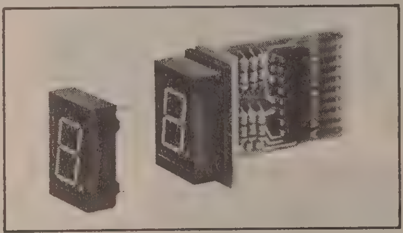
Contact rating information: 1. low level — 0.4 Volt Amps Max @ 20 VAC or DC. 2. standard — 5 Amps @ 120 VAC and 28 VDC, or 2 Amps @ 250 VAC. 3. standard/low level combination — 5 Amps @ 120 VAC/28 VDC, 0.4 VA Max @ 20 VAC or DC.

READOUT DISPLAYS



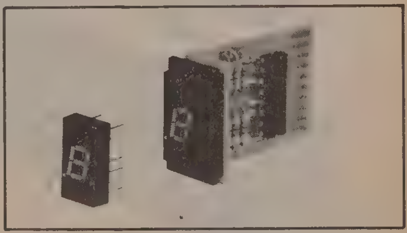
READOUT ASSEMBLY

Series 739 are 0.600″, seven-segment LED readout displays designed in a package with their associated decoder-driver circuitry and mounting bezel. The entire assembly, with as many digits as you need, is ready for instant panel mounting. Series 749 assembly uses 0.300″ display modules.



0.600″ DISPLAY MODULES

Series 730 have 0.600″ LED character in super bright red, seven-segment readout. Low power; draws 10mA/segment or less. TTL compatible. Uses 5-volt power supply. Very high contrast ratio... visible from 40′. Available with or without on-board decoder/driver, ±1, and with bezel mounting (739 series).



0.300″ DISPLAY MODULES

Series 745 have 0.300″ LED character in a very bright red, seven-segment readout. Low power requirements. Standard 14 pin DIP. Available with left decimal ±1, and with or without on-board decoder/driver, bezel mounting (749 series).

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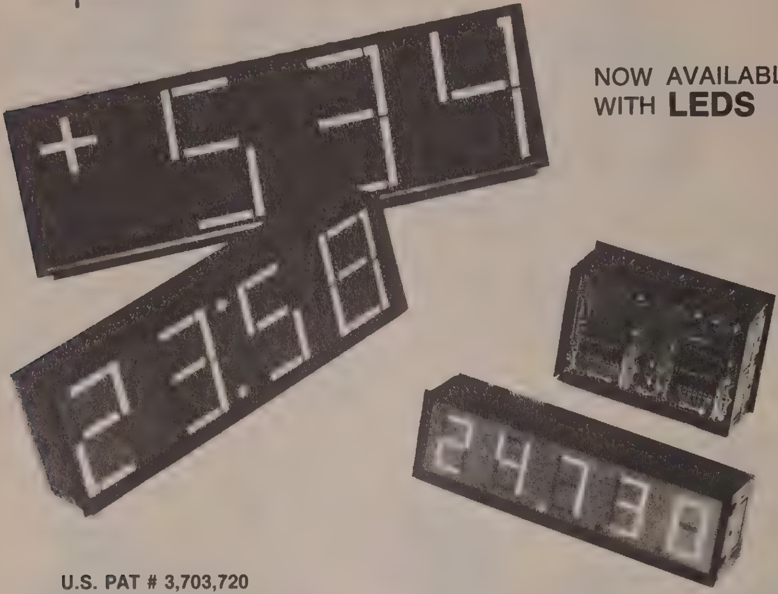
LARGE CHARACTER DIGITAL DISPLAYS

NOW AVAILABLE WITH **LEDS**



U.S. PAT # 3,703,720

DESIGNER SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68131	1.0 IN.	30 FT.
68132	2.0 IN.	60 FT.
68133	2.7 IN.	80 FT.

FEATURES

- Supplied in attractive, 1 to 8 digit assemblies
- Ready to install into rectangular panel cutout
- Assembly includes bezel & anti-glare "Black-Out" front panel
- Six standard, integral color filters, including High-Efficiency Red
- Low power: 0.8 W/1″ digit; 1.6 W/2″ & 2.7 digit (w/ HER filter)
- TTL or CMOS logic boards are part of assembly — Memory opt'l
- ± sign, colons, fixed or floating decimal are standard options
- Serviced from front without tools
- All wear parts (lamps and logic) socket mounted

NOW AVAILABLE WITH **LEDS**

825
20.45
± 1.395
23456

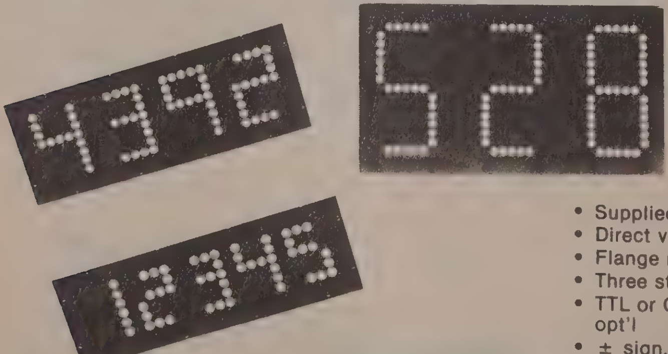
U.S. PAT # 3,703,720

INDUSTRIAL SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68231	1.0 IN.	30 FT.
68232	2.0 IN.	60 FT.
68233	2.7 IN.	80 FT.
68236	5.5 IN.	150 FT.

FEATURES

- Supplied in 1 to 8 digit assemblies w/anti-glare front panel
- Flange mounting w/gasket for NEMA environments
- TTL or CMOS drive logic boards are part of assembly — Memory opt'l
- Six standard, integral color filters, including High-Efficiency Red
- ± sign, colons, fixed or floating decimal are standard options
- All wear parts (lamps and logic) socket mounted



U.S. PAT # 3,703,720

OUTDOOR SERIES

SERIES	DIGIT HT.	VIEW'G DIST.
68332	2.0 IN.	60 FT.
68333	2.7 IN.	80 FT.
68336	5.5 IN.	150 FT.

FEATURES

- Supplied in 1 to 8 digit assemblies w/anti-glare front panel
- Direct viewed filaments for sunlight or stage light applications
- Flange mounting w/gasket for NEMA environments
- Three standard, integral color filters, including High-Efficiency Red
- TTL or CMOS drive logic boards are part of assembly — Memory opt'l
- ± sign, colons, fixed or floating decimal are standard options
- All wear parts (lamps and logic) socket mounted

DIO-REY • Div. of INFO-LITE • 422 Cliff Street • Fairview, NJ 07022 • (201) 941-4455 • "LINKS BETWEEN MAN AND MACHINE"

DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

SPECIFYING INFORMATION

GENERATING PART NUMBERS

68X 3X – XX – X X – X – X – X

SERIES

DESIGNER 1
INDUSTRIAL 2
OUTDOOR 3

DIGIT HT.

1″ 1
2″ 2
3″ 3
5½″ 6

LOGIC CODE (SEE TABLE 1)

NO. OF DIGITS

DISPLAY FORMAT

88	8	A
8.8.	.8	B
±88	8	C
±8.8.	.8	D
88:88:88 or 88:88		E
88	80	F
OTHER F'MATS (4)		X

GASKET (1)

O NONE
F FRONT FLANGE MT'G (2)
R REAR FLANGE MT'G

COLOR FILTER

1 WHITE
2 RED
3 AMBER
4 YELLOW (3)
5 GREEN (3)
6 BLUE (3)

LAMP CODE (SEE TABLE 2)

NOTES:
(1) Gasket not available on Designer Series.
(2) Not available on 68X31 (1″) & 68X36 (5½″) Series.
(3) Not available on 68X36 (5½″) & Outdoor Series.
(4) If the unit in the example had a single decimal to the left of the least significant digit, it would be called out as: #68132-D1-3X-C-2-0; ± 88.8 format.

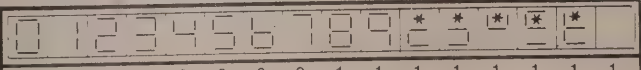
EXAMPLE: A Designer Series with 2″ digits; TTL, BCD to 7-Bar decoder-drivers without leading zero blanking; 3 digits, ± sign and floating decimal point (± 8.8.8 format); 5 volt, #345 lamps and red color filter (High Efficiency Red is mated with the #345 lamps) would have part #68132-D1-3D-C-2-0.

LAMP & DRIVE LOGIC OPTIONS

TABLE 1

VARIABLE	LOGIC CODE DASH NO.														
	-D1	-D2	-M1	-M2	-M3	-M4	-M5	-M6	-M7	-M8	-C1	-C2	-C3	-C4	-00
W/O Lead'g Zero Blank'g	●														W/O LOGIC
W/Lead'g Zero Blank'g		●													
1 Latch Per Digit			●	●	●	●									
1 Latch Per Display							●	●	●	●					
Latch Inactive											●	●	●	●	
Blanking User Driven					●	●			●	●			●	●	
Blanking Inactive			●	●			●	●			●	●			
Test User Driven				●		●		●		●		●		●	
Test Inactive			●		●		●		●		●		●		
Logic Type	TTL		CMOS w/ Latch Memory								CMOS				

DISPLAY



BINARY INPUTS 8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
1 = High 4	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
0 = Low 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

DRIVE LOGIC NOTES

The 68X32 & 68X33 Series use SN7448 (TTL) or 4511B (CMOS), BCD to 7 Bar decoders which drive ULN2003A, 7 channel darlington drivers.

The 68X36 Series employs the same decoders and drivers as the 68X32 & 68X33 Series. For added reliability, these are arranged in a dual-parallel circuit with each decoder-driver powering half of the lamps that light each segment.

As with all CMOS devices, options with user driven inputs must be switched high or low during operation.

The logic supply current for TTL options is 55ma, typ., per digit except for the 68X36 Series and the 68X31 Series with J lamps where 110ma per digit is required.

* *With CMOS logic options, the display will blank if the BCD input is greater than 9.*

TABLE 2

LAMP TYPE	LAMP CODE	G.E. NO.	VOLTS (2)	Ma PER LAMP	MAX. AMPS/DIGIT (3)						AVG. LIFE (K HRS)
					68131 68231	68132 68232	68332	68133 68233	68333	68236 68336	
INCAN-DESANT	C (1)	345	5	33	.231	.462		.462		1.287	50 (5)
	J	377	5	60	.420	.840		.840		2.340	10 (5)
	K (4)	394	12	39	.273	.546	.702	.546	.975	1.521	10 (5)
	L (1)	344	12	15	.105	.210		.210		.585	10 (5)
RED LED	M5	—	5-6	30-40	.252	.504		.504		.756	100+
	M12	—	12-14	15-20	.126	.252		.252		.378	100+

NOTES:
(1) Use with High Efficiency Red only.
(2) Input DC volts to lamp drivers.
(3) With figure 8 displayed.
(4) Use with all 6833X Outdoor Series.
(5) Reducing voltage by 6% doubles life.

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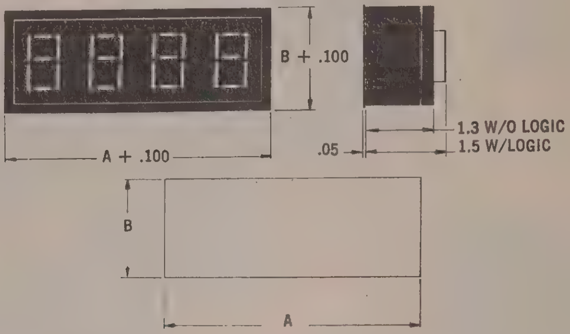
DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

MOUNTING INFORMATION

6813X DESIGNER SERIES

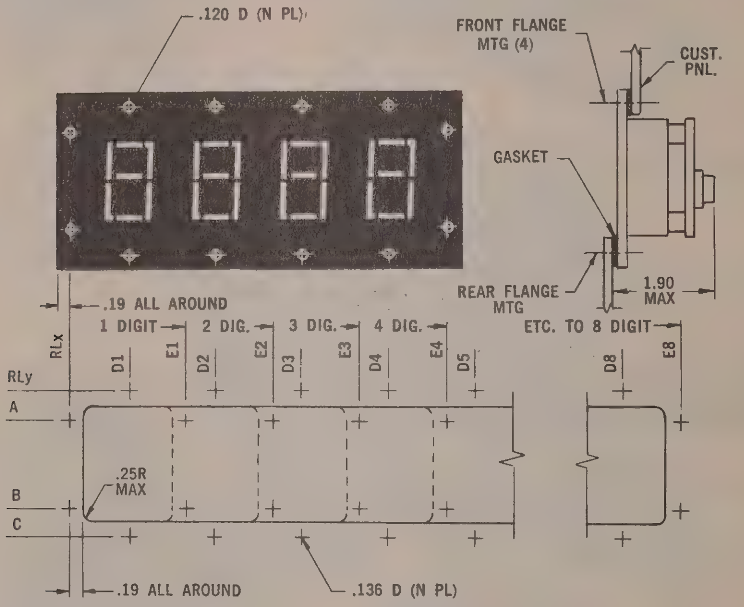

B + .100
A + .100
.05
1.3 W/O LOGIC
1.5 W/LOGIC
B
A

CUTOUT DIMENSIONS
ALL TOLERANCES +.015, −.000

No. of Digits In Assy*	Series 82131 B=1.630	Series 82132 B=2.380	Series 82133 B=3.130
	A	A	A
1	1.253	1.629	2.010
2	2.381	3.511	4.650
3	3.509	5.393	7.290
4	4.637	7.275	9.930
5	5.765	9.157	12.570
6	6.893	11.039	15.210
7	8.021	12.921	17.850
8	9.149	14.803	20.490

* ± sign equals one digit

6823X INDUSTRIAL SERIES & 6833X OUTDOOR SERIES


.120 D (N PL)
FRONT FLANGE MTG (4)
CUST. PNL.
GASKET
REAR FLANGE MTG
1.90 MAX
.19 ALL AROUND
1 DIGIT
2 DIG.
3 DIG.
4 DIG.
ETC. TO 8 DIGIT
RLx
RLy
D1
E1
D2
E2
D3
E3
D4
E4
D5
D8
E8
A
B
C
.25R MAX
.19 ALL AROUND
.136 D (N PL)

NOTES:

(1) Segments on all OUTDOOR Series are dot type. See photos.

(2) Two dimensions for a given Dim. Code indicate 2 mounting hole locations.

(3) ± sign equals one digit.

(4) Front Flange Mtg available on 2″ & 3″ models only — consult factory if this is required on 1″ or 5½″ models.

CUTOUT DIMENSIONS
ALL DIMENSIONS OFF RLX & RLY

DIM. CODE (2)	SERIES 68231	SERIES 68232 & 68332	SERIES 68233 & 68333	SERIES 68236 & 68336
A	.375	.750	.750	1.125 3.375
B	1.500	2.625	3.375	5.625
C	1.875	3.375	4.125	6.750
D1	.750	1.500	1.500	.750 3.000
D2	1.875	3.375	4.125	5.250 7.500
D3	3.000	5.250	6.750	9.750 12.000
D4	4.125	7.125	9.375	14.250 16.500
D5	5.250	9.000	12.000	18.750 21.000
D6	6.375	10.875	14.625	23.250 25.500
D7	7.500	12.750	17.250	27.750 30.000
D8	8.625	14.625	19.875	32.250 34.500
E1	1.500	2.625	3.000	3.750
E2	2.625	4.500	5.625	8.250
E3	3.750	6.375	8.250	12.750
E4	4.875	8.250	10.875	17.250
E5	6.000	10.125	13.500	21.750
E6	7.125	12.000	16.125	26.250
E7	8.250	13.875	18.750	30.750
E8	9.375	15.750	21.375	35.250
NO. OF DIGITS	N (Qty. of Mtg. Holes)			
1	6	6	6	10
2	8	8	8	14
3	10	10	10	18
4	12	12	12	22
5	14	14	14	26
6	16	16	16	30
7	18	18	18	34
8	20	20	20	38

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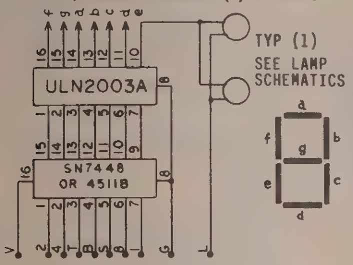
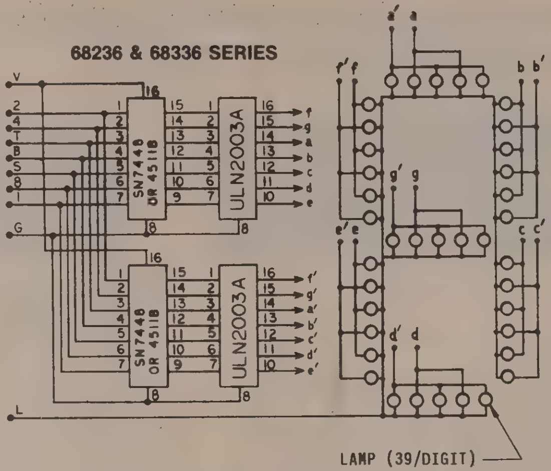
NUMERIC SCHEMATICS
ALPHA NUMERICS

DRIVE LOGIC SCHEMATICS

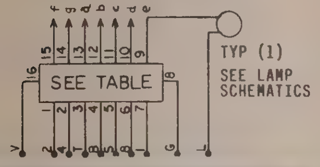
68132, 68232, 68332 (1)
68133, 68233 & 68333 (1) SERIES



68236 & 68336 SERIES



68131 & 68231 SERIES



LOGIC CODE	LAMP CODE	DECODER DRIVER
DX	C,K,L	SN7447A
DX	J	PB7447A
CX & MX	L	4511B
CX & MX	C,K	PB4511B

NOTES:
(1) **68332 Series** have 3 lamps in segments b, c, e & f. **68333 Series** have 3 lamps in segments a, d & g; 4 lamps in segments b, c, e & f.
(2) The T and/or B inputs are strapped high for CMOS logic options calling for inactive test or blanking.
(3) The S input is strapped low for CMOS logic options without memory (latch inactive).
(4) For ± sign: BCD 2 = +; BCD 1 = −
(5) Fixed decimal points and colons are strapped ON. Floating decimal points are user driven thru terminal D.
(6) In the −D2 logic option calling for leading zero blanking, the S terminal of the most significant digit is strapped low and the B terminal is connected to the S terminal of the next least significant digit (LSD). This B to S connection is repeated on all the following digits except on the LSD of the display assembly (right-most digit) which is set up not to blank leading zeros.

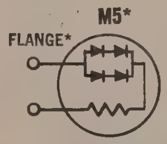
DRIVE LOGIC TERMINAL DESIGNATIONS

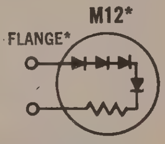
— FUNCTION —

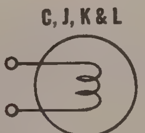
TERMINAL CODE	TTL (1) (68X3X-DX Series)	CMOS (3) (8) (68X3X-CX & -MX Series)
1, 2, 4 & 8	BCD INPUTS	BCD INPUTS
B	BLANKING INPUT (2)	BLANKING INPUT (4) (6)
D	DECIMAL POINT	DECIMAL POINT
G	GROUND	GROUND
L	LAMP POS. COMM	LAMP COMM (5)
S	NONE	LATCH (4)
T	LAMP TEST (6)	LAMP TEST (4) (6)
V	LOGIC POS	LOGIC POS.

NOTES:
(1) See electrical characteristics of SN7447A or SN7448 for details.
(2) Not available if leading zero suppression is specified.
(3) See electrical characteristics of 4511B for details.
(4) Strapped inactive (hi or lo) if function is not called for when purchasing.
(5) Positive for all series EXCEPT 68X31-CX & 68X31-MX where lamp common is negative.
(6) If active, only one connection required to operate (all terminals are common).
(7) Regulated power supplies are recommended for lamps & logic.
(8) For CMOS Logic options, handle display at a conductive work station until it is wired into the system.

LAMP SCHEMATICS



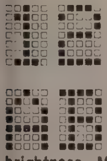




All lamps are T1¾, midget flange base. See Table 2, Lamp & Drive Logic Options, on previous page for further details.
*ZMX should be specified for 68X31 Series W/ CMOS Logic (cathode to flange).

ALPHANUMERICS — 0.7", 2.0" & 5.4"

5X7 DOT MATRIX



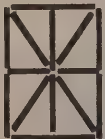
84040 SERIES, 0.7" LED

Features an on-board, 7 bit, TTL latch, character generator & LED drive circuitry, as well as a four level brightness control & lamp test. It will display a 96 character ASCII repetoire. Power is 5 volt at 200ma max. Available in orange & green with 500ucd brightness. Micro-processor buss compatible & can interface with Dio-Rey's 820 Series ASCII Serial Receivers (up to 16 characters can be driven by one 820 receiver)*. The characters may be stacked horizontally on .7" centers. Loading data: The desired data and chip enable should be present & stable during a write pulse. No sync is necessary & character will continue to be displayed until replaced with another. Multi-character units supplied (16 character Std.).
*See SYSTEM INTERFACES on following page.

84042 SERIES, 2.0" LED &
84044 SERIES, 4.0" LED

Complete multi-character units (18 character units are Std.) can be supplied to meet a wide variety of applications. They can be supplied in NEMA or Designer enclosures. Alternately, the hardware can be supplied bare, ready for user mounting. Included in the unit: Serial ASCII current loop receiver (300 to 1200 baud); Character generator and display driver; Optional display controller which allows various modes of display including direct copy, horizontal scroll, vertical scroll, etc.; All required DC power supplies. Multiple units may be driven off a single data loop with each unit being addressable. Up to 1756 characters can be stored in the memory.—For further information or applications engineering assistance, please contact us or your area representative.

14 SEGMENT



84045 SERIES, 5.4" LED

Multi-character units are available for industrial and commercial applications. Features superbright, 20mcd segments; Serial ASCII input at RS232 or current loop levels, or 6 bit parallel ASCII inputs at TTL levels; Displays 64 character ASCII subset; Supplied with all required DC power supplies, in NEMA or Designer enclosures; Input power is 115/230 VAC; Available with high efficiency red, green or yellow segments; Multiple units may be driven off a single data loop; Up to 65 location addresses per data loop; Input data rates from 110 to 9600 baud; 8 character and 16 character standard units.—For further information or applications engineering assistance, please contact us or your area representative.

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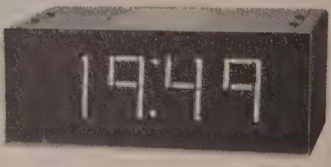
DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

DIGITAL INSTRUMENTS AND SYSTEMS

SERIAL INTERFACE DISPLAYS, DIGITAL METERS, COUNTERS, CLOCKS & TIMERS



FEATURES

- Large, easy to read LED displays for high reliability (1″, 2″, 3″ and 5½″)
- Available in rugged Industrial or attractive Designer packages
- Designed for long, trouble-free service
- Suitable for a wide variety of applications
- Serial interface is EIA RS232 or current loop compatible
- Analog to digital interfaces are voltage, current, temperature, load-cell and tachometer compatible
- Counters, clocks and timers in most popular configurations are available
- Powered from 110/220V, 50/60 Hz
- All wear and calibration components easily accessible

SPECIFICATIONS

- For Displays, see previous pages.
- For Interfaces, see next page.
- For Enclosures, see below
- Termination: barrier terminal block

GENERAL:

Dio-Rey standard instruments integrate a wide range of display interfaces and power supplies. Whether it be a 6 digit, 5½″ high display w/serial interface in a NEMA 12 box or a 2″ 4 digit clock in a designer enclosure, Dio-Rey has the unit.

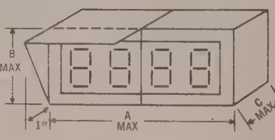
APPLICATIONS

- Analog to digital converters
- Clocks
- Bidirectional counters
- Coil winding counters
- Decade counters
- Event counters
- Pulse counters
- AC/DC ammeters
- AMP-HR meters
- Decibel indicating meters
- Fluid flow meters
- Volt meters
- Ohm meters
- Temperature meters
- Watt meters
- Timers
- Special indicators

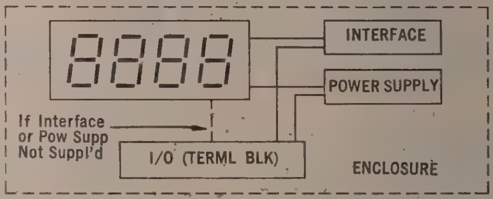
ENCLOSURE SIZE

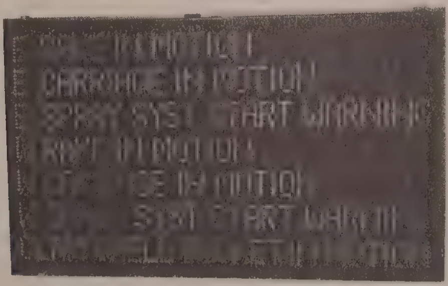
Dimension Code		Dash Number (Number of Digits)*						
		-1X	-2X	-3X	-4X	-5X	-6X	-7X
A	82231				8	12¼	12¼	12¼
	82232			12¼	12¼	18¼	18¼	18¼
	82233	12¼	12¼	12¼	24¼	24¼	24¼	24¼
	82236	16¼	16¼	16¼	24¼	24¼	36¼	36¼
B	82231				6	6¼	6¼	6¼
	82232			6¼	6¼	6¼	6¼	6¼
	82233	6¼	6¼	6¼	12¼	12¼	12¼	12¼
	82236	14¼	14¼	14¼	12¼	12¼	12¼	12¼
C	82231				6	6	6	6
	82232			6	6	6	6	6
	82233	6	6	6	12	12	12	12
	82236	8	8	8	12	12	12	12

* ± sign counts as one digit, ie: -2C (±88 Format), uses a -3X enclosure

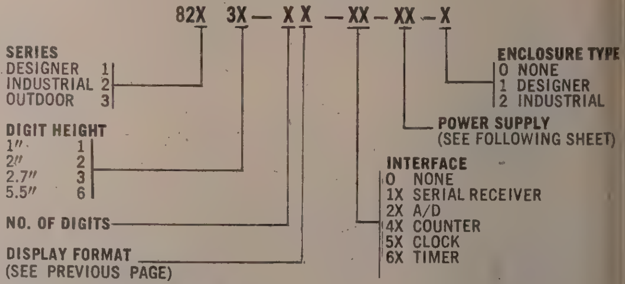

B MAX
1″
A MAX
C MAX

BLOCK DIAGRAM


8888
INTERFACE
POWER SUPPLY
If Interface or Pow Supp Not Suppl'd
I/O (TERML BLK)
ENCLOSURE


CARRIAGE IN MOTION
SPRAY SYST START WARNING
RACE IN MOTION
START WARNIN

HOW TO SPECIFY

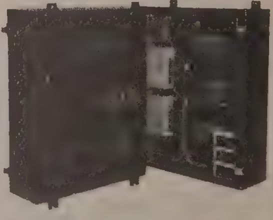

82X 3X — X X — XX — XX — X
SERIES
DESIGNER 1
INDUSTRIAL 2
OUTDOOR 3
DIGIT HEIGHT
1″ 1
2″ 2
2.7″ 3
5.5″ 6
NO. OF DIGITS
DISPLAY FORMAT (SEE PREVIOUS PAGE)
ENCLOSURE TYPE
0 NONE
1 DESIGNER
2 INDUSTRIAL
POWER SUPPLY (SEE FOLLOWING SHEET)
INTERFACE
0 NONE
1X SERIAL RECEIVER
2X A/D
4X COUNTER
5X CLOCK
6X TIMER

SPECIAL NUMERIC & ALPHA NUMERIC DISPLAY SYSTEMS

Laddle Wt meter (5½″)

Two sided 5½″ high digital thermometer

Keyboard entry, serial ASCII transmission remote display system (1″)



Laddle temp/cast feed/cast length digital instrument unit for metal slab casting plant (3″)

Dio-Rey has supplied a wide variety of display systems and custom displays to meet the special needs of our customers. These include:

- High noise immunity logic interfaces
- Keyboard & thumbwheel entry for remote displays
- Large character speed/length displays
- Digital Wt meters
- Visual annunciator systems

If you have a special requirement for lighted displays, please call us for applications engineering assistance. — We will be happy to help you.

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DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

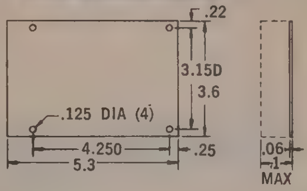
SYSTEM INTERFACES POWER SUPPLIES

GENERAL

DIO-REY has developed a wide variety of standard system interfaces for its numeric/alphanumeric readouts and lighted indicator/annunciators. These are the result of over 12 years experience in serving a broad spectrum of ndustries including instrumentation process ontrol, communications, metals, chemicals, ata processing, agriculture, security, office equipment, petroleum, auto, aerospace, textile, packaging, paper, transportation, governmental agencies and military.

These products may also be used in systems which do not require displays. In addition, custom interface electronics, designed to perform outside the specifications or capabilities of our standard units are available. Contact our sales department for technical application assistance.

820 SERIES SERIAL ASCII INTERFACES



The DIO-REY 820 Series Serial to Parallel and Parallel to Serial Converters are microprocessor based and are primarily intended for driving remote display decoders.

The input to the 820 Receiver is a Serial ASCII coded data stream at either RS232 or current loop levels. The 820 Receiver automatically adapts itself to incoming data rates over the range of 110 to 1200 baud. In addition it features a six position DIP switch which allows selective addressing of up to 64 separate receivers on one data link. The output of the receiver is six bits of data and sixteen strobe lines. The receiver, therefore, can drive either sixteen numeric or alphanumeric displays per receiver or up to 96 points in an annunciator system.

The 820A Transmitter accepts parallel, 7-bit ASCII (monocase) and converts it into a serial data format (RS232 or current loop) compatible with the receiver. Alternately, an array of sixteen, 6-bit registers may be sequentially inputed to the 820B Transmitter and converted to the same serial output, for annunciator systems.—See EEM pg. 3•1159 (in Section 2325) for further data

Part Number	Interface Code	Description	Transmission Mode
820-1	—11	Serial ASCII Data Receiver	EIA RS232
820-2	—12	(Serial to Parallel Converter)	Current Loop
820X-3	*	Serial ASCII Data Transmitter	EIA RS232
820X-4	*	(Parallel to Serial Converter)	Current Loop

* Not used for display.

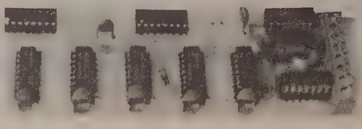
21 SERIES ANALOG TO DIGITAL CONVERTERS

he DIO-REY 821 Series are bipolar A/D's with up to 3¾ digit output capacity • BCD output ranges are: ±1999, ±3999, ±19999 and ±3999.

All features state-of-the-art technology at competitive cost • Input impedance >100 mΩ • Common mode rejection is 110 dB for DC; 90 dB for AC • ccuracy is ±0.05%, ±1 count • Auto zero and zero ffset available • Ranging and zero adjustments coneniently located • 5 VDC and 110/220, 47-500 Hz nput, depending on model • −10°C to +65°C; -90% RH non-condensing operating environment • ½″ LED display available • 100 K hr MTBF.

Part Number	Interface Code	Range	Input Power	
			5 VDC	110/220 VAC
821-1	—21	±1.999V	●	
821-2	—22	±199.9V	●	
821-3	—23	±20.0 mA		●
821-4	—24	±20.00 mA		●
821-5	—25	4.0-20.0 mA		●
821-6	—26	4.00-20.00 mA		●
821-7	—27	10.0-50.0 mA		●
821-8	—28	10.00-50.00 mA		●
821-9	—29	±1.999 mV		●
821-10	—30	±1999 mV		●
821-11	—31	±3.999 mV		●
821-12	—32	±3999 mV		●

822 SERIES DECADE COUNTERS



This series of counters includes Up, Down, Bi-Directional and Presetable (or combinations of these) units. All have T²L BCD outputs, compatible with DIO-REY displays. ⁽¹⁾Reset count and power (5 VDC) are brought in via a terminal block. Outputs terminate through a header.

(1) Contact debounce circuitry is supplied for mechanical switch count pulses. Decoupling capacitors are used for noise immunity.

Part Number	Interface Code	Description
822-4-1	—41	4 Decade, Up Counter
822-4-2	—42	4 Decade, Down Counter
822-4-3	—43	4 Decade, Up-Down Counter
822-4-4	—44	4 Decade, Preset Up Counter
822-4-5	—45	4 Decade, Preset Down Counter
822-4-6	—46	4 Decade, Preset Up-Down Counter

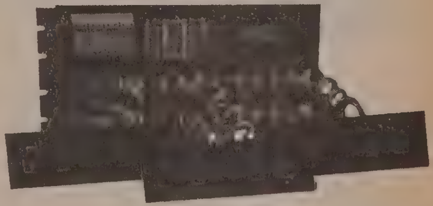
23 SERIES CLOCK & TIMERS

tandard Clock Interfaces are supplied in 4 or 6 digit, 12 or 24 hour formats. alendar and decimal formats are available. Fast and Slow set inputs are standard; old is optional.(1) As with the timers, All have BCD outputs compatible with io-Rey's Numeric Readouts. Timer interfaces that are available include count up, ount down, both with preset options. Switch operation at a specified time ptional.

) 50/60 Hz and crystal oscillation time bases are optional as are master/slave ystems.

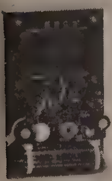
Part Number	Interface Code	Description
823-1	—61	4/6 Digit, 12 Hr Clock
823-2	—62	4/6 Digit, 24 Hr Clock
823-3	—63	Up Timer
823-4	—64	Down Timer

SPECIAL INTERFACES



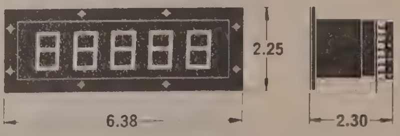
DIO-REY's repertoire of special interfaces include Hi NIL, T²L, CMOS and LSI logic technology. Our building blocks range from the SN7400, Quad gate to the 68000 Microprocessor. These we combine to produce the most cost effective and reliable answer to our customer's requirements. Please contact us to discuss your special needs.

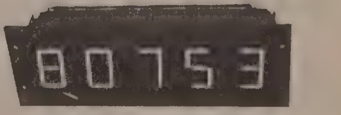
POWER SUPPLIES



Part No.	Code	Voltage (Volts)	Current (Amps)
HA5-1.2	81	5	1.2
HB5-3	82	5	3.0
HC5-6	83	5	6.0
HA12-0.5	84	12	0.5
HB12-1.7	85	12	1.7
HC12-3.4	86	12	3.4

NEW, 5 DECADE, 1″ COUNTER — SPECIAL OFFER





DIO-REY'S NEW 68196 Series decade counters are available from stock in Up Count (#68196A), Down Count (#68196B) & Bi-Directional (#68196C) models. The unit features a 68231 Series 1″ red LED display, an 822 Series, TTL counter circuit with contact debouncer for count pulses (uncommitted contact or open collector), rugged, gasketed design for NEMA environments, mini terminal block I/O (includes points for +5VDC, Up Count, Down Count, Reset & all return lines) & leading zero blanking. Input power required is 6.7 watt avg.; 8.5 watt max.
SPECIAL OFFER: Include a photocopy of this page with your order and receive one 68196A at the 24 pc. price of $298.50. Only one per customer. Offer expires 9/30/85.

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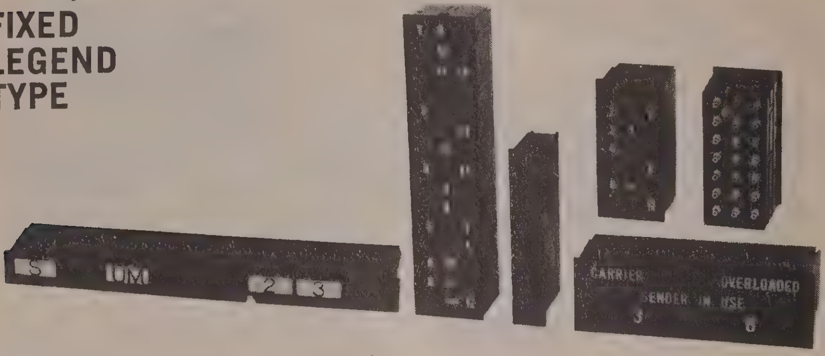
DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

LIGHTED INDICATORS AND ANNUNCIATORS

FIXED LEGEND TYPE



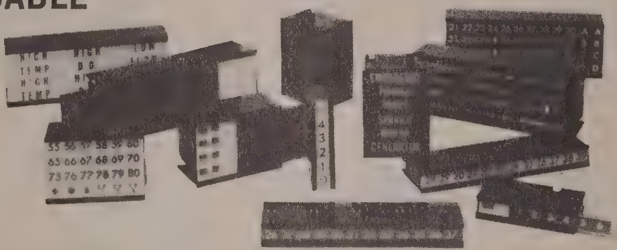
U.S. PAT #3,703,720

Series	Indicator Module Size	Series	Indicator Module Size
82811	3/8″ x 3/8″	82822	3/4″ x 3/4″
82812	3/8″ x 3/4″	82823	3/4″ x 1 1/8″
82813	3/8″ x 1 1/8″	82824	3/4″ x 1 1/2″
82814	3/8″ x 1 1/2″	Special	Any Size on 3/8″ Grid

Any group of messages/symbols can be displayed in any combination of colors

- Construction is modular
- Front panel graphics are back lighted using LEDS — STD MFB T1¾ lamps also available
- Units are supplied in an attractive package with bezel and "Black-Out" front panel, ready to snap into rectangular panel cutout
- Lamp common reduces installation time
- Serviced from the front
- Lamp drivers and special logic available
- Standard MFB T1¾ lamps also available

RELEGENDABLE TYPE

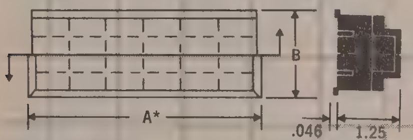


U.S. PAT #3,703,720

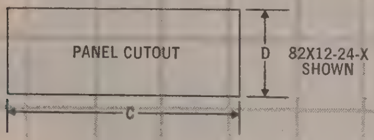
Series	82911	82912	82914
Indicator Module Size	3/8″ x 3/8″	3/8″ x 3/4″	3/8″ x 1 1/2″

For applications where the legend or graphics must be able to be changed

- Same features as the FIXED LEGEND TYPE
- Can be supplied with photographic film legend
- Relegendable from front
- Six standard color filters
- Twenty-three standard units with from 2 to 48 indicator modules
- Special assemblies available

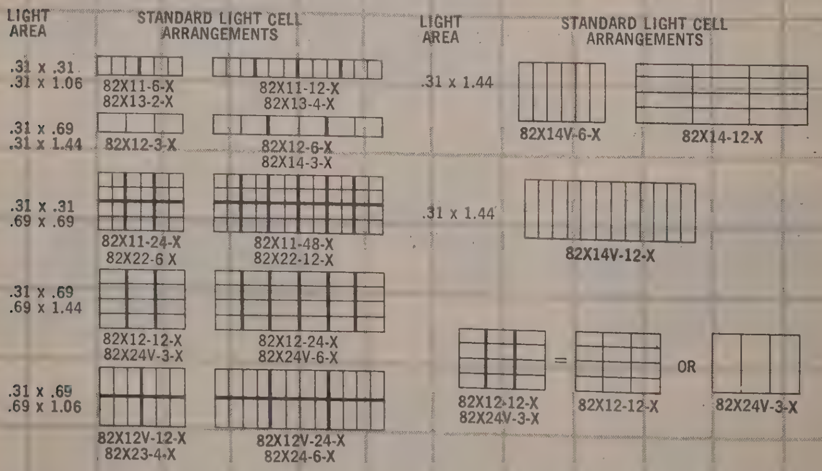


LONG SIDES HAVE BEZELS. SHORT SIDES HAVE NO BEZELS (ON RELEGENDABLE ONLY).


PANEL CUTOUT
D
C
82X12-24-X SHOWN

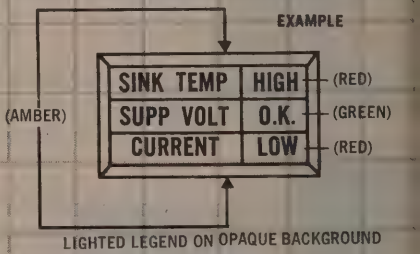
Basic Part Number	A*	B	C +.015 −.000	D +.015 −.000
82X11-6-X, 82X13-2-X, 82X12-3-X		.590	2.380	.500
82X11-24-X, 82X22-6-X	**2.375**	1.720	2.380	1.630
82X12-12-X, 82X24V-3-X	2.465	1.720	2.380	1.630
82X12V-12-X, 82X23-4-X		1.720	2.380	1.630
82X14V-6-X		1.720	2.380	1.630
82X11-12-X, 82X13-4-X, 82X12-6-X, 82X14-3-X		.590	4.630	.500
8211-48-X, 82X22-12-X	**4.625**	1.720	4.630	1.630
82X12-24-X, 82X24V-6-X	4.715	1.720	4.630	1.630
82X12V-24-X, 82X24-6-X		1.720	4.630	1.630
82X14-12-X		1.720	4.630	1.630
82X14V-12-X		1.720	4.630	1.630

* Bold type indicates dims. for relegendables (829XX-XX-X)


LIGHT AREA
STANDARD LIGHT CELL ARRANGEMENTS
.31 x .31
.31 x 1.06
82X11-6-X
82X13-2-X
82X11-12-X
82X13-4-X
.31 x .69
.31 x 1.44
82X12-3-X
82X12-6-X
82X14-3-X
.31 x .31
.69 x .69
82X11-24-X
82X22-6 X
82X11-48-X
82X22-12-X
.31 x .69
.69 x 1.44
82X12-12-X
82X24V-3-X
82X12-24-X
82X24V-6-X
.31 x .69
.69 x 1.06
82X12V-12-X
82X23-4-X
82X12V-24-X
82X24-6-X
LIGHT AREA
STANDARD LIGHT CELL ARRANGEMENTS
.31 x 1.44
82X14V-6-X
82X14-12-X
.31 x 1.44
82X14V-12-X
=
OR
82X12-12-X
82X24V-3-X
82X12-12-X
82X24V-3-X

LAYOUT SHEET FOR DIO-REY 82000 SERIES LIGHTED INDICATORS

Units which combine two or more of the standard module sizes can be supplied in attractive, integrated assemblies. To determine the assembly that will meet your requirements, just follow these steps: 1 — List the information (Words, Numbers, Letters, Symbols, etc.) to be displayed and then lay it out on a 3/8″ square grid. (A vellum or onion-skin overlay on the grid pattern printed on this sheet may be helpful for this purpose.) 2 — Choose lighted legend or lighted background for displayed information. 3 — Select the module sizes that will meet your display requirements and block them in on the layout. If you need a larger lighted area than is available from a single module, combine modules. 4 — Add a 1/8″ bezel around the light module layout to obtain the overall appearance of the display unit. 5 — Choose the color(s) for the lighted areas. 6—Choose a LED/lamp, considering Power Available, and Ambient Light Intensity from **Table 2, Page 1B•1041.—At this point, or if applications engineering assistance is required earlier, contact our office or your area representative.**


EXAMPLE
SINK TEMP
HIGH
(RED)
SUPP VOLT
O.K.
(GREEN)
CURRENT
LOW
(RED)
(AMBER)

LIGHTED LEGEND ON OPAQUE BACKGROUND

SPECIFYING PART NUMBERS

82X XX - XX - X

FIXED LEGEND 8
RELEGENDABLE 9

OPTIONS, LED/LAMP SEE TABLE 2, Page 1B•1041

INDICATOR MODULE SIZE

.375 x .375	11
.375 x .750	12
.375 x 1.125	13
.375 x 1.500	14
.750 x .750	22
.750 x 1.125	23
.750 x 1.500	24

NUMBER OF LIGHTED INDICATOR MODULES (SEE DETAILS ABOVE FOR ARRANGEMENT)

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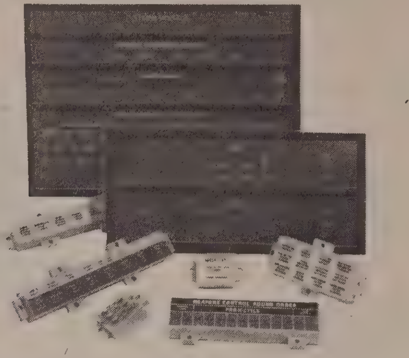
DIO-REY

THE LIGHTED DISPLAY DIVISION OF
INFO-LITE CORPORATION

LIGHTED INDICATORS
ANNUNCIATORS

STATUS DISPLAYS/ ANNUNCIATORS

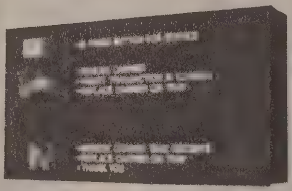


The upper two large display panels are status displays for a power generating station; the lower six annunciators are used in weapons control systems

BACK LIGHTED INDICATOR PANELS

Back lighted indicator panels used to monitor an automated engine plant.

INSTRUCTION INDICATOR



An instruction indicator used as part of an automated banking system

POWER SYSTEM MONITORING PANEL

A power system monitoring panel used in fossil and nuclear fueled installations. The lower display graphically represents the condition of a portion of the generating network.

ANNUNCIATORS • STATUS DISPLAYS • BACK LIGHTED INDICATOR PANELS • MAP/FLOW DISPLAYS • DEAD FRONT PANELS

Dio-Rey's back lighted displays are now available with either LEDS and/or incandescent light sources. They provide design flexibility and attractive appearance usually associated with expensive custom units. Dio-Rey allows you to choose the size, shape, color, legend and intensity combination that will meet your requirements. Color filters, special legends and masks are supplied to meet customer specifications. As well as having a standard line, we have supplied a wide range of hardware designed to meet special requirements. Contact us to discuss your specific needs.

FEATURES

- Available with standard LED and/or incandescent light source
- Sizes range from several square inches to square yards
- Fixed legends may be screened in one or more colors
- Can be supplied to endure severe environments (NEM4 or MIL-E-5400 and MIL-STD-202)
- Special units with any group of messages/ symbols may be displayed in any combination of colors
- Units are supplied in an attractive package with bezel
- Front panel options include: "black out", clear, high efficiency red, amber or green. Lampdrivers/flashers and annunciator logic is available
- All incandescent lamps are socket mounted to ease servicing
- Termination options include: terminal block, header, connector-harness, taper pin and solder terminal

APPLICATIONS

- Industrial process control
- Security systems
- Automated machine control
- Power generation system status
- Chemical/petroleum/textile flow indicators
- Steel/aluminum plant condition displays
- Weapons systems status indicator
- Map display boards
- Banking system displays
- Nuclear power warning indicators
- Medical instrument displays
- Communication network indicators
- Data processing/computer system communication
- Transportation route indicators

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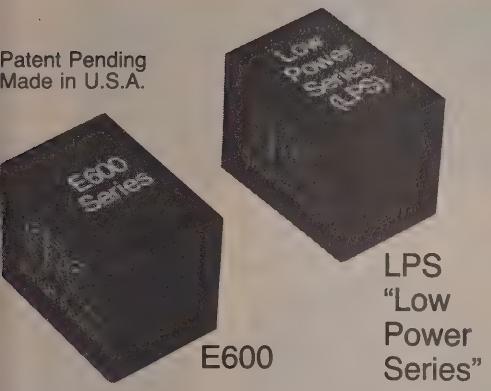
EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

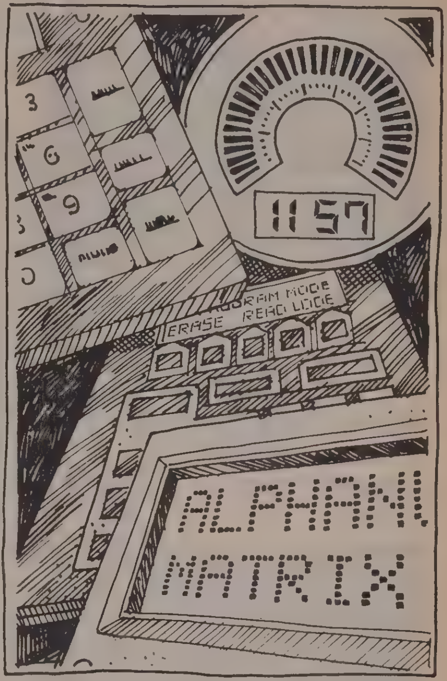
SMART FORCE™ INVERTERS

for electroluminescent lamps!

Patent Pending
Made in U.S.A.

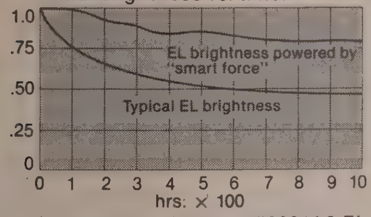


Use to Backlight:
- *LCDs*
- *Membrane switches*
- *Dead front panels and legends*
- *and more*



ERG SMART FORCE™ DC-AC Inverters **compensate for the aging characteristics of electroluminescent phosphors** to improve useful EL lamp life! (See "Initial brightness vs. Time" graph below.) Automatically adapt their own voltage and frequency over the course of EL lamp life to deliver constant power output. Use ERG SMART FORCE Inverters to help backlight LCDs, membrane switches, dead front panels and legends, decorative trim and more . . . **From Low DC Voltages!** Our **free** EL SOURCE LIST will help you source EL lamps, LCDs, membrane switches, etc. Call today.

Initial brightness vs. time:



Luminescent Systems #20014-2 EL lamp (16 IN²) and ERG E613 - E0003 inverter (V IN = 12V).

General Specifications

Input: 3,5,6,9,12,15,18,24,28 V DC standard
Output: 60–130V RMS @ 400–700 Hz. nom.
Package: Nylon
Mounting: P.C. board standard
Encapsulation: All ERG inverters are fully encapsulated.

ERG Inverter Series	Size	Weight	Note
E600	1.25" (31.75 mm) × .85" (21.59 mm) × .95" (24.13 mm) high	30 gms.	For more information see our E600 data sheet.
LPS "Low Power Series"	1.25" (31.75 mm) × .85" (21.59 mm) × .95" (24.13 mm) high	30 gms.	Same pinout as E600. Choose for applications where low brightness and/or small lit area is required.

Other packages available. Consult factory for more information.

All specifications subject to change without notice.

MPORTANT

o help us determine what SMART FORCE inverter ou will need for your application, let us know:) input voltage; 2) lamp surface area to be excited;) brightness level desired (in ft-Lamberts); 4) lamp perating life; 5) type and brand of EL phosphors;) number of EL segments, and 7) application.

Power mini-fluorescent lamps, too!

Use our E613-E0003 Inverter (12V DC Input) to power JKL Components Corp. Micro-Lume mini-fluorescent lamps including Model # BF659-01! Call factory for *free* circuit diagram and other product data!

See our ad next page →

lso see our ad in EEM Sec. 4000, Power Supplies DC.

o expedite smaller orders (up to $250) ve welcome credit card purchases.

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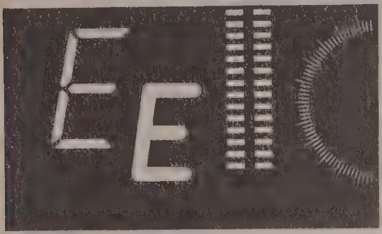
Power your displays

DC-DC converters for Gas Discharge Displays up to 25W



E700R
E700U
E500
E1600

Made in U.S.A.

Convert low DC line voltage to the higher voltage levels required to activate multi-segment plasma gas discharge displays (including bar graphs). ERG Converters eliminate need for 200–250V DC line.

E1200
E900
E1600

General Specifications

ERG Converter Series	Input	Output†	Size	Weight	Package
E700U	5,9,12,15 V DC standard (to 48 available)	Up to 3W unregulated (e.g. 200 V DC @ 15 ma)	1.1″ (27.94 mm) × 1.2″ (30.48 mm) × .91″ (23.11 mm) max. high	30 gms.	Plastic
E700R (Regulated)	5,9,12,15 V DC standard (to 48 available)	Up to 3W regulated (e.g. 200 V DC @ 15 ma)	1.43″ (36.32 mm) × 1.5″ (38.10 mm) × 1.03″ (26.16 mm) max. high	40 gms.	Plastic
E500*	5,9,12,15 V DC standard (to 48 available)	Up to 3W unregulated (e.g. 200 V DC @ 15 ma)	1.00″ (25.40 mm) × 1.38″ (35.05 mm) × 0.70″ (17.78 mm) high	20 gms.	Plastic
E1600	5,9,12,15 V DC standard (to 48 available)	Up to 6W unregulated (e.g. 250 V DC @ 24 ma)	1.30″ (33.02 mm) × 1.88″ (47.75 mm) × 0.82″ (20.83 mm) high	44 gms.	Plastic
E900	5,12,15 V DC standard (to 48 available)	Up to 12W total, with single or dual outputs, unregulated; (e.g. Single: 250V DC @ 30 ma Dual: 250V DC @ 30 ma and −16V DC @ up to 200 ma to power the drive electronics in many applications using the Burroughs SELF-SCAN® or IEE® ARGUS displays)	2″ (50.80 mm) × 2.5″ (63.50 mm) × .95″ (24.13 mm) high	122 gms.	Aluminum
E1200	12,15 V DC standard (others to your spec)	Up to 25W unregulated (e.g. 250V DC @ 100 ma)	2″ (50.80 mm) × 2.5″ (63.50 mm) × 1.19″ (30.23 mm) high	185 gms.	Aluminum

*For high-volume requirements, E500 delivers same performance as E700 at significantly lower unit cost!

Mounting: P.C. board standard
Encapsulation: All ERG converters are fully encapsulated
Isolation (in/out): 600V RMS (60 Hz. breakdown for 1 min.) standard
Temperature: 0–70° C. standard. Wider ranges available. 85° C. case max. 25° C. temp. rise typical for E12

†Output power may be derated up to 50%, dependent on output voltage, output current and temperature.

Match our converter to your display

Use this handy chart to find the right ERG converter for your gas discharge display application. Remember, this is just a guideline. Consult the factory if your application requires a series or part number other than shown! Ask about our expanded Cross Reference Index for gas discharge displays.

All converters below are 12V DC input; other input voltages available

Mfr.	Mfr.'s Part #	V DC Out	Output Current (ma)	Total Watts	ERG Part #
Beckman	SP-252	180	4	.7	E712-215U
Beckman	DP-0216-C1	185	32	5.9	E1612-1.8532
Beckman	DP-96G240-C1	185	120	22.2	E1212-1.8513
Burroughs	BG12201-2	250	3	.8	E712-2.512U
Burroughs	SII0140A-0030/39	250	20	5.0	E1612-2.520S
Burroughs	SII1240-200	250	100	25.0	E1212-2.5100
Cherry	W416-1051	185	35	6.5	E1612-1.835S
Cherry	W424-1053	185	35	6.5	E1612-1.835S
Dale	PD-32A025	200	5	1.0	E712-215U
Fujitsu	FPN020DRUD	150	35	5.2	E1612-1.535S
IEE	MAXI 32 (16 × 2)	150	25	3.8	E1612-1.535S
IEE	MAXI 256 (32 × 8)	150	90	13.5	E1212-1.5100
PCPC	RU-40-12RD10 (40 × 12)	250	90	22.5	E1212-2.5100
Thomson CSF	TH7606	100	160	16.0	E1212-1.0016
(needs both)		100	150	15.0	E1212-1.0016
Thorn EMI	P157/03-MI	270	32	8.6	E912-2.732S

All specifications subject to change without notice.

Tell us about your display power needs

- **Custom Designs**
- **Variations for multi-segment, bar graph and dot matrix gas discharge and vacuum fluorescent displays**
- **Inputs from 5V DC to 48V DC (your choice)**
- **Outputs from 5V DC to 1,000V D (your choice)**
- **Single and dual outputs (up to 25W total)**
- **Regulated and unregulated**
- **Center tap (± voltages)**

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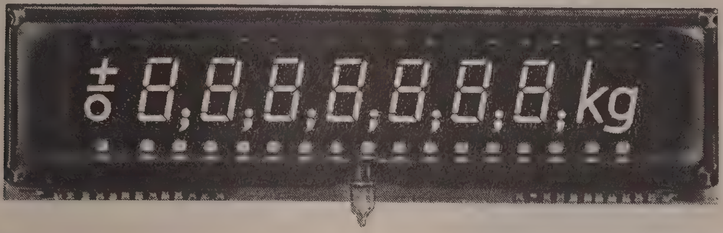
from low DC voltage

DC-DC converters for Vacuum Fluorescent Displays up to 12W



Made in U.S.A.

ERG
E700U
Series

E700 VF

ERG
Inc.
E900
Series

E900 VF

GRAPHICS
STATISTICS

lo need for “special” multiple output power supplies. ERG converters produce both anode and ilament voltages for VF displays up to 12W. Compatible with all major VF display makes. Mount on your PC board as needed, where needed.

General Specifications

ERG Converter Series	Input	Output*	Size	Weight	Package
E700 VF	5,12V DC (other inputs available upon request)	DC Anode voltage and Center tap (AC) filament voltage at combined currents to yield up to 3W max.	1.1″ (27.94 mm) × 1.2″ (30.48 mm) × .91″ (23.11 mm) max. high	30 gms.	Plastic
E900 VF	5,12V DC (other inputs available upon request)	Up to 12W max. (to 7.5W max. with 5V DC input)	2″ (50.80 mm) × 2.5″ (63.50 mm) × .95″ (24.13 mm) high	122 gms.	Aluminum

Mounting: P.C. board standard
Encapsulation: All ERG converters are fully encapsulated
Isolation (in/out): 300V RMS (60 Hz. breakdown for 1 min.) standard
Temperature: 0–70° C. standard. Wider ranges available. 85° C. case max.

*Output power may be derated up to 50%, dependent on output voltage, output current and temperature.

Match our converter to your display

Jse this handy chart to find the ight ERG converter for your VF lisplay application. Remember, his is just a guideline. Consult he factory if your application equires a series or part number ther than shown! Ask ibout our expanded Cross Reference Index for vacuum luorescent displays.

All converters below are 12V DC input; other input voltages available

Mfr.	Mfr.'s Part #	Anode Voltage (DC)	Anode Current (ma)	Filament Voltage (AC)	Filament Current (ma)	Total Watts	ERG Part #
Choa	CLD401	85	16	7.2	52	1.7	E712-.85V7.2
Choa	GH-512×256	100	6	11.4	1000	12.0	E912-1.006V11.4
Futaba	14-LD-01Z	31	25	6.5	125	1.4	E712-.31V6.5
NEC	FIP40A5X	45	8	8.9	78	1.0	E712-.45V8.9
NEC	FIP80A5X	45	30	9.0	156	2.5	E712-.45V9.0
Noritake	DC409A2	55	40	9.7	80	3.0	E712-.55V9.7
Noritake	DC440046A	60	60	9.2	310	6.5	E912-.6060V9.2
Noritake	DM80X80A	70	80	4.3	680	8.5	E912-.7080V4.3

All specifications subject to change without notice.

lso see our ad in EEM Sec. 4000, Power Supplies DC.

VISA MasterCard

o expedite smaller orders (up to $250) ve welcome credit card purchases.

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EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

SPECS?
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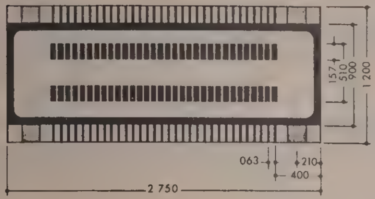
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?

CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?

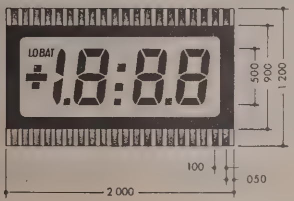
EXCEL Technology International Corp.

EXCELIX LCD

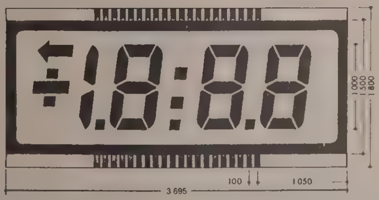
0520 d = N/A


157
510
900
1 200
063
210
400
2 750

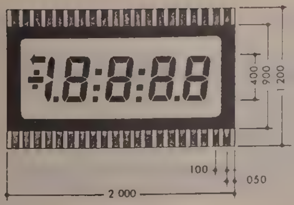
3555 d = 1.25

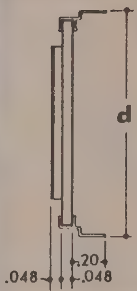

LO BAT
1.8:8.8
500
900
1 200
100
050
2 000

31051 d = 1.85

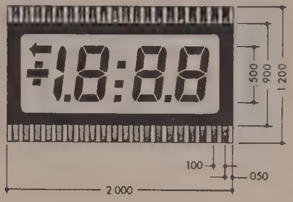

1.8:8.8
1 000
1 500
1 800
100
1 050
3 695

4451 d = 1.25

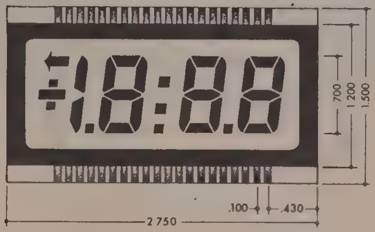

1.8:8:8.8
400
900
1 200
100
050
2 000



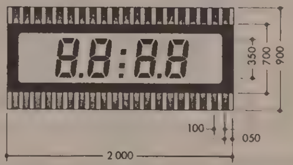
3551 d = 1.25


1.8:8.8
500
900
1 200
100
050
2 000

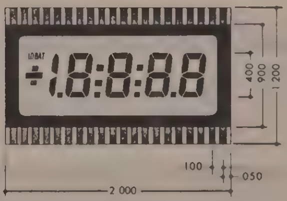
3751 d = 1.55


1.8:8.8
700
1 200
1 500
.100
.430
2 750

4320 d = .95


8.8:8.8
350
700
900
100
050
2 000

4455 d = 1.25


LO BAT
1.8:8:8.8
400
900
1 200
100
050
2 000

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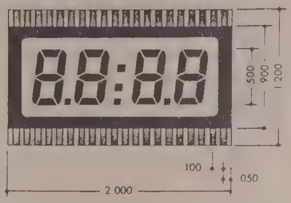
DEPT. EM, 5-4 STRYKER LANE, HILLSBOROUGH IND. PK., BELLE MEAD, NJ 08502

EXCEL

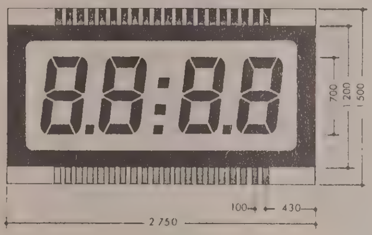
EXCELIX LCD

Technology International Corp.

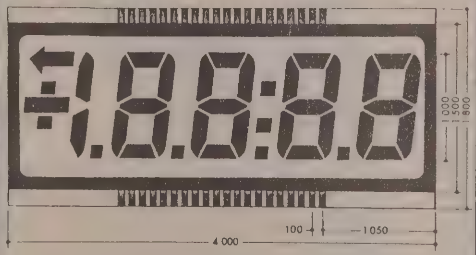
4500 d = 1.25


500
900
1 200
100
050
2 000

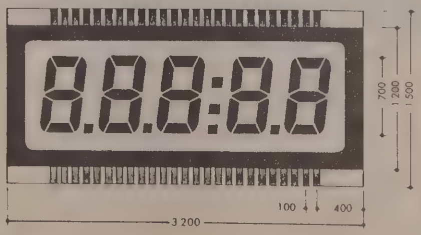
4700 d = 1.55

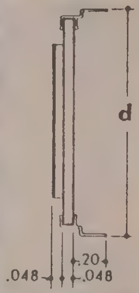

700
1 200
1 500
100
430
2 750

41051 d = 1.85

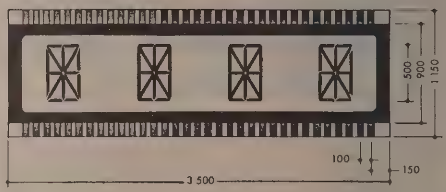

1 000
1 500
1 800
100
1050
4 000

5700 d = 1.55

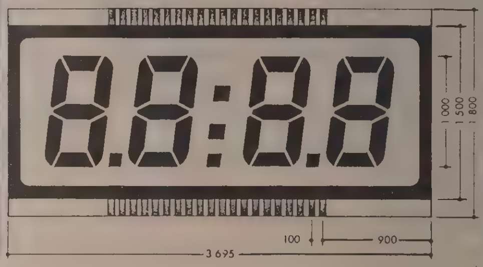

700
1 200
1 500
100
400
3 200



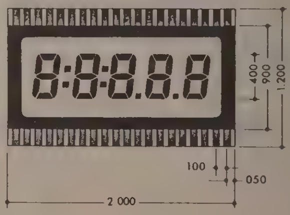
4540 d = 1.20


500
900
1 150
100
150
3 500

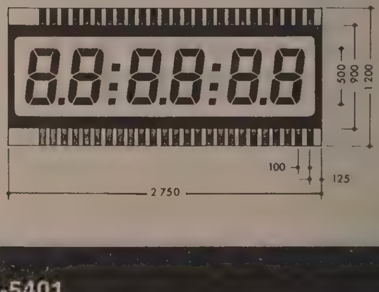
41000 d = 1.85


1 000
1 500
1 800
100
900
3 695

5400 d = 1.55


400
900
1 200
100
050
2 000

6500 d = 1.25


500
900
1 200
100
125
2 750

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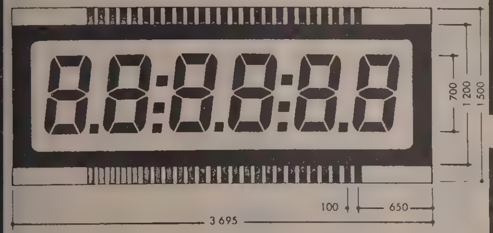
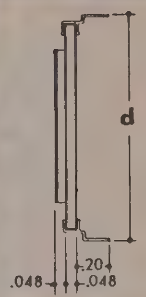
EXCEL Technology International Corp.

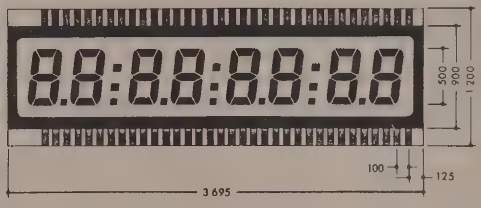
EXCELIX LCD

6700 d = 1.55





8500 d = 1.25



PERFORMANCE SPECIFICATIONS

PARAMETER	UNITS	MIN.	TYP.	MAX.
Operating Voltage	V	3	5	10
Operating Frequency	Hz	30	60	120
Current*	µA		3	10
Capacitance*	pf		3,000	
DC Resistance*	MΩ	20		
Allowable DC Offset	mV			50
Response Times (25°C)				
Rise to 90% ON	ms		30	50
Decay to 10% OFF	ms		50	100
Contrast Ratio			20:1	
Viewing Angle (at 5V)			±75°	
Operating Temp. Range	°C	−30		85
Storage Temp. Range	°C	−30		85
Estimated Life	hrs.		50,000	

* All Segments ON.
Specifications are for 3½ digit 0.5"DH LCDs.

ORDERING INFORMATION

EXCELIX□□□□-□□□-□

Excelix Part Number

OPTICAL MODES:
- **R** Reflective
- **T** Transmissive
- **S** Transflective
- **O** No Polarizer

PRINTING MODES:
- **P** Positive Printing (dark segments on light background)
- **N** Negative Printing (light segments on dark background)
- **O** No Polarizer

DEVIATION:
- **0** Standard, Epoxied Pins 0.100" center-to-center
- **1** Snap on Terminal 0.100" center-to-center
- **2** No Pins Conductive Pads Up
- **3** No Pins Conductive Pads Down

POLARIZERS:
- **H** Standard
- **Q** High Humidity
- **O** No Polarizer

* Q-type polarizer is less bright than H-type.

We are ever expanding our standard Excelix LCD products. If you need displays that are not listed in this catalog, call us. They may have already been our standard products.

We can tailor our standard products to meet your particular needs. We also provide services for custom designed displays, from concept, artwork, prototype, all the way up to volume production. Our Engineering Department will be happy to discuss with you and help you with your specific applications.

For your display needs, please contact our local sales representative or Excel Technology International directly.

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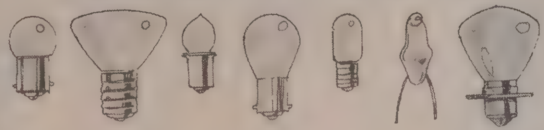
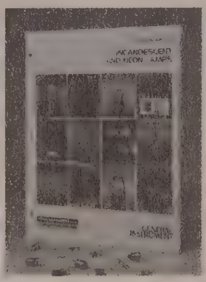




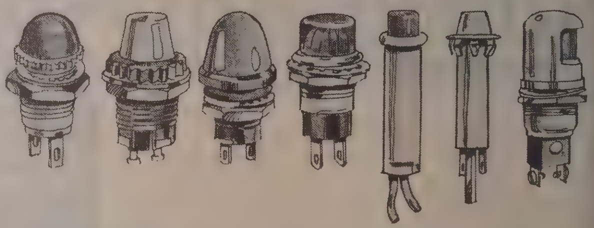
All standard sizes:
T-¾ through T-3½

All base configurations:
Bayonette, slide, screw

Custom Design Capability

Ask for Cat. No. 8400

Incandescent, neon and LED indicators for all applications



INDICATORS
GENERAL INSTRUMENT

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- Teleslide • Solid state
- Neons • Cartridge indicators
- Instrument lites

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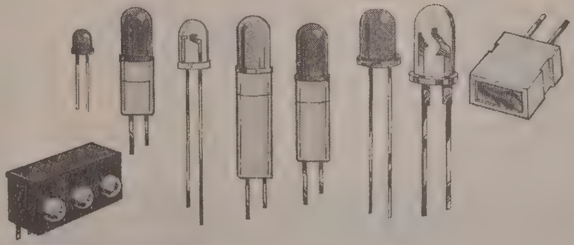
Solid state lamps and circuit board mounting devices



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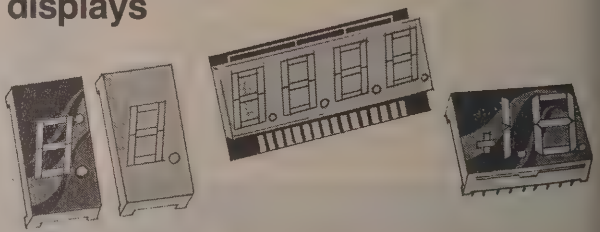
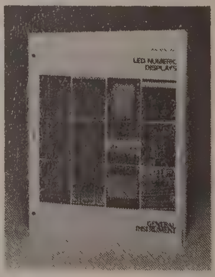
High performance, optically precise LED alpha-numeric displays





All display sizes including .300", .400", .500", .560", .800" in high efficiency red, yellow, orange and green, in 10 and 14 pin mounting packages • Complete cross-reference to HP, Fairchild, IEE.

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Technical Lamp

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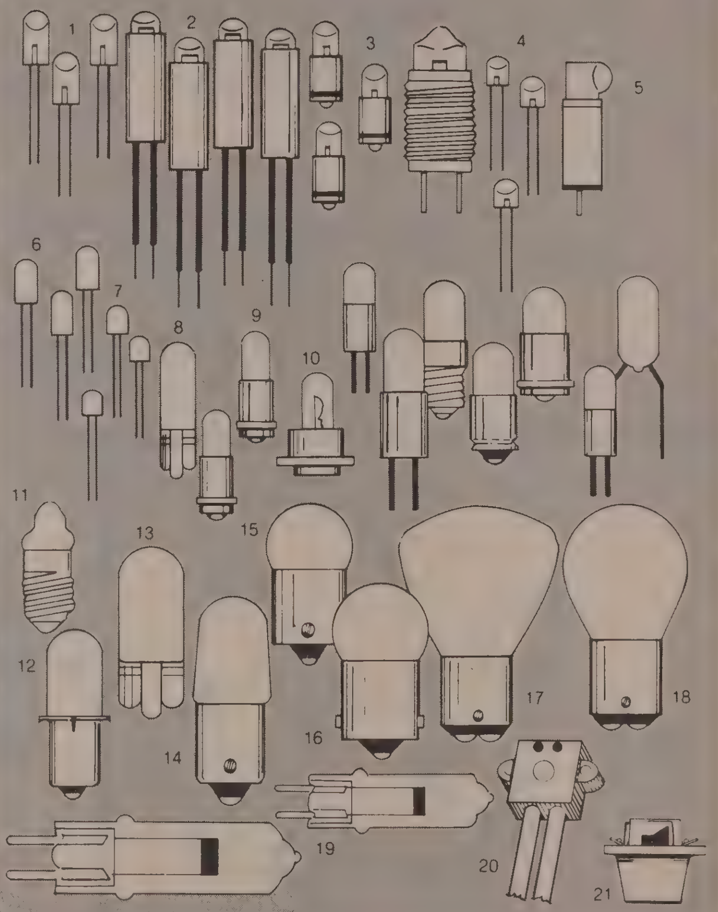
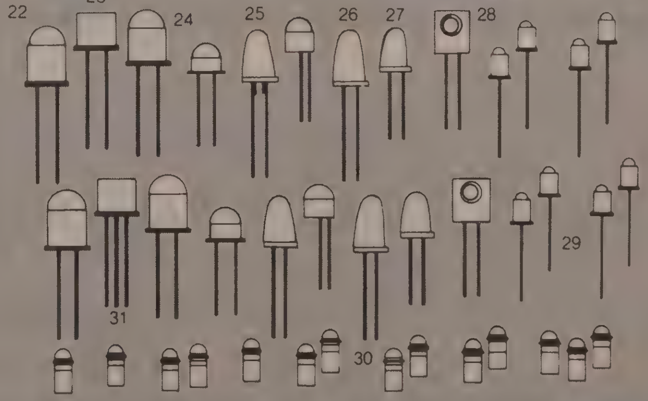
LAMPS

LENS END LAMPS				
180-1	T-1¾	2 5V	350 mA	1
L1023	T-2	2 5V	350 mA	2
L4044	MIDGET GROOVED	2 5V	350 mA	3
L4040	CARTRIDGE	2 5V	300 mA	5
L1006	T-2	3 5V	450 mA	2
L1021	T-2	3 5V	600mA	2
L1022	T-2	3 5V	750mA	2
1150-1	T-1	5 0V	115 mA	4
SUBMINIATURE LAMPS				
7153	T-¾	5 0V	115 mA	6
683	T-1	5 0V	60 mA	6
715	T-1	5.0V	115 mA	6
6832	T-1 SHORT	5.0V	60 mA	7
7152	T-1 SHORT	5 0V	115 mA	7
6838	T-1	28 0V	25 mA	6
73	WEDGE	14 0V	80 mA	8
74	WEDGE	14 0V	100 mA	8
328	T-1¾	6 0V	200 mA	9
387	T-1¾	28 0V	40 mA	9
8610-PC	PRINTED CIRCUIT	6.3V	200 mA	10
8605-PC	PRINTED CIRCUIT	14 0V	80 mA	10
KRYPTON LAMPS				
K-3	PR-3 TYPE	3.5V	650mA	12
K-13	PR-13 TYPE	5.0V	650mA	12
MINIATURE LAMPS				
222	T-3¼	2.2V	250 mA	11
243	T-3¼	2 4V	270 mA	11
PR2	T-3¼	2 5V	500 mA	12
259	WEDGE	6 3V	250 mA	13
194	WEDGE	14 0V	270 mA	13
47	T-3¼	6 3V	150 mA	14
1815	T-3¼	14 0V	200 mA	14
757	T-3¼	28 0V	80 mA	14
1873	T-3¼	28 0V	200 mA	14
219	G-3½	6.3V	250 mA	15
53	G-3½	14.4V	120 mA	15
356	G-3½	28 0V	170 mA	15
1895	G-4½	14 0V	240 mA	16
67	G-6	13 5V	590 mA	16
2530	RP-11	5 9/6.2V	6 5 AMP	17
1503	RP-11	5.9V	6.5 AMP	17
1034	S-8	12/14V	1.80 AMP	18
1157	S-8	12/14V	2 10 AMP	18
1204	S-8	28.0V	.70 AMP	18
HALOGEN LAMPS				
L7387	10W	6 0V	100 HR	19
L7388	20W	6.0V	100 HR	19
L7394	20W	6.0V	2000 HR	19
L7401	20W	12 0V	250 HR	19
L7389	50W	12 0V	2000 HR	19
L7390	100W	12.0V	2000 HR	19
HALOGEN LAMP HOLDERS				20
WEDGE BASE LAMP HOLDERS				21



OPTODEVICES

EMITTERS, INFRARED				
E10	TO-18 LENS	940 nm	15 mW	22
E11	TO-18	940 nm	4 mW	23
E14	T-1¾	940 nm	15 mW	25
E17	T-1	940 nm	3 mW	27
E19	COAXIAL	940 nm	1 mW	29
E20	PILL	940 nm	1 mW	30
DETECTORS, SILICON — PHOTOTRANSISTORS				
D30	TO-18 LENS	8 0 mA	500 LUX	22
D31	TO-18 FLAT	1 5 mA	1000 LUX	31
D37	T-1	1 0 mA	500 LUX	27
D39	COAXIAL	7 mA	1000 LUX	29
D40	PILL	5 mA	1000 LUX	30
DETECTORS, SILICON — PHOTODARLINGTONS				
D57	T-1	5 0 mA	200 LUX	27



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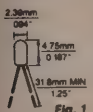
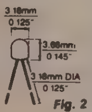
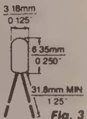
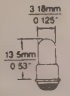
MINIATURE, SUBMINIATURE AND MICROMINIATURE LAMPS

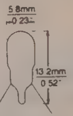
Lamp No.	Bulb	Volts	Amps	M.S. C.P.	Fig.
PR2	B-3½	2.38	.50	.80	15
PR3	B-3½	3.57	.50	1.50	15
PR4	B-3½	2.33	.27	.40	15
PR6	B-3½	2.47	.30	.45	15
PR7	B-3½	3.7	.30	.90	15
PR12	B-3½	5.95	.50	3.10	15
PR13	B-3½	4.75	.50	2.20	15
PR18	B-3½	7.2	.55	5.5	15
6S6	S-6	120	6W	......	25
7C7	C-7	115–125	7W	......	30
12	G-3½	6.3	.15	.35	16
13	G-3½	3.7	.30	.98	17
14	G-3½	2.47	.30	.50	17
19	G-3½	14.4	.10	.90	16
27	G-4½	4.9	.30	1.4	19
31	G-4½	6.15	.30	2.0	19
41	T-3¼	2.5	.50	.50	12
43	T-3¼	2.5	.50	.50	13
44	T-3¼	6.3	.25	.90	13
45	T-3¼	3.2	.35	.50	13
46	T-3¼	6.3	.25	.90	12
47	T-3¼	6.3	.15	.52	13
48	T-3¼	2.0	.06	.04	12
49	T-3¼	2.0	.06	.04	13
51	G-3½	7.5	.22	1.0	18
53	G-3½	14.4	.12	1.0	18
53X	G-3½	14.4	.12	1.0	18
55	G-4½	7.0	.41	2.0	20
57	G-4½	14.0	.24	2.0	20
57X	G-4½	14.0	.24	2.0	20
63	G-6	7.0	.63	3.0	21
67	G-6	13.5	.59	4.0	21
81	G-6	6.5	1.02	6.0	21
82	G-6	6.5	1.02	6.0	26
87	S-8	6.8	1.91	15.0	31
88	S-8	6.8	1.91	15.0	29
89	G-6	13.0	.58	6.0	21
93	S-8	12.8	1.04	15.0	31
112	TL-3	1.2	.22	......	11
123	G-3½	1.25	.30	.10	17
136	G-4½	1.25	.60	.20	19
158	T-3¼	14.0	.24	2.0	14
161	T-3¼	14.0	.19	1.0	14
168	T-3¼	14.0	.35	3.0	14
194	T-3¼	14.0	.27	2.0	14
222	TL-3	2.25	.25	......	11
301	G-5	28.0	.17	3.0	23
302	G-5	28.0	.17	3.0	24
303	G-6	28.0	.30	6.0	21
305	S-8	28.0	.51	15.0	31
307	S-8	28.0	.67	21.0	31
308	S-8	28.0	.67	21.0	29
309	S-11	28.0	.9	32.0	33
313	T-3¼	28.0	.17	3.5	13
327	T-1¾	28.0	.04	.34	6
328	T-1¾	6.0	.20	.34*	6
330	T-1¾	14.0	.08	.5	6
331	T-1¾	1.35	.06	.006	6
334	T-1¾	28.0	.04	.34	7
344	T-1¾	10.0	.014	.004	6
382	T-1¾	14.0	.08	.30	6
387	T-1¾	28.0	.04	.30	6
388	T-1¾	28.0	.04	.30	6
680	T-1	5.0	.06	.03	3
682	T-1	5.0	.06	.029	4
683	T-1	5.0	.06	.05	3
685	T-1	5.0	.06	.048	4
713	T-1	5.0	.075	.09	3
714	T-1	5.0	.075	.08	4
715	T-1	5.0	.115	.15	3
718	T-1	5.0	.115	.132	4
1003	B-6	12.8	.94	15.0	27
1004	B-6	12.8	.94	15.0	28
1034	S-8	12.8 14.0	1.80 .59	32.0 3.0	32
1076	S-8	12.8	1.80	32.0	29
1133	RP-11	6.2	3.91	32.0	34
1156	S-8	12.8	2.10	32.0	31
1157	S-8	12.8 14.0	2.10 .59	32.0 3.0	32
1176	S-8	12.8 14.0	1.34 .59	21.0 6.0	29
1183	RP-11	5.5	6.25	50.0	34
1195	RP-11	12.5	3.0	50.0	34
1445	G-3½	14.4	.135	.7	18
1447	G-3½	18.0	.15	1.5	17
1495	T-4½	28.0	.30	6.0	22
1764	T-1¾	28.0	.04	.34	5
1784	T-1¾	6.0	.20	.60	5
1813	T-3¼	14.4	.10	.86	13
1815	T-3¼	14.0	.20	1.4	13
1816	T-3¼	13.0	.33	3.0	13
1819	T-3¼	28.0	.04	.34	13
1820	T-3¼	28.0	.10	1.6	13
1829	T-3¼	28.0	.07	1.0	13
1847	T-3¼	6.3	.15	.38	13
1850	T-3¼	5.0	.09	.25	13
1864	T-3¼	28.0	.17	3.0	13
1869	T-1¾	10.0	.014	.004	5
1888	T-3¼	7.0	.50	2.0	13
1889	T-3¼	14.0	.27	2.0	13
1891	T-3¼	14.0	.24	2.0	13
1893	T-3¼	14.0	.33	2.0	13
1895	G-4½	14.0	.27	2.0	20
2162	T-1¾	14.0	.10	.5	5
2182	T-1¾	14.0	.08	.30	5
2187	T-1¾	28.0	.04	.30	5
6832	T-1	5.0	.06	.05	2
6833	T-¾	5.0	.06	.05	1
6838	T-1	28.0	.024	.15	3
6839	T-1	28.0	.024	.15	4
7152	T-1	5.0	.115	.15	2
7327	T-1¾	28.0	.04	.34	8
7328	T-1¾	6.0	.20	.6	8
7344	T-1¾	10.0	.014	.004	8
7382	T-1¾	14.0	.08	.30	8
7387	T-1¾	28.0	.04	.30	8
7931	T-1¾	1.35	.06	.006	8

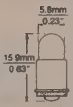

2.39mm
.094"
4.75mm
0.187"
31.8mm MIN
1.25"
Fig. 1

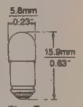

3.18mm
0.125"
3.68mm
0.145"
3.18mm DIA
0.125"
Fig. 2

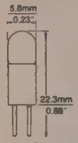

3.18mm
0.125"
6.35mm
0.250"
31.8mm MIN
1.25"
Fig. 3

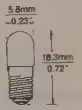

3.18mm
0.125"
13.5mm
0.53"
Fig. 4

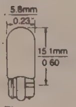

5.8mm
0.23"
13.2mm
0.52"
Fig. 5

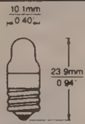

5.8mm
0.23"
15.9mm
0.63"
Fig. 6

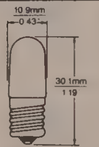

5.8mm
0.23"
15.9mm
0.63"
Fig. 7

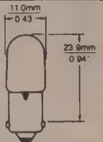

5.8mm
0.23"
22.3mm
0.88"
Fig. 8

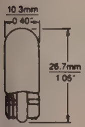

5.8mm
0.23"
18.3mm
0.72"
Fig. 9

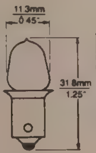

5.8mm
0.23"
15.1mm
0.60
Fig. 10

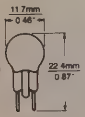

10.1mm
0.40"
23.9mm
0.94"
Fig. 11

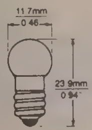

10.9mm
0.43"
30.1mm
1.19
Fig. 12

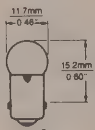

11.0mm
0.43
23.9mm
0.94"
Fig. 13

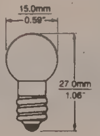

10.3mm
0.40"
26.7mm
1.05"
Fig. 14

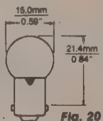

11.3mm
0.45"
31.8mm
1.25"
Fig. 15

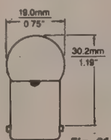

11.7mm
0.46"
22.4mm
0.87"
Fig. 16

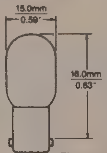

11.7mm
0.46
23.9mm
0.94"
Fig. 17

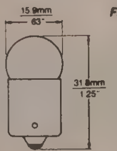

11.7mm
0.46
15.2mm
0.60"
Fig. 18

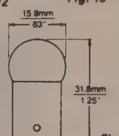

15.0mm
0.59"
27.0mm
1.06"
Fig. 19


15.0mm
0.59"
21.4mm
0.84"
Fig. 20


19.0mm
0.75"
30.2mm
1.19"
Fig. 21


15.0mm
0.59"
16.0mm
0.63"
Fig. 22


15.9mm
.63"
31.8mm
1.25"
Fig. 23


15.9mm
.63"
31.8mm
1.25"
Fig. 24

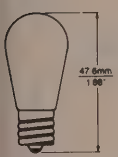
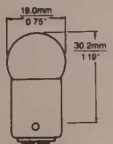
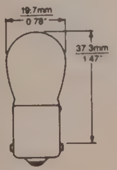
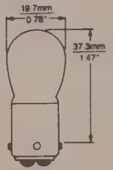
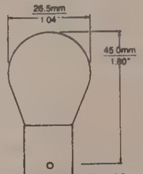


Fig. 25


19.0mm
0.75"
30.2mm
1.19"
Fig. 26


19.7mm
0.78"
37.3mm
1.47"
Fig. 27


19.7mm
0.78"
37.3mm
1.47"
Fig. 28


26.5mm
1.04"
45.0mm
1.80"
Fig. 29

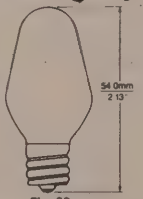
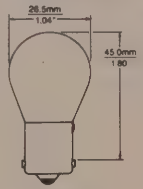
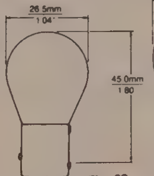
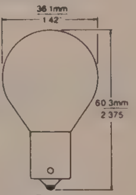


Fig. 30


26.5mm
1.04"
45.0mm
1.80
Fig. 31


26.5mm
1.04"
45.0mm
1.80
Fig. 32


36.1mm
1.42"
60.3mm
2.375
Fig. 33

NEON GLOW INDICATOR LAMPS

Lamp No.	Bulb	Circuit Volts	Ext. Res. (K-ohms)	Fig.
NE-2 (A1A)	T-2	105–125	150	38
NE-2A (A2A)	T-2	105–125	220	38
NE-2V (A2B)	T-2	105–125	100	38
NE-2E (A9A)	T-2	105–125	100	38
NE-51 (B1A)	T-3¼	105–125	220	39
NE-51H (B2A)	T-3¼	105–125	27	39
NE-17 (B5A)	T-4½	105–125	30	45
NE-45 (B7A)	T-4½	105–125	None	43
NE-47 (B8A)	T-4½	105–125	30	44
NE-48 (B9A)	T-4½	105–125	30	45
NE-2H (C2A)	T-2	105–125	30	38
NE-2D (C7A)	T-2	105–125	100	40
NE-2J (C9A)	T-2	105–125	30	40
NE-57 (F3A)	T-4½	105–125	None	43
NE-58 (F4A)	T-4½	210–150	None	43
NE-30 (J5A)	S-11	105–125	None	47
NE-56 (J9A)	S-11	210–150	None	47
NE-84 (K1A5)	T-2	105–125	30	41
NE-32 (L5A)	G-10	105–125	4.8	48

NEON GLOW CIRCUIT COMPONENT LAMPS

Lamp No.	Bulb	Start. Volts (DC)	Nom. Cur. (mA)	Fig.
NE-96 (4AB)	T-2	120–150	0.5	38
NE-97 (4AC)	T-2	110–140	0.5	38
NE-23 (5AB)	T-2	60–90	0.3	38
NE-68 (5AC)	T-2	60–90	0.3	38
NE-81 (5AG)	T-2	64–80	0.3	38
NE-76 (5AG-A)	T-2	68–76	0.4	38
NE-83 (5AH)	T-2	60–100	5.0	38
NE-86 (5AJ)	T-2	55–90	1.5	38
NE-67 (6AC)	T-3¼	55–90	0.2	39
NE-16 (7AA)	T-4½	67–87	1.5	45
NE-3 (8AA)	T-2	55–90	0.3	46
NE-4 (8AB)	T-2	60–90	0.3	42
NE-75	T-2	60–90	0.4	38

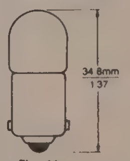


Fig. 44

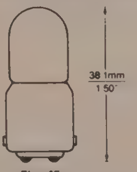


Fig. 45

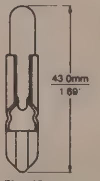


Fig. 46

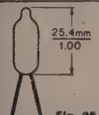


Fig. 38

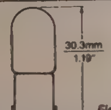


Fig. 39

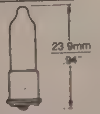


Fig. 40

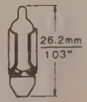


Fig. 41

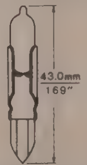


Fig. 42

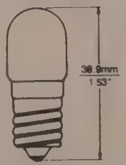
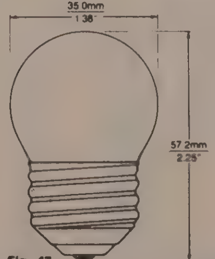
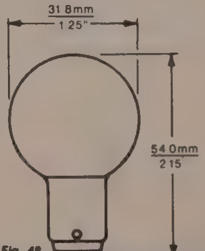


Fig. 43


35.0mm
1.38"
57.2mm
2.25"
Fig. 47

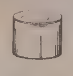

31.8mm
1.25"
54.0mm
2.15
Fig. 48

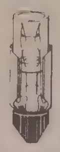
SYLVANIA **Miniature Lighting** **GTE**

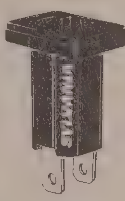
GTE Products Corporation
West Main Street, Dept. EM, Hillsboro, NH 03244
(603) 464-5533

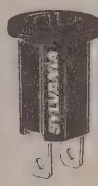
SINGLE SOCKET ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

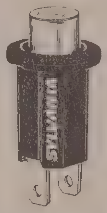
Available sockets include P N 30153 (round flange) and P N 30151 (rectangular flange). Sockets may be used with or without colored lens cap covering end of bulb which extends .18" beyond .09" flange. Socket P N 30153 (round flange) can also be used with round (.70" dia x .48" high) or square (.70" x .70" x .48" high) lenses. Both sockets 1.14" M.O.L. Mounting hole, .50" dia. Sockets accept T-2 lamps rated at 4, 5, 6, 10, 12, 14, 16, 18, 24, 28 or 48 volts.

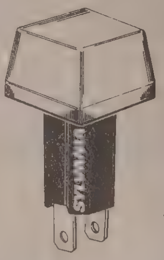

End Cap

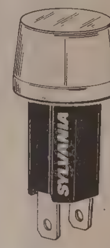

Indicator Lamp


P/N 30151


P/N 30153


With End Cap


With Square Lens


With Round Lens

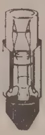
*Polycarbonate end caps are press fit to the lamp; cannot be used with lamps rated over 1.1 watts.

Pyrex end caps must be cemented to the lamp with a translucent silicone rubber adhesive.

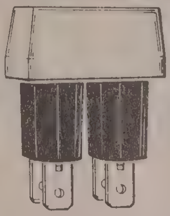
Part Number	Description
30151	Socket, rectangular flange
30153	Socket, round flange
38001	End cap, (*), red
38002	End cap, (*), yellow
38003	End cap, (*), white
38004	End cap, (*), green
38005	End cap, (*), blue
38006	End cap, (*), pearl white
38007	End cap. (*), orange
38071	End cap, Pyrex, red
38072	End cap, Pyrex, yellow
38073	End cap, Pyrex, white
38074	End cap, Pyrex, green
38075	End cap, Pyrex, blue
30160	Lens, round, red
30161	Lens, round, clear
30162	Lens, round, amber
30163	Lens, round, white
30164	Lens, round, green
30165	Lens, round, blue
30170	Lens, square, red
30171	Lens, square, clear
30172	Lens, square, amber
30173	Lens, square, white
30174	Lens, square, green
30175	Lens, square, blue

TWIN LIGHT ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

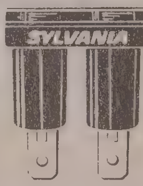
T-2 lamp



Complete Ass'y.

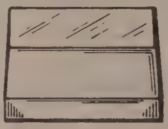


TWIN LIGHT SOCKETS



Ordering Number	Description	No. of Contacts
31351	Both sides common	2
31352	One side common	3
31353	Individual contacts	4

TWIN LIGHT LENSES



Ordering Number	Color
30180	Red
30182	Amber
30183	White
30184	Green
30185	Blue

STRIP SOCKET ASSEMBLIES FOR T-2 SLIDE BASE INDICATOR LAMPS

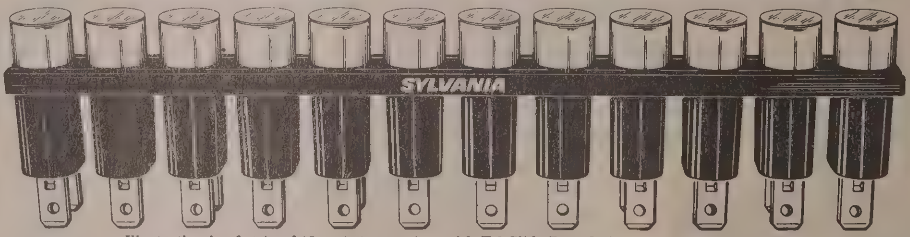


Illustration is of strip of 12 sockets complete with T-2 Slide Base Indicator Lamps and end caps.

Strip socket assemblies may be used with or without end caps listed above. Polycarbonate caps are press fit to the lamp; cannot be used with lamps rated over 1.1 watts. Pyrex caps must be cemented to the lamp with a translucent silicone rubber adhesive. Strip socket assemblies are available with 2 thru 12 sockets on 1/2" or 3/4" centers; common ground or individual contacts. Sockets accept T-2 indicator lamps rated at 4, 5, 6, 10, 12, 14, 16, 18, 24, 28 or 48 volts.

INDICATOR LAMP STRIP SOCKETS

Number of Sockets	Ordering Number			
	1/2" Centers		3/4" Centers	
	Common Ground	Individual Contacts	Common Ground	Individual Contacts
2	31301	31311	31321	31337
3	31302	31312	31322	31338
4	31303	31313	31323	31334
5	31304	31314	31324	31339
6	31305	31315	31325	31333
7	31306	31316	31326	31340
8	31307	31317	31327	31341
9	31308	31318	31328	31342
10	31309	31319	31329	31343
11	31310	31320	31330	31344
12	31250	33250	31275	33275

T-2 SLIDE BASE INDICATOR LAMPS FOR ABOVE ASSEMBLIES

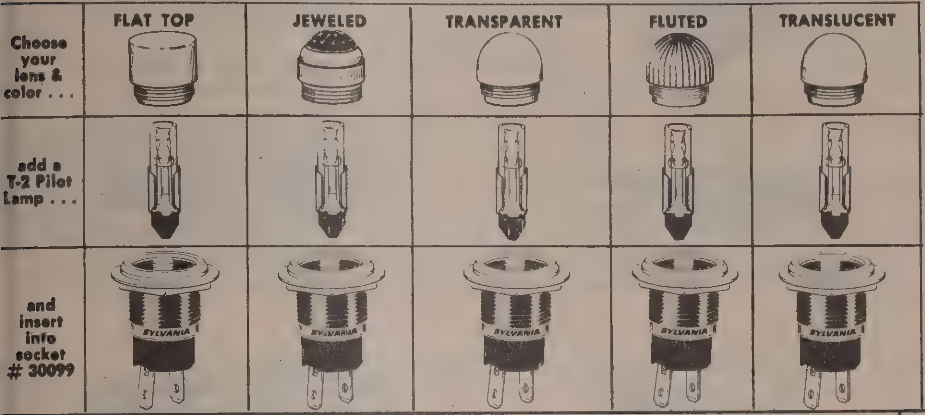
Lamp Number	Design			Filament	M.S.C.D.	Average End Foot Candles	Rated Average Life (Hrs.)
	Volts	Amperes	Watts				
4ESB	4.0	.040	.16	C-6	.03	200	10,000
5ESB	5.0	.040	.20	C-6	.04	225	8,000
6ESB	6.0	.040	.24	C-2V	.025	250	10,000
53B	6.0	.240	1.44	C-2V	.24	2,000	5,000
10ASB	10.0	.010	.10	C-2F	.001	.....	50,000
10CSB	10.0	.017	.17	C-2V	.01	60	20,000
10ESB	10.0	.040	.40	C-2V	.07	450	10,000
12ESB	12.0	.040	.48	C-2V	.09	650	10,000
14FSB	14.0	.080	1.12	C-2F	.50	4,000	500
16CSB	16.0	.017	.27	C-2F	.016	80	15,000
16ESB	16.0	.040	.64	C-2F	.17	800	7,500
18ESB	18.0	.040	.72	C-2F	.14	850	5,000
24CSB	24.0	.017	.42	C-2F	.02	100	15,000
24ESB	24.0	.040	.96	C-2F	.12	850	8,000
28ESB	28.0	.040	1.12	C-2F	.25	1,500	6,000
48ESB	48.0	.040	1.92	CC-2F	.44	3,000	5,000

SYLVANIA Miniature Lighting GTE

GTE Products Corporation
West Main Street, Dept. EM, Hillsboro, NH 03244
(603) 464-5533

UNIVERSAL PILOT LAMP HOUSING FOR T-2 SLIDE BASE PILOT LAMPS

A variety of lens styles, each available in a choice of colors, plus a standard socket (P/N 30099) provide a wide choice of configurations for virtually every application when used with T-2 slide base Pilot Lamps rated at 5, 6, 12, 28, 48, 60 or 120 volts. **Dimensions: Lenses**—Height, .38"; diameter, .63". **Socket**—Front of panel to end of terminals, .91"; mounting hole, .75" dia.


FLAT TOP
JEWELED
TRANSPARENT
FLUTED
TRANSLUCENT
Choose your lens & color . . .
add a T-2 Pilot Lamp . . .
and insert into socket # 30099
SYLVANIA

LENSE PART NO'S.

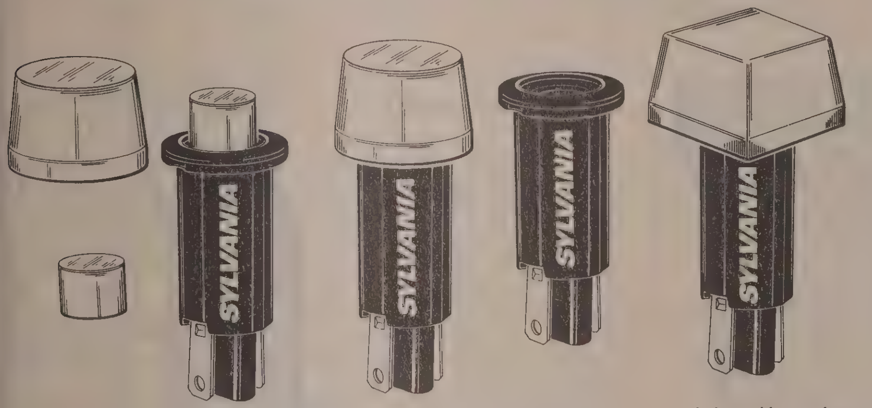
30200	Flat Top Translucent—Red
30212	Flat Top Translucent—Green
30213	Flat Top Translucent—Blue
30214	Flat Top Translucent—Yellow
30100	Jeweled—Red
30102	Jeweled—Green
30103	Jeweled—Blue
30106	Jeweled—Amber
30110	Transparent—Red
30112	Transparent—Green
30113	Transparent—Blue
30111	Transparent—Amber
30114	Transparent—Yellow
30116	Transparent—Clear
30120	Fluted—Red
30122	Fluted—Green
30124	Fluted—Blue
30126	Fluted—Amber
30125	Fluted—Clear
30130	Dome Translucent—Red
30132	Dome Translucent—Green
30131	Dome Translucent—Yellow
30133	Dome Translucent—White

SOCKET

30099	Socket

SINGLE SOCKET ASSEMBLIES FOR T-2 SLIDE BASE PILOT LAMPS

Socket P/N 30152 plus round (.70" dia. x .48" high) or square (.70" x .70" x .48" high) lens also uses T-2 slide base Pilot Lamps rated at 5, 6, 12, 24, 28, 48, 60 or 120 volts. Sockets can also be used without lens, with or without colored end cap covering end of bulb which extends .18" beyond .09" socket flange. **Dimensions:** Socket—1.31" M.O.L.; mounting hole .50" dia.



—*Polycarbonate end caps are press fit to the lamp: cannot be used with lamps rated over 1.1 watts.

#Pyrex end caps must be cemented to the lamp with a translucent silicone rubber adhesive.

LENSES

Color	Ordering Number Round Lens	Ordering Number Square Lens
Red	30160	30170
Clear	30161	30171
Amber	30162	30172
White	30163	30173
Green	30164	30174
Blue	30165	30175

POLYCARBONATE END CAPS*

Color	Ordering Number
Red	38001
Yellow	38002
White	38003
Green	38004
Blue	38005
Pearl White	38006
Orange	38007

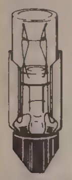
PYREX END CAPS#

Color	Ordering Number
Red	38071
Yellow	38072
White	38073
Green	38074
Blue	38075

SOCKET

30152	Socket

T-2 SLIDE BASE PILOT LAMPS FOR ABOVE HOUSING AND ASSEMBLIES



Lamp No.	Design Volts	Design Amps	Design Watts	Filament	M.S. C.D.	Average End Foot Candles	Rated Average Life (Hours)
5SLB	5	.12	.6	C-2V	. . .	1,600	2,500
6PSB	6	.14	.8	C-2F	.12	500	20,000
6SLB	6	.144	.6	C-2V	. . .	1,700	2,500
12PSB	12	.17	2.0	C-2F	.35	2,000	12,000
24PSB	24	.073	1.7	C-2F	.50	3,000	10,000
28PSB	28	.04	1.1	C-2F	.29	1,600	5,000
48PSB	48	.053	2.5	C-7A	.7	1,800	7,500
60PSB	60	.05	3.0	C-7A	.73	2,600	7,500
120PSB	120	.025	3.0	CC-7A	.36	1,200	10,000

WIRE LEAD INDICATOR LAMPS

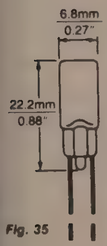


Fig. 35

Lamp No.	Volts	Amps.	M.S. C.P.
4ES	4	.04	.03
5ES	5	.04	.04
6ES	6	.04	.025
10AS	10	.01	.001
10CS	10	.017	.01
10ES	10	.04	.07
12ES	12	.04	.09
16CS	16	.017	.016
16ES	16	.04	.17
18ES	18	.04	.14
24CS	24	.017	.02
24ES	24	.04	.12
28ES	28	.04	.25
48ES	28	.04	.44

WIRE LEAD PILOT LAMPS

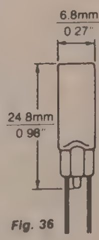


Fig. 36

Lamp No.	Volts	Amps	M.S. C.P.
6PS	6	.14	.12
12PS	12	.17	.35
24PS	24	.073	.5
28PS	28	.04	.29
48PS	48	.053	.7
60PS	60	.05	.73
120PS	120	.025	.36
120PS/6	120	.052	1.43

MINIATURE BAYONET BASE PILOT LAMPS

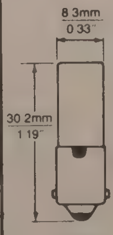
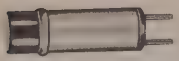


Fig. 37

Lamp No.	Volts	Amps	M.S. C.P.
6MB	6	.140	.12
12MB	12	.170	.35
24MB	24	.073	.50
28MB	28	.040	.29
48MB	48	.053	.70
60MB	60	.050	.73
90MB	90	.033	.37
120MB	120	.025	.36
120MB/6	120	.052	1.43

LITTELFUSE® LITTELITES® SELECTOR GUIDE

WRITE OR CALL FOR OUR COMPLETE CATALOG.


900 Series Cartridge Lamps

922, 923, 924 Series Subminiature

970 Series 5/16" Diameter Snap-Mount Plastic

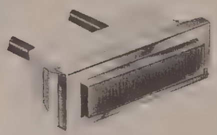
Cartridge Lampholders

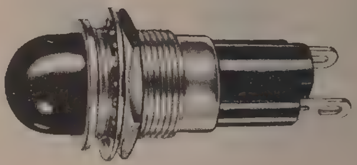
925, 926, 927 Series Subminiature

980 Series 1/2" Diameter Snap-Mount Plastic

920 Series Subminiature

921 Series Subminiature


960 Series Rectangular Snap-Mount Plastic


930 Series Miniature Lampholders

LITTELITES

		CARTRIDGE LAMPS & HOLDERS					SUBMINIATURE LAMPHOLDERS								MINIATURE LAMPHOLDERS	SNAP-MOUNT PLASTIC LITES		
		CARTRIDGE LAMPS		CARTRIDGE LAMPHOLDERS		SOCKETS												
		900 SERIES	901 SERIES	910 SERIES (Mate with 900 SERIES Cartridge lamps)	911 SERIES (Mate with 901 SERIES Cartridge lamps)	910-000-***	920 SERIES	921 SERIES	922 SERIES	923 SERIES	924 SERIES	925 SERIES	926 SERIES	927 SERIES	930 SERIES	960 SERIES (Rectangular)	970 SERIES (5/16" DIA.)	980 SERIES (1/2" DIA.)
MOUNTINGS	FRONT MOUNT						X	X	X	X	X			X	X	X	X	X
	REAR MOUNT			X	X						X	X	X					
	MOUNTING HOLE SIZE			3/8"	3/8"		15/32"	15/32"	15/32"	17/32"	15/32"	3/8"	3/8"	15/32"	11/16"	1.281" X .395"	.312" / .318"	.500" / .510"
	MAXIMUM PANEL THICKNESS			3/8"	3/8"		3/16"	7/16"	1/4"	1/4"	1/4"	1/8"	3/16"	5/16"	3/8"	.090"	W/BEZ .090 W/O BEZ .125	W/BEZ .090 W/O BEZ .125
TERMINATIONS	SOLDER LUG			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	SOLDER CUP			X	X	X												
	SCREW TYPE														X			
	TURRET PIN			X	X	X												
	6" WIRE LEADS															X	X	X
	1/8" Q.C.																X	
	3/16" Q.C.															X		X
	1/4" Q.C.															X		
	.040 STAIN. BI-PIN	X	X															
	.040 TIN BI-PIN	X	X															
OPTIONS	D-HOLE MOUNTING			X	X										X			
	DRIP-PROOFING											X	X	X	X			
LAMPS	INCANDESCENT	X					X		X	X	X	X	X	X	X	X	X	X
	NEON STANDARD	X	X					X				X	X	X	X	X	X	X
	NEON GREEN		X													X	X	X
	NEON BLUE		X													X	X	X
	LED RED	X															X	
	LED GREEN	X															X	
	LED YELLOW	X															X	
	LAMPS INCLUDED	X	X	NA	NA	NA										X	X	X
UL	LISTED														X	X	X	X
	RECOGNIZED	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X
CSA	APPROVED	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X

HAMLIN INC

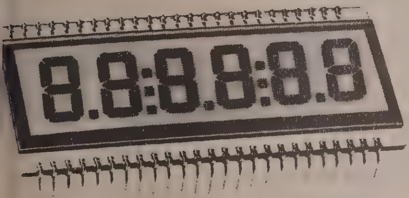
AKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
HONE: SALES 414/648-2361 · TWX 910-260-3740

LIQUID CRYSTAL DISPLAYS

- CUSTOM
- STATIC DRIVE
- MULTIPLEX DRIVE
- DICHROIC (COLOR)

IAMLIN LCD FEATURES

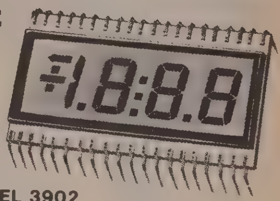
- Ultra low power consumption
- Wide temperature range
- Excellent readability in direct sunlight
- CMOS compatibility
- Format flexibility
- Superior reliability
- Numerous fluid and viewing mode options



MODEL 3918

CUSTOM DESIGN/APPLICATION ASSISTANCE

Hamlin application engineers can help in the design and application of the display that best meets your needs. Call or write for our latest catalogs which list available options and include design sheets and ordering information.



MODEL 3902

STANDARD STATIC DRIVE LCD'S

4 DIGIT PART NUMBER		NUMBER OF DIGITS	DIGIT HEIGHT (INCHES)	DISPLAY LENGTH (INCHES)	DISPLAY HEIGHT (INCHES)
DUAL IN-LINE PINS	ELASTOMERIC CONNECTOR				
3900	3950	4	.35	2.0	0.9
3901	3933	3.5/LO BAT	.5	2.0	1.2
3902	3962	3.5	.5	2.0	1.2
3903	3953	3.5	.7	2.75	1.5
3906	3966	4	.5	2.0	0.9
3907	3967	4	.7	2.75	1.5
3908	3968	4	1.0	3.695	1.8
3909	3959	4.5	.4	2.0	1.2
3912	3952	4.5	.8	3.695	1.8
3913	3963	5	.4	2.0	1.2
3915	3965	5	.7	3.2	1.5
3918	3978	6	.5	2.75	1.2
3919	3969	6	.7	3.695	1.5
3920	3980	6	1.0	5.4	1.8
3922	3972	8	.5	3.695	1.2
3935	3985	2	.5	1.2	1.2
N/A	3936	24 hr. clock	.35	2.0	0.9
3937	3987	3.5	.35	2.0	0.9
3938	3988	4.5	.35	2.0	0.9
3939	3989	4.5/LO BAT	.4	2.0	1.2
3940	3990	3	.35	1.2	0.9
N/A	3946	A/N 8 character	.4	3.695	1.2
3970	3995	Dual 20-Bar Graph	—	2.75	1.5
N/A	3996	Dual 32-Bar Graph	—	2.75	1.2
4572	N/A	A/N 4 character	.5	3.5	1.15
N/A	4578	8	.3	2.75	0.9
3916	3976	5	1.0	4.5	1.8
3941	3991	3.5/LO BAT	.7	2.75	1.5
3942	3992	3/6 Pointers	.7	2.65	1.5

Hamlin offers four grades of liquid crystal fluids for use in a wide variety of static drive applications.

Type 5 Fluid (0 to 55°C operation)
Our most economical fluid, intended for use in equipment not requiring storage or operation at extreme temperature and humidity levels.

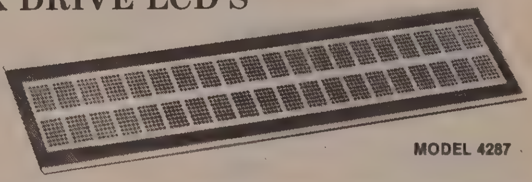
Type 1 Fluid (−20 to 60°C operation)
An instrument grade fluid offering fast speed of response combined with excellent low voltage operation.

Type 6 Fluid (−10 to 90°C operation)
A high temperature fluid exhibiting excellent standability under extremely harsh operating conditions. Recommended for applications requiring continuous outdoor usage.

Type 2 Fluid (−20 to 85°C operation)
A wide temperature fluid with enhanced speed of response at extremely low temperatures.

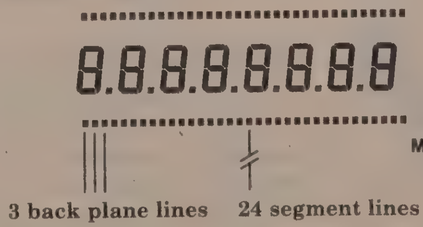
STANDARD MULTIPLEX DRIVE LCD'S

4 DIGIT PART NUMBER		NUMBER OF DIGITS/ CHARACTERS	MATRIX FORMAT	DISPLAY LENGTH (INCHES)	DISPLAY HEIGHT (INCHES)	DIGIT/ CHARACTER HEIGHT (INCHES)
DUAL IN-LINE PINS	ELASTOMERIC CONNECTOR					
4285	N/A	1 x 16 (5 x 7 Dot Matrix)	7 x 80	4.7	0.9	0.3
N/A	4286	2 x 16 (5 x 7 Dot Matrix)	7 x 80 (each row)	4.8	1.3	0.3
N/A	4287	2 x 20 (5 x 7 Dot Matrix)	7 x 100 (each row)	5.75	1.3	0.3
4293	4293	36 element bargraph	3 x 12	2.0	1.2	0.3
4294	4294	48 element bargraph	3 x 16	2.75	1.2	0.3
4295	4295	48 element bargraph	4 x 12	2.75	1.2	0.3
4200	4200	6 digit	4 x 12	2.75	1.2	0.3
4201	N/A	4.5 digit/ LO BAT	3 x 12	2.0	1.05	0.3
4203	4203	6 digit	3 x 18	2.75	1.2	0.3
4204	4204	4 digit	3 x 12	2.0	1,2	0.3
4216	4216	8 digit	3 x 24	3.695	1.2	0.3



MODEL 4287

Hamlin offers two grades of liquid crystal fluids for use in multiplex drive applications.



MODEL 4216

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700

Panel Mounted LEDs

IDI panel mounted LED assemblies feature quick snap-fit panel mounting, wide angle visibility, and attractive appearance. While most assemblies incorporate ultra high intensity **SUPER-BRITE** LEDs, we also offer our Dual Color (Red/Green) LED in a panel mounted assembly (Model 5100H1/5). IDI LED assemblies are an economical way to enhance your front panel's appearance.

FEATURES

- Quick snap-fit panel mounting
- Attractive appearance
- **SUPER-BRITE** or Dual Color LEDs

SERIES 3990A 7/32″ DIA.

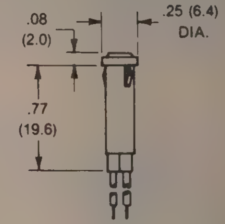
Mounting: Will snap-fit into .217/.221 (5.51/5.61) dia. hole in panels .031/.062 (.79/1.58) thick

Wire Leads: No. 24 AWG., 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Anode (+): Red lead

Housing: White nylon

MODEL NO.	COLOR	INCORPORATES LED*
3990A1	Red	4303F1
3990A5	Green	4303F5
3990A7	Yellow	4303F7



SERIES 5100H, 5102H 1/4″ DIA.

Mounting: Will snap-fit in .249/.254 (6.33/6.45) dia. hole in panels .031/.062 (.79/1.58) thick

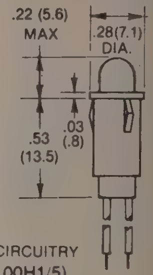
Wire Leads: No. 24 AWG. 4.4/4.8 (111.8/121.9) long

Anode (+): Red lead (Model 5100H1/5) Yellow lead anode for red light — blue lead anode for green light

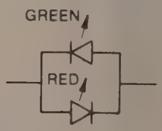
Housing: Black nylon

MODEL NO.	COLOR	INCORPO-RATES LED*
5100H1	Red	4304H1
5100H5	Green	4304H5
5100H7	Yellow	4304H7
5100H1/5	Red/Green	4301H1/5
5100H1LC	Red	4300H1LC
5100H7LC	Yellow	4300H7LC
5102H1-5V	Red	4302H1-5V
5102H3-5V	Amber	4302H3-5V
5102H5-5V	Green	4302H5-5V

} **NEW!**



INTERNAL CIRCUITRY (Model 5100H1/5)



SERIES 5101H 1/4″ DIA.

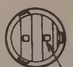
NEW!

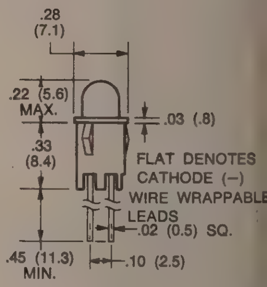
Mounting: Will snap-fit in .249/.254 (6.33/6.45) dia. hole in panels .031/.062 (.79/1.58) thick

Terminals: .02 (0.5) Sq.

Housing: Black nylon

MODEL NO.	COLOR	INCORPO-RATES LED*
5101H1	Red	4304H1
5101H5	Green	4304H5
5101H7	Yellow	4304H7





SERIES 5110F 5/32″ DIA.

Mounting: Will snap-fit in .155/.158 (3.94/4.01) dia. hole in panels .031/.062 (.79/1.58) thick†

Wire Leads: No. 26 AWG., 4.4/4.8 (112/122) long, stripped .18/.32 (4.6/8.1)

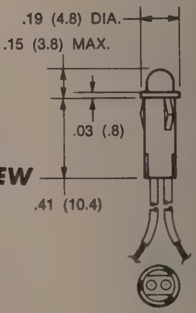
Anode (+): Red lead

Housing: Black nylon

† We recommend using an installation tool to press against flange of housing rather than LED.

MODEL NO.	COLOR	INCORPO-RATES LED*
5110F1	Red	4303F1
5110F5	Green	4303F5
5110F7	Yellow	4303F7
5110F1LC	Red	4300F1LC
5110F7LC	Yellow	4300F7LC

} **NEW**



* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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Panel Mounted LEDs

SERIES 5111F $\frac{5}{32}$" DIA.

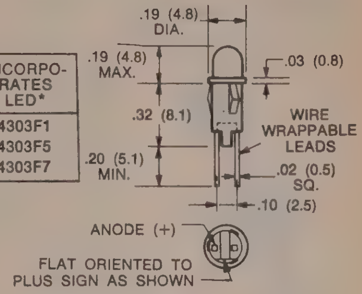
NEW!

Mounting: Will snap-fit in .155/.158 (3.94/4.01) dia. hole in panels .031/.062 (.79/1.58) thick†

Terminals: .02 (0.5) Sq.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5111F1	Red	4303F1
5111F5	Green	4303F5
5111F7	Yellow	4303F7


.19 (4.8) DIA.
.19 (4.8) MAX.
.03 (0.8)
.32 (8.1)
WIRE WRAPPABLE LEADS
.20 (5.1) MIN.
.02 (0.5) SQ.
.10 (2.5)
ANODE (+)
FLAT ORIENTED TO PLUS SIGN AS SHOWN

SERIES 5120F

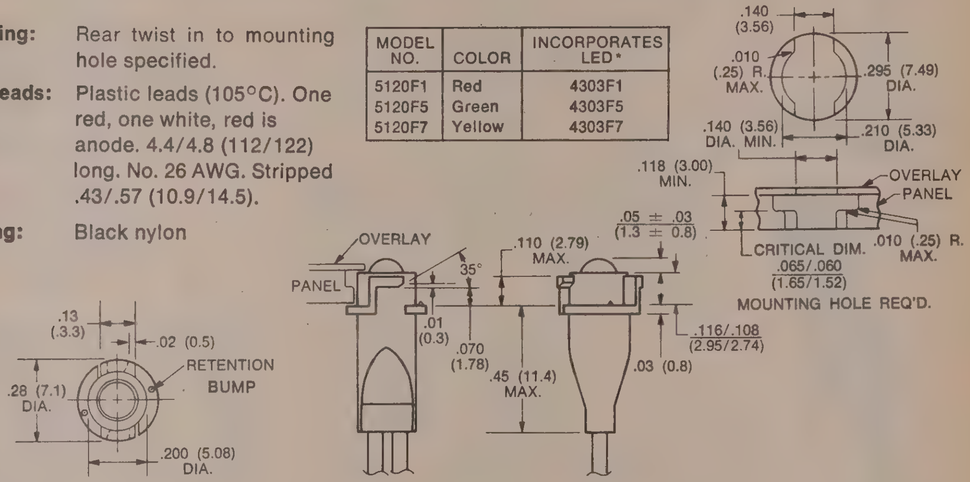
NEW!

Mounting: Rear twist in to mounting hole specified.

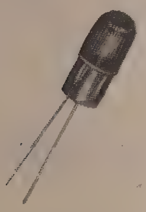
Wire Leads: Plastic leads (105°C). One red, one white, red is anode. 4.4/4.8 (112/122) long. No. 26 AWG. Stripped .43/.57 (10.9/14.5).

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5120F1	Red	4303F1
5120F5	Green	4303F5
5120F7	Yellow	4303F7


.140 (3.56)
.010 (.25) R. MAX.
.295 (7.49) DIA.
.140 (3.56) DIA. MIN.
.210 (5.33) DIA.
.118 (3.00) MIN.
OVERLAY
PANEL
.05 ± .03 (1.3 ± 0.8)
CRITICAL DIM.
.010 (.25) R. MAX.
.065/.060 (1.65/1.52)
MOUNTING HOLE REQ'D.
OVERLAY
PANEL
35°
.110 (2.79) MAX.
.01 (0.3)
.070 (1.78)
.45 (11.4) MAX.
.116/.108 (2.95/2.74)
.03 (0.8)
.13 (3.3)
.02 (0.5)
RETENTION BUMP
.28 (7.1) DIA.
.200 (5.08) DIA.

SERIES 5200F $\frac{3}{16}$" DIA.



SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

Sub-miniature LED assemblies feature:

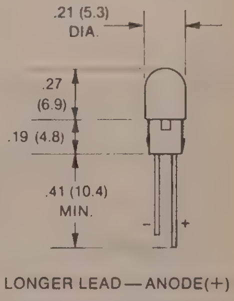
- quick push-in panel mounting
- attractive appearance
- wide angle visibility
- high-intensity light output
- state-of-the-art construction (GaAsP on GaP for red and yellow, GaP for green)

These assemblies offer the superior performance of **SUPER-BRITE** LEDs in a package that is economical to buy and install.

Mounting: Will snap-fit into .187/.192 (4.75/4.87) dia. hole in panels .020/.097 (.51/2.46) thick

Lens: Polycarbonate

MODEL NO.	COLOR	INCORPORATES LED*
5200F1	Red	4303F1
5200F5	Green	4303F5
5200F7	Yellow	4303F7


.21 (5.3) DIA.
.27 (6.9)
.19 (4.8)
.41 (10.4) MIN.
+
LONGER LEAD—ANODE(+)

SERIES 5210F $\frac{3}{16}$" DIA.

This is an insulated lead version of the 5200F Series Sub-miniature **SUPER-BRITE** LED assembly that offers superior performance in a package that is economical to buy and install. This series gives protection against static discharge.

Mounting: Will snap-fit into .187/.192 (4.75/4.87) dia. hole in panel .020/.097 (.51/2.46) thick.

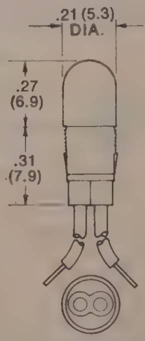
Wire Leads: No. 26 AWG., 4.4/4.8 (111.8/ 121.9) long, stripped: .18/.32 (4.6/8.1).

Anode (+): Red lead

Lens: Polycarbonate

Housing: Polycarbonate

MODEL NO.	COLOR	INCORPORATES LED*
5210F1	Red	4303F1
5210F5	Green	4303F5
5210F7	Yellow	4303F7


.21 (5.3) DIA.
.27 (6.9)
.31 (7.9)

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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Panel Mounted LEDs

SERIES 5400A 5⁄16″ DIA.

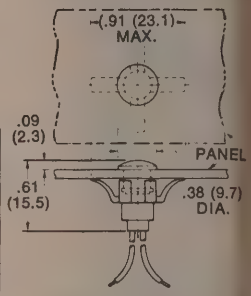
A unique design, the 5400 Series is a two-piece unit consisting of a lens and the housing-LED assembly. Simple, fast installation provided by placing the lens into mounting hole from the panel front and snapping the housing assembly onto the lens from the rear. Allows pre-wiring into the circuit and testing before installation. Has low-profile, damage-resistant lens offering static discharge protection and wide-angle viewing.

Mounting: Will snap-fit into .312/.317 (7.93/8.05) dia. hole in panel .020/.098 (0.51/2.49) thick.

Wire Leads: No. 24 AWG., 4.4/4.8 (111.8/121.9) long, stripped: .43/.57 (10.9/14.5)

Anode (+): Red lead
Lens: Polycarbonate
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES SUPER-BRITE LED*	INCLUDES LENS MODEL NO.
5400A1	Red	4305H1	4741
5400A5	Green	4305H5	4745
5400A7	Yellow	4305H7	4747



Note: To install, insert lens into panel and press firmly to snap LED assembly onto rear of lens.

SERIES 5500Y 9⁄32″ DIA.

Miniature **SUPER-BRITE** LED assemblies offer attractive appearance, wide-angle viewing, electrostatic discharge protection, wire-wrap terminals. Available in plain LED and 5V resistor-included versions.

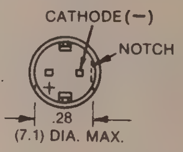
Mounting Hole: .29 (7.4) min. dia. for front-of-panel mounting use push-on speednut SN2212 or tubular mounting clip SN1220 (see page 20). Order mounting hardware separately.

Terminals: .025 (.64) square tinned brass pins

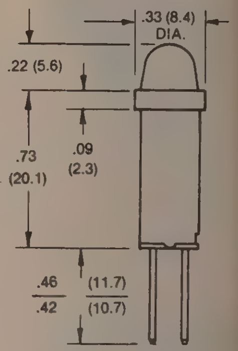
Lens: Polycarbonate

Bezel: Black oxide finished brass

Housing: White nylon



MODEL NO.	COLOR	INCORPORATES LED*
5500Y1	Red	4304H1
5500Y5	Green	4304H5
5500Y7	Yellow	4304H7
5502Y1-5V	Red	4302H1-5V
5502Y3-5V	Amber	4302H3-5V
5502Y5-5V	Green	4302H5-5V



PC Board Mounted LEDs

IDI printed circuit board mounted LED assemblies feature press-in mounting for accurate location on the board. These assemblies utilize **SUPER-BRITE** LEDs with state-of-the-art construction (GaAsP on GaP for red and yellow, GaP on GaP for green). They are easy to mount and have a high contrast ratio. The design of IDI board mounted LED assemblies includes a board standoff to prevent flux entrapment and permit easy washing.

FEATURES

- Attractive
- Economical
- Easy to Mount
- **SUPER-BRITE** LEDs

SERIES 5300E, 5300H, 5302H

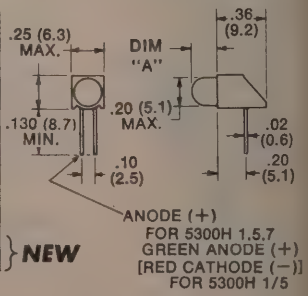
BOARD MOUNTED LED BLOCKS

- Easy to mount
- High contrast ratio
- High -intensity light output
- Includes board standoff to prevent flux entrapment — permit easy washing
- TTL compatible — requires no external current-limiting resistors (Series 5302H-5V only)

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM "A"
5300E1	Red	4300E1NF	.13(3.3)
5300E5	Green	4300E5NF	.13(3.3)
5300E7	Yellow	4300E7NF	.13(3.3)
5300H1	Red	4304H1	.19(4.3)
5300H5	Green	4304H5	.19(4.3)
5300H7	Yellow	4304H7	.19(4.3)
5300H1/5	Red/Green	4301H1/5	.21(5.3)
5302H1-5V	Red	4302H1-5V	.21(5.3)
5302H3-5V	Amber	4302H3-5V	.21(5.3)
5302H5-5V	Green	4302H5-5V	.21(5.3)
5300H1LC	Red	4300H1LC	.21(5.3)
5300H7LC	Yellow	4300H7LC	.21(5.3)

} NEW



ANODE (+) FOR 5300H 1.5.7
GREEN ANODE (+) [RED CATHODE (−)] FOR 5300H 1/5

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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PC Board Mounted LEDs

ERIES 5310F, 5312F

5310F
5312F

SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

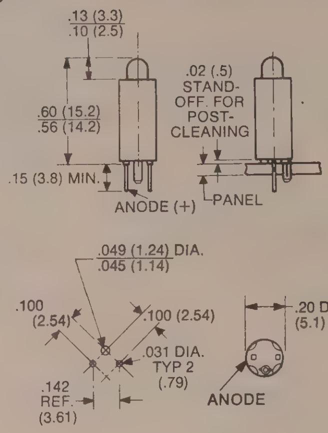
- Press-in mounting for accurate location on printed circuit board
- High-intensity light output

Ideal for use where LEDs must align with opening in a cover or panel.

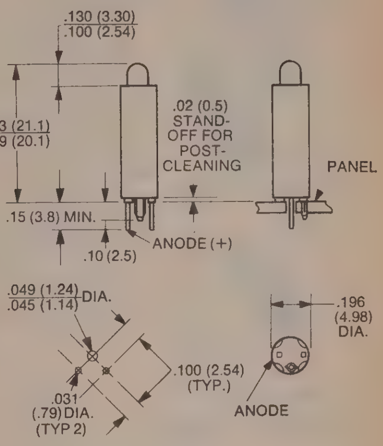
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM "A"
5310F1 5310F5 5310F7	Red Green Yellow	4303F1 4303F5 4303F7	.60(15.2) .60(15.2) .60(15.2)
5312F1 5312F5 5312F7	Red Green Yellow	4303F1 4303F5 4303F7	.83(21.1) .83(21.1) .83(21.1)

5310F


.13 (3.3)
.10 (2.5)
.60 (15.2)
.56 (14.2)
.02 (.5) STAND-OFF. FOR POST-CLEANING
.15 (3.8) MIN.
ANODE (+)
PANEL
.049 (1.24) DIA.
.045 (1.14)
.100 (2.54)
.100 (2.54)
.20 DIA. (5.1)
.031 DIA. TYP 2 (.79)
.142 REF. (3.61)
ANODE

5312F


.130 (3.30)
.100 (2.54)
.83 (21.1)
.79 (20.1)
.02 (0.5) STAND-OFF FOR POST-CLEANING
PANEL
.15 (3.8) MIN.
ANODE (+)
.10 (2.5)
.049 (1.24)
.045 (1.14) DIA.
.196 (4.98) DIA.
.100 (2.54) (TYP.)
.031 (.79) DIA. (TYP 2)
ANODE

SERIES 5311F

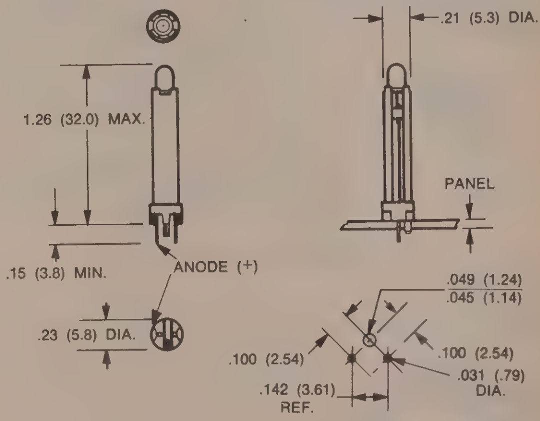
SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Press-in mounting for accurate location on printed circuit board
- High -intensity light output

Ideal for use where LEDs must align with opening in a cover panel.

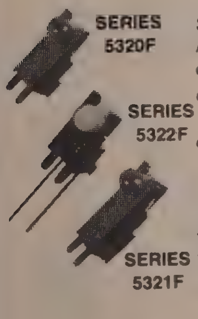
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5311F1 5311F5 5311F7	Red Green Yellow	4303F1 4303F5 4303F7


.21 (5.3) DIA.
1.26 (32.0) MAX.
PANEL
.15 (3.8) MIN.
ANODE (+)
.23 (5.8) DIA.
.049 (1.24)
.045 (1.14)
.100 (2.54)
.100 (2.54)
.031 (.79) DIA.
.142 (3.61) REF.

HOLE PATTERN REQUIRED

SERIES 5320F, 5321F, 5322F


SERIES 5320F
SERIES 5322F
SERIES 5321F

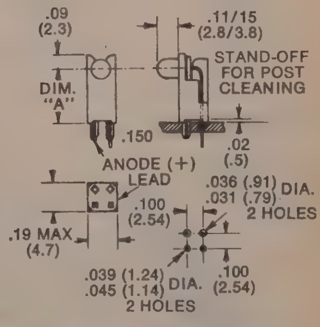
SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- 3 different board heights available
- Easy press-in mounting for precise positioning on printed circuit board
- T-1 size high intensity LEDs (GaAsP on GaP for red and yellow, GaP on GaP for green)

Ideal for use when the LED must line up with a panel opening or to provide uniform height for a row of LEDs.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM. "A"
5320F1 5320F5 5320F7	Red Green Yellow	4303F1 4303F5 4303F7	.35 (8.9) .35 (8.9) .35 (8.9)
5321F1 5321F5 5321F7	Red Green Yellow	4303F1 4303F5 4303F7	.45 (11.4) .45 (11.4) .45 (11.4)
5322F1 5322F5 5322F7	Red Green Yellow	4303F1 4303F5 4303F7	.25 (6.4) .25 (6.4) .25 (6.4)


.09 (2.3)
.11/15 (2.8/3.8)
STAND-OFF FOR POST CLEANING
DIM. "A"
.150
ANODE (+) LEAD
.02 (.5)
.036 (.91)
.031 (.79) DIA. 2 HOLES
.100 (2.54)
.19 MAX (4.7)
.039 (1.24)
.045 (1.14) DIA. 2 HOLES
.100 (2.54)

HOLE PATTERN REQUIRED

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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IDI
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PC Board Mounted LEDs

SERIES 5330H, 5331H, 5335H

SERIES 5330H
SERIES 5331H
SERIES 5335H

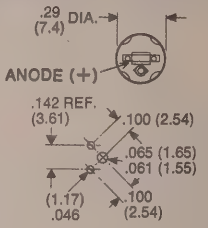
MINIATURE **SUPER-BRITE** LED ASSEMBLIES

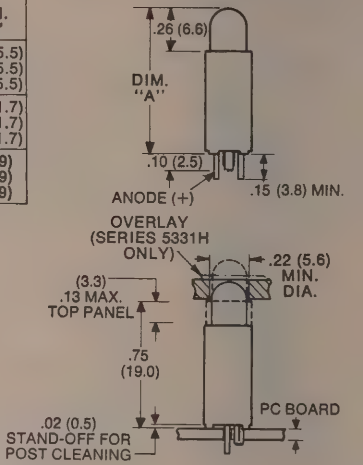
- T-1¾ size wide viewing angle (SERIES 5330H) or intense beam (SERIES 5331H) LEDs
- Easy press-in mounting for precise positioning on printed circuit board
- Includes board stand-off to prevent flux entrapment — permit easy washing

Height matches popular rocker and toggle switches
—use SERIES 5330H to fit panel hole openings
—use SERIES 5331H to line up behind panel overlays

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM. "A"
5330H1	Red	4304H1	.61 (15.5)
5330H5	Green	4304H5	.61 (15.5)
5330H7	Yellow	4304H7	.61 (15.5)
5331H1	Red	4305H1	.46 (11.7)
5331H5	Green	4305H5	.46 (11.7)
5331H7	Yellow	4305H7	.46 (11.7)
5335H1	Red	4304H1	.31 (7.9)
5335H5	Green	4304H5	.31 (7.9)
5337H7	Yellow	4304H7	.31 (7.9)


.29 (7.4) DIA.
ANODE (+)
.142 REF. (3.61)
.100 (2.54)
.065 (1.65)
.061 (1.55)
(1.17) .046
.100 (2.54)


.26 (6.6)
DIM. "A"
.10 (2.5)
.15 (3.8) MIN.
ANODE (+)
OVERLAY (SERIES 5331H ONLY)
.22 (5.6) MIN. DIA.
(3.3) .13 MAX. TOP PANEL
.75 (19.0)
PC BOARD
.02 (0.5) STAND-OFF FOR POST CLEANING

SERIES 5332H

NEW!

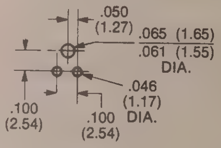
MINIATURE **SUPER-BRITE** LED ASSEMBLIES

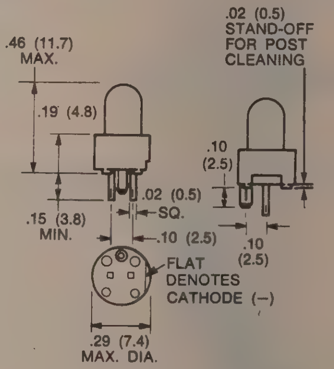
- T-1¾ size intense beam LEDs
- Easy press-in mounting for precise positioning on printed circuit board
- Includes board stand-off to prevent flux entrapment — permit easy washing

Low height makes this unit ideal for use on a board behind panel overlays where a precisely located illuminated spot is required.

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5332H1	Red	4305H1
5332H5	Green	4305H5
5332H7	Yellow	4305H7


.050 (1.27)
.065 (1.65)
.061 (1.55) DIA.
.046 (1.17) DIA.
.100 (2.54)
.100 (2.54)


.46 (11.7) MAX.
.02 (0.5) STAND-OFF FOR POST CLEANING
.19 (4.8)
.10 (2.5)
.02 (0.5) SQ.
.15 (3.8) MIN.
.10 (2.5)
.10 (2.5)
FLAT DENOTES CATHODE (−)
.29 (7.4) MAX. DIA.

SERIES 5340H

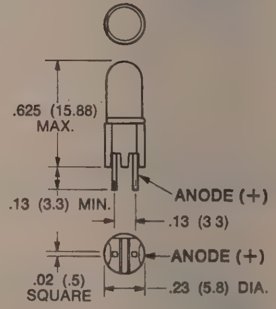
NEW!

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- T-1¾ size wide viewing angle LEDs
- Includes board stand-off, features .13 centers

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5340H1	Red	4304H1
5340H5	Green	4304H5
5340H7	Yellow	4304H7


.625 (15.88) MAX.
.13 (3.3) MIN.
ANODE (+)
.13 (3.3)
ANODE (+)
.02 (.5) SQUARE
.23 (5.8) DIA.

SERIES 5341H

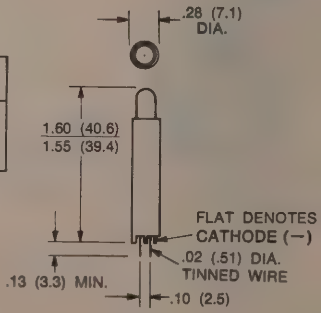
NEW!

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- LED is fully insulated, fully supported high above the board
- Economical to buy and install
- T-1¾ size wide viewing angle LEDs

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5341H1	Red	4304H1
5341H5	Green	4304H5
5341H7	Yellow	4304H7


.28 (7.1) DIA.
1.60 (40.6)
1.55 (39.4)
FLAT DENOTES CATHODE (−)
.02 (.51) DIA. TINNED WIRE
.13 (3.3) MIN.
.10 (2.5)

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

Industrial Devices, Inc., Edgewater, New Jersey 07020 • (201) 224-4700

PC Board Mounted LEDs

SERIES 5350T, 5370T

SERIES 5350T

SUB-MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Small size enables these to be stacked on 0.100″ centers
- High-intensity light output

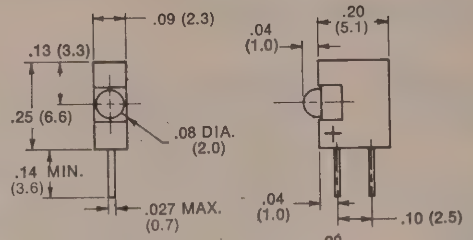
Ideal for use where LEDs must align with opening in a cover panel.

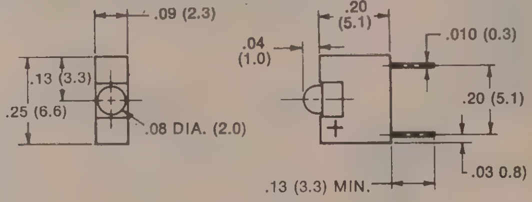
Housing: Black nylon

MODEL NO.	MODEL NO.	LENS COLOR	INCORPORATES LED*
5350T1	5370T1	Red	4307T1
5350T5	5370T5	Green	4307T5
5350T7	5370T7	Yellow	4307T7
5352T1-5V	5372T1-5V	Red	4302T1-5V
5350T1LC	5370T1LC	Red	4300T1LC
5350T7LC	5370T7LC	Yellow	4300T7LC

} ***NEW***

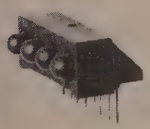
SERIES 5370T


.09 (2.3)
.13 (3.3)
.25 (6.6)
.08 DIA. (2.0)
.14 MIN. (3.6)
.027 MAX. (0.7)
.04 (1.0)
.20 (5.1)
.04 (1.0)
.10 (2.5)


.09 (2.3)
.13 (3.3)
.25 (6.6)
.08 DIA. (2.0)
.04 (1.0)
.20 (5.1)
.010 (0.3)
.20 (5.1)
.03 0.8)
.13 (3.3) MIN.

SERIES 5360F

NEW!

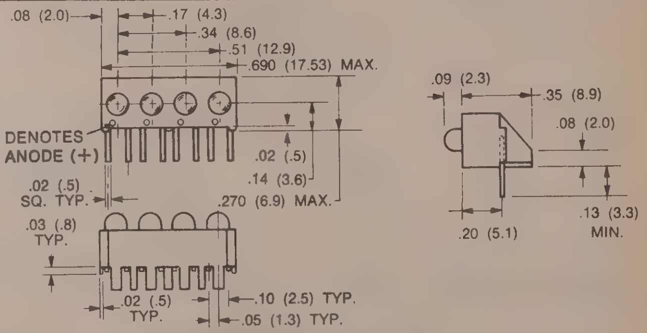


SUB-MINIATURE **BRITE** LED ASSEMBLIES

- Quad assembly permits economical purchase, easy mounting of 4 LEDs
- Includes board stand-off to prevent flux entrapment — permit easy washing

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES 4 LEDS
5360F1	Red	4300F1


.08 (2.0)
.17 (4.3)
.34 (8.6)
.51 (12.9)
.690 (17.53) MAX.
DENOTES ANODE (+)
.02 (.5)
.14 (3.6)
.02 (.5) SQ. TYP.
.270 (6.9) MAX.
.03 (.8) TYP.
.02 (.5) TYP.
.10 (2.5) TYP.
.05 (1.3) TYP.
.09 (2.3)
.35 (8.9)
.08 (2.0)
.13 (3.3) MIN.
.20 (5.1)

SERIES 5380E, 5380H

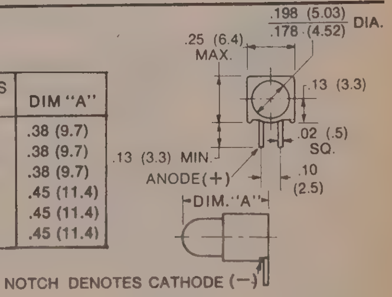
NEW!

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Easy to mount
- High contrast raised shell
- Includes board stand-off to prevent flux entrapment — permit easy washing
- Takes minimum board space

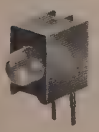
Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED *	DIM "A"
5380E1	Red	4300E1NF	.38 (9.7)
5380E5	Green	4300E5NF	.38 (9.7)
5380E7	Yellow	4300E7NF	.38 (9.7)
5380H1	Red	4304H1	.45 (11.4)
5380H5	Green	4304H5	.45 (11.4)
5380H7	Yellow	4304H7	.45 (11.4)


.198 (5.03)
.178 (4.52) DIA.
.25 (6.4) MAX.
.13 (3.3)
.02 (.5) SQ.
.13 (3.3) MIN.
ANODE(+)
.10 (2.5)
DIM. "A"
NOTCH DENOTES CATHODE (−)

SERIES 5600F

NEW!

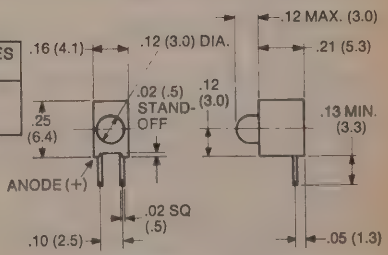


SUB MINIATURE **SUPER-BRITE** LED ASSEMBLIES

- Easy to mount
- Includes board standoff to prevent flux entrapment — permit easy washing
- T-1 size high intensity LEDs (GaAsP on GaP for red and yellow, GaP on GaP for green)

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*
5600F1	Red	4303F1
5600F5	Green	4303F5
5600F7	Yellow	4303F7


.12 MAX. (3.0)
.16 (4.1)
.12 (3.0) DIA.
.21 (5.3)
.02 (.5) STAND-OFF
.12 (3.0)
.25 (6.4)
.13 MIN. (3.3)
ANODE (+)
.02 SQ (.5)
.10 (2.5)
.05 (1.3)

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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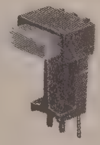
PC Board Mounted LEDs

SERIES 5610R, 5620R

NEW!

5610R

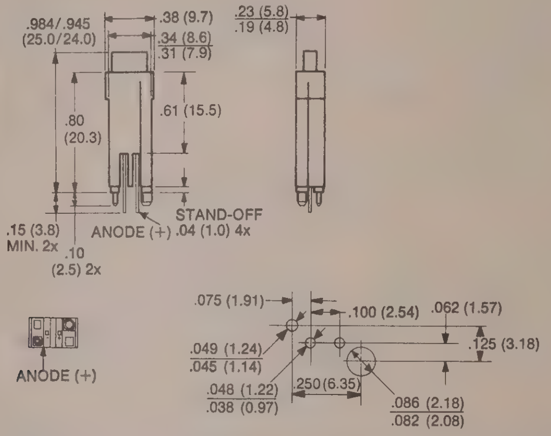

5620R

RECTANGULAR BOARD MOUNTED **SUPER BRITE** LED ASSEMBLIES

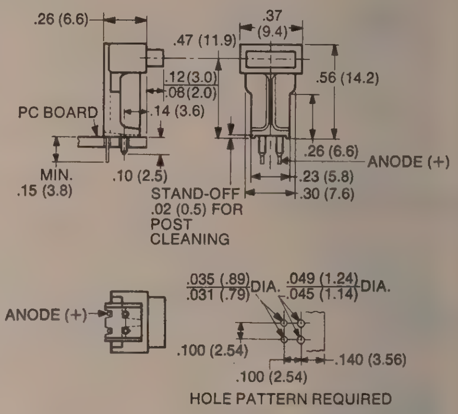
- Press-in mounting for accurate location on printed circuit board
- High-intensity light output spread uniformly over entire front surface
- State-of-the-art construction (GaAsP on GaP for red and yellow, GaP on GaP for green)

MODEL NO.	COLOR	INCORPORATES LED*
5610R1	Red	4306R1
5610R5	Green	4306R5
5610R7	Yellow	4306R7
5620R1	Red	4306R1
5620R5	Green	4306R5
5620R7	Yellow	4306R7

5610R


.984/.945 (25.0/24.0)
.38 (9.7)
.34 (8.6)
.31 (7.9)
.23 (5.8)
.19 (4.8)
.61 (15.5)
.80 (20.3)
STAND-OFF .04 (1.0) 4x
ANODE (+)
.15 (3.8) MIN. 2x
.10 (2.5) 2x
ANODE (+)
.075 (1.91)
.100 (2.54)
.062 (1.57)
.125 (3.18)
.049 (1.24)
.045 (1.14)
.048 (1.22)
.038 (0.97)
.250 (6.35)
.086 (2.18)
.082 (2.08)

5620R


.26 (6.6)
.47 (11.9)
.37 (9.4)
.12 (3.0)
.08 (2.0)
.14 (3.6)
.56 (14.2)
PC BOARD
.26 (6.6)
ANODE (+)
MIN. .15 (3.8)
.10 (2.5)
.23 (5.8)
.30 (7.6)
STAND-OFF .02 (0.5) FOR POST CLEANING
ANODE (+)
.035 (.89) / .031 (.79) DIA.
.049 (1.24) / .045 (1.14) DIA.
.100 (2.54)
.140 (3.56)
.100 (2.54)
HOLE PATTERN REQUIRED

SERIES 5390E, 5390H, 5392H

MINIATURE **SUPER-BRITE** LED ASSEMBLIES

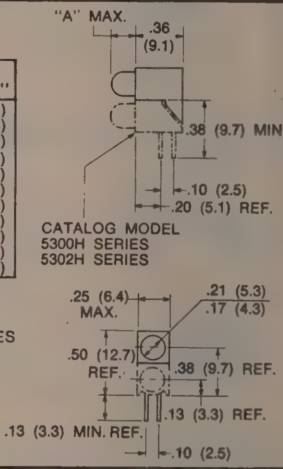
For use in connection with 5300E and H series board mounted LED blocks (see page 20)

- Easy installation — slide onto 5300 series blocks, must be pre-assembled before mounting on PC board
- Allow 2 LEDs in the same board area required for a single LED
- High contrast ratio, high-intensity light output

Housing: Black nylon

MODEL NO.	COLOR	INCORPORATES LED*	DIM. "A"
5390E1	Red	4300E1NF	.13 (3.3)
5390E5	Green	4300E5NF	.13 (3.3)
5390E7	Yellow	4300E7NF	.13 (3.3)
5390H1	Red	4304H1	.19 (4.8)
5390H5	Green	4304H5	.19 (4.8)
5390H7	Yellow	4304H7	.19 (4.8)
5392H1-5V	Red 5V	4302H1-5V	.21 (5.3)
5392H3-5V	Amber 5V	4302H3-5V	.21 (5.3)
5392H5-5V	Green 5V	4302H5-5V	.21 (5.3)
5390H1LC	Red	4300H1LC	.21 (5.3)
5390H7LC	Yellow	4300H7LC	.21 (5.3)

NOTE: 5390 SERIES PIGGY-BACK BLOCK SLIDES ONTO 5300H BLOCK, MUST BE PRE-ASSEMBLED BEFORE MOUNTING ON PC BOARD


"A" MAX.
.36 (9.1)
.38 (9.7) MIN
.10 (2.5)
.20 (5.1) REF.
CATALOG MODEL
5300H SERIES
5302H SERIES
.25 (6.4) MAX.
.21 (5.3)
.17 (4.3)
.50 (12.7) REF.
.38 (9.7) REF.
.13 (3.3) REF.
.13 (3.3) MIN. REF.
.10 (2.5)

LED Clip and Lenses

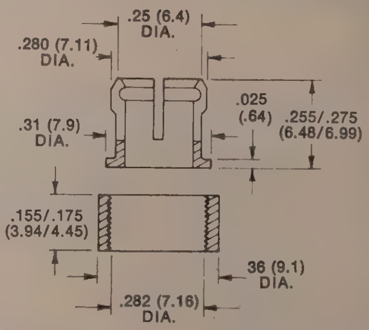
MODELS 4304MC, ¼" DIA.

LED MOUNTING CLIP FOR T-1¾ SIZE LEDS

This attractive and economical mounting clip installs quickly and provides secure mounting for LEDs. Order Model 4304MC two-piece mounting clip for T-1¾ high dome LEDs such as 4301H, 4304H, or 4305H Series.

Material: Black polypropylene

Mounting Hole: .250 (6.35) min. dia. in panels up to .125 (3.18) thick.


.25 (6.4) DIA.
.280 (7.11) DIA.
.025 (.64)
.255/.275 (6.48/6.99)
.31 (7.9) DIA.
.155/.175 (3.94/4.45)
.36 (9.1) DIA.
.282 (7.16) DIA.

* SEE PAGE 9 FOR LED RATINGS

ALL DIMENSIONS ARE IN INCHES (MM).

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LED Clip and Lenses

ERIES 4311, 4321 ¼″ DIA., ¼″ SQ.

SERIES 4311

SERIES 4321

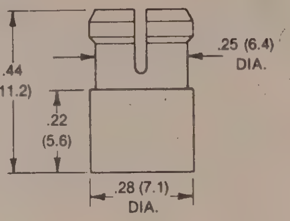
OUND & SQUARE LED LENSES FOR T-1¾ LEDS

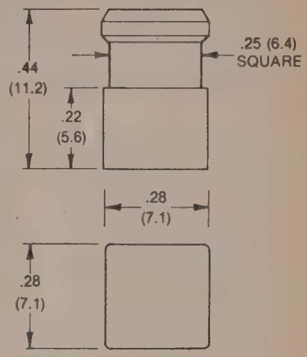
hese lenses provide quick and economical panel mounting, plus electrostatic discharge protection, for T-1¾ igh dome LEDs. Molded in Fresnel rings spread light venly, provide wide viewing angle viewing (up to 180°) nd bright attractive appearance. Use 4311 or 4321 red enses with 4305H1 LEDs, 4315 or 4325 green lenses with 305H5 LEDs, 4317 or 4327 yellow lenses with 4305H7 EDs. Clear lenses, 4312 or 4322, may be used with 301H1/5 red/green LED.

lounting: Snap round lenses into .248/.252 (6.30/6.40) dia. hole, square lenses into .248/.252 (6.30/6.40) square hole in panels .06/.13 (1.5/3.3) thick. Square lenses may also be gang mounted in slotted hole. .248/.252 (6.30/6.40) wide. .280 (7.00) times number of lenses minus .030 (.76) long.

laterial: Cellulose acetate butyrate

MODEL NO. ROUND	MODEL NO. SQUARE	LENS COLOR
4311	4321	Red
4312	4322	Clear
4315	4325	Green
4317	4327	Yellow


.44
(11.2)
.22
(5.6)
.25 (6.4)
DIA.
.28 (7.1)
DIA.


.44
(11.2)
.22
(5.6)
.25 (6.4)
SQUARE
.28
(7.1)
.28
(7.1)

ERIES 4331 ¹¹⁄₆₄″ DIA.

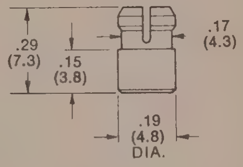
OUND LED LENS FOR T-1 LEDS

his is a smaller version of the 4311 series lenses and is lesigned for T-1 LEDs rather than T-1¾ LEDs. The plastic lens provides protection against electrostatic discharge.

lounting: Snap round lens into .170/.174 (4.32/4.42) dia. hole in panels .03-.06 (.8-1.5) thick.

laterial: Cellulose acetate butyrate

MODEL NO. ROUND	LENS COLOR
4331	Red
4335	Green
4337	Yellow


.29
(7.3)
.15
(3.8)
.17
(4.3)
.19
(4.8)
DIA.

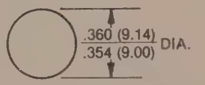
SERIES 4341 ²³⁄₆₄″ (9mm) DIA.

ROUND PANEL LENSES FOR T-1¾ PC BOARD MOUNTED LEDS

Attractive snap-in panel lenses provide wide-angle viewing plus mechanical security and electrostatic discharge protection. Generous clearance and "forgiving" optics speed product assembly. Ideal for use with narrow beam LEDs, such as 4305H or 4308H series — or use with incandescent lamps.

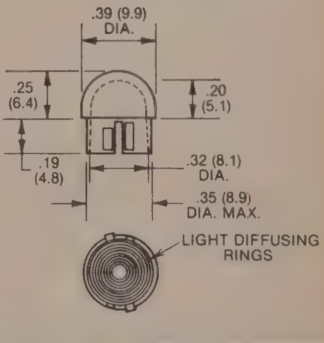
Mounting: Snap into .354/.360 (9.00/9.14) dia hole in panels .03-.08 (.76-2.03) thick.

Material: Polycarbonate


.360 (9.14)
.354 (9.00)
DIA.

MOUNTING HOLE:
UNIT WILL SNAP INTO
.03-.08 (.76-2.03) THICK PANEL

MODEL NO.	LENS COLOR
4341	Red
4342	Clear
4343	Amber
4344	White
4345	Green
4346	Blue
4347	Yellow


.39 (9.9)
DIA.
.25
(6.4)
.20
(5.1)
.19
(4.8)
.32 (8.1)
DIA.
.35 (8.9)
DIA. MAX.
LIGHT DIFFUSING
RINGS

SERIES 4350 ³⁄₁₆″ DIA.

NEW!

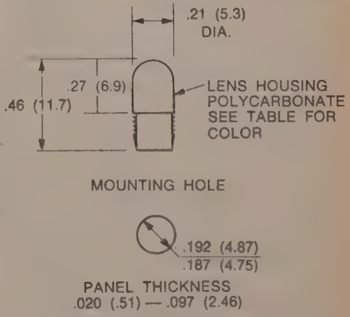
ROUND PANEL LENS FOR T-1 LEDs

Attractive snap-in panel lenses provide wide-angle viewing plus mechanical security and electrostatic discharge protection. Ideal for use with T-1 LEDs such as 4303F series.

Mounting: Snap into .187/.192 (4.75/4.87) dia. hole in panels .020/.097 (.51/2.46) thick.

Material: Polycarbonate

MODEL NO.	LENS COLOR
4351	Red
4352	Clear
4353	Amber
4354	White
4355	Green
4356	Blue
4357	Yellow


.21 (5.3)
DIA.
.27 (6.9)
.46 (11.7)
LENS HOUSING
POLYCARBONATE
SEE TABLE FOR
COLOR
MOUNTING HOLE
.192 (4.87)
.187 (4.75)
PANEL THICKNESS
.020 (.51) — .097 (2.46)

ALL DIMENSIONS ARE IN INCHES (MM).

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Bare LEDs

A wide variety of top-quality LEDs in a variety of sizes and package styles.

- All IDI LEDs provide bright, unmistakable indication **SUPER-BRITE** LEDs are GaAsP on GaP for red and yellow, **EXTRA-SUPER-BRITE** (series) are ultra bright LEDs utilizing GaA1As construction for red, GaAsP on GaP for amber, and high-efficiency GaP for yellow and green.
- New "LC" LEDs are high efficiency types available in red and yellow, require only 2 mA, ideal for battery-operated devices and limited-current power supplies.
- −5V LEDs have a current-limiting resistor on the chip, are TTL compatible — require no external current-limiting resistors.
- IDI LEDs are available as components, and also in a variety of panel-mounted and printed circuit-board mounted assemblies.

SPECIFICATIONS

													POWER						
* OUTPUT COLOR	* DIFFUSED-NON DIFFUSED	* PACKAGE COLOR	VIEWING ANGLE	MIN. LUM. INTENSITY AT RATED CURRENT	TYP. LUM. INTENSITY AT RATED CURRENT	RATED CURRENT	FORWARD VOLTAGE TYP.	FORWARD VOLTAGE MAX.	CONTINUOUS FORWARD CURRENT, MAX.	PEAK FORWARD CURRENT @ 1 µS-300 PPS.	REVERSE BREAKDOWN VOLTAGE (MIN.)	PEAK WAVELENGTH	DISSIPATION MAX. AT 25°C.	DERATE LINEARLY FROM 25°C.	CAPACITANCE @ V = 0	FORWARD CURRENT @ V_f = 5V TYP.	FORWARD CURRENT @ V_f = 5V MAX.	PHYSICAL DIMENSIONS	
	COLOR		DEG.	mcd	mcd	mA	V	V	mA	A	V	nm	nW	mW/C°	P.F.	mA	mA	FIG.	MODEL NO.
R	D	R	70	.5	2	20	1.7	2.2	30	1.0	5	660	105	1.14	25	—	—	B	4300E1NF
G	D	G	70	3.0	12	20	2.2	3.0	30	.09	5	567	105	1.14	20	—	—	B	4300E5NF
Y	D	Y	70	2.0	11	20	2.1	3.0	30	1.0	5	585	105	1.14	45	—	—	B	4300E7NF
R	D	R	125	0.5	1.0	20	1.6	2.0	50	1.0	3	655	100	—	100	—	—	F	4300F1
R	D	R	50	1.0	1.8	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	F	4300F1LC
Y	D	Y	50	1.0	1.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	F	4300F7LC
R	D	R	80	0.5	1.6	20	1.7	2.2	100	1.0	5	670	180	2.0	30	—	—	C	4300H1
R	D	R	50	1.2	2.0	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	C	4300H1LC
Y	D	Y	50	1.2	1.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	C	4300H7LC
R	D	R	80	.6	1.5	10	2.0	2.8	30	1	5	697	100	1.5	50	—	—	A	4300S1
R	D	R	70	0.4	0.8	2	1.8	2.2	7	.007	5	635	27	—	4	—	—	G	4300T1LC
Y	D	Y	70	0.4	0.8	2	1.9	2.7	7	.007	5	583	24	—	4	—	—	G	4300T7LC
R/G	D	CLR	—	R-0.6 G-0.6	R-1.8 G-1.8	10	2.2	2.8	25	.06	—	R-697 G-565	115	1.5	100	—	—	D	4301H1/5
R	D	R	60	0.8	1.5	13	5	7.5	20	—	3	655	—	—	—	13	20	F	4302F1-5V
R	D	R	90	1.5	4.0	10	5	7.5	15	—	5	635	—	—	—	10	15	E	4302H1-5V
A	D	A	90	1.5	4.0	10	5	7.5	15	—	5	583	—	—	—	10	15	E	4302H3-5V
G	D	G	90	1.5	4.0	12	5	7.5	15	—	5	565	—	—	—	12	15	E	4302H5-5V
R	D	R	80	1.0	2.4	9.6	5	6	13	—	5	635	—	—	—	9.6	13	G	4302T1-5V
R	D	R	90	1.5	2.5	10	2.0	3.0	30	1.0	5	635	120	—	45	—	—	F	4303F1
G	D	G	90	2.0	5.0	20	2.2	3.0	30	.09	5	562	120	—	20	—	—	F	4303F5
Y	D	Y	90	1.5	3.0	20	2.1	3.0	30	1.0	5	585	120	—	45	—	—	F	4303F7
R	D	R	65	3.0	10	20	2.0	3.0	35	1.0	5	635	120	1.14	45	—	—	C	4304H1
G	D	G	75	3.0	12	20	2.2	3.0	30	.09	5	562	120	—	20	—	—	C	4304H5
Y	D	Y	65	2.5	11	20	2.1	3.0	35	1.0	5	585	120	1.14	45	—	—	C	4304H7
R	D	R	50	2.0	4.0	10	2.0	3.0	35	1.0	5	630	105	1.14	45	—	—	A	4304S1
G	D	G	50	.5	3.0	10	2.2	3.0	30	.09	5	562	180	—	20	—	—	A	4304S5
Y	D	A	50	1.5	3.0	10	2.1	3.0	35	1.0	5	585	105	1.14	45	—	—	A	4304S7
R	N	R	28	17	40	20	2.0	3.0	35	1.0	5	635	120	—	45	—	—	C	4305H1
G	N	G	35	12	25	20	2.3	3.0	30	.09	5	562	120	—	20	—	—	C	4305H5
Y	N	Y	28	10	45	20	2.1	3.0	35	1.0	5	585	120	—	45	—	—	C	4305H7
R	D	R	100	2.5	5.0	25	2.1	3.0	30	.09	5	635	135	—	17	—	—	H	4306R1
G	D	G	100	1.5	2.5	25	2.3	3.0	30	.09	5	565	135	—	18	—	—	H	4306R5
Y	D	Y	100	3.0	5.0	20	2.2	3.0	20	.06	5	583	85	—	17	—	—	H	4306R7
R	D	R	80	1.0	3.0	10	2.2	3.0	30	.06	5	635	120	—	11	—	—	G	4307T1
G	D	G	70	1.0	3.0	10	2.3	3.0	30	.06	5	565	120	—	18	—	—	G	4307T5
Y	D	Y	90	1.0	3.0	10	2.2	3.0	20	.06	5	583	120	—	15	—	—	G	4307T7
R	N	CLR	20	80	160	20	1.7	2.0	50	.3	4	660	100	—	50	—	—	C	4308H1
A	N	CLR	20	60	90	20	2.2	2.5	50	.1	4	580	125	—	50	—	—	C	4308H3
G	N	CLR	20	50	80	20	2.1	2.5	50	.1	4	555	125	—	50	—	—	C	4308H5
Y	N	CLR	20	80	160	20	2.1	2.5	50	.1	4	570	125	—	40	—	—	C	4308H7

* COLOR CODE: A - AMBER, CLR - CLEAR, G - GREEN, R - RED, Y - YELLOW, D - DIFFUSED, N - NON-DIFFUSED

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Bare LEDs

FIG. A

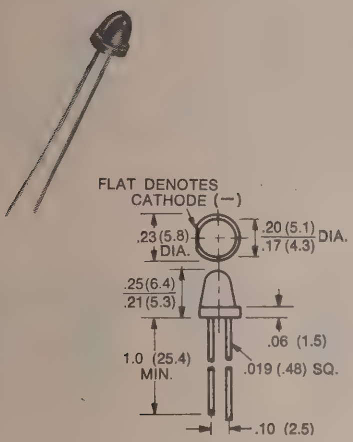

FLAT DENOTES
CATHODE (−)
.23 (5.8) DIA.
.20 (5.1) / .17 (4.3) DIA.
.25 (6.4) / .21 (5.3)
.06 (1.5)
1.0 (25.4) MIN.
.019 (.48) SQ.
.10 (2.5)

FIG. B

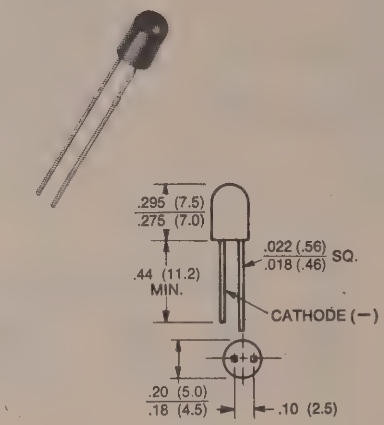

.295 (7.5) / .275 (7.0)
.022 (.56) / .018 (.46) SQ.
.44 (11.2) MIN.
CATHODE (−)
.20 (5.0) / .18 (4.5)
.10 (2.5)

FIG. C

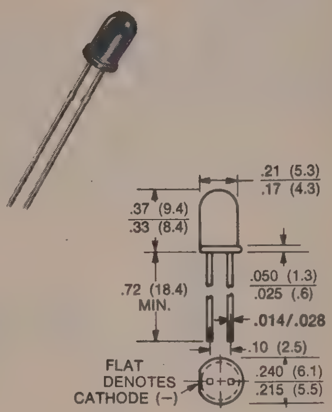

.21 (5.3) / .17 (4.3)
.37 (9.4) / .33 (8.4)
.050 (1.3) / .025 (.6)
.72 (18.4) MIN.
.014/.028
.10 (2.5)
FLAT DENOTES CATHODE (−)
.240 (6.1) / .215 (5.5)

FIG. D

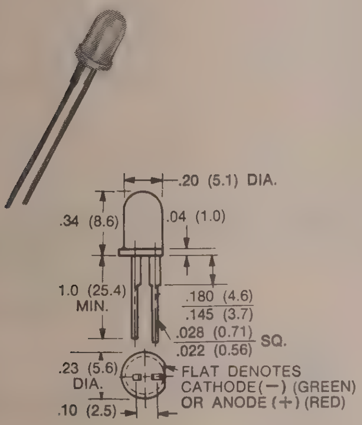

.20 (5.1) DIA.
.34 (8.6)
.04 (1.0)
1.0 (25.4) MIN.
.180 (4.6) / .145 (3.7)
.028 (0.71) / .022 (0.56) SQ.
.23 (5.6) DIA.
FLAT DENOTES CATHODE (−) (GREEN) OR ANODE (+) (RED)
.10 (2.5)

FIG. E

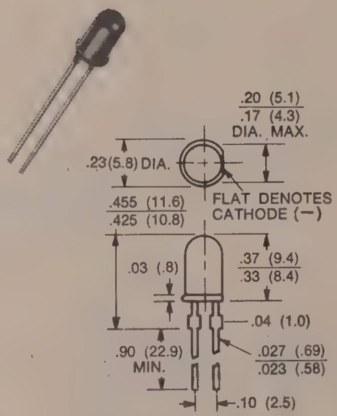

.20 (5.1) / .17 (4.3) DIA. MAX.
.23 (5.8) DIA.
.455 (11.6) / .425 (10.8)
FLAT DENOTES CATHODE (−)
.03 (.8)
.37 (9.4) / .33 (8.4)
.04 (1.0)
.90 (22.9) MIN.
.027 (.69) / .023 (.58)
.10 (2.5)

FIG. F

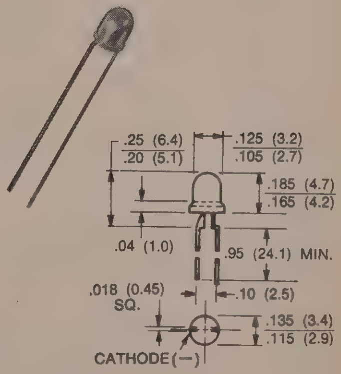
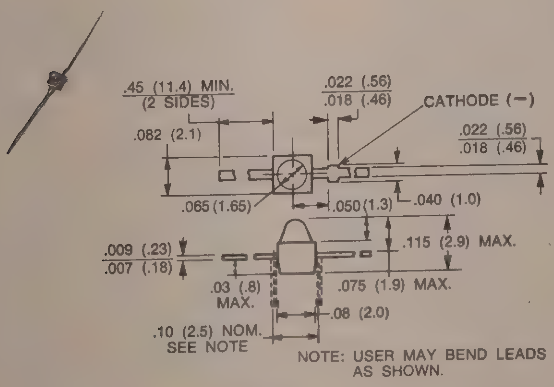
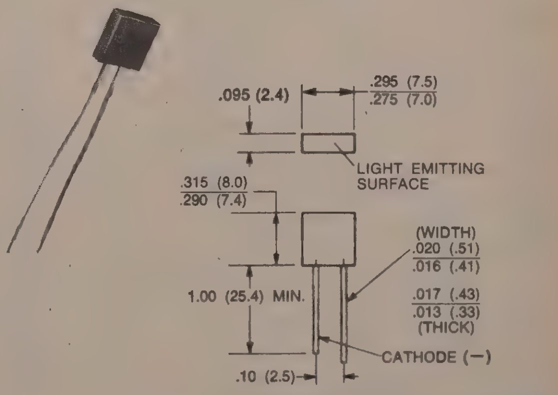

.25 (6.4) / .20 (5.1)
.125 (3.2) / .105 (2.7)
.185 (4.7) / .165 (4.2)
.04 (1.0)
.95 (24.1) MIN.
.018 (0.45) SQ.
.10 (2.5)
.135 (3.4) / .115 (2.9)
CATHODE (−)

FIG. G


.45 (11.4) MIN. (2 SIDES)
.022 (.56) / .018 (.46)
CATHODE (−)
.082 (2.1)
.022 (.56) / .018 (.46)
.065 (1.65)
.050 (1.3)
.040 (1.0)
.009 (.23) / .007 (.18)
.115 (2.9) MAX.
.03 (.8) MAX.
.075 (1.9) MAX.
.08 (2.0)
.10 (2.5) NOM. SEE NOTE

NOTE: USER MAY BEND LEADS AS SHOWN.

FIG. H


.095 (2.4)
.295 (7.5) / .275 (7.0)
LIGHT EMITTING SURFACE
.315 (8.0) / .290 (7.4)
(WIDTH) .020 (.51) / .016 (.41)
1.00 (25.4) MIN.
.017 (.43) / .013 (.33) (THICK)
CATHODE (−)
.10 (2.5)

ALL DIMENSIONS ARE IN INCHES (MM).

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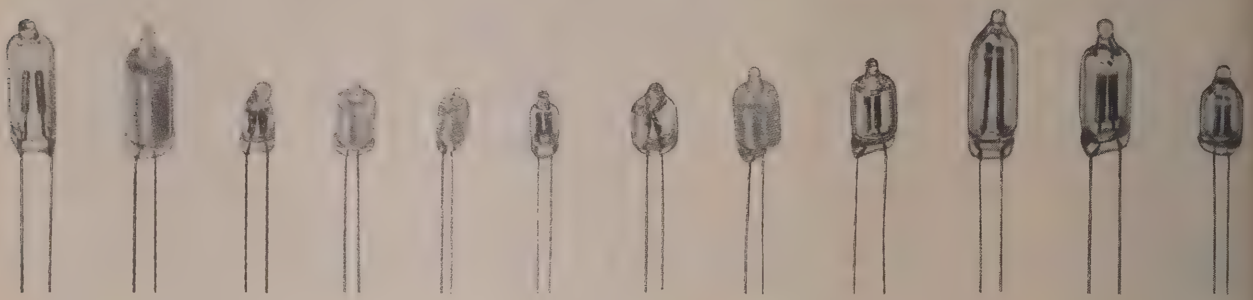
Neon Glow Lamps

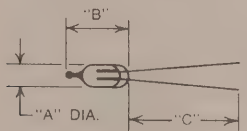
Neon lamps are ideal for line-voltage AC as well as for 90V and up DC applications. They are rugged and long-lived; properly specified neon lamps will outlast the equipment in which they are incorporated.

IDI 4900 series neon lamps have tinned leads, and are ideal for use on printed circuit boards. Unique sizes, colors, and voltage characteristics provide a wide range of options.

Plain glass lamps include both standard brightness and high brightness types, and include a unique high-current lamp for greater light output and a unique high brightness low voltage lamp. Green, blue, and amber lamps have a phospher coating on the inside of the glass envelope to convert the typical orange-red neon glow to other colors, and are available in both miniature and sub-miniature sizes.

A wide variety of complete panel-mounted neon indicator lights is listed in the "non-relampable" section of this catalog. Several PC Board-mounted neon assemblies are in development; please let us know if you have specific needs.





(SEE TABLE FOR DIM'S)

NOTES:
1. Leads are Tinned.
2. DC life is 60% of AC life.
3. All lamps must be ballasted.
4. All lamps may be used on higher voltages with appropriate value resistor in series.
5. Max. firing voltage when lamp is new, for high brightness lamps voltage increases as lamp ages.
6. Voltage measured across lamp at design current.

MODEL NO.	LAMP TYPE	CIRCUIT VOLTAGE (VAC)	MAX. FIRING VOLTAGE (NOTE 5) (VAC)	TYP. MAINTAINING VOLTAGE (NOTE 6) (VAC)	END OF LIFE FIRING VOLTAGE (VAC)	NOMINAL CURRENT (mA)	RECOMMENDED EXT. RESISTOR FOR SHOWN CIRCUIT VOLTAGE (NOTE 4) (OHMS)	AVERAGE USEFUL LIFE AT RATED CURRENT. (HRS) AC	COMMENTS	DIM'S. IN INCHES (MM) A MAX.	B MAX.	C
4915H5	—	95-120	95	40	—	0.7	100,000	10,000	Green Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4915H6	—	95-120	95	40	—	0.7	100,000	10,000	Blue Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4915H7	—	95-120	95	40	—	0.7	100,000	10,000	Orange Sub-Miniature	.16 (4.1)	.40 (10.2)	1.0 (25) MIN.
4916S1	2ML	85-125	65	40	—	0.3	150,000	25,000	Standard Brightness Sub-Miniature	.16 (4.1)	.43 (10.9)	1.0 (25) NOM.
4916H1	1MH	105-125	100	40	—	0.7	100,000	5,000	High Brightness Sub-Miniature	.16 (4.1)	.43 (10.9)	1.0 (25) NOM.
4920H5	—	95-120	95	40	—	0.8	91,000	10,000	Green Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4920H6	—	95-120	95	40	—	0.8	91,000	10,000	Blue Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4920H7	—	95-120	95	40	—	0.8	91,000	10,000	Orange Miniature	.20 (5.1)	.60 (15.2)	1.0 (25) NOM.
4921S1	A1B	75-125	65	40	—	0.3	220,000	25,000	Standard Brightness Miniature	.25 (6.4)	.50 (12.7)	1.0 (25) NOM.
4921H1	A1C	105-125	95	50	—	1.2	47,000	25,000	High Brightness Miniature	.25 (6.4)	.50 (12.7)	1.0 (25) NOM.
4924J1	—	100	55	40	75	1.5	33,000	10,000	Low Voltage High Brightness	.25 (6.4)	.60 (15.2)	1.0 (25) MIN.
4925S1	A9A	75-125	65	40	—	0.7	100,000	10,000	Standard Brightness	.25 (6.4)	.75 (19.1)	2.0 (51) NOM.
4925U1	—	105-125	85	45	95	5.0	8,200	15,000	High Current High Brightness	.25 (6.4)	.79 (20.1)	1.0 (25) MIN.
4925H1	C2A	105-125	95	65	—	1.9	30,000	25,000	High Brightness	.25 (6.4)	.75 (19.1)	2.0 (51) NOM.
4925H5	G2B	95-120	95	40	—	1.6	36,000	20,000	Green	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4925H6	T2B	95-120	95	40	—	1.6	36,000	20,000	Blue	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4925H7	—	95-120	95	40	—	1.6	36,000	20,000	Orange	.25 (6.4)	.75 (19.1)	1.0 (25) MIN.
4926H1	C6A	105-125	95	50	—	2.0	18,000	10,000	Long Electrode High Brightness	.25 (6.4)	1.0 (25)	1.0 (25) MIN.

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Tiny-Mite™

FEATURES

- Attractive
- Compact
- Easy lamp insertion and removal
- Economical

TINY-MITE indicator light assemblies and sockets feature a unique socket construction which holds the lamp securely, makes contact reliably, and will not loosen with vibration or shock, yet permits easy lamp removal and replacement.

TINY-MITE 4600 Series indicator light assemblies are extremely attractive, rugged, and reliable, yet utilize minimal panel space. TINY-MITE 4100 Series sub-miniature wedge-base lamp sockets are available in both lead and solder terminal versions, as well as in a printed circuit board version.

Sub-miniature wedge-base lamps evolved from the design originally developed for miniature (T-3-1/4) lamps. The ruggedness and reliability of wedge-base lamps has been proved by the annual use of hundreds of millions of units. Wedge-base design is economical because the base is formed from the glass of the bulb and lead-in wires. There are no separate parts or extra welded connections. There are 13 different types presently available with voltage ratings ranging from 2.5 volts to 28 volts.

SUB-MINIATURE (T-1¾) WEDGE-BASE LAMPS

LAMP NO.	DESIGN VOLTAGE	DESIGN AMPS	CANDLE POWER (APPROX.)	RATED LIFE HOURS
11	2.5	.20	.20	1,000
56	5	.115	.15	20,000
79	6	.20	.60	1,000
84	6.3	.04	.03	20,000
16	6.3	.15	.34	5,000
86	6.3	.20	.40	20,000
18	14	.04	.13	5,000
73	14	.08	.30	15,000
37	14	.09	.50	1,500
74	14	.10	.70	500
70	14	.15	.15	100
85	28	.04	.30	7,000
17	28	.06	.65	5,000

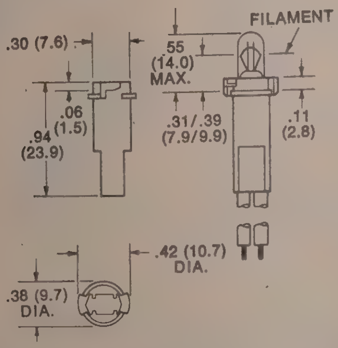
MODEL 4100 5/16" DIA. — KEYED

Mounting: For rear insertion in panels .06 (1.5) thick, see pg. 20 for mounting hole

Wire Leads: No. 22 AWG, 4.4/4.8 (111.8/121.9) long,stripped .43/.57 (10.9/14.5)

Housing: White nylon

Note: Available with other leads and/or terminals on special order


FILAMENT
.30 (7.6)
.55 (14.0) MAX.
.06 (1.5)
.94 (23.9)
.31/.39 (7.9/9.9)
.11 (2.8)
.42 (10.7) DIA.
.38 (9.7) DIA.

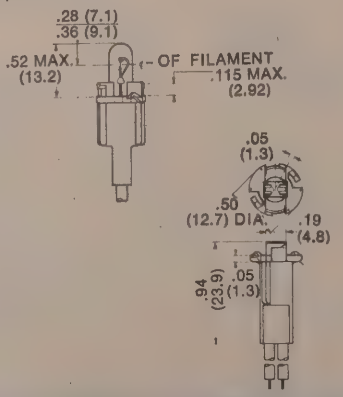
MODEL 4104

Mounting: For rear insertion in panels .06 (1.5) thick see pg. 20 for mounting hole

Wire Leads: No. 20 AWG, 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Housing: White nylon

Note: Available with other leads and/or terminals on special order

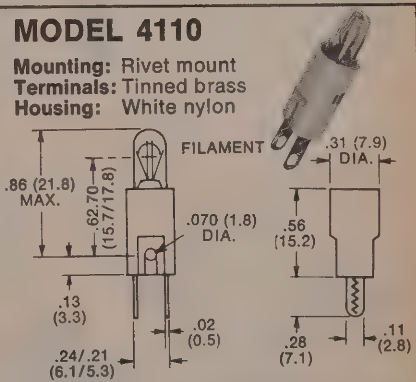

.28 (7.1)
.36 (9.1)
.52 MAX. (13.2)
OF FILAMENT
.115 MAX. (2.92)
.05 (1.3)
.50 (12.7) DIA.
.19 (4.8)
.94 (23.9)
.05 (1.3)

MODEL 4110

Mounting: Rivet mount

Terminals: Tinned brass

Housing: White nylon

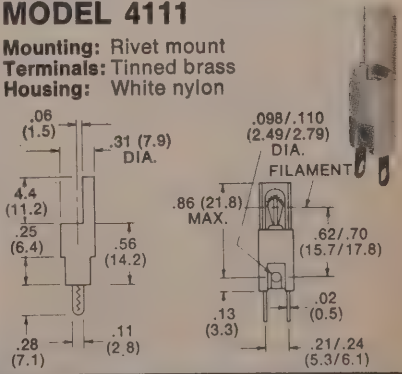

FILAMENT
.31 (7.9) DIA.
.86 (21.8) MAX.
.62/.70 (15.7/17.8)
.070 (1.8) DIA.
.56 (15.2)
.13 (3.3)
.02 (0.5)
.24/.21 (6.1/5.3)
.28 (7.1)
.11 (2.8)

MODEL 4111

Mounting: Rivet mount

Terminals: Tinned brass

Housing: White nylon


.06 (1.5)
.31 (7.9) DIA.
.098/.110 (2.49/2.79) DIA.
FILAMENT
4.4 (11.2)
.25 (6.4)
.56 (14.2)
.86 (21.8) MAX.
.62/.70 (15.7/17.8)
.13 (3.3)
.02 (0.5)
.28 (7.1)
.11 (2.8)
.21/.24 (5.3/6.1)

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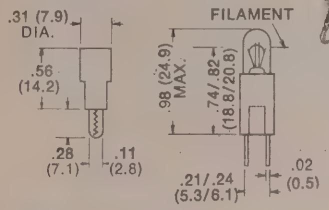
Tiny-Mite™ Sub-Miniature Wedge-Base Lamp Sockets

MODEL 4112

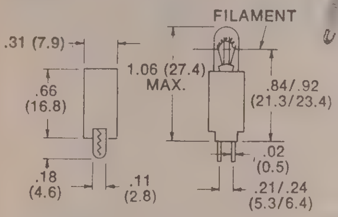
Terminals: Tinned brass
Housing: White nylon



.31 (7.9) DIA.
FILAMENT
.56 (14.2)
.98 (24.9) MAX.
.74/.82 (18.8/20.8)
.28 (7.1)
.11 (2.8)
.02 (0.5)
.21/.24 (5.3/6.1)

MODEL 4113

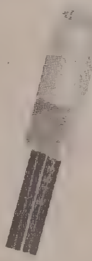
Terminals: Tinned brass
Housing: White nylon

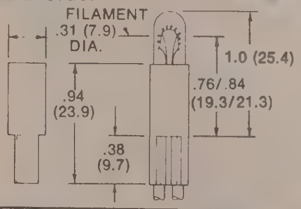


FILAMENT
.31 (7.9)
1.06 (27.4) MAX.
.66 (16.8)
.84/.92 (21.3/23.4)
.02 (0.5)
.18 (4.6)
.11 (2.8)
.21/.24 (5.3/6.4)

MODEL 4120

Mounting: Tab mount, see pg. 20 for mounting tab
Wire Leads: No. 22 AWG, 4.5 (114.3) long, stripped .5 (12.7)
Housing: White nylon
Note: Available with other leads and/or terminals on special order



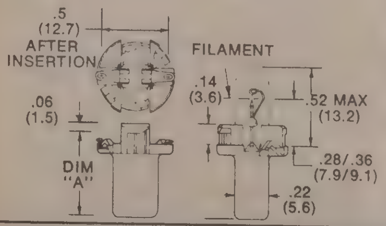


FILAMENT
.31 (7.9) DIA.
1.0 (25.4)
.76/.84 (19.3/21.3)
.94 (23.9)
.38 (9.7)

MODEL 4130, 4133

Mounting: Printed circuit board, see pg. 20 for mounting hole
Contacts: CA-725 alloy
Housing: Nylon (see table for color)

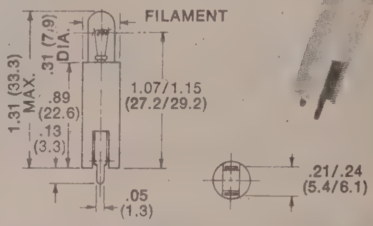
MODEL	DIM "A"	COLOR
4130	.55 (14.0)	Gray
4133	.51 (13.0)	Black



.5 (12.7) AFTER INSERTION
FILAMENT
.06 (1.5)
.14 (3.6)
.52 MAX (13.2)
DIM "A"
.28/.36 (7.9/9.1)
.22 (5.6)

MODEL 4140

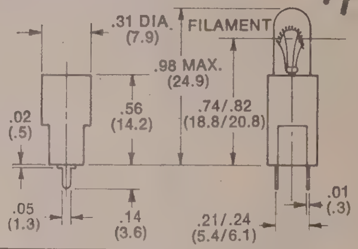
Mounting: Printed circuit board
Terminals: Tinned brass
Housing: White nylon



.31 (7.9) DIA.
FILAMENT
1.31 (33.3) MAX.
.89 (22.6)
1.07/1.15 (27.2/29.2)
.13 (3.3)
.05 (1.3)
.21/.24 (5.4/6.1)

MODEL 4141

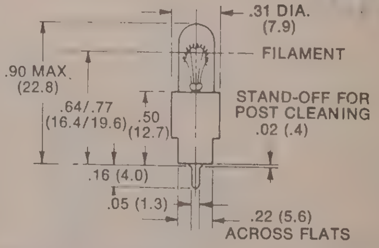
Mounting: Printed circuit board
Terminals: Tinned brass
Housing: White nylon



.31 DIA. (7.9)
FILAMENT
.98 MAX. (24.9)
.02 (.5)
.56 (14.2)
.74/.82 (18.8/20.8)
.05 (1.3)
.14 (3.6)
.21/.24 (5.4/6.1)
.01 (.3)

MODEL 4142, 4142WT

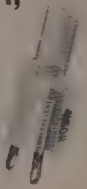
Mounting: Printed circuit board
Terminals: Tinned brass
Housing: Black nylon for 4142
White nylon for 4142WT



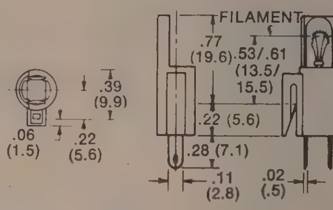
.31 DIA. (7.9)
FILAMENT
.90 MAX (22.8)
STAND-OFF FOR POST CLEANING .02 (.4)
.64/.77 (16.4/19.6)
.50 (12.7)
.16 (4.0)
.05 (1.3)
.22 (5.6) ACROSS FLATS

MODELS 4150, 4150R, 4150L

Mounting: Hook mount, see pg. 20 for optional mounting holes
Terminals: Tinned brass
Housing: White nylon



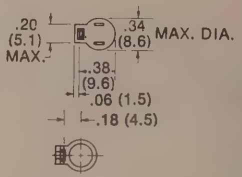
SOCKET NO.	LIGHT SHIELD
4150L	Left Hand (as shown)
4150R	Right Hand
4150	None



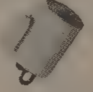
FILAMENT
.77 (19.6)
.53/.61 (13.5/15.5)
.39 (9.9)
.22 (5.6)
.06 (1.5)
.22 (5.6)
.28 (7.1)
.11 (2.8)
.02 (.5)

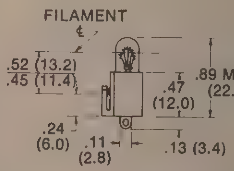
MODEL 4151

Mounting: Snap on edge or center, see pg. 20 for optional mounting holes
Terminals: Tinned brass
Housing: White nylon



.20 (5.1) MAX.
.34 (8.6) MAX. DIA.
.38 (9.6)
.06 (1.5)
.18 (4.5)



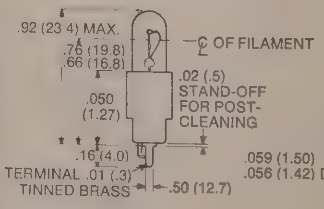


FILAMENT
.52 (13.2)
.45 (11.4)
.47 (12.0)
.89 MAX. (22.6)
.24 (6.0)
.11 (2.8)
.13 (3.4)

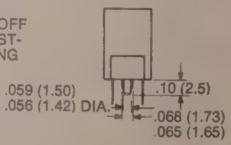
MODEL 4144

NEW!

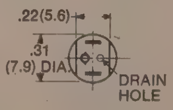
Mounting: Press-in mounting for accurate location on printed circuit board
Terminals: Tinned brass
Housing: White nylon



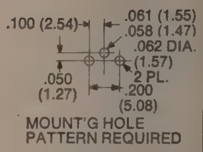
.92 (23.4) MAX.
.76 (19.8)
.66 (16.8)
℄ OF FILAMENT
.050 (1.27)
.02 (.5) STAND-OFF FOR POST-CLEANING
.16 (4.0)
TERMINAL .01 (.3) TINNED BRASS
.50 (12.7)



.059 (1.50)
.056 (1.42) DIA.
.10 (2.5)
.068 (1.73)
.065 (1.65)



.22 (5.6)
.31 (7.9) DIA.
DRAIN HOLE



.100 (2.54)
.061 (1.55)
.058 (1.47)
.062 DIA. (1.57) 2 PL.
.050 (1.27)
.200 (5.08)
MOUNT'G HOLE PATTERN REQUIRED

ALL DIMENSIONS ARE IN INCHES (MM).

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Non-Relampable Indicator Lights

DI non-relampable, or unit-construction, indicator light assemblies are compact and attractive. They are essentially tamperproof and have outstanding reliability due to the elimination of sockets and spring contacts. In addition, IDI non-relampable indicator light assemblies are extremely economical to buy and install.

Omni-Glow 1000 SERIES

GENERAL PURPOSE INDICATOR LIGHTS

- Available in five lens shapes and two body sizes.
- Neon models incorporate appropriate current-limiting resistors.
- A choice of wire leads or quick connect terminals.
- Lights can be easily mounted by either push-on speednut or snap-fit into a .500 (12.70) dia. hole.
- UL Recognized — CSA Approved.

Rugged and long-lived, OMNI-GLOW Indicator Lights usually outlast the product on which they are used. Conservatively rated, the neon lights will function in excess of 10,000 hours — and often much longer. Depending on usage, the incandescent models can also provide outstanding performance. Tamper-proof housing and elimination of sockets and spring contacts — along with intrinsically rugged shock-proof design — all combine to provide outstanding reliability.

OMNI-GLOW Indicator Lights are compact and economical. They take little space on your panel or behind it and make modest demands on your budget.

LAMP DATA TABLES

Neon Lamps (All High-Brightness)

LAMP NO.	INCORPORATED RESISTANCE (Ohms)		AVERAGE RATED LIFE (Hours)	
	125VAC	250V	125VAC	250V
C2A (NE-2H)	30k	100k	25,000	25,000
C6A	18k	—	10,000	—
G2B (Green)	39k	120k	25,000	25,000
T2B (Blue)	39k	120k	25,000	25,000

Incandescent Lamps (T-1¾)

NOMINAL VOLTAGE	LAMP NO.	DESIGN VOLTAGE	DESIGN AMPS	MSCP (Approx.)	RATED LIFE (Hours)
6V	2112	6.3	.20	.55	20,000
12V	2162	14.0	.10	.50	10,000
28V	2187	28.0	.04	.30	7,000

Note: To convert 125V models to 250V service, add a 47k series resistor for C6A lamps; add a 100k series resistor for NE-2H, G2B and T2B lamp.

* Incandescent lamp life ratings are based on static (vibration-free) conditions. Unit should be tested in your application to assure that it will perform satisfactorily.

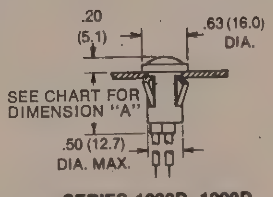
SERIES 1030D, 1030QD, 1090D ½" DIA.

SERIES 1030D, 1090D

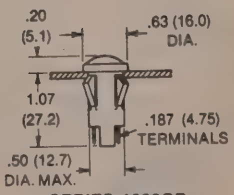
SERIES 1030QD

Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see page 20) also available. See page 20 for optional mounting hole

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)



SERIES 1030D, 1090D



SERIES 1030QD

Terminals: Tinned brass **Bezel:** Chrome plated brass
Lens: Polycarbonate **Housing:** White nylon

LENS COLOR	NEON		INCANDESCENT			NEON	
	MODEL NO. 105-125VAC	MODEL NO. 208-250V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125VAC	MODEL NO. 208-250V
Red	1030D1	1031D1	1090D1-6V	1090D1-12V	1090D1-28V	1030QD1	1031QD1
Amber	1030D3	1031D3	1090D3-6V	1090D3-12V	1090D3-28V	1030QD3	1031QD3
White	1030D4	1031D4	1090D4-6V	1090D4-12V	1090D4-28V	1030QD4	1031QD4
Green	1032D5*	1033D5*	1090D5-6V	1090D5-12V	1090D5-28V	1032QD5*	1033QD5*
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black/One Red	White	Yellow	Purple	Quick Connect Terminals	
"A"	1.13 (28.7)	1.13 (28.7)	.91 (23.1)	.91 (23.1)	.91 (23.1)	—	—

* Incorporates G2B lamp and resistor

ALL DIMENSIONS ARE IN INCHES (MM).

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Omni-Glow 1000 SERIES

SERIES 1050A, 1050QA, 1090A ½″ DIA.

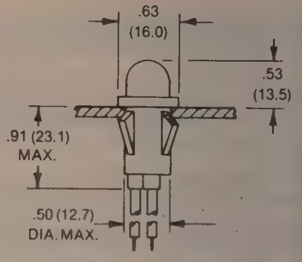
SERIES 1050A, 1090A

SERIES 1050QA

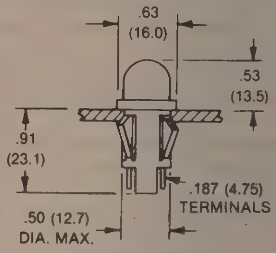
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 20) also available. See page 20 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Nylon on models 1050A1, 1050A3, 1050A4 — Polycarbonate on all other models
Bezel: Chrome plated brass
Housing: White nylon

LENS COLOR	NEON		INCANDESCENT			NEON	
	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V
Red	1050A1	1051A1	1090A1-6V	1090A1-12V	1090A1-28V	1050QA1	1051QA1
Clear	1050A2	1051A2	—	—	—	1050QA2	—
Amber	1050A3	1051A3	1090A3-6V	1090A3-12V	1090A3-28V	1050QA3	1051QA3
White	1050A4	1051A4	1090A4-6V	1090A4-12V	1090A4-28V	1050QA4	1051QA4
Green	1052A5*	1053A5*	1090A5-6V	1090A5-12V	1090A5-28V	1052QA5*	1053QA5*
Blue	1052A6†	1053A6†	1090A6-6V	1090A6-12V	1090A6-28V	1052QA6†	1053QA6†
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black One Red	White	Yellow	Purple	Quick Connect Terminals	

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor



SERIES 1050A, 1090A



SERIES 1050QA

SERIES 1050C, 1050QC, 1090C ½″ DIA.

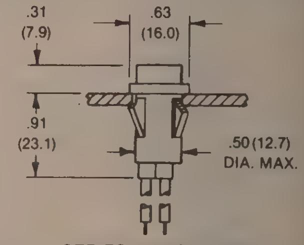
SERIES 1050C, 1090C

SERIES 1050 QC

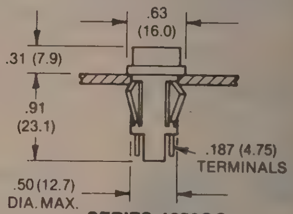
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 20) also available. See page 20 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Nylon on models 1050C1, 1050C3, 1050C4 — Polycarbonate on all other models
Bezel: Chrome plated brass
Housing: White nylon

LENS COLOR	NEON		INCANDESCENT			NEON	
	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC	MODEL NO. 208-250 V
Red	1050C1	1051C1	1090C1-6V	1090C1-12V	1090C1-28V	1050QC1	1051QC1
Clear	1050C2	1051C2	—	—	—	1050QC2	—
Amber	1050C3	1051C3	1090C3-6V	1090C3-12V	1090C3-28V	1050QC3	1051QC3
White	1050C4	1051C4	1090C4-6V	1090C4-12V	1090C4-28V	1050QC4	1051QC4
Green	1052C5*	1053C5*	1090C5-6V	1090C5-12V	1090C5-28V	1052QC5*	1053QC5*
Lamp	C2A + Resistor		#2112	#2162	#2187	C2A + Resistor	
Lead Color	Black	One Black One Red	White	Yellow	Purple	Quick Connect Terminals	

* Incorporates G2B lamp and resistor

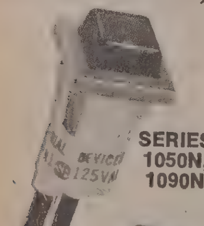


SERIES 1050C, 1090C



SERIES 1050QC

SERIES 1050N, 1050QN, 1090N ½″ DIA.



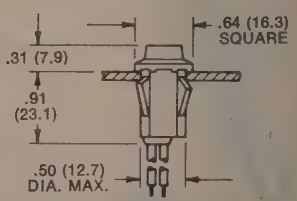
SERIES 1050N, 1090N

SERIES 1050QN

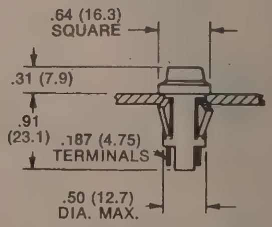
Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 (see pg. 20) also available. See page 20 for optional mounting hole.
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals: Tinned brass
Lens: Polycarbonate
Bezel: Chrome plated brass
Housing: White nylon

LENS COLOR	NEON	INCANDESCENT			NEON
	MODEL NO. 105-125VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125VAC
Red	1050N1	1090N1-6V	1090N1-12V	1090N1-28V	1050QN1
Clear	1050N2	—	—	—	—
Amber	1050N3	1090N3-6V	1090N3-12V	1090N3-28V	1050QN3
White	1050N4	1090N4-6V	1090N4-12V	1090N4-28V	1050QN4
Green	1052N5*	1090N5-6V	1090N5-12V	1090N5-28V	1052QN5*
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals

* Incorporates G2B lamp and resistor



SERIES 1050N, 1090N



SERIES 1050QN

Underwriters Laboratories (UL) File No. E20325 Canadian Standards Association (CSA) File No. 13346 ALL DIMENSIONS ARE IN INCHES (MM).

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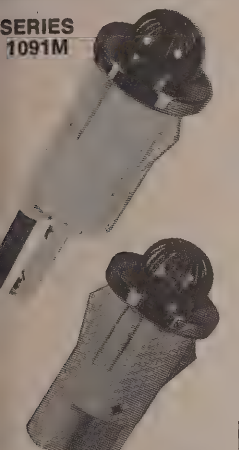
Omni-Glow 1000 SERIES

SERIES 1091M, 1091QM ½" DIA.


SERIES 1091M

SERIES 1091QM

Solid-State Indicator Lights Complete With Built-in Current-Limiting Resistor and Rectifier Diode

Mounting: Will snap-fit into .500/.505 (12.70/12.83) dia. hole in panels .020/.100 (.51/2.54) thick. Push-on speednut SN0461 also available. See catalog page 20.

Wire Leads: No. 22 AWG (105°C) lead color: red and white 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Quick connect, tinned brass **Bezel:** Chrome plated brass

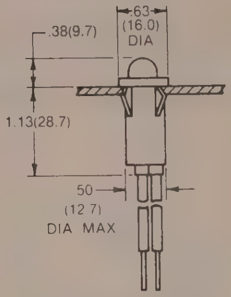
Lens: Polycarbonate **Anode (+):** Red lead **Housing:** White nylon

SOLID STATE						
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V	MODEL NO. 12V	MODEL NO. 24V	INCORPORATES LED*
Red	1091M1-6V	1091M1-12V	1091M1-24V	1091QM1-12V	1091QM1-24V	4304H1
Green	1091M5-6V	1091M5-12V	1091M5-24V	1091QM5-12V	1091QM5-24V	4304H5
Yellow	1091M7-6V	1091M7-12V	1091M7-24V	1091QM7-12V	1091QM7-24V	4304H7
Internal Resistor (ohms)	150	390	1000	390	1000	—

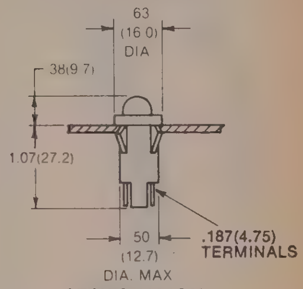
Note: Also incorporates 1N4004 (400 P.I.V.) rectifier diode.

VOLTAGE TABLE		
NOMINAL	VAC	VDC
6V	5 to 11	3.5 to 6.5
12V	10 to 20	6 to 13.5
24V	22 to 32	12 to 24

To Use 24V model:
Beyond 32 VAC add 30 ohms per volt
Beyond 24 VDC add 50 ohms per volt
Use ½W resistor up to 50V
1W resistor for 50V to 70V
2W resistor for 75V to 125V
Do not use beyond 125V



SERIES 1091M



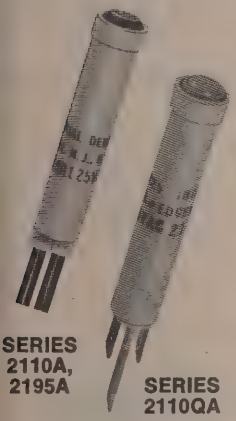
SERIES 1091QM

Glo-Dot 2100 SERIES

MINIATURE INDICATOR LIGHTS

GLO-DOT Indicator Lights are available in five body sizes and four lens shapes in a wide choice of colors. Conservatively rated, these rugged, long-lived units outlast the product in which they are installed. Tamper-proof housings, elimination sockets and spring contacts plus rugged shock-proof design combine to provide highest reliability.

SERIES 2110A, 2110QA, 2195A ⁵⁄₁₆" DIA.


SERIES 2110A, 2195A

SERIES 2110QA

Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 20)

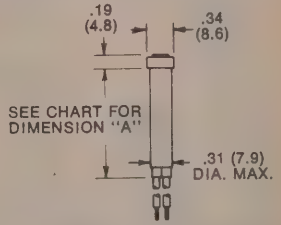
Wire Leads: No. 22 AWG (105°), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Tinned brass

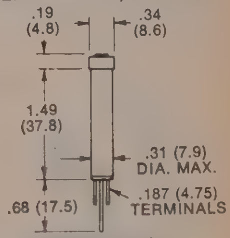
Lens: Polycarbonate **Housing:** White nylon

	NEON	INCANDESCENT			NEON
LENS COLOR	MODEL NO. 105-125VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125VAC
Red	2110A1	2195A1-6V	2195A1-12V	2195A1-28V	2110QA1
Clear	2110A2	—	—	—	2110QA2
Amber	2110A3	2195A3-6V	2195A3-12V	2195A3-28V	2110QA3
White	2110A4	2195A4-6V	2195A4-12V	2195A4-28V	2110QA4
Green	2112A5*	2195A5-6V	2195A5-12V	2195A5-28V	2112QA5*
Blue	2112A6†	—	—	—	—
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals
"A"	1.48 (37.6)	.74 (18.8)	.74 (18.8)	.74 (18.8)	—

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor

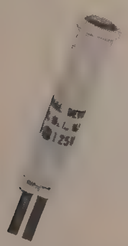


SERIES 2110A, 2195A



SERIES 2110QA

SERIES 2120A ⁵⁄₁₆" DIA.



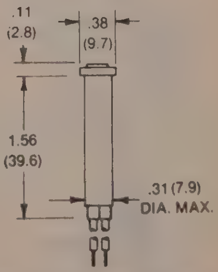
Mounting Hole: .31 (7.87) min. dia. Supplied with push-on speednut SN1287 (see page 20)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Lens: Polycarbonate

Housing: White nylon

	NEON
LENS COLOR	MODEL NO. 105-125VAC
Red	2120A1
Amber	2120A3
White	2120A4
Lamp	C2A + Resistor



Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

ALL DIMENSIONS ARE IN INCHES (MM).

* SEE PAGE 9 FOR LED RATINGS

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Glo-Dot 2100 SERIES

SERIES 2150A, 2150QA, 2194A 5/16" DIA.

SERIES 2150A, 2194A
SERIES 2150QA

Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 20)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Tinned brass

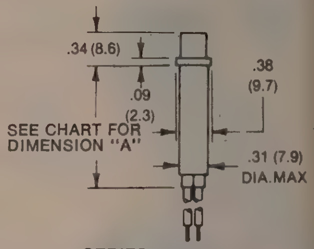
Lens: Polycarbonate

Bezel: Chrome plated brass

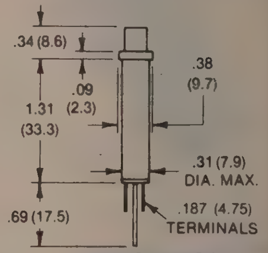
Housing: White nylon

	NEON	INCANDESCENT			NEON
LENS COLOR	MODEL NO. 105-125 VAC	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V	MODEL NO. 105-125 VAC
Red	2150A1	2194A1-6V	2194A1-12V	2194A1-28V	2150QA1
Clear	2150A2	—	—	—	—
Amber	2150A3	2194A3-6V	2194A3-12V	2194A3-28V	2150QA3
White	2150A4	2194A4-6V	2194A4-12V	2194A4-28V	2150QA4
Green	2152A5*	2194A5-6V	2194A5-12V	2194A5-28V	2152QA5*
Blue	2152A6†				
Lamp	C2A + Resistor	#2112	#2162	#2187	C2A + Resistor
Lead Color	Black	White	Yellow	Purple	Quick Connect Terminals
"A"	1.31 (33.3)	.83 (21.1)	.83 (21.1)	.83 (21.1)	—

* Incorporates G2B lamp and resistor † Incorporates T2B lamp and resistor

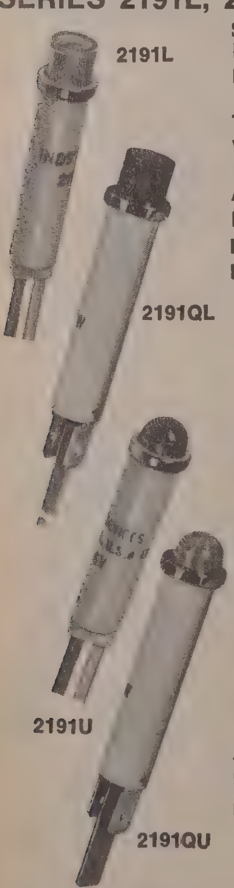

.34 (8.6)
.09
(2.3)
.38
(9.7)
SEE CHART FOR DIMENSION "A"
.31 (7.9)
DIA.MAX

SERIES 2150A, 2194A


.34 (8.6)
.09
1.31 (2.3)
(33.3)
.38
(9.7)
.31 (7.9)
DIA. MAX.
.69 (17.5)
.187 (4.75)
TERMINALS

†SERIES 2150QA

SERIES 2191L, 2191QL, 2191U, 2191QU 5/16" DIA.


2191L
2191QL
2191U
2191QU

Solid-State Indicator Lights Complete With Built-in Current-Limiting Resistor and Rectifier Diode.

Mounting Hole: .31 (7.9) min. dia. Supplied with push-on speednut SN1287 (see page 20)

Terminals: Quick connect, tinned brass

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Anode (+): Red lead

Lens: Polycarbonate

Bezel: Chrome plated brass

Housing: White nylon

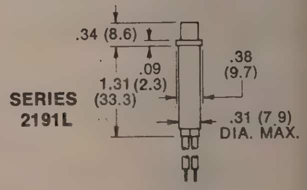
	SOLID STATE					
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 24V
Red	2191L1-6V	2191L1-12V	2191L1-24V	2191U1-6V	2191U1-12V	2191U1-24V
Green	2191L5-6V	2191L5-12V	2191L5-24V	2191U5-6V	2191U5-12V	2191U5-24V
Yellow	2191L7-6V	2191L7-12V	2191L7-24V	2191U7-6V	2191U7-12V	2191U7-24V
Red	—	2191QL1-12V	2191QL1-24V	—	2191QU1-12V	2191QU1-24V
Green	—	2191QL5-12V	2191QL5-24V	—	2191QU5-12V	2191QU5-24V
Yellow	—	2191QL7-12V	2191QL7-24V	—	2191QU7-12V	2191QU7-24V
Internal Resistor (ohms)	150	390	1000	150	390	1000

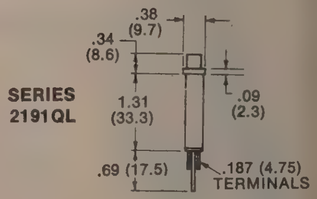
LENS COLOR	INCORPORATES LED*
Red	4304H1
Green	4304H5
Yellow	4304H7

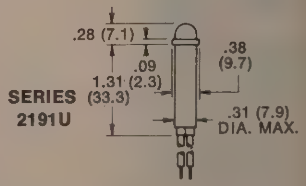
VOLTAGE TABLE		
NOMINAL	VAC	VDC
6V	5 to 11	3.5 to 6.5
12V	10 to 20	6 to 13.5
24V	22 to 32	12 to 24

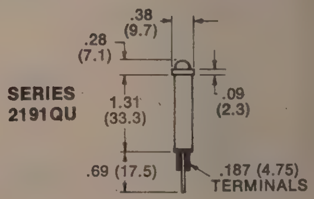
* Also incorporates 1N4004 (400 P.I.V.) rectifier diode.

To use 24V model:
Beyond 32 VAC add 30 ohms per volt. Beyond 24 VDC add 50 ohms per volt.
Use ½W resistor up to 50V, 1W resistor for 50V to 70V, 2W resistor for 75V to 125V.
Do not use beyond 125V.


.34 (8.6)
.09
1.31 (2.3)
(33.3)
.38
(9.7)
SERIES 2191L
.31 (7.9)
DIA. MAX.


.38
(9.7)
.34
(8.6)
SERIES 2191QL
1.31
(33.3)
.09
(2.3)
.69 (17.5)
.187 (4.75)
TERMINALS


.28 (7.1)
.09
1.31 (2.3)
(33.3)
.38
(9.7)
SERIES 2191U
.31 (7.9)
DIA. MAX.


.38
(9.7)
.28
(7.1)
SERIES 2191QU
1.31
(33.3)
.09
(2.3)
.69 (17.5)
.187 (4.75)
TERMINALS

* SEE PAGE 9 FOR LED RATINGS

Underwriters Laboratories (UL) File No. E20325 — Canadian Standards Association (CSA) File No. 13346

ALL DIMENSIONS ARE IN INCHES (MM).

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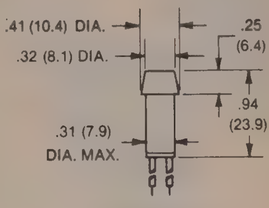
Glo-Dot 2900 SERIES

SERIES 2990D 5/16" DIA.

Low-cost GLO-DOT 2900 Series Indicator Lights offer a wide choice of colors in a one piece lens-body. Both push-on speednut and plug-button bezel mounting styles are available.

Mounting Hole: .31 (7.9) min.
Wire Leads: No. 24 AWG 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Lens: Polycarbonate
Bezel: Mirror finish chrome plated steel (Series 2990P)

	INCANDESCENT		
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V
Red Amber White Green Blue	2990D1-6V 2990D3-6V 2990D4-6V 2990D5-6V 2990D6-6V	2990D1-12V 2990D3-12V 2990D4-12V 2990D5-12V 2990D6-12V	2990D1-28V 2990D3-28V 2990D4-28V 2990D5-28V 2990D6-28V
Lamp	#2112	#2162	#2187
Lead Color	White	Yellow	Purple
Mounting	Supplied with push-on speednut SN1287 (see page 20)		



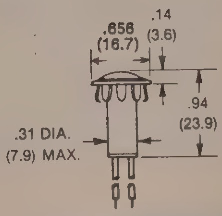
SERIES 2990D

SERIES 2990P 1/2" DIA.

Mounting Hole: .50 (12.7) min. dia.

Wire Leads: No. 24 AWG 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Lens: Polycarbonate
Bezel: Mirror finish chrome plated steel (Series 2990P)

	INCANDESCENT		
LENS COLOR	MODEL NO. 6V	MODEL NO. 12V	MODEL NO. 28V
Red Amber White Green Blue	2990P1-6V 2990P3-6V 2990P4-6V 2990P5-6V 2990P6-6V	2990P1-12V 2990P3-12V 2990P4-12V 2990P5-12V 2990P6-12V	2990P1-28V 2990P3-28V 2990P4-28V 2990P5-28V 2990P6-28V
Lamp	#2112	#2162	#2187
Lead Color	White	Yellow	Purple
Mounting	Plug-button bezel		



SERIES 2990P

Line-O-Lite 2300 SERIES

RECTANGULAR INDICATOR LIGHTS

LINE-O-LITE rectangular neon indicator lights provide a perfect assembly for illuminating a message or high-lighting a function. Units are supplied complete with a built-in current-limiting resistor. Snapfit mounting reduces assembly time to a minimum. 2300 Series lights are available with a push-on speednut which adjusts to any panel thickness. Use 3600 Series lights to squeeze more illuminated legends into less panel space — or simply to complement your design. LINE-O-LITE Indicator Lights offer a desirable method of placing a bright, attention-getting bar of light on your product.

- UL Recognized — CSA Approved

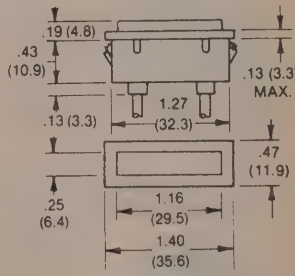
SERIES 2330D, 2330QD 1 5/32" x 13/32"

2330D
2330QD

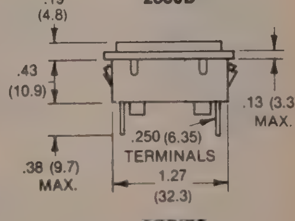
Mounting:	Will snapfit into .032/.100 (.81/.254) thick panel, use speednut for other panel thicknesses. Available with speednut SN1963 (see page 20). See page 20 for mounting hole dimensions
Wire Leads:	No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)
Terminals:	Tinned brass
Lens:	Polycarbonate
Bezel:	Chrome plated brass

	NEON		INCANDESCENT
	MODEL NO. 105-125 VAC		MODEL NO. 28V
LENS COLOR	WIRE LEADS	.250 TERMINALS	.250 TERMINALS
Red Amber White Green	2330D1 2330D3 2330D4 2332D5*	2330QD1 2330QD3 2330QD4 2332QD5*	2390QD1-28V 2390QD3-28V 2390QD4-28V 2390QD5-28V
Lamp	C6A + Resistor		#2187

* Incorporates G2B lamp and resistor



SERIES 2330D



SERIES 2330QD

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Line-O-Lite 3600 SERIES

SERIES 3620D, 3620QD 5/16″ x 55/64″

3620D
3620QD

Mounting: Will snapfit into .020/.130 (0.51/3.30) thick panel. See page 20 for mounting hole dimensions

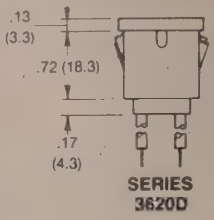
Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (111.8/121.9) long, stripped .43/.57 (10.9/14.5)

Terminals: Tinned brass

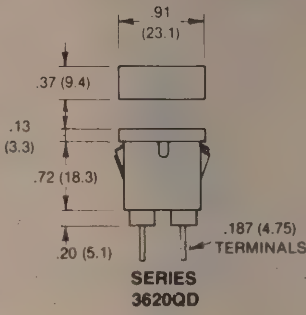
Lens: Polycarbonate

NEON		
MODEL NO. 105-125VAC		LENS COLOR
WIRE LEADS	.187 TERMINALS	
3620D1	3620QD1	Red
3620D3	3620QD3	Amber
3620D4	3620QD4	White
3622D5*	3622QD5*	Green
C2A + Resistor		Lamp

* Incorporates G2B lamp and resistor



SERIES 3620D



SERIES 3620QD

Omni-Glow 2600 SERIES

If you are looking for unmistakable indication, look at OMNI-GLOW 2600 Series Indicator Lights. These big lights are instant attention getters. A push-on speednut (included) provides secure mounting in any panel — and the mounting hole can be "D" shaped for keying. Economical to buy and install, these rugged, ultra-reliable indicator lights will enhance the appearance and performance of your product.

SERIES 2620K, 2620QK 7/8″ DIA.

SERIES 2620QK
SERIES 2620K

Mounting: See page 20 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 20)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

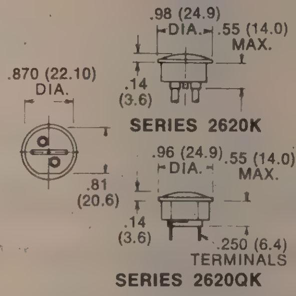
Terminals: Tinned brass

Lens: Polycarbonate

Housing: White nylon

NEON		
MODEL NO. 105-125VAC		
WIRE LEADS	.250 TERMINALS	LENS COLOR
2620K1	2620QK1	Red
2620K3	2620QK3	Amber
2620K4	2620QK4	White
2622K5*	2622QK5*	Green
C2A + Resistor		Lamp

* Incorporates G2B lamp and resistor



SERIES 2620K
SERIES 2620QK

SERIES 2620T 7/8″ DIA.

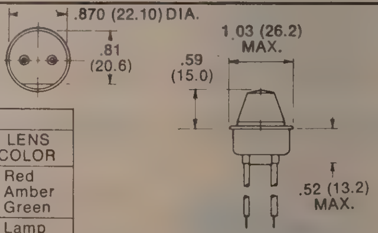
Mounting: See page 20 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 20)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

Lens: Polycarbonate

Bezel: Mirror finish chrome plated brass

Housing: White nylon



NEON		
MODEL NO. 105-125VAC	MODEL NO. 208-250V	LENS COLOR
2620T1	2621T1	Red
2620T3	2621T3	Amber
2622T5*	2623T5*	Green
C2A + Resistor		Lamp

* Incorporates G2B lamp and resistor

SERIES 2650T 7/8″ DIA. FLASHERS

These neon flashers incorporate a built-in flashing circuit to provide unmistakable indication even in high ambient light environments. Bulb is up into the lens and can be seen from any angle.

Mounting: See page 20 for optional mounting holes. Supplied with push-on speednut SN2089 (see page 20)

Wire Leads: No. 22 AWG (105°C), 4.4/4.8 (112/122.9) long, stripped .43/.57 (10.9/14.5)

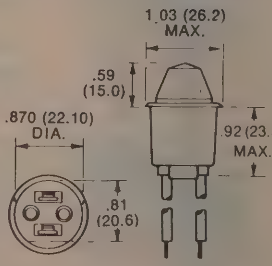
NEON	
MODEL NO. 105-125VAC	LENS COLOR
2650T1	Red
2650T3	Amber
C2A + Resistor	Lamp

Note: Flashing rate 60 to 120 per minute

Lens: Polycarbonate

Bezel: Mirror finish chrome plated brass

Housing: White nylon



* SEE PAGE 9 FOR LED RATINGS

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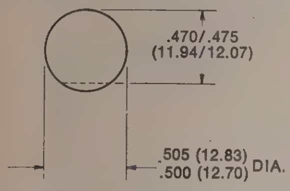
Mounting Information

MOUNTING HOLES

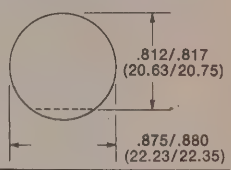
SERIES 1000, 3000

OPTIONAL ROUND OR FLAT

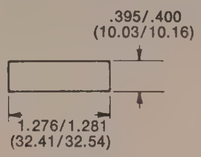

.470/.475
(11.94/12.07)
.505 (12.83)
.500 (12.70) DIA.

SERIES 2620K, 2620QK, 2620T, 2650T

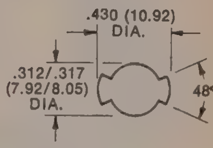
OPTIONAL ROUND OR FLAT


.812/.817
(20.63/20.75)
.875/.880
(22.23/22.35)

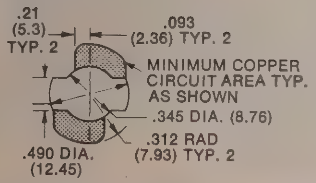
SERIES 2300


.395/.400
(10.03/10.16)
1.276/1.281
(32.41/32.54)

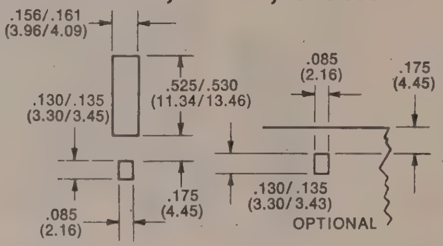
MODEL 4100


.430 (10.92)
DIA.
.312/.317
(7.92/8.05)
DIA.
48°

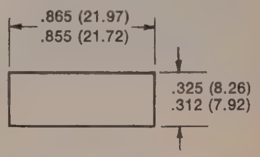
MODEL 4104, 4130, 4133


.21
(5.3)
TYP. 2
.093
(2.36) TYP. 2
MINIMUM COPPER
CIRCUIT AREA TYP.
AS SHOWN
.345 DIA. (8.76)
.312 RAD
(7.93) TYP. 2
.490 DIA.
(12.45)

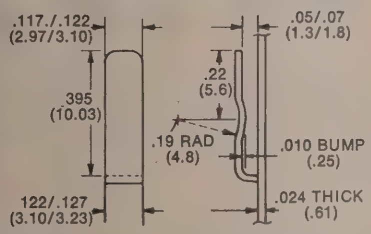
MODELS 4150, 4150L, 4150R


.156/.161
(3.96/4.09)
.130/.135
(3.30/3.45)
.525/.530
(11.34/13.46)
.085
(2.16)
.175
(4.45)
.085
(2.16)
.175
(4.45)
.130/.135
(3.30/3.43)
OPTIONAL

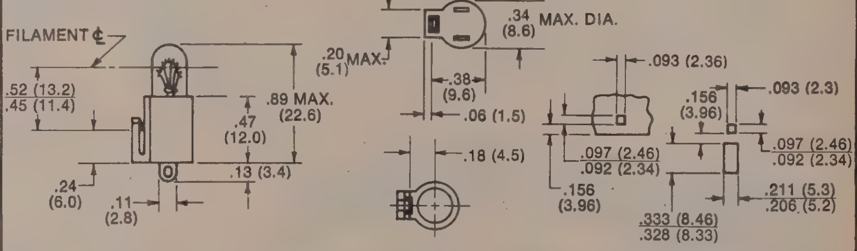
SERIES 3600


.865 (21.97)
.855 (21.72)
.325 (8.26)
.312 (7.92)

MODEL 4120

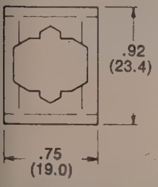

.117/.122
(2.97/3.10)
.05/.07
(1.3/1.8)
.22
(5.6)
.395
(10.03)
.19 RAD
(4.8)
.010 BUMP
(.25)
.122/.127
(3.10/3.23)
.024 THICK
(.61)

MODEL 4151

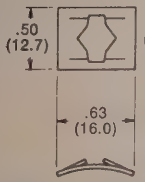

FILAMENT ℄
.52 (13.2)
.45 (11.4)
.89 MAX.
(22.6)
.47
(12.0)
.13 (3.4)
.24
(6.0)
.11
(2.8)
.20
(5.1) MAX.
.34
(8.6) MAX. DIA.
.38
(9.6)
.06 (1.5)
.18 (4.5)
.093 (2.36)
.093 (2.3)
.156
(3.96)
.097 (2.46)
.092 (2.34)
.097 (2.46)
.092 (2.34)
.156
(3.96)
.211 (5.3)
.206 (5.2)
.333 (8.46)
.328 (8.33)

Speednuts

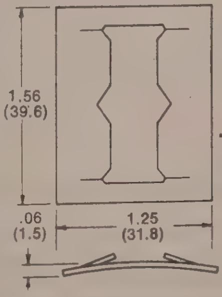
SN0461
For 1/2″ Dia.


.92
(23.4)
.75
(19.0)

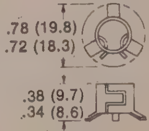
SN1287
For 5/16″ Dia.


.50
(12.7)
.63
(16.0)

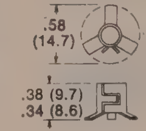
SN1963
For 1 9/32″ x 13/32″ Rectangular


1.56
(39.6)
.06
(1.5)
1.25
(31.8)

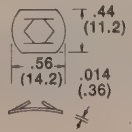
SN1336
For 1/2″ Dia.


.78 (19.8)
.72 (18.3)
.38 (9.7)
.34 (8.6)

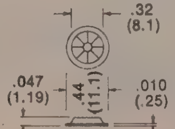
SN1220
For 19/64″ Dia.


.58
(14.7)
.38 (9.7)
.34 (8.6)

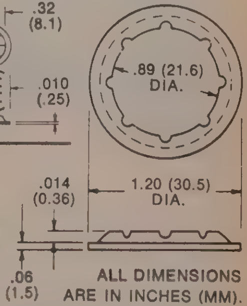
SN3678
For 1/4″ Dia.


.44
(11.2)
.56
(14.2)
.014
(.36)

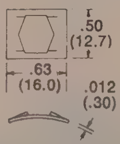
SN3775
For 5/32″ Dia.


.32
(8.1)
.047
(1.19)
.44
(11.1)
.010
(.25)

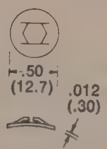
SN2089
For 7/8″ Dia.


.89 (21.6)
DIA.
.014
(0.36)
1.20 (30.5)
DIA.
.06
(1.5)

SN2212
For 19/64″ Dia.


.50
(12.7)
.63
(16.0)
.012
(.30)

SN2763
For 7/32″ Dia.


.50
(12.7)
.012
(.30)

ALL DIMENSIONS ARE IN INCHES (MM).

$25 Buys You $65 Worth Of Bright Ideas From IDI

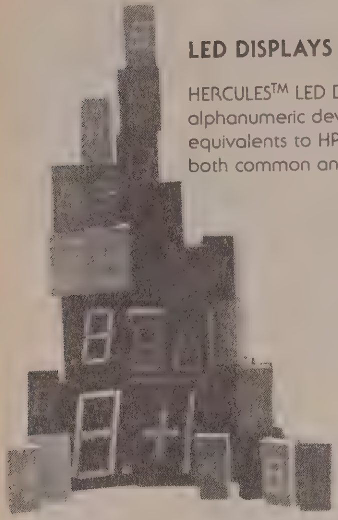
NEW EK-3 ENGINEER'S KIT IS AVAILABLE. Supplied in a handy compartmented plastic box full of $65 worth of IDI products you can use for building prototypes and to stimulate ideas for future projects. It costs us more than $25 for the samples, the box, and mailing it to you, but you can have EK-3 for a $25 check or money order along with the coupon. At this price don't ask us to bill you — check or money order with your order please. THE IDI ENGINEER'S KIT. Lots of big bright ideas in small packages.

ENGINEER'S KIT EK-3 28 LEDs and LED assemblies. 21 styles, 3 colors. Plain LEDs including Super-Brite and Extra-Super-Brite, panel-mounted LEDs, P.C. board-mounted LEDs, complete assemblies including current-limiting resistors and rectifier diodes.

In addition 9 sockets and relampable incandescent lamp assemblies, and 13 neon and incandescent non-relampable assemblies. In all over a dozen styles, 7 colors, 5 voltages, and 5 mounting hole sizes. Both wire lead and terminal types.

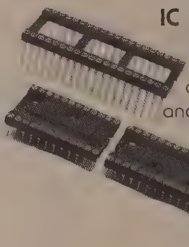
PLEASE SEND ME THE IDI EK-3 ENGINEER'S KIT. I enclose $25, check or money order.

IEE Component Products Division



LED DISPLAYS

HERCULES™ LED Displays offer a complete assortment of numeric and alphanumeric devices ranging in size from .27" to 2.0". All popular equivalents to HP, GI, TI, Fairchild, and Litronix displays are available in both common anode and common cathode configurations.

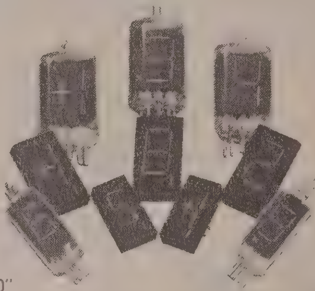


IC SOCKETS/CONNECTOR

PRECI-DIP™ features a full compliment of I.C. Sockets and pin-strips using precision, screw machine contacts. Standard items exceed MIL-G-45204 and MIL-T-10727 ratings.

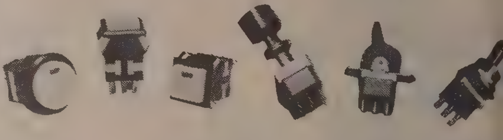
LED & INCANDESCENT LAMPS/INDICATORS

These high quality products are available in a broad range of styles, colors and industry standard sizes ranging from T-¾ (.094" Dia.) to T-2 (.250" Dia.). Various voltage and current ranges are available with complementary lens caps and other support hardware for panel mounting.



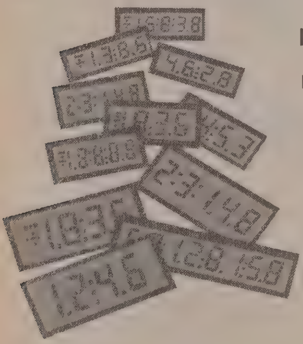
INCANDESCENT DISPLAYS

AURORA™ and APOLLO™ Displays are 7-segment digital displays available in .400", .472", .614" and 1.0" character heights. Models are offered with brightness levels suited to either indoor ambient lighting conditions or direct sunlight readable applications. The displays may be filtered to almost any desired display color, adding to their versatility. They operate at 5.0 volts, are multiplexible, TTL compatible and feature a ruggedized filament which yields extremely long life of more than 10 years on most models.



LED AND INCANDESCENT LIGHTED PUSHBUTTON SWITCHES – MINIATURE TOGGLE, ROCKER, LEVER AND PUSHBUTTON SWITCHES

The MULON™ Series Switches represent one of the smallest and brightest LED and incandescent illuminated switches on the market today. Featuring: snap action; self-cleaning contacts requiring less than one inch behind ½" panel using PCB terminal; silver contacts as standard, gold or alloy optional; high brightness with superb evenness of illumination across switch cap. Both spot type and full face illuminated caps are available in red, green and yellow. The OTAX™ line of premium quality miniature toggle, rocker, lever and pushbutton switches feature molded-in terminals, fine silver contacts, gold flashed terminals, stainless steel frame design.



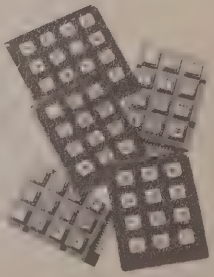
LCD DISPLAYS

POLARIS™ LCD Displays with permanently fixed DIL pins as standard, are available with a wide assortment of popular models in character heights of .35" to .70" and lengths of 3½ to 8 digits. Featured are reflective and transflective polarizers with commercial and high temperature/humidity fluids for almost every environment. Elastomeric design serves as an alternate means of termination and is available upon request.

QUALITY KEYBOARDS

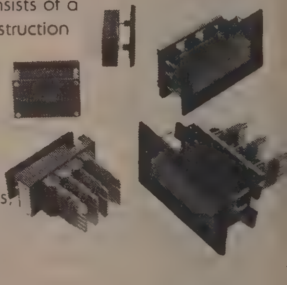
THRIFTSWITCH™ Keyboard products are offered in a variety of styles in 3x4 and 4x4 key formats. Both silicone conductive rubber and metal contact types with either rubber or double-shot molded keys are offered with all popular output codes.

The PCB's are gold-plated and each keyboard is supplied with an electrostatic shield to protect sensitive circuitry.



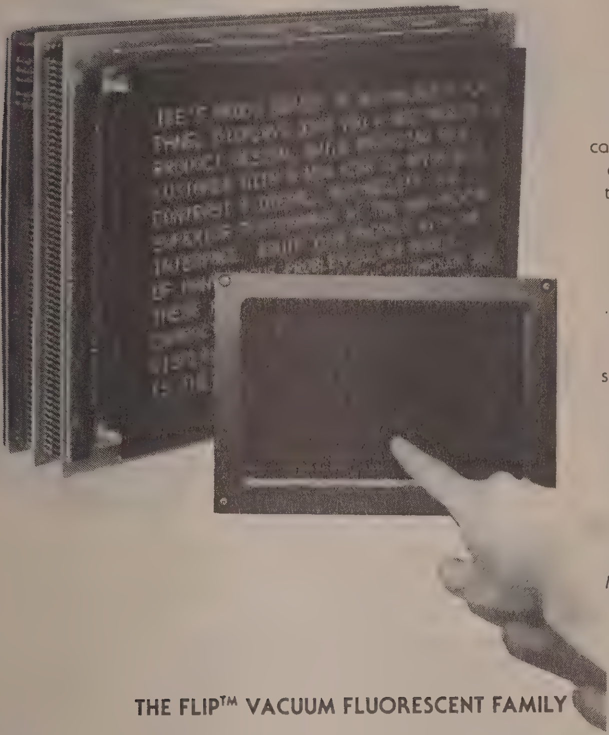
DISPLAY MOUNTING HARDWARE

ATLAS™ Mounting Hardware consists of a single piece, molded frame construction which accommodates LED, LCD and Incandescent displays in widths up to 8 digits. Each is fitted with a colored filter or clear viewing screen available in polarized and unpolarized materials. Mounting rails, sockets, and several decoder/driver assemblies have been made available to complement the individual display component.



INDUSTRIAL ELECTRONIC ENGINEERS, INC. ● 7740 Lemona Ave., Van Nuys, CA 91405 ● Tel. (818) 787-0311 ● TELEX: 4720556 IEE CPD

IEE® Industrial Products Division

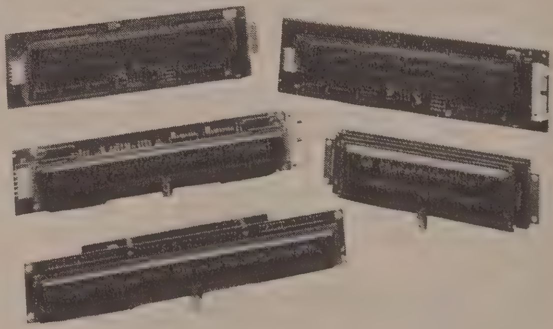


THE ARGUS™ GAS PLASMA FAMILY PEP™ INTERACTIVE TOUCH DISPLAY

These compact DC plasma display modules, some with interactive capabilities, revolutionized an entire industry. They utilize neon-orange or green 5x7 dot matrix plasma panels and integrated support electronics to produce bright, easy to read alphanumeric characters. U.S. ASCII and several European font sets are available, or optional custom programmed (masked ROM or EPROM) font sets can be provided at additional cost. Multiple lines (2, 4, 6, 8 & 12) of 16, 32 and 40 characters per line are standard with character heights of .21, .26 and .33 inches. A simple TTL level, 64-character 7-bit ASCII interface scheme is utilized (6 bits for characters, the 7th for cursor control). Most models contain on-board control, memory, and refresh electronics, further simplifying the interface task. Direct memory access (DMA), synchronous, asynchronous and individual character entry modes are all provided as standard features. Data rates of 40,000 to 750,000 characters per second are possible depending on the model and interface method chosen. Careful attention has been paid to packaging, resulting in very compact modules. ARGUS display life normally exceeds 30,000 hours, depending on application and environment. A wide range of accessories, including filters, power supplies, and serial data converters round out the current ARGUS Family. Low cost, "minimum logic" ARGUS MPX™ modules compatible with competitive product lines are also now available; and, the newest members of the Family, ARGUS AIM™, provide the user with 8-bit bus interfaces and low-voltage operation.

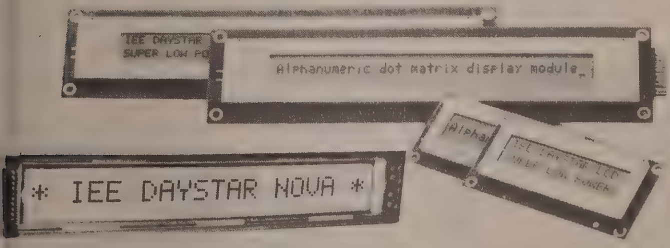
THE FLIP™ VACUUM FLUORESCENT FAMILY

These vacuum fluorescent display modules feature bright (100fL) blue-green characters filterable to blue, yellow, green or red. A wide variety of models use a 5x7 or 5x12 dot matrix format to display alphanumeric data along with European, scientific or custom characters. Available, 14-segment models allow display of upper case for low-cost applications. Single and multiple line displays are available with character heights ranging from .2" to .59". All FLIP modules operate on +5VDC only, and most are less than 1" deep. Each unit has a self-contained microprocessor and accepts both serial and parallel (8-bit bus) ASCII data. A number are drop-in replacements for competitive products and several are priced at under $100 in production quantities. The FLIP Family's latest additions are a line of extended temperature range models which operate from −40 to +85°C (−40 to +185°F). New models are frequently added to this growing and compatible line.



THE DAYSTAR™ LIQUID CRYSTAL FAMILY

Members of IEE's newest and fastest growing alphanumeric family, these low power, compact Liquid Crystal Display Modules are ideal for battery operated portable equipment, especially when sunlight readability is a must. Low-cost DAYSTAR single and multi-line displays are available as ASCII modules which interface easily to a 4 or 8-bit data bus. The new "unique to the industry" DAYSTAR NOVA line features large (.33 inch to .5 inch) characters, wide operating temperature (−30° to +85°C), and optional electroluminescent backlighting for night viewing. They operate on a single 5V power supply. Coming soon is a graphic LCD panel capable of up to 16 lines of alphanumeric data. The attractive DAYSTAR and DAYSTAR NOVA Alphanumeric LCD Families from the People you can trust at IEE.

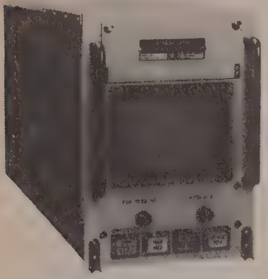


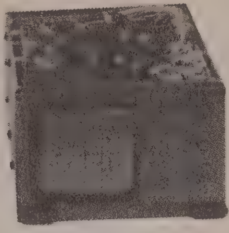
INDUSTRIAL ELECTRONIC ENGINEERS, INC. ● 7740 Lemona Ave., Van Nuys, CA 91405 ● Telephone (818) 787-0311 ● TWX: 910-495-4586

INFODEX INCORPORATED

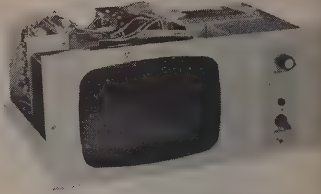
395 WEST MAIN STREET, WATERBURY, CT 06702 • (203) 757-9291

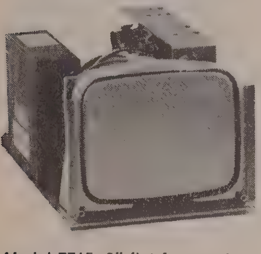
OEM CRT DISPLAYS

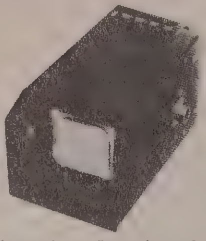

5″ waveform display for Airborne MIL-Spec application. Complete unit supplied ready for operation as shown.

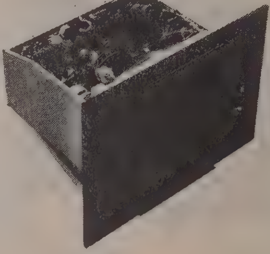

Model 7800. Extremely compact 3″ waveform monitor.

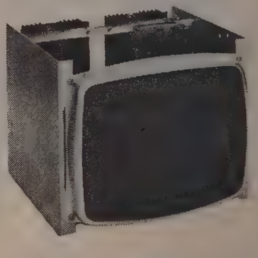
Ruggedized 12″ MIL-Spec raster scan display includes sealed face panel that provides EMI shielding and visual contrast enhancement.


Nonfade 8″ cardioscope display. Infodex supplied the industry's earliest nonfade designs in 1972. Many 8″ and 17″ versions are still in use in hospitals worldwide. Ruggedized 6″ and 12″ models are recommended for new design.


Model 7715. 6″ flat face raster scan display.


Unusual configuration of this 3″ oscilloscope display provides extremely dense and compact packaging that most effectively uses a limited mounting space.


Ruggedized 8″ x 11″ display includes special yoke supports designed to withstand 100g shocks.


Model 2780. 12″ X-Y display for medical applications, including ultrasound and nonfade cardiac.

Infodex CRT Displays include a wide range of standard sizes, capabilities, and features that encompass most needs of builders of military, industrial, and medical equipment. Custom models are also supplied in single or production quantities to satisfy individual requirements or provide special features. Recent applications for Infodex displays include:

MILITARY (MIL SPEC)

Flight simulators, Automatic carrier landing systems, Radar bomb directors, Weapons system trainers, Airborne and ground based electronic warfare systems.

MEDICAL

Ultrasonic diagnostic systems, X-Ray film recording (e.g., CAT scanners), EKG monitors, Nonfade cardiac monitors, Pulse monitors, X-Ray image intensifiers.

INDUSTRIAL

Graphic slide and film recorders, Engine analyzers, Television monitors, Oceanographic displays, Computer output graphics, Waveform monitors.

Most Infodex OEM displays are supplied as compact one piece assemblies, without enclosures, for direct installation behind control panels. Screens up to seven inch diagonal are typically flat face, and include both magnetic and electrostatic deflection amplifiers, video amplifiers, and high voltage power supplies. The only connections needed to use circuits are low level video and sync inputs, or X and Y deflection signals for random access displays. Units may be supplied to operate from 12, 15, 24, or 28 Vdc sources within user equipment, or from 110/220 Vac.

Custom displays may be variations of standard designs to provide special electrical or mechanical features, including repackaging to fit unusual or restricted spaces. Even completely new custom designs enjoy a head start based on our experience in solving CRT display problems for an extremely wide range of applications.

In military and medical applications, there can be no tradeoff on reliability, yet continuous operation is common at elevated temperatures and high humidity, and technical maintenance is often unavailable on site. Some techniques we have developed to deal with these hostile environments include:

- Sealing and encapsulating high voltage components to permit safe operation under conditions of 100% humidity, *with* condensation.
- Mechanical designs that can support tubes and deflection yokes to prevent damage or misalignment by severe shock and vibration.
- EMI shielding through the CRT faceplate, combined with optical filtering to enhance contrast in high ambient light conditions, while simultaneously avoiding fog due to condensation at 100% humidity, and permitting easy field replacement.
- Functionally separate replaceable modules that are designed for safe, easy fault isolation and fast replacement in the field.
- Diagnostic output signals that indicate normal conditions within the equipment, or the presence and location of a fault.

THE FOLLOWING TABLE LISTS THE MAJOR FEATURES OF SEVERAL REPRESENTATIVE DISPLAY MONITORS.

TYPE	MODEL	DEFLECTION	RATE	POWER	REMARKS
3″ X-Y	7800 7801	Electrostatic Electrostatic	1 MHz 1 MHz	12 Vdc 12 Vdc	Mount easily to user's panel. Adjustable, built-in sweep.
6″ X-Y	2740A	Magnetic	25,000 cm/sec	12 Vdc	Nonfade display (2000 x sweep time) for cardiac and medical monitors.
	2750A 2750B	Magnetic Magnetic	25,000 cm/sec 125,000 cm/sec	12 Vdc 15 Vdc	For waveforms in audio range. For fast waveforms.
6″ RASTER	7715 7715A	Magnetic Magnetic	525 line 525 line	12 Vdc 15 Vdc	600 line resolution. 800 line resolution.
7″ RASTER	7725	Magnetic	525 line	15 Vdc	1000 line resolution.
12″ X-Y	2780	Magnetic	200,000 cm/sec	24 Vdc	Ultrasound display.

INFODEX INCORPORATED

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At Infodex, we are specialists who manufacture just one product line — monitors and CRT displays. OEMs and builders of military, industrial, medical, and computer graphics equipment know that we can deliver one unit or 1000, and meet military specifications and industry standards.

STANDARD AND CUSTOM MONITORS AND DISPLAYS

Sizes from 1″ to 21″, with capabilities for on/off modulation or video images with shades of gray. Raster scan, stroke writing, and X-Y or waveform display. Many models already tested for shock, vibration, humidity, temperature, altitude, and EMI. Compact OEM configurations for simple, easy mounting. Models for direct viewing and film recording. Special displays for high ambient light conditions in industrial and airborne applications.

PRECISION X-Y CRT DISPLAYS

5″ and 7″ displays with extremely high resolution, brightness, and linearity. X-Y deflection with high slew rates and fast settling. High stability and repeatability. Precision power supplies, deflection amplifiers, tube mounts, and other components and modules separately available.

INFODEX EXPERIENCE BENEFITS USERS

Our experience in design, manufacturing, and testing of CRT displays means that every model benefits from proven approaches, especially in meeting stringent performance and environmental specifications. We have developed methods for mounting tubes and deflection yokes to withstand extremes of shock and vibration, yet remain compact and easily serviced. We have provided special combinations of CRT, optical filter, and antireflection coatings to provide bright, high contrast displays for use under high ambient light conditions.

INFODEX DISPLAYS CAN MEET MIL AND INDUSTRIAL STANDARDS

Workmanship on virtually all units, whether for military or commercial applications, meets MIL STD 454. The MIL-I-45208 level of 9858 Quality Assurance Program is in place, and we have quality assurance facilities to support all MIL SPEC production. All models conform to applicable EIA and ARINC standards, and are designed to comply with UL requirements, or to facilitate obtaining UL approval.

INFODEX FACILITIES FOR CRT DISPLAY TESTING

Infodex test equipment includes specialized generators that can provide a wide range of input signals as well as standard EIA test signals. Light measuring instruments permit accurate measurement of peak and average luminance, spot size, line width, contrast ratio, and modulation transfer function in accordance with accepted standards.

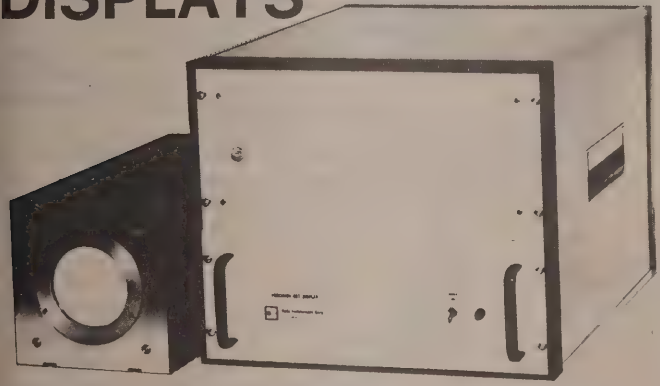
INFODEX DISPLAYS ARE COST EFFECTIVE

Standard models and standard subassemblies are kept in inventory, and can be quickly assembled or modified for fast delivery. Many designs have already been environmentally tested. Many special designs have already been delivered to users in production quantities.

THE RESULT

Infodex customers get reliable, proven CRT displays that can meet all applicable specifications, in less time and at lower cost than in house designs.

PRECISION X-Y CRT DISPLAYS



Infodex Precision CRT Displays are high performance X-Y displays that combine high resolution with accurate deflection, fast settling, and high stability. They are used in precision display applications such as:

- Film recorders and hard copy recorders
- Precision radar and sonar displays
- Computer output graphics displays
- Flying spot scanners
- Precision television monitors

PD series displays use magnetically deflected flat face cathode ray tubes with small deflection angles to achieve small spot size with minimum geometric distortion. Spot growth is minimized by dynamic focus, and electronic linearity correction is used to improve deflection accuracy and minimize pincushion distortion.

The displays are capable of random access X-Y deflection precisely proportional to X-Y input voltages (±5V full scale) at all rates from dc to the maximum specified bandwidth. Options include sawtooth and raster generators and PPI (rho-theta) generators for internal generation of deflection signals.

Spot intensity is controlled by separate unblanking (on/off) and video (analog) inputs. Options include phosphor protection circuits that blank the spot whenever writing speed drops below an adjustable minimum value, and gamma corrected video amplifiers that linearize the relationship between video signal amplitude and spot intensity.

PD displays consist of separate CRT and electronics assemblies that may be located several feet apart. The CRTs thus may be separately mounted in display panels, in camera or recorder structures, or other locations with restricted mounting space. The electronics assemblies are rack mounted chassis that contain low and high voltage power supplies, magnetic deflection amplifiers, video amplifiers, and low level correction and linearization circuits. An attractive metal cabinet is optionally available (see figure).

PRECISION DISPLAY COMPONENTS

High voltage supplies, deflection amplifiers, video amplifiers, linearization circuits, and precision adjustable tube mounts are separately available for OEMs who integrate precision CRT displays into their end products.

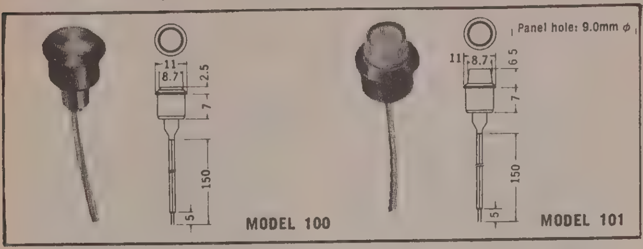
	PD900	PD950	PD1200	PD1250	PD1400
TUBE SIZE (DIA)	5″	5″	5″	5″	7″
USEFUL DIAMETER	4.25″	4.25″	4.25″	4.25″	6.25″
SPOT SIZE*, CENTER WITHIN USEFUL DIAMETER	.0015″ .0025″	.0015″ .0020″	.0007″ .0010″	.0013″ .0015″	.0008″ .0015″
SETTLING TIME (TO .1%)	10 usec	10 usec	14 usec	12 usec	14 usec
LINEARITY**	±1.0%	±.25%	±.5%	±.5%	±.5%
SMALL SIGNAL BANDWIDTH	1 MHz	1 MHz	.75 MHz	1 MHz	.75 MHz

* Measured by the slit analyzer method at the 50% point.
** Maximum deviation from ideal location anywhere within useful area, referred to full useful diameter.

IMLEC® INTER-MARKET INCORPORATED

1946 LEHIGH AVENUE, GLENVIEW, ILLINOIS 60025 • (312) 729-5330 • TWX 910-651-1997

MODELS 100/101 — MODULAR INDICATORS

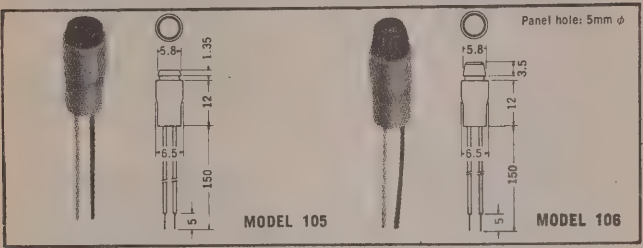

Panel hole: 9.0mm φ
11
8.7
2.5
7
150
5
MODEL 100
11
8.7
6.5
7
150
5
MODEL 101

Modular concept provides low cost and great versatility. Rubber bushing snaps into 9mm panel cut out. Lens then snaps into bushing from front while light source fits in from behind. Ordering example: F606-101-R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	F606	5-6.3V	50		
Incandescent	F614	12-14V	80	100-R Red	101-R Red
Incandescent	F628	24-48V	40	100-A Amber	101-A Amber
Neon	N5115	100-120V AC	1.5	100-G Green	101-G Gren
Green Glow	G5115	100-120V AC	1.5	100-B Blue	101-B Blue
Red LED	L-617RL	2.0 Typ	10	100-W White	101-W White
Green LED	L-617GL	1.9 Typ	10	100-C Clear	101-C Clear
Yellow LED	L-617YL	1.9 Typ	10		

MODELS 105/106 — MODULAR INDICATORS

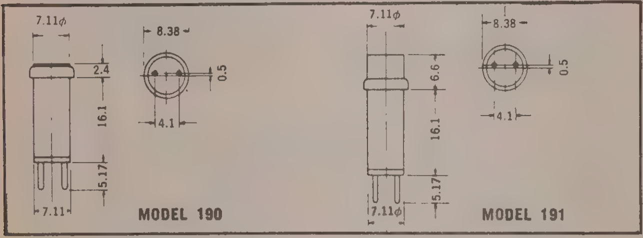

Panel hole: 5mm φ
5.8
1.35
12
6.5
150
5
MODEL 105
5.8
3.5
12
6.5
150
5
MODEL 106

Miniature modular concept requires only 5mm panel hole. They are installed by pressing the lens through the panel from the front into the rubber bushing containing the lamp on the back. Ordering example: F305-105-R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	F305	4-6V	60		
Incandescent	F314	12-14V	40	105-R Red	106-R Red
Incandescent	F328	24-28V	24	105-A Amber	106-A Amber
Neon	N3115	100-120V AC	1.0	105-G Green	106-G Green
Red LED	L-317RL	2.0 Typ	10	105-B Blue	106-B Blue
Green LED	L-317GL	1.9 Typ	10	105-W White	106-W White
Yellow LED	L-317YL	1.9 Typ	10		

MODELS 190/191 — CARTRIDGE LAMPS

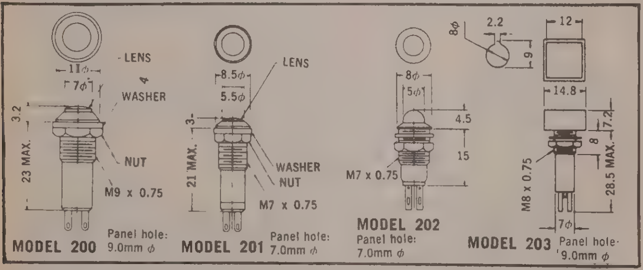

7.11φ
8.38
2.4
0.5
16.1
4.1
5.17
7.11
MODEL 190
7.11φ
8.38
6.6
0.5
16.1
4.1
5.17
7.11φ
MODEL 191

Cartridge style lamps are available in both flush and top hat type lens. Can be used in place of similar types from other manufacturers. Cartridge Lamp holders are also available as CLH-B (black) or CLH-S (silver).

SPECIFICATIONS — LIGHT SOURCE — LENSES

Light Source	Type	Voltage	mA	Flush Lens	Top Hat Lens
Incandescent	CLF06	5-7V	200		
Incandescent	CLF14	12-14V	80	190-R Red	191-R Red
Incandescent	CLF28	24-28V	40	190-Y Yellow	191-Y Yellow
Neon	CLN115	110-120	1.5	190-G Green	191-G Green
Green Glow	CLG	110-120	1.5	190-B Blue	191-B Blue
Red LED	CLLR	2.0	10	190-W White	191-W White
Green LED	CLLG	1.9	10	190-C Clear	191-C Clear
Yellow LED	CLLY	1.9	10		

MODELS 200 to 203 — INCANDESCENT INDICATORS

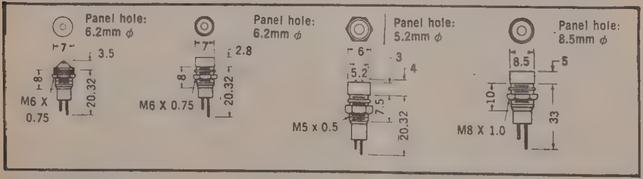

LENS
11φ
7φ
WASHER
3.2
23 MAX.
NUT
M9 x 0.75
MODEL 200
Panel hole: 9.0mm φ
LENS
8.5φ
5.5φ
3
21 MAX.
WASHER
NUT
M7 x 0.75
MODEL 201
Panel hole: 7.0mm φ
8φ
5φ
4.5
15
M7 x 0.75
MODEL 202
Panel hole: 7.0mm φ
8φ
2.2
6
12
14.8
7.2
8
28.5 MAX.
M8 x 0.75
7φ
MODEL 203
Panel hole: 9.0mm φ

Model 200 is rugged chrome plated brass with long life T1¾ lamp. Model 201 is smaller version of 200 above. Model 202 is chrome plated brass with removable lens for lamp replacement. Model 203 is designed to accommodate custom legends and is front relampable.

SPECIFICATIONS — LIGHT SOURCE — LENSES

Series	Type	Voltage	mA	Lens
200	FA06	5-7	50	R — Red
	FA14	12-14	30	
201	FB06	5-7	50	Y — Yellow
	FB14	12-14	30	
202	FK05	4-6	60	G — Green
	FK14	12-14	40	
	FK28	24-28	24	B — Blue
203	FJ06	5-7	200	
	FJ14	12-14	80	W — White
	FJ28	24-28	40	

MODELS 406 to 409 — SOLID STATE INDICATORS

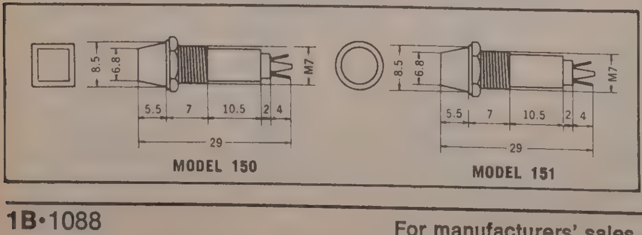

Panel hole: 6.2mm φ
7
3.5
8
M6 X 0.75
20.32
Panel hole: 6.2mm φ
7
2.8
8
M6 X 0.75
20.32
Panel hole: 5.2mm φ
6
3
5.2
4
7.5
M5 x 0.5
20.32
Panel hole: 8.5mm φ
8.5
5
10
M8 X 1.0
33

All of chrome plated brass except 409 is black anodized only, with low current LED lamp. Ordering example: LED-406R

SPECIFICATIONS — LIGHT SOURCE — LENSES

Type	Color (All)	Volts (All)	MA (All)	MCD
LED-406	R — Red	2.0	1.0	1.2
LED-407	G — Green			
LED-440	Y — Yellow			
LED-409				

MODELS 150/151 — UNIVERSAL INDICATORS


8.5
6.8
M7
5.5
7
10.5
2
4
29
MODEL 150
8.5
6.8
M7
5.5
7
10.5
2
4
29
MODEL 151

Attractive, low cost plastic assembly, mounts in 7mm hole with nut and washer supplied. Square or round in a variety of light sources and colors. Ordering example: F151-12R

HOW TO ORDER: XX - 15X - XXX

LIGHT SOURCE
F — Incandescent
L — LED
NR — Neon, w/resistor

SHAPE
0 — Square
1 — Round

VOLTS
06 — 6 Volts
12 — 12 Volts
24 — 24 Volts
10 — 110 Volts
20 — 220 Volts

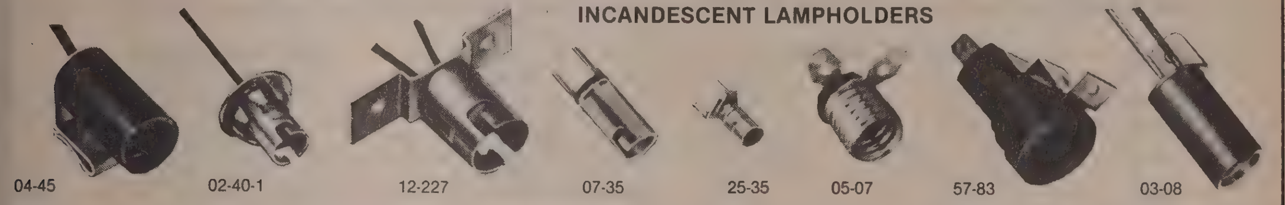
COLOR
A — Amber
G — Green
R — Red
C — Clear
B — Blue
Y — Yellow

"You See Us Everywhere"

LEECRAFT

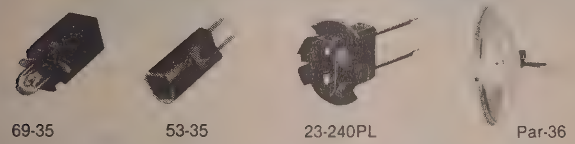
LAMPHOLDERS • INDICATOR LIGHTS • LED DEVICES

INCANDESCENT LAMPHOLDERS



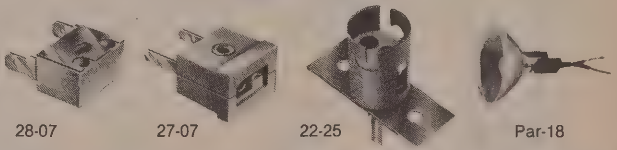
Leecraft lampholders are available in a full range of sizes from Midget through Intermediate bases. Hundreds of bracket styles, suitable for most applications, are available from stock. The illustrations shown are just a few of the standard designs Leecraft has manufactured for over 40 years. Special assemblies or mounting systems to specification are available on order.

WEDGE BASE LAMPHOLDERS



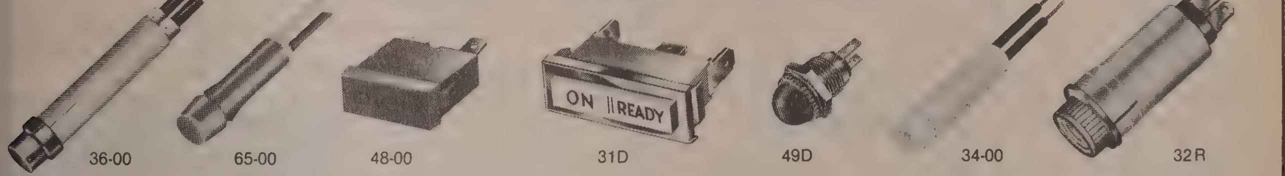
Wedge base lampholders and lamps offer the designer new ways to save time, money, weight and space. Brackets are available to accommodate comparable bayonet and screw base types. The Reflector-Light Par-36 high illumination reflector system is another important example of the wedge base concept at work — also available in Halogen.

HALOGEN CYCLE LAMPHOLDERS



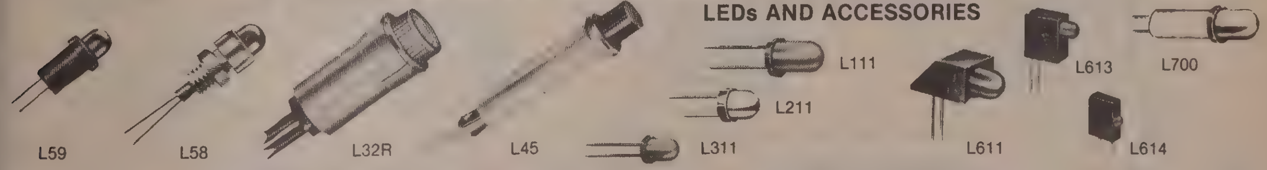
Halogen Cycle lamps and lampholders have the distinct advantages of high light output, efficiency and small size. The new, Par-18, Bi-pin high illumination Reflector-Light is one of many Halogen applications with extended useful lamp life and continued reliability through quality construction — also available in incandescent and wedge base.

NEON AND INCANDESCENT INDICATOR LIGHTS



Leecraft indicator light assemblies are available with low voltage incandescent lamps and up to 600 Volts neon. All standard colors may be selected. Most types are supplied with either tab terminals or 6" wire leads. While front mount is more common, rear mount styles are also available. The 31 Series shown above is available with dual colors and two units may be stacked for a double dual indicator in a single mounting hole. The 65-00 and 32-00 snap-fit standard 5/16" and 1/2" mounting holes respectively. Others are a press fit with speed nut supplied for additional security. Most popular types are available from stock. (UL/CSA may be specified).

LEDs AND ACCESSORIES



Lampholder Lighting Guide
LEECRAFT
Wedge Base Lighting
LEECRAFT

Leecraft also produces a full and versatile line of packaged and discrete hi-brightness LEDs. Shown above are some of the most popular styles, many of which snap fit into panels. Mounting hardware may also be ordered, if needed. Value added assemblies include flexible wire leads, internal or external dropping resistors, spacers, etc. Various sizes and styles of PC Board status or "no fault" LED Indicators are also available. Contact the local Leecraft Representative or the factory direct for details.

Write Today
for free LED, Indicator,
Reflector-Light and
Lampholder
Lighting Guides.

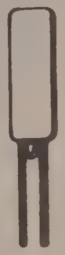
LEECRAFT MANUFACTURING CO., INC.
21-20 44th ROAD LONG ISLAND CITY, N.Y. 11101
(212) 392-8800 TWX: 710-582-2897

MURA®
CORPORATION

177 CANTIAGUE ROCK ROAD, WESTBURY, N.Y. 11590
(516) 935-3640/Telex: 967 879

INCANDESCENT, NEON AND FLORESCENT LAMPS

This page summarizes the many subminiature and miniature incandescent lamps, neons and florescent tubes available from Mura. For fast reference we have shown the size and voltage ranges that are available for each of the different standard lamp bases. Please call or write us for our complete catalog.

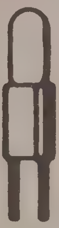


WIRE TERMINAL

Size	Voltage
T-¾	1½ - 5V
T-1	1¼ - 28V
T-1¼	1.3 - 28V
T-1¾	1.35 - 48
T-2	4 - 120V
TL-¾	
TL-1	

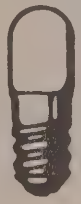
MIDGET FLANGED

T-¾	1½ - 5V
T-1	1¼ - 28
T-1¼	1.3 - 28
T-1¾	1.35 - 48
TL-¾	5V
TL-1	1.5 & 5V



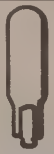
BI-PIN

T-¾	1½ - 5V
T-1	1¼ - 28V
T-1¼	1.3 - 28V
T-1¾	1.35 - 28V
TL-¾	5V
TL-1	1.5 & 5V



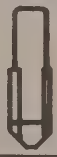
SCREW BASE

T-1¼	1.3 - 28V
T-1¾	1.35 - 28V
T-3¼	2 - 28V
GTL-3	1.2 - 2.33V
G-2	7-14 - 28V
G-3½	1.25 - 14.4V



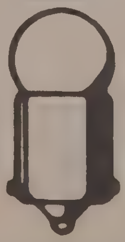
WEDGE BASE

T-1¾	6.3 - 28V
T-3¼	6.3 - 28V



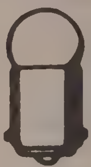
SLIDE BASE

T-2	4 - 120V



S/C BAYONET

T-3¼	2 - 55V
G-3½	6.3 - 18
G-4½	6.5 - 14
G-6	7 - 28
S-8	5 - 28



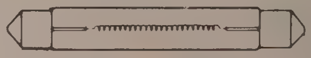
D/C BAYONET

Size	Voltage
G-6	7 - 28
S-8	5 - 28

STD. VOLTAGE LAMPS

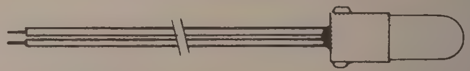
CANDELABRA	S-6	115 - 250V
	T-4½	115V
	C-7	115V
	T-6	115V
	T-7	115V
	T-8	115V
D.C. BAYONET	S-6	115V - 250V
	C-7	115V
	T-7	115V

FUSE LAMP



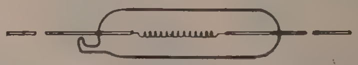
6 and 12 volt in lengths of 1.3″ and 1.7″

"L" SERIES



2 thru 28 volts
Standard with 6″ UL insulated leads.
Plastic lens caps in a variety of colors are available as well.

PIGTAIL LAMP



6 and 12 volt in lengths of 0.68″ and 1.05″

NEON LAMPS:

A wide selection of neon lamps with wire terminal, midget flange, telephone slide, bayonet and candelabra bases are available.

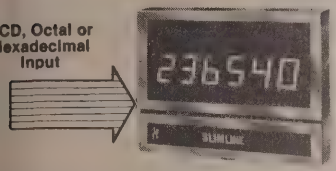
MINIATURE FLORESCENT:

Available in sizes T5 to T8, from 4 to 25 watts in daylight, coolwhite, black light and black light blue. U shaped and "tight-U" are also available.

SLIMLINE® DISPLAYS

LOCAL & DISTANT

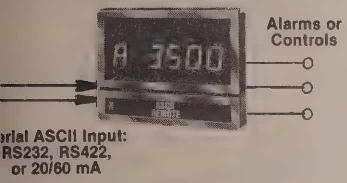
OCAL DISPLAY


CD, Octal or
exadecimal
Input
236540
SLIMLINE

Accepts BCD, octal or hexadecimal code and displays up to 6 digits in either an LCD or LED display. Meter will accept full parallel or data bus input. Large, bright displays are highly readable even in high ambient light conditions. Easy panel drilling, mounting and wiring.

• Latch capability • 2 to 6 digit models • LED or LCD displays • Large, bright, easily-read numerals • Non-glare faceplate • Polarity, decimal point, colons available • Accepts 5 to 24 V input • Surface mounting • 3-year warranty • Price: $140 - $200

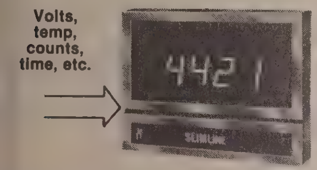
ISTANT DISPLAY


Alarms or
Controls
A 3500
REMOTE
erial ASCII Input:
RS232, RS422,
or 20/60 mA

Units accept 2-wire serial ASCII input for numerical and most alpha character display. There are also ASCII controlled output capabilities to provide alarm or control functions. There is individual character control (dimming, flashing and blanking).

• Accepts RS232, 422 or 20/60 mA loop • 110 - 9600 baud • Limited alpha capability • μprocessor based • Large, bright display, easily read • Flexible addressing capability • ASCII Command switch outputs • Rugged industrial design • 3-year warranty • Price: $325 - $450

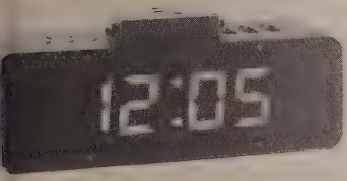
IGNAL READOUT


Volts,
temp,
counts,
time, etc.
4421
SLIMLINE

Display a wide range of volts, amps, watts, resistance, counts, temperature, etc. with these units. Meters include full input conditioning and built-in A-to-D signal conversion. Unit can be field scaled to read out directly in any desired engineering unit.

• 2 to 6 digits • Highly rugged, accurate input circuitry • Preset units • Data outputs available • μprocessor-based units • Easy wiring - no soldering necessary • Easy panel surface mounting • Large, bright easily-read display • 3-year warranty • Price: $140 - $350

ARGE DISPLAY

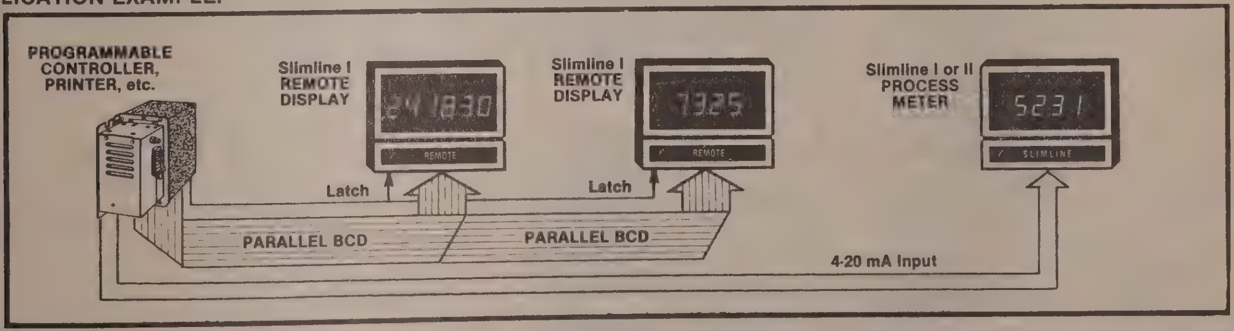


Meters feature 3 or 5-inch, 7 segment, incandescent displays. Many different colors are available Meter will accept inputs from:

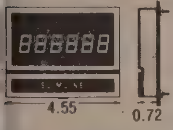
1) Parallel data (BCD, octal, hexadecimal)
2) Serial ASCII (RS232, 422, 20/60 mA)
3) Wide metering range (volts, amps, temperature, counts, time, etc.)

• Self-contained displays • Bright displays for long distance viewing • Decimal point or colons available • Latching and blanking capabilities • Rugged, NEMA-12 industrial enclosure • Great for distances up to 250′ • Price: $650 - $750

PLICATION EXAMPLE:


PROGRAMMABLE
CONTROLLER,
PRINTER, etc.
Slimline I
REMOTE
DISPLAY
241830
REMOTE
Slimline I
REMOTE
DISPLAY
7325
REMOTE
Slimline I or II
PROCESS
METER
5231
SLIMLINE
Latch
Latch
PARALLEL BCD
PARALLEL BCD
4-20 mA Input

LIMLINES' UNIQUE FEATURES


888888
4.55
0.72

Size: 4.55″ x 3.55″ x 0.72″. Panel surface mounting means easy & fast installation. Also fast wiring – no soldering needed.

igh Quality: Less downtime, long seful life. Much better investment: ocketed parts and highest quality components. Conservative design; works well in harsh factory environments, not like other meters that are made to only work in a laboratory.

Who Uses: With over 1 million meters shipped, NES is recognized as the leader in high quality industrial meters. Some users are: the Space Shuttle, Air Force 1, virtually all of the Fortune 1000's and tens of thousands of others.

Other Products: NES designs & manufactures over 3,000 different products from Broadcast Automation Computers to the broadest range of panel meters available.

Please call us. It is easy to talk to one of our expert Application Engineers. They care about your problem and will do all they can to assure your success.

Call: ***(312) 289-8820***

NES, Inc. ***NATIONWIDE ELECTRONIC SYSTEMS***
1536 Brandy Parkway, Streamwood, IL 60103 • (312) 289-8820

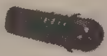
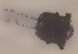
For other products in EEM from NES, see Sections 2000, 2200, 2325 & 2950.

OAK INDICATORS

INDICATOR SELECTION GUIDE

INCANDESCENT		
SIZE	**DESCRIPTION**	**SERIES**
T-1 	General Purpose, Sub-Miniature	99-33180
		99-33080
	Sub-Miniature, Watertight	95-33180
T-1¾ 	General Purpose, Miniature	14-33880
		14-33881
		14-33882
		14-30380
		14-30080
	Watertight	15-30083
	Watertight, Press-to-Test	05-91182
		05-90880
	E.M.I. Suppressed	18-36880
	E.M.I., Watertight	18-36680
	E.M.I., Watertight, Press-to-Test	08-83283
T-3¼ 	General Purpose, Press-to-Test	04-VM905
		02-91180
	Watertight, Press-to-Test	06-91182

NEON		
SIZE	**DESCRIPTION**	**SERIES**
T-1 	Sub-Miniature	99-33080
T-2 	General Purpose, Miniature	22-35380
		33-30880
		33-30881
	E.M.I. Watertight	38-36680
T-3¼ 	E.M.I. Suppressed	38-83681
		38-83682

LIGHT EMITTING DIODE (L.E.D.)		
SIZE	**DESCRIPTION**	**SERIES**
	General Purpose, Miniature	14-35380
	Low Cost, Hi-Rel Specifications, Easy Mounting	T-1¾

* UL Recognized
☐ MILITARY APPROVED

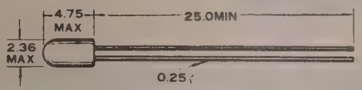
OAK SWITCH SYSTEMS INC. P.O. Box 517, Crystal Lake, IL 60014
(815) 459-5000 • TWX 910-634-3353 • TLX 72-2447

OSHINO

unit in m/m

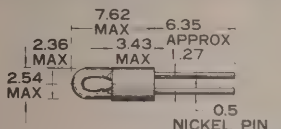
SUBMINIATURE LAMP BULBS

1. T-3/4 Wire Terminals US Mil. Std MS90452


4.75 MAX
25.0MIN
2.36 MAX
0.25

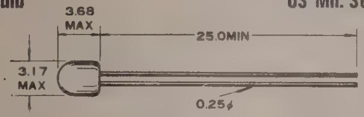
1.5-5V

2. T-3/4 Bi-Pin


7.62 MAX
6.35 APPROX
2.36 MAX
3.43 MAX
1.27
2.54 MAX
0.5 NICKEL PIN

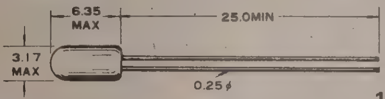
1.5-5V

3. T-1 Short Bulb US Mil. Std. MS90451


3.68 MAX
25.0MIN
3.17 MAX
0.25⌀

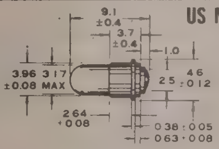
1.5-5V

4. T-1 Wire Terminals US Mil. Std. MS24367


6.35 MAX
25.0MIN
3.17 MAX
0.25⌀

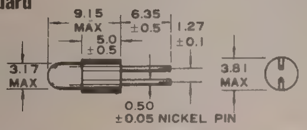
1.5-28V

5. T-1 Sub-Midget Flanged Base (SM4s/4) US Mil. Std. MS24515 MS3338


9.1 ±0.4
3.7 ±0.4
1.0
3.96 ±0.08
3.17 MAX
4.6
2.5 ±0.12
2.64 ±0.08
0.38 ±0.05
0.63 ±0.08

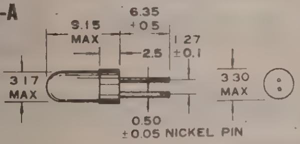
1.5-28V

6. T-1 Bi-Pin Standard


9.15 MAX
6.35 ±0.5
1.27 ±0.1
5.0 ±0.5
3.17 MAX
3.81 MAX
0.50 ±0.05 NICKEL PIN

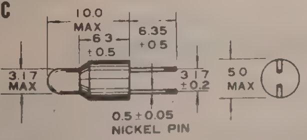
1.5-28V

7. T-1 Bi-Pin Type-A


9.15 MAX
6.35 ±0.5
1.27 ±0.1
2.5
3.17 MAX
3.30 MAX
0.50 ±0.05 NICKEL PIN

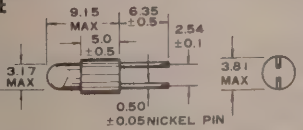
1.5-28V

8. T-1 Bi-Pin Type-C


10.0 MAX
6.3 ±0.5
6.35 ±0.5
3.17 MAX
3.17 ±0.2
5.0 MAX
0.5 ±0.05 NICKEL PIN

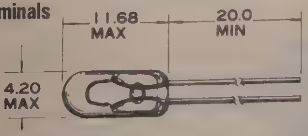
1.5-28V

9. T-1 Bi-Pin Type-E


9.15 MAX
6.35 ±0.5
2.54 ±0.1
5.0 ±0.5
3.17 MAX
3.81 MAX
0.50 ±0.05 NICKEL PIN

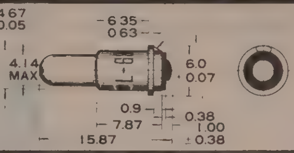
1.5-28V

10. T-1 1/4 Wire Terminals


11.68 MAX
20.0 MIN
4.20 MAX

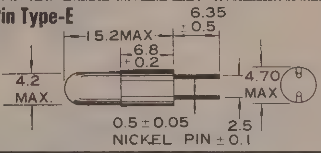
1.5-60V

11. T-1 1/4 Special Flarged


4.67 ±0.05
6.35
0.63
4.14 MAX
6.0 ±0.07
0.9
7.87
0.38
1.00 ±0.38
15.87

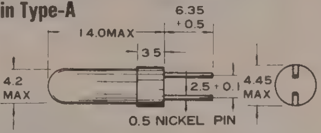
1.5-60V

12. T-1 1/4 Bi-Pin Type-E


6.35 ±0.5
15.2MAX
6.8 ±0.2
4.2 MAX.
4.70 MAX
0.5 ±0.05 NICKEL PIN
2.5 ±0.1

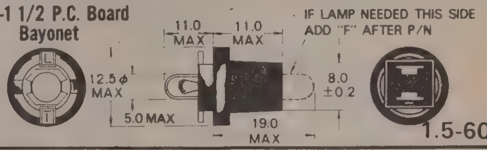
1.5-60V

13. T-1 1/4 Bi-Pin Type-A


6.35 ±0.5
14.0MAX
3.5
4.2 MAX
2.5 ±0.1
4.45 MAX
0.5 NICKEL PIN

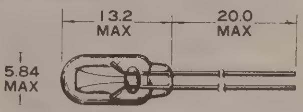
1.5-60V

14. T-1 1/2 P.C. Board Bayonet


11.0 MAX
11.0 MAX
IF LAMP NEEDED THIS SIDE ADD "F" AFTER P/N
12.5⌀ MAX
8.0 ±0.2
5.0 MAX
19.0 MAX

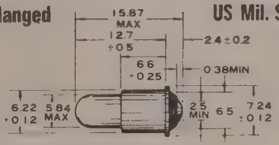
1.5-60V

15. T-1 3/4 Wire Terminals


13.2 MAX
20.0 MAX
5.84 MAX

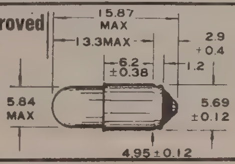
1.5-60V

16. T-1 3/4 Midget Flanged (MF6s/8) US Mil. Std. MS25237 JIS C7522


15.87 MAX
12.7 ±0.5
2.4 ±0.2
6.6 ±0.25
0.38MIN
6.22 ±0.12
5.84 MAX
2.5 MIN
6.5
7.24 ±0.12

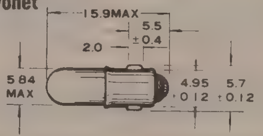
1.5-60V

17. T-1 3/4 Midget Groved (MG6s/9)


15.87 MAX
13.3MAX
2.9 ±0.4
6.2 ±0.38
1.2
5.84 MAX
5.69 ±0.12
4.95 ±0.12

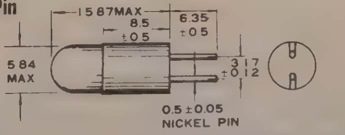
1.5-60V

18. T-1 3/4 Midget Bayonet (BA5s)


15.9MAX
5.5 ±0.4
2.0
5.84 MAX
4.95 ±0.12
5.7 ±0.12

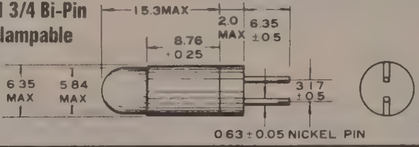
1.5-60V

19. T-1 3/4 Bi-Pin


15.87MAX
8.5 ±0.5
6.35 ±0.5
5.84 MAX
3.17 ±0.12
0.5 ±0.05 NICKEL PIN

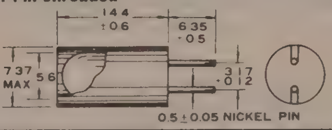
1.5-60V

20. T-1 3/4 Bi-Pin Relampable


15.3MAX
2.0 MAX
6.35 ±0.5
8.76 ±0.25
6.35 MAX
5.84 MAX
3.17 ±0.5
0.63 ±0.05 NICKEL PIN

1.5-60V

21. T-1 3/4 Bi-Pin Shrouded


14.4 ±0.6
6.35 ±0.5
7.37 MAX
5.6
3.17 ±0.12
0.5 ±0.05 NICKEL PIN

1.5-28V

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- ☐ Low Cost
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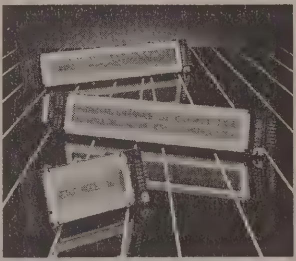
- ☐ Extended Operating Temperature −30°C to 85°C
- ☐ Various polarizer and reflectors including color
- ☐ Attached pins or elastomer versions are available
- ☐ Compatible with other manufacturer's LCD's

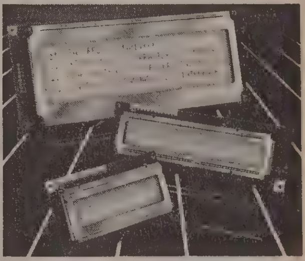
Model No.	Digit Ht. (Inch)	Glass Size (Inch)	Description
SP-530	0.35	2.00 x 0.90 x 0.103	3½ DIGIT, +, ←, :
SP-531	0.35	2.00 x 0.90 x 0.103	4 DIGIT, :
SP-516	0.30	2.00 x 0.90 x 0.103	4½ DIGIT, +, ←, :
SP-521	0.50	2.00 x 1.20 x 0.103	3½ DIGIT, −, LO BAT, :
SP-503	0.50	2.00 x 1.20 x 0.103	3½ DIGIT, +, ←, :
SP-505	0.50	2.00 x 1.20 x 0.103	4 DIGIT, :
SP-501	0.47	2.00 x 1.20 x 0.103	4½ DIGIT, +, LO BAT, :
SP-532	0.50	2.75 x 1.20 x 0.103	6 DIGIT, :, :
SP-535	0.50	3.70 x 1.20 x 0.103	8 DIGIT, :, :, :
SP-537	0.70	2.75 x 1.50 x 0.103	4 DIGIT, :
SP-508	0.70	2.75 x 1.50 x 0.103	3½ DIGIT, :, +, ←
SP-538	0.70	3.20 x 1.50 x 0.103	5 DIGIT, :
SP-511	0.70	3.70 x 1.50 x 0.103	6 DIGIT, :, :
SP-540	1.0	3.70 x 1.80 x 0.103	4 DIGIT, :
SP-541	1.0	4.50 x 1.80 x 0.103	5 DIGIT, :
SP-542	1.0	5.35 x 1.80 x 0.103	6 DIGIT, :, :
SP-533	—	2.75 x 1.20 x 0.103	101 bar graph
SP-539	—	3.70 x 1.50 x 0.103	2 column, 20 bars each

DOT MATRIX MODULES

Seiko Instruments "Smart Dot" modules all have the LCD drivers and controller on board which provides easy interface and saves host CPU overhead.

- ☐ Low power consumption
- ☐ High contrast
- ☐ Wide viewing angle
- ☐ Compact construction
- ☐ 5 x 7 dot matrix plus cursor
- ☐ Character generator and Data RAM on board
- ☐ Wide logic voltage range
- ☐ Serial and parallel interface versions available
- ☐ Ribbon cable interface
- ☐ Wide operating and storage temperature range
- ☐ EL Backlight Option





SERIAL INTERFACE

Model	Outside Dim. (W x H x D)	No. Char. x No. Line	Char. Size (W x H) With Cursor	Dot Size (W x H)
M1621	106 x 35.6 x 11	16 x 1 line	2.9 x 5.3	0.5 x 0.5
M1622	106 x 35.6 x 11	16 x 2 lines	2.9 x 5.3	0.5 x 0.5
M3221	190 x 33 x 10	32 x 1 line	3.4 x 6.0	0.6 x 0.6
M3222	190 x 33 x 10	32 x 2 lines	2.9 x 5.1	0.5 x 0.5
M3214	210 x 80 x 13	32 x 4 lines	3.50 x 6.45	0.62 x 0.65
M4021	190 x 33 x 10	40 x 1 line	2.7 x 5.0	0.5 x 0.5
M4022	190 x 33 x 10	40 x 2 lines	2.7 x 5.0	0.5 x 0.5

Unit : mm

PARALLEL INTERFACE

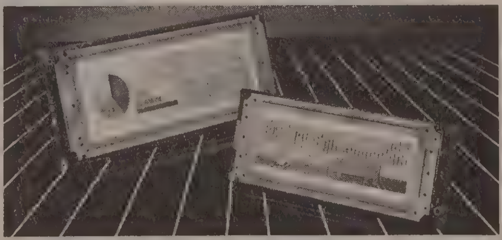
Model	Outside Dim. (WxHxD)	No. Char. x No. Lines	Char. Size (WxH) With Cursor	Dot Size (WxH)
M1611	85x30x10	16x1 line	2.9x5.3	0.5x0.5
M1631	80x36x10	16x1 line	3.2x8.7	0.55x0.7
M1612	106x30x10	16x2 lines	2.9x5.3	0.5x0.5
M2411	126x36x10	24x1 line	3.2x8.7	0.55x0.7
M3211	186x33x10	32x1 line	3.4x6.0	0.6x0.6
M3212	186x33x10	32x2 lines	2.9x5.1	0.5x0.5
M4011	186x33x10	40x1 line	2.7x5.0	0.45x0.45
M4012	186x33x10	40x2 lines	2.7x5.0	0.45x0.45
M4014	200x70x13	40x4 lines	3.1x5.9	0.54x0.57
M8011	260x43x9.4	80x1 line	2.3x4.5	0.39x0.43

Unit: mm

GRAPHIC MODULES

Model	Outside Dim. (WxHxD)	Dot Format (Row x Column)	Display Area (WxH)	Dot Size (WxH)
F1632	210x80x13	32x160	143.9x33.8	0.8x0.96
F2416	220x80x13	64x240	149.9x41.2	0.55x0.57
F4816	270x70x13	64x480	215.9x31.9	0.375x0.425
F481C	290x110x13	128x480	215.9x63.9	0.375x0.425
F641D	300x16x13	200x640	256x87.9	0.35x0.38

Unit: mm



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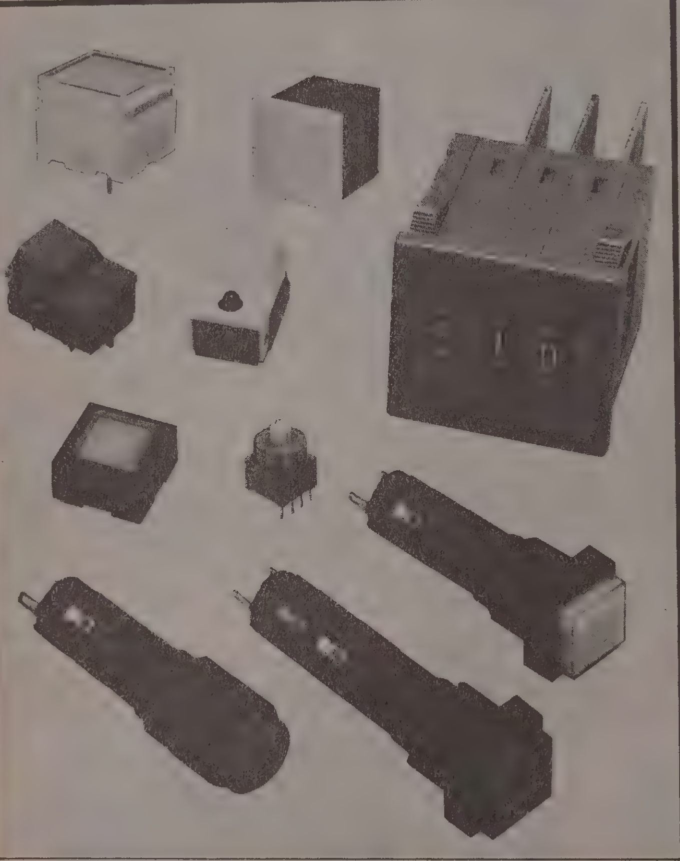

SWITCHES—LED or incandescent lighted pushbutton ■ lighted and unlighted momentary key ■ thumbwheel and pushwheel ■ rotary DIP ■ illuminated PCB mount

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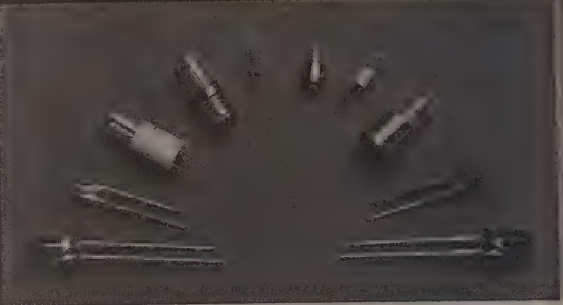
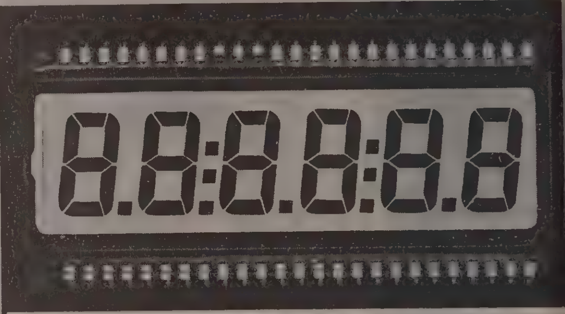


INCANDESCENT & NEON LAMPS
LED LAMPS (T-1 and T-1¾)



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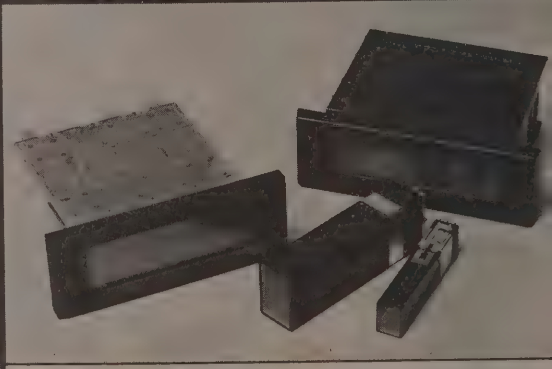

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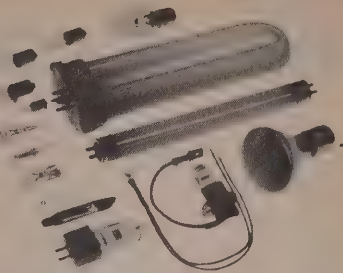


MINIATURE AND SUBMINIATURE LAMPS

GLOBES AND FILAMENTS

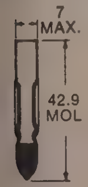
The products illustrated and listed are only a small representation of the full range of items available.

GENERAL SPECIFICATIONS The following chart gives a range of specifications available within each globe size.

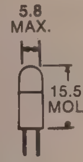
GLOBE	VOLTS	AMPS	CANDLE POWER	LIFE	FILAMENT	BASES AVAILABLE
T½	1.5	15 MA	0.003	100 Hrs.	——	W.T.
T-1	3-5	.010-.115	.0005-.15	25,000-40,000 Hrs.	C-2R	W.T., Sub. Min. Flg.
T1¾	1.3-28	.03-.20	.001-.60	30-30,000 Hrs.	S-2, C-6, C-2R, C-2V, C-2F	W.T., S.C. Mid. Flg., Mid. Screw, Bi-Pin, Mid. Grooved, Wedge
T-2	6-60	.017-.16	.04-.75	1,500-15,000 Hrs.	C-2R, C-2V, C-2F, C-5	Tel. Slide #1, #2, #5, W.T.
TL-3	1.2-2.33	.22-.27	——	5-10 Hrs.	S-2, C-2R	Min. Screw, W.T.
G3½	1.25-28	.035-.50	.03-3.5	1-5000 Hrs.	S-2, C-2R, C-2V, C-2F	Min. Screw, Bi-Pin, Min. Bay., W.T.
G4½	1.25-28	.04-.60	.09-3.7	3-5000 Hrs.	C-6, S-2, C-2R, C-2V, C-2F	Min. Screw, Min. Bay., Bi-Pin
B3½	1.9-12.5	.07-.55	.15-5.5	3-50 Hrs.	C-2R	S.C. Min. Flg.
T3¼	2-55	.05-.50	.04-3.4	100-20,000 Hrs.	S-2, C-2R, C-6, C-2V, C-2F	Min. Screw, Min. Bay., W.T., Wedge, S.C. Bay.
G-6	5.8-34	.16-1.10	2.3-8.1	10-5000 Hrs.	C-2R, C-2V, 2C-2V, C-2F	Min. Screw, S.C. Bay., D.C. Bay., Cand. Screw
S-8	4-40	.38-5.0	2.5-36	20-5000 Hrs.	C-2R, C-6, C-2V, CC-6, 2C-6, 2C-2R	S.C. Bay., D.C. Bay., S.C. Pf., D.C. Pf., D.C. Index, W.T.
RP-11	4.5-44	.47-6.53	5.7-105	25-400 Hrs.	C-6, C-2V, C-2R, 2CC-6, C-5, C-13	S.C. Pf., D.C. Bay., S.C. Bay., D.C. Pf.

ABBREVIATIONS

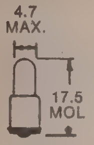
A — Amperes
Bay. — Bayonet
C — Candlepower
Cand. — Candelabra
Cont. — Contact
C.I.M. — Construction & Industrial Machinery
D.C. — Double Contact
Flg. — Flanged
Med. — Medium
Mid. — Midget
Min. — Miniature
Nom. — Nominal
Pf. — Prefocus
S.C. — Single Contact
Spec. — Special
Tel. — Telephone
Term. — Terminals
V — Volts
W — Watts



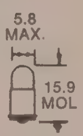
T-2
Tel. Slide
Base



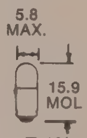
T-1¾
Bi-Pin
Base



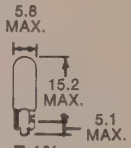
TL-1¾
S.C. Mid. Flg.
Base



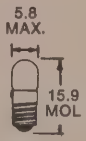
T-1¾
S.C. Mid. Flg.
Base



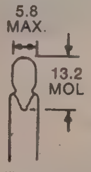
T-1¾
Mid. Grooved
Base



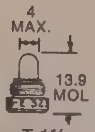
T-1¾
Wedge
Base



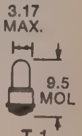
T-1¾
Midget Screw
Base



T-1¾
Wire Term.
Base

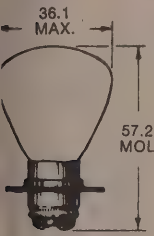


T-1¼
Special
Base

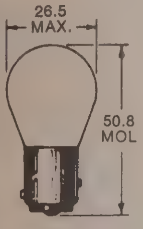


T-1
Sub.-Mid. Flg.
Base

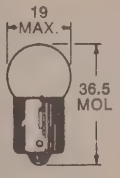
FILAMENT SHAPES AVAILABLE Straight (not coiled)
Coiled
Coiled Coil
Flat Coil
Supported



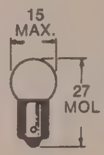
RP-11
D.C. Pref.
Base



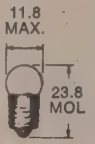
S-8
D.C. Index
Base



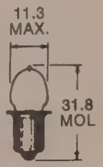
G-6
S.C. Bay.
Base



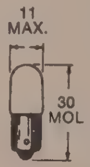
G-4½
Min. Bay.
Base



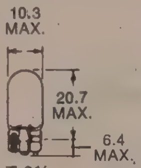
G-3½
Min. Screw
Base



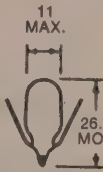
B-3½
S.C. Min. Flg.
Base



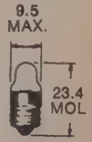
T-3¼
Min. Bay.
Base



T-3¼
Wedge
Base



T-3¼
Wire Term.
Base



TL-3
Min. Screw
Base

FLUORESCENT LAMPS

BULB	ORDERING CODE	COLOR DESCRIPTION	COLOR TEMP. (K)	BASE (bi-pin)	NOMINAL WATTS (W)	NOMINAL LENGTH(1)		TUBE DIAMETER			APPROX. INITIAL LUMENS (Lm)(2)	APPROX. LIFE (hrs.)
						(mm)	(inches)	(mm)	(inches)	(type)		
	F4T5/D	Daylight	6500	Med	4	134.5	6	15.5	⅝	T-5	120	3000
	F4T5/CW	Cool White	4300	Med	4	134.5	6	15.5	⅝	T-5	135	3000
	F6T5/D	Daylight	6500	Med	6	210.5	9	15.5	⅝	T-5	250	3000
	F6T5/CW	Cool White	4300	Med	6	210.5	9	15.5	⅝	T-5	300	3000
	F8T5/D	Daylight	6500	Med	8	287	12	15.5	⅝	T-5	400	3000
	F8T5/CW	Cool White	4300	Med	8	287	12	15.5	⅝	T-5	470	3000
	F10T8/D	Daylight	6500	Med	10	330	13	25.5	1	T-8	445	5000
	F10T8/CW	Cool White	4300	Med	10	330	13	25.5	1	T-8	490	5000
	F15T8/D	Daylight	6500	Med	15	436	18	25.5	1	T-8	775	5000
	F15T8/CW	Cool White	4300	Med	15	436	18	25.5	1	T-8	850	5000
	F20T10/D	Daylight	6500	Med	20	589	24	32	1¼	T-10	1070	7500
	F20T10/CW	Cool White	4300	Med	20	589	24	32	1¼	T-10	1210	7500
	F40T10/D	Daylight	6500	Med	40	1198	48	32	1¼	T-10	2790	10,000
	F40T10/CW	Cool White	4300	Med	40	1198	48	32	1¼	T-10	3170	10,000

Items shown represent a small portion of the full production line. Circular, Rapid-Start, High-Output and Decorative Fluorescent Lamps also available. Consult Shogyo for full line catalog.

Shogyo also produces a full line of S-8, RP-11, Xenon flash tubes, C7½, C9½, Festoons, Neons, Fluorescents, and Germicidal lamps.

For detailed information covering the individual industry lamp numbers . . . Please write or call for our full line lamp catalog.

SEE OUR OTHER CATALOG PAGES IN EEM SECTIONS 1300/2100/2950/4750/5600/6000

---

1) Nominal Length indicated by (mm) is the overall length of one lamp base face to base face.

2) Approx. Initial Lumens after 100 hours operation. Actual lumens produced will depend upon the operating conditions; chiefly on the ballast used and the line voltage applied.

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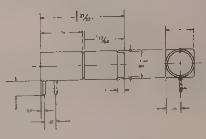
SERIES	DRAWINGS	LENS COLOR	HOW TO ORDER

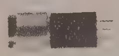
101

T-1 BASED LAMP

LENS BAYONET TYPE. LENS STYLES AVAILABLE — DS, DSC, Q, QB.

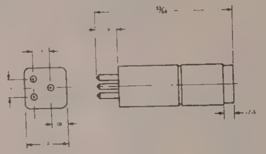


111



T-1 BASED LAMP

LENS BAYONET TYPE. SAME AS 101.



TRANSPARENT	TRANSLUCENT
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

EXAMPLE:

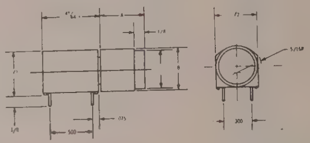
101-RL-DSC

101 → Model No.
RL → Lens Color
DSC → Lens Style

864

T-1¾ BASED LAMP

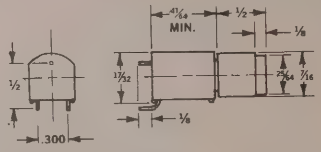
LENS BAYONET TYPE. LENS STYLES AVAILABLE — DS7, DSC7, Q7, QB7.
DS8, DSC8, Q8, QB8.



874

T-1¾ BASED LAMP

LENS BAYONET TYPE. SAME AS 864.


43/64 MIN.
1/2
1/8
1/2
17/32
25/64
7/16
.300
1/8

TRANSPARENT	TRANSLUCENT
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

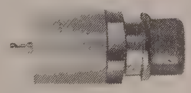
EXAMPLE:

864-RL-DSC

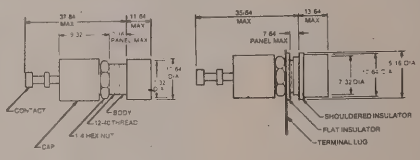
864 → Model No.
RL → Lens Color
DSC → Lens Style

107

T-1 BASED LAMP



REAR RELAMPABLE. LENS STYLES AVAILABLE — STD, DS, DSC, Q, QB.


PANEL MAX
CONTACT
BODY
12-40 THREAD
1/4 HEX NUT
CAP
PANEL MAX
SHOULDERED INSULATOR
FLAT INSULATOR
TERMINAL LUG

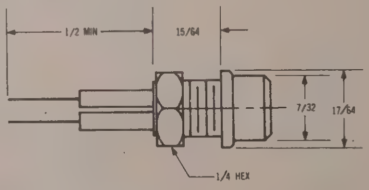
EXAMPLE:

107 → Body Type
RLUC → Lens Color
DS → Lens Style
FB60 → Lamp Type

105

T-1 LAMP

FIXED
LENS STYLES AVAILABLE — STD, DS, DSC, Q, QB

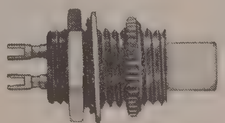

1/2 MIN
15/64
7/32
17/64
1/4 HEX

EXAMPLE:

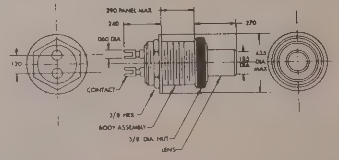
105 → Body Style
R → Lens Color
STD → Lens Style
F60 → Lamp Type

106

T-1 LAMP



FIXED


290 PANEL MAX
240
270
060 DIA
CONTACT
3/8 HEX
BODY ASSEMBLY
3/8 DIA. NUT
LENS

(Translucent)
R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

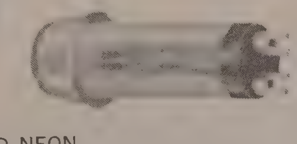
(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

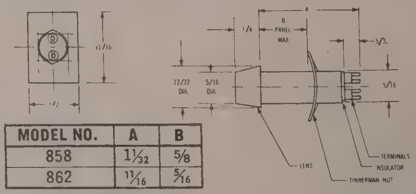
EXAMPLE:

106 → Model No.
CL → Lens Color
F60 → Lamp Type

858
862



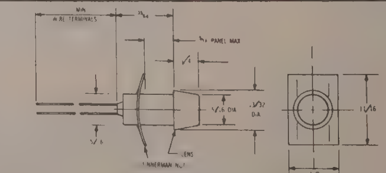
FIXED NEON


PANEL MAX
13/32 DIA
5/16 DIA
LENS
TERMINALS
INSULATOR
TINNERMAN NUT

MODEL NO.	A	B
858	1⅓₂	⅝
862	1¹¹⁄₁₆	5⁄16

859

FIXED NEON


PANEL MAX
LENS
TINNERMAN NUT

R — Red
W — White
* B — Blue
* G — Green
A — Amber
C — Clear

* Not recommended for Neon

EXAMPLE:

858-C-AIB-220K

858 → Model No.
C → Lens Color
AIB → Lamp Type
220K → Resistor

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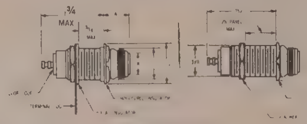
SERIES | DRAWINGS | LENS COLOR | HOW TO ORDER

855 T-1¾ BASED LAMP

BODY STYLES AVAILABLE S OR SI

LENS STYLES AVAIL. — STD, DS, DSC, Q, QB, D, M, SE, MB



	A		B	C
LENS STYLES	S	SI		
STD	5/16	11/32	17/64	3/8
D	21/64	3/8	3/8	1/2
DS, DSC, Q, QB	23/64	25/64	23/64	7/16
M, MB	5/8	21/32	7/16	1/2
SE	27/64	15/32	—	1/2

TRANSLUCENT
EXCEPT M & MB LENS

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

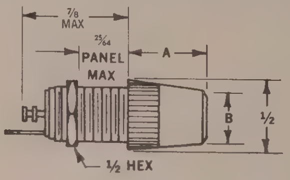
EXAMPLE:

855S → Body Type
G → Lens Color
4 → Color Code
D → Lens Style
327 → Lamp Type

856 T-1¾ BASED LAMP

AVAILABLE IN BODY STYLE S ONLY

(2 TERMINAL BODY ONLY)
LENS STYLES AVAIL. — M, Q, DS, MB, QB, DSC



LENS STYLE	A	B
M, MB	7/8	3/8
DS, DSC, Q, QB	13/32	15/32

M & MB LENS
TRANSPARENT EXCEPT
FOR WHITE

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

ALL LENS EXCEPT
M & MB

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

EXAMPLE:

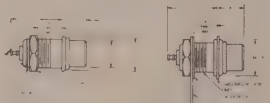
856 → Model No.
R → Lens Color
QB → Lens Style
327 → Lamp Type

102

T-1 BASED LAMP

AVAILABLE IN ALL BODY TYPES

LENS STYLES AVAILABLE — STD, DSC, QB, DS, Q.



BODY TYPES	A	B	C
SI	5/32	21/64	27/64
SSI	3/16	19/64	29/64
SKI	17/64	9/32	15/32
SRI	19/64	1/4	1/2
S	13/64	19/64	7/16
SS	15/64	17/64	15/32
SK	5/16	1/4	31/64
SR	11/32	7/32	33/64

(Translucent)

R — Red
W — White
*B — Blue
G — Green
A — Amber
C — Clear

(Transparent)	(Translucent)
RL — Red	RLUC — Red
*BL — Blue	WLUC — White
GL — Green	*BLUC — Blue
AL — Amber	GLUC — Green
CL — Clear	ALUC — Amber

* Not recommended for LED

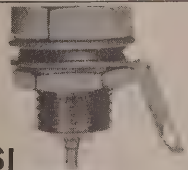
EXAMPLE:

102SI-AL-DSC

102SI → Body Type
AL → Lens Color
DSC → Lens Style

102 BODY STYLES

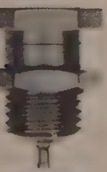
S



SI

SR

SRI



SS

SSI

SK

SKI

102 LENS STYLES

STD

Full 180° visibility and maximum illumination

DS

Matte black anodized bezel prevents sidelight emission. Blends with dark colored panels: contrasts with light colored panels.

DSC

Aluminum anodized bezel (silver appearing) prevents sidelight emission. Blends with light colored panels; contrasts with dark colored panels.

Q

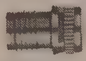
Aluminum anodized bezel (silver appearing) allows 180° visibility. Blends with light colored panels; contrasts with dark colored panels.

QB

Matte black anodized bezel. Allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels.

855 LENS STYLES

STD



Flat slightly projected lens gives 180° visibility. Lens on the 855 differs, see drawing.

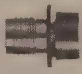
QB

Matte black anodized bezel. Allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels. BI-COLOR has the added feature white when unlighted and colored when lighted.

DS

Matte black annodized bezel prevents sidelight emmision. Blends with dark colored panels; contrasts with light colored panels. BI-COLOR has the added feature, white when unlighted and colored when lighted.

D

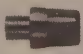


Skirted lens covers, metal parts for neat panel appearance. Large lighted surface assures positive indication. BI-COLOR has the added feature white when unlighted and colored when lighted.

DSC

Aluminum anodized bezel (matte silver appearing) prevents sidelight emission. Blends with light colored panels; contrasts with dark colored panels. BI-COLOR has the added feature, white when unlighted and colored when lighted.

M



Large lens for maximum visibility from all angles. Engineered to offer the most uniform light distribution. Full 180° visibility.

Q

Aluminum anodized bezel (matte silver appearing) allows 180° visibility, blends with light colored panels; BI-COLOR has the added feature, white when unlighted and colored when lighted.

SE

Edgelight for plastic panels. Small diameter light gasket minimizes wasted panel space. Can be relamped with gloved hands.

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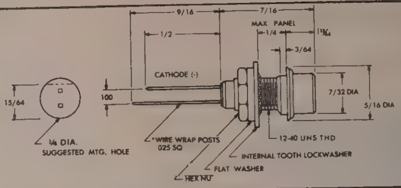
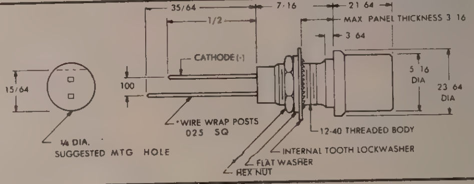
MODEL 2L501

2L5 AVAILABLE ON SPECIAL ORDER


9/16
7/16
MAX PANEL
1/2
1/4
1¹³⁄₆₄
3/64
CATHODE (-)
15/64
100
7/32 DIA
5/16 DIA
¼ DIA.
SUGGESTED MTG. HOLE
•WIRE WRAP POSTS
025 SQ
12-40 UNS THD
INTERNAL TOOTH LOCKWASHER
FLAT WASHER
HEX NUT

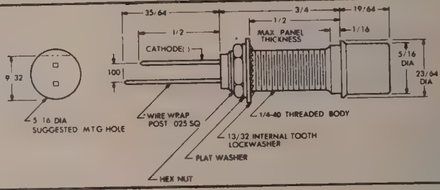
MODEL 2L601

2L6 AVAILABLE ON SPECIAL ORDER


35/64
7·16
21 64
MAX PANEL THICKNESS 3 16
1/2
3 64
CATHODE (-)
15/64
100
5 16
DIA
23 64
DIA
•WIRE WRAP POSTS
025 SQ
¼ DIA.
SUGGESTED MTG HOLE
12-40 THREADED BODY
INTERNAL TOOTH LOCKWASHER
FLAT WASHER
HEX NUT

MODEL 2L7/2L703

WATERPROOF VERSION AVAILABLE


35/64
3/4
19/64
1/2
1/2
MAX PANEL THICKNESS
1/16
CATHODE( )
9 32
100
5/16
DIA
23/64
DIA
5 16 DIA
SUGGESTED MTG HOLE
WIRE WRAP POST 025 SQ
1/4-40 THREADED BODY
13/32 INTERNAL TOOTH LOCKWASHER
FLAT WASHER
HEX NUT

HOW TO ORDER

Example: 2A501W - ATP - F△ L• 5 / 20 - 2

MODEL
2L501
2R501 — Red
2A501 — Amber
2G501 — Green
2L601
2R601 — Red
2A601 — Amber
2G601 — Green
2L7
2R7 — Red
2A7 — Amber
2G7 — Green
2L703
2R703 — Red
2A703 — Amber
2G703 — Green

TERMINALS
W — Wire Wrap Post (Solderable)*
L — Wire Leads

LENS COLOR
R — Red
A — Amber
G — Green
C — Clear
W — White

LENS CHARACTERISTICS
TL — Translucent
TP — Transparent

LENS STYLE
F — Flat
D — Dome

LENSING
L — Lensed,
P — Plain

VOLTAGE†/CURRENT†
See below†

BODY
1 — "D" Flat
2 — Round

2L601 — w/r — Voltage + current not to exceed .125W
w/o — 2.0 VDC (Typ), 35 mA (Max)
2L7/2L703 — w/r — Voltage + current not to exceed .500W
w/o — 2.0 VDC (Typ), 35 mA (Max)
2L501 — w/r — Voltage + current not to exceed .125W
w/o — 2.0 VDC (Typ), 50 mA (Max)

* — Wire Wrap is Gardner-Denver™ △ — 2L501 Only † — To order without internal resistor omit callout for voltage and current
● — 2L501/2L7/2L703

MODELS 121 • 122 • 123 • 124

- Front relampable.
- All models designed to use a T-1 flange based incandescent or LED lamp.
- All models are two terminal.
- RFI shielding can be provided on request.
- Hot stamping of lenses can also be furnished upon request.
- A variety of lens colors available.
- Waterproof version available.

MODEL	BODY DIA.	MTG. HOLE	WATERPROOF
121	9/32	19/64	NO
122	9/32	19/64	YES
123	5/16	21/64	NO
124	5/16	21/64	YES

LENS STYLES

QB

Black anodized bezel allows 180° visibility. Blends with dark colored panels; contrasts with light colored panels.

Q

Aluminum anodized bezel allows 180° visibility. Blends with light colored panels; contrasts with dark colored panels.

STB

Full 180° visibility • Maximum illumination • Black bezel.

STC

Full 180° visibility • Maximum illumination • Black bezel.

DS

Black anodized aluminum bezel prevents sidelight emission. Blends with dark panels; contrasts with light colored panels.

DSC

Aluminum anodized bezel (silver appearing) prevents sidelight emissions. Blends with light colored panels; contrasts with dark colored panels.

HOW TO ORDER

Example: 121 B - RL - STB - 682

MODEL
121
122
123
124

BODY COLOR
B — Black (Anodize)
C — Clear (Anodize)

4L0 ALSO AVAILABLE ON SPECIAL ORDER

LENS COLOR

Transparent	Translucent
RL — Red	RLUC — Red
AL — Amber	ADUC — Amber
GL — Green	GLUC — Green
BL — Blue	*BLUC — Blue*
CL — Clear	WLUC — White

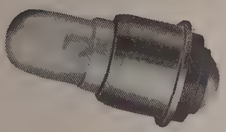
* Not recommended for LED.

LENS STYLE
STB
STC
DS
DSC
QB
Q

LAMP
T-1 Incandescent or LED.
(Contact factory for lamp specifications)

THE SLOAN COMPANY
"THE TOUCH OF BRILLIANCE IN PANEL DESIGN"
7704 San Fernando Road, P.O. Box 367, Sun Valley, CA 91353
(818) 875-1123 • TWX 910-498-2250

4L001 SERIES
T-1 FLANGED BASE LED



ACTUAL SIZE

HOW TO ORDER

Example: 4R001

MODEL — LED COLOR

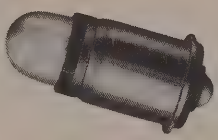
4R001 — Red
4A001 — Amber
4G001 — Green

ELECTRICAL

1.7-2.2 VDC (Typ)
@ 20 mA

4LO ALSO AVAILABLE ON SPECIAL ORDER

5L001 SERIES
T1-¾ FLANGED BASE LED



HOW TO ORDER

Example: 5A001 - 5 / 15

MODEL — LED COLOR
5A001 — Amber
5G001 — Green
5R001 — Red

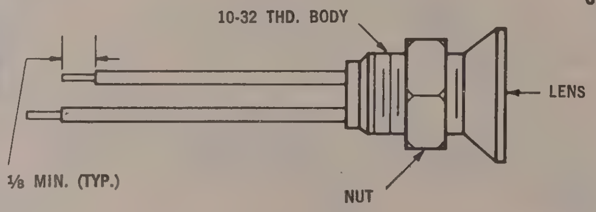
VOLTAGE †

CURRENT †

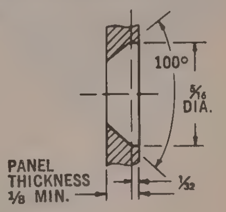
ELECTRICAL

w/o Resistor — 2.0 VDC (Typ), 35 mA (Max)
w/Resistor — Voltage X current not to exceed .250W
† — To order without internal resistor omit callout for voltage and current.

MODEL 109 (INCANDESCENT)/1L9 (LED)



SUGGESTED MOUNTING



ELECTRICAL SPECIFICATIONS

LED

MODEL	CURRENT (mA)	VOLTAGE (Volts)
1R9	20	1.7 (TYP.)
1A9	20	2.2 (TYP.)
1G9	20	2.2 (TYP.)

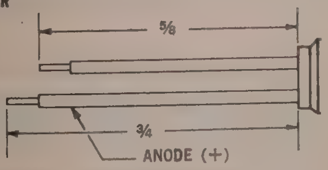
Many other lamps available — consult factory.

INCANDESCENT

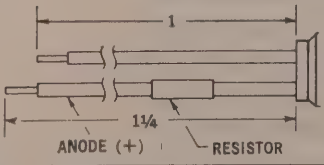
MODEL	CURRENT (Amps)	VOLTAGE (Volts)
F60	.060	5.0
F44	.026	18.0
F59	.024	28.0

LEAD DIMENSIONS

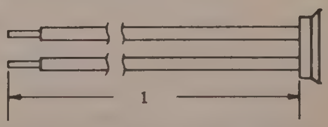
1L9 (LED)
WITHOUT RESISTOR



WITH RESISTOR



109 (INCANDESCENT)



HOW TO ORDER

Examples: 1R9 - R TP - 5/15 - 6"

MODEL
1R9 — Red
1G9 — Green
1A9 — Amber

LENS COLOR
R — Red
G — Green
A — Amber
C — Clear
W — White

LENS TYPE
TP — Transparent
TL — Translucent

VOLTAGE/ CURRENT
To order without resistor omit callout for voltage and current.

LEADS
Extended leads in inches (if required).

109 - G TL - F60 - 12"

MODEL
109

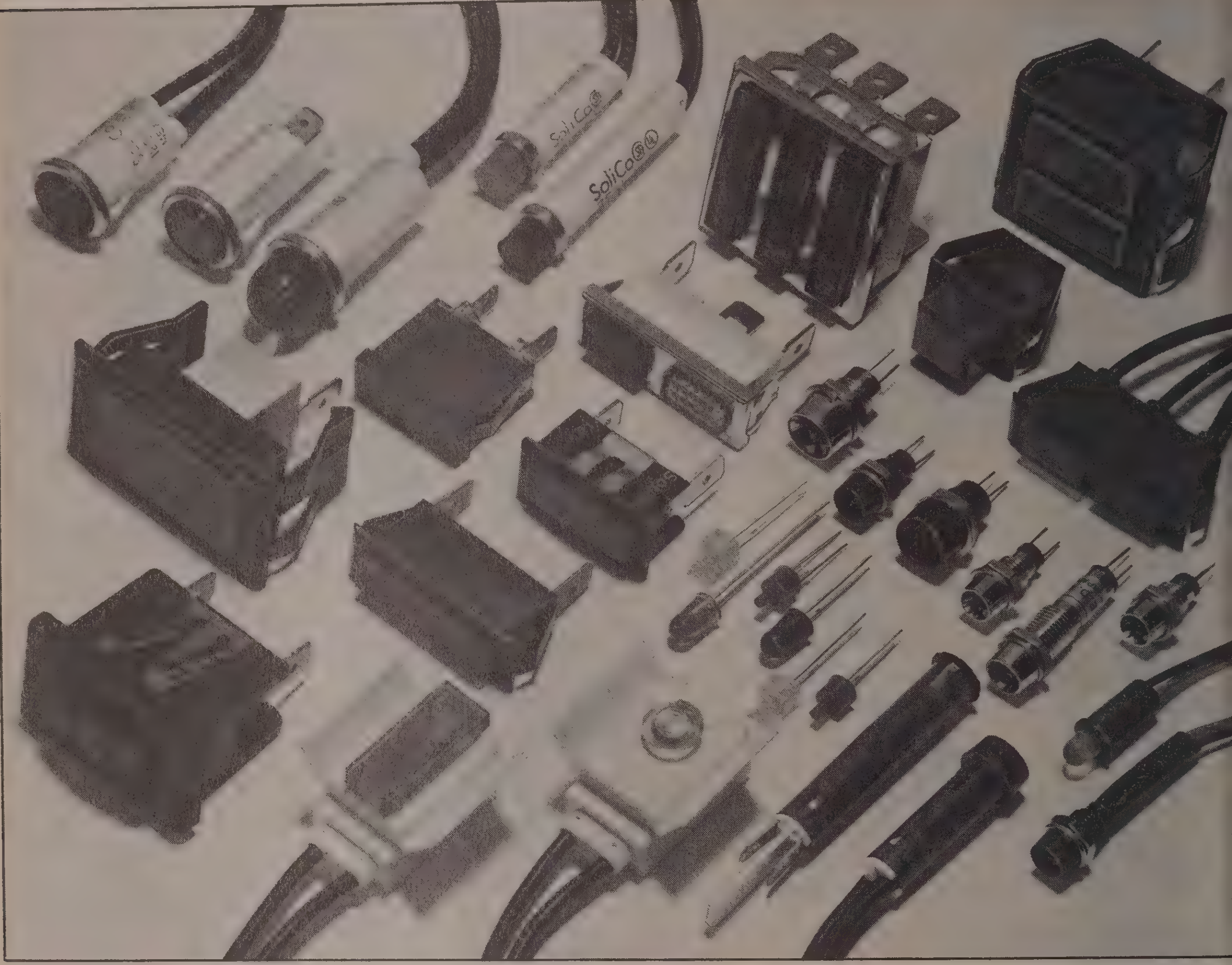
LENS COLOR
R — Red
G — Green
A — Amber
B — Blue
C — Clear
W — White

LENS TYPE
TP — Transparent
TL — Translucent

LAMP TYPE
F60
F59
F44

LEADS
Extended leads in inches (if required).

SoLiCo has lots of ways



SoLiCo pilot lights, indicator lights and lighted pushbutton switches come in a wide variety of styles and sizes to suit a broad range of products and applications. Just give us your panel depth, thickness and hole size required, mounting methods, lens size and style, material and termination. Chances are, we'll have an inexpensive standard part to suit your needs. We'll even send you a free sample on request.

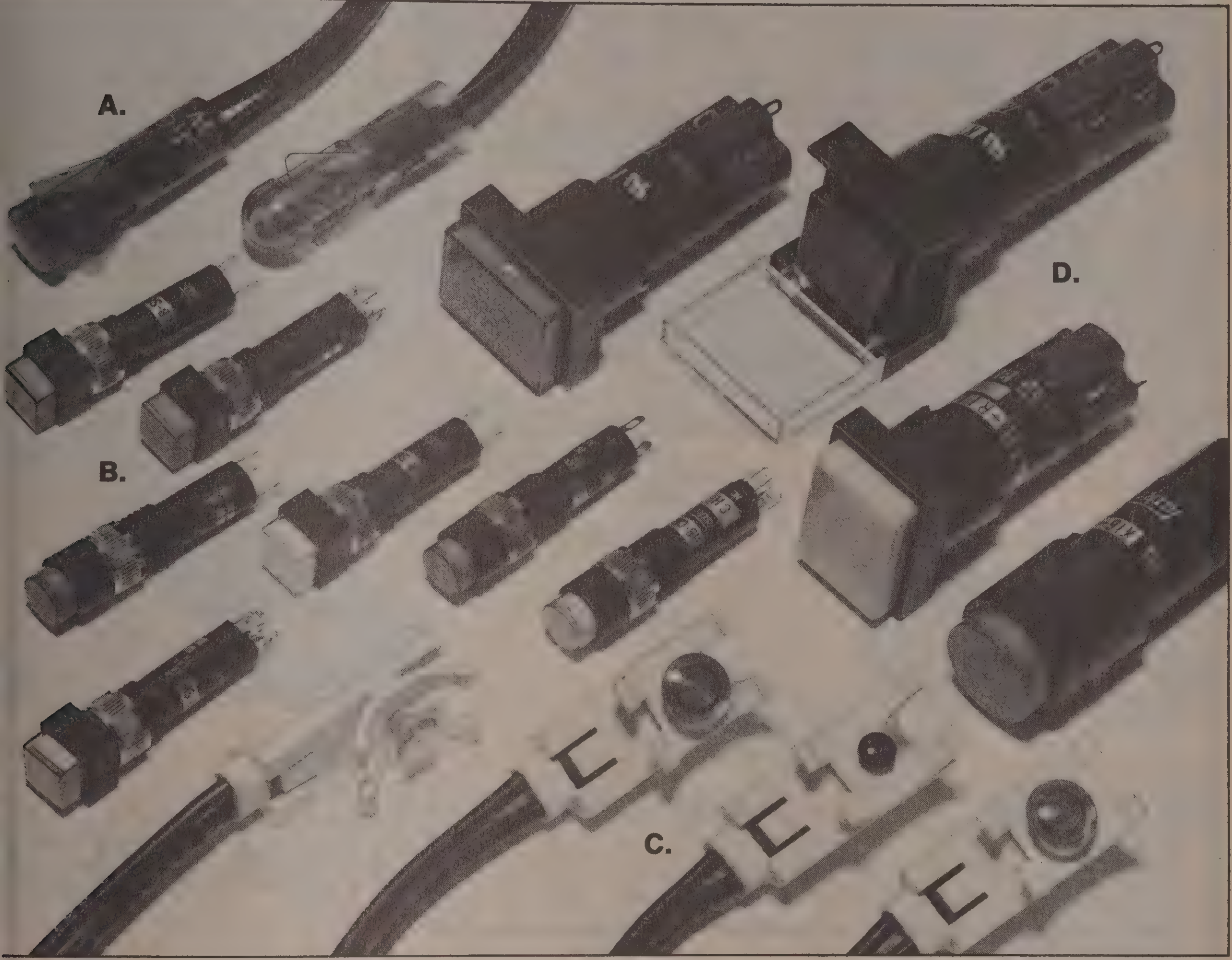
We can provide special items, too. Just consult our factory sales department. Technical assistance is always available to help you find the light that best suits your application. We've got lots of ways to see the light, just call:

(203) 527-3092

SoLiCo

SORENSON LIGHTED CONTROLS, INC. 75 Locust Street, Hartford, Connecticut 06114

to see the light.



. Series 8000 Snap-in Indicator Lights.

Real time-savers. Snap into .375″ hole from front of panel. Pre-wired leads. Red, green, yellow or amber LEDs. Red or green neon. Lens bodies: domed or flat, translucent or transparent. Bright. Quick. Easy.

. Taiko Series K8 Lighted Mini Pushbutton Switches.

For when panel space is at a premium. Mount easily from front of panel into 5/16″ round hole. Matching indicator, single-pole momentary and maintained styles. T-3/4 incandescent bulbs or LEDs.

C. QM-100 Snap-in Indicator Lights.

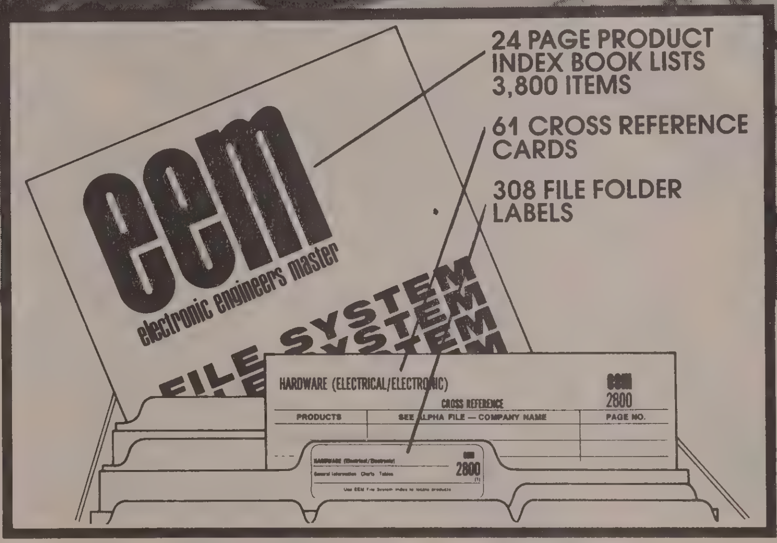
Lens fits through panel front. Lamp snaps to it from back. Pre-wired 6″ leads. Standard blue or green neon lamp. 4 lens shapes, 6 colors. UL and CSA rated at 125-250V.

D. Taiko K16 Series Lighted Pushbutton Switches.

Incandescent or LED. In momentary, maintained and indicator styles. Solder lug terminals, independent lamp terminals and T1 BiPins for durability. Round, square or rectangular. 5 lens colors or clear. 1,2,3 or 4-pole double-make/double-break contacts. Fit 5/8″ round hole.

SoLiCo

SORENSON LIGHTED CONTROLS, INC. 75 Locust Street, Hartford, Connecticut 06114


24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
PRODUCTS
SEE ALPHA FILE — COMPANY NAME
PAGE NO.
eem
2800

GET ORGANIZED!

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There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

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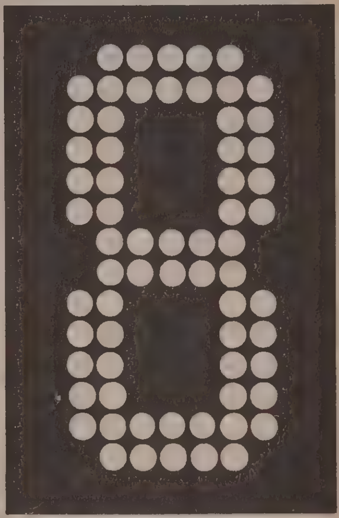
EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

HIGH VISIBILITY® Displays

Inherent memory • Energy saving • High contrast ratios • Versatile • Rugged

SIGNALEX® ALPHANUMERICS



Any number of dots can be assembled horizontally or vertically. Standard number of 7 vertical dots produces 4″, 6″, 9″, 12″, 16″, 18″ or 39″ characters. Inherent latching magnetic memory requires no power except during moment of change.

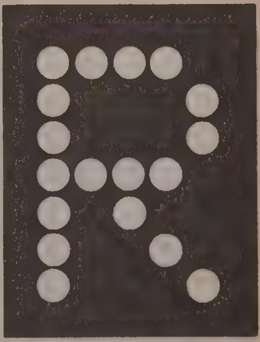
Signalex® Alphanumerics may be assembled in the standard 35-dot matrix format—and also provide the flexibility which allows for various matrix sizes. White, fluorescent yellow, or fluorescent red on black standard. Other colors available on request.

Model	Character Height (in.)	(mm)	Dot Diameter (in.)	(mm)	Pulse Length @ 12 VDC*
470R	4	101.6	1/2	12.7	2ms
670R	6	152.0	3/4	19.05	2ms
972R	9	229.0	1-1/8	28.6	2ms
1272R	12	305.0	1-1/2	38.1	2ms
1672R	16	408.0	2	51.0	2ms
1872R	18	457.0	2-1/4	57.1	2ms
3970R	39	1000.0	5	127.0	2ms**

*Shorter pulse lengths can be attained by increasing voltage. **30 VDC

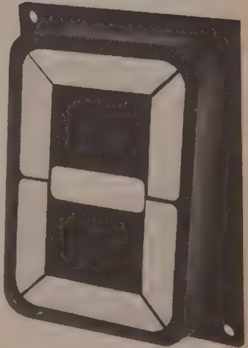
U.S. patents pending

SIGNALEX® 7-SEGMENT DISPLAYS



DISPLAY SIZES	1½″	4″	6″	9″	12″	18″	24″
Model	152L	402L	602L	900L	1200L	1810L	2410L
Character Height	1-9/16″ 40mm	4-1/16″ 103mm	6-1/16″ 154mm	9″ 228mm	12″ 305mm	18″ 46cm	24″ 61cm
Character Width	15/16″ 24mm	2-5/16″ 59mm	3-9/16″ 91mm	6″ 152mm	8″ 204mm	12″ 30cm	16″ 41cm
Frame Height	1-7/8″ 49mm	5″ 127mm	7-1/4″ 184mm	11″ 279mm	14″ 36cm	21″ 54cm	28″ 72cm
Frame Width	1-5/16″ 33mm	3-1/4″ 83mm	5-1/8″ 130mm	8-1/4″ 210mm	11″ 28cm	16-1/2″ 42cm	22″ 56cm
Viewing Distance	50′ 15m	160′ 50m	240′ 75m	360′ 110m	480′ 150m	720′ 220m	960′ 300m
Weight	2-1/4 oz. 65gm	8-1/2 oz. 240gm	12-2/3 oz. 360gm	1-1/2 lbs. 680gm	2-1/4 lbs. 1kg	4-1/2 lbs. 2kg	6 lbs. 2.7 kg
Min. Pulse Length	25 ms	50 ms	90 ms	150 ms	200 ms	300 ms	400 ms
Segment Power	0.35 W	0.93 W	1.4 W	3.6 W	3.6 W	9.0 W	9.0 W

U.S. Patent Nos. 3,886,545; 4,117,478; 4,327,357; 4,393,362 & patents pending U.S. Design Patent 249,985.



All models are bi-stable electromagnetic displays and draw no power except during the moment of change. Standard voltage is 12 VDC. White, fluorescent yellow, or fluorescent red vanes on black background standard. Angular visibility, 75° either side of the perpendicular. Low cost BCD to 7 segment decoder drive circuitry is available.

NOTE: Model 152L is UL Recognized (No. MH10471)

SIGNALEX® TWO-STATE INDICATORS

3/8″ x 1/2″ window has two alternating display faces, with each position snapping into view with a 12 VDC pulse. Bistable operation.

2-State Indicator

U.S. Patent No. 3,936,818

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eem/1984

The Staver Company, Inc.
P.O. Box H, Bay Shore, N.Y. 11706
(516) 666-8000 TWX: 510-227-6142

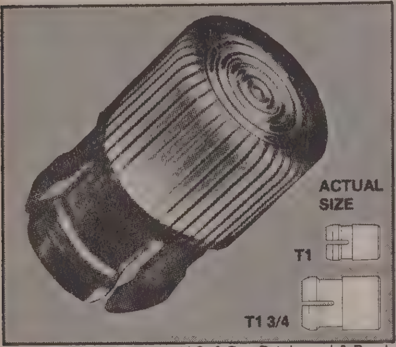
SIGNALEX®

VCC
MINIATURE
INDICATORS

VISUAL COMMUNICATIONS COMPANY

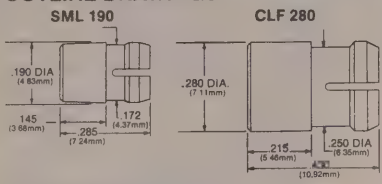
P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727

CLIPLITE® LENS/MOUNTS FOR T1 & T1 3/4 LEDs

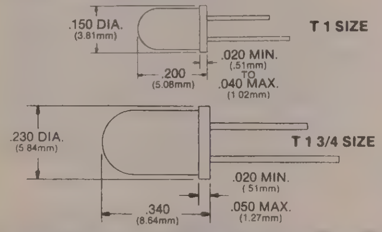


U.S. & For. Pat. Issued & Pend.

OUTLINE DRAWINGS



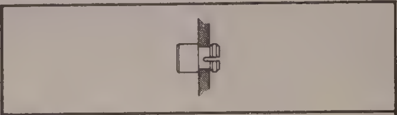
RECOMMENDED LEDs



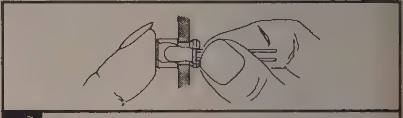
FEATURES

- Installs with finger pressure — no tools required —takes only six seconds
- Increases viewing angle up to 180 degrees using either diffused or point source LEDs
- Protects LED against being pushed back through panel — LED backout
- Moisture seals easily to panel with the application of common sealants
- Intensifies apparent brightness up to 125% by the use of striated lines and fresnel rings
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

SIMPLE TWO-STEP INSTALLATION



1 Snap the CLIPLITE into panel hole.



2 While holding the CLIPLITE tight to the panel with your finger, insert the LED into the CLIPLITE from the back

SPECIFICATIONS

MATERIAL — Cellulose acetate butyrate

LENS — Flat top design using fresnel rings and striated lines

MOUNTING — Both size CLIPLITEs mount from the front of the panel. Holes should be deburred but not chamfered. The T1 3/4 mounts in a .250 ± .002 (6.35mm) hole on 3/8" centers. Panel thickness from 1/16" to 1/8". The T1 mounts in a .172 ± .002 (4.4mm) hole on 1/4" centers. Panel thickness from 1/32" to 1/16". P C BOARD attached T 1 LED, major dia. .125, slips into the SML 190 CLIPLITE mounted in a 1/16" thick panel.

NOTE: For panels less than prescribed, standard metal or plastic washers can be used to increase panel thickness.

ORDERING CODES

CLF 280 RTP

MODEL
SML 190 (T 1 SIZE)
CLF 280 (T 1 3/4 SIZE)

COLOR

RTP Red Transparent	YTP Yellow Transparent
ATP Amber Transparent	CTP Clear Transparent
GTP Green Transparent	BTP Blue Transparent

OEM PRICES

QUANTITY	100	500	1000
SML 190	17.00/C	14.00/C	11.00/C
CLF 280	18.00/C	15.00/C	12.00/C

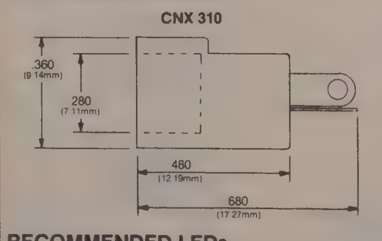
All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.

CONXRITE™ SOLDERLESS LED CONNECTOR

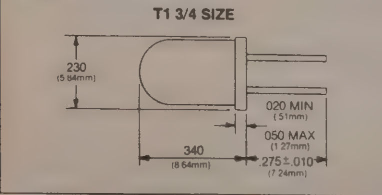
ACTUAL SIZE

U.S. & For. Pat. Issued & Pend.

OUTLINE DRAWINGS



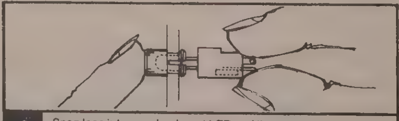
RECOMMENDED LEDs



FEATURES

- Incorporates a ballast resistor for use on circuits from 3 to 28 volts.
- Requires no tools — provides a simple fast press-fit connection to either Cliplite or clip mount
- Stress relieved connection controls the problem of broken LED leads
- Various colored lenses are available for use with the Cliplite Lens/Mount
- When preassembled to the wiring harness final assembly of the panel mounted LED is greatly simplified
- Makes field replacement of defective LEDs practical and cost-effective

EASY INSTALLATION



1 Snap lens into panel — Insert LED — Align leads with Conxrite spring contacts — Press fit to back of lens/mount.

SPECIFICATIONS:

MATERIAL:
Housing — Polypropylene (Natural)

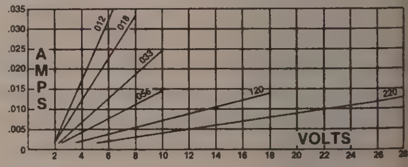
Terminals — Phosphor bronze/tin plated

Resistor — Melf 1/4 watt resistor provides current limiting to 28 volts

Panel Mounts — Cliplite CLF 280 series cellulose acetate butyrate (see specs above). Clip mount polypropylene (Hewlett Packard P/N 5082-4707 or equal)

Note: Trim LED lead length to .275± .010 (7.24 .254mm)

RESISTOR SELECTION GUIDE



ORDERING CODES

CNX 310 012

MODEL

RESISTOR

000 OHMS — 000	560 OHMS — 056
120 OHMS — 012	1200 OHMS — 120
180 OHMS — 018	2200 OHMS — 220
330 OHMS — 033	

OEM PRICES

QUANTITY	100	500	1000
CNX 310	.64	.55	.46

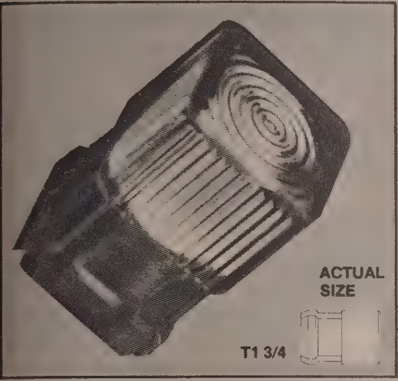
All units and values can be combined for price advantage. For higher quantity pricing contact VCC. Prices subject to change without notice.

MINIATURE
INDICATORS

VISUAL COMMUNICATIONS COMPANY

P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727

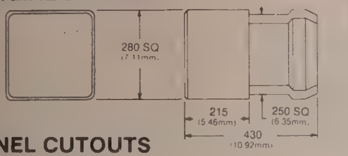
CUBELITE® SQUARE LENS/MOUNTS FOR LEDs



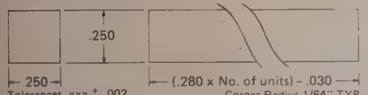
U.S. & For. Pat. Issued & Pend.

OUTLINE DRAWING

SQL 360

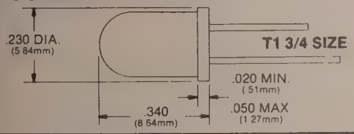


PANEL CUTOUTS



Tolerances .xxx ± .002
Corner Radius 1/64" TYP.

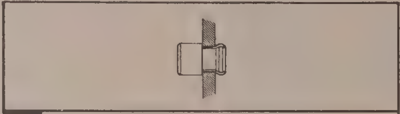
RECOMMENDED LED



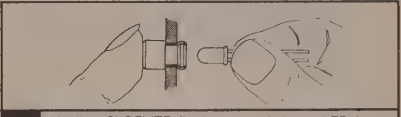
FEATURES

- Enhances aethestics — eliminates "dark corners"— produces a completely even light pattern
- Mounts either as a single square lens or stacks — gangs in bar configuration
- Increases viewing angle up to 180 degrees using either diffused or point source LEDs
- Intensifies apparent brightness up to 140% by the use of striated lines and fresnel rings
- Installs with finger pressure — no tools required —takes only six seconds
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

EASY TWO-STEP INSTALLATION



1 Snap CUBELITE in a ¼ inch square panel hole.



2 Holding CUBELITE firmly to panel, insert LED into CUBELITE from the back. Installs in just 6 seconds

SPECIFICATIONS

MATERIAL — Cellulose acetate butyrate

LENS — Square design using fresnel rings and striated lines

SINGLE MOUNT — Square punched hole .250 on 3/8" centers. Panel thickness 1/16" to 1/8"

GANG MOUNT — Slotted hole .250 by (.280 x No. of units) minus .030. Panel thickness 1/8"

Hole Tolerance: .XXX ± .002. Corner Radius 1/64" TYP Holes should be deburred but not chamfered

SUGGESTED PUNCH SOURCES — Porter Precision Cincinnati OH; Strippet Div. Houdaille Industries, Inc. Akron NY; Unipunch Products Inc. Buffalo NY; Wiederman Co. King of Prussia PA

ORDERING CODES

SQL 360 RTP

MODEL

COLOR

RTP Red Transparent
ATP Amber Transparent
GTP Green Transparent

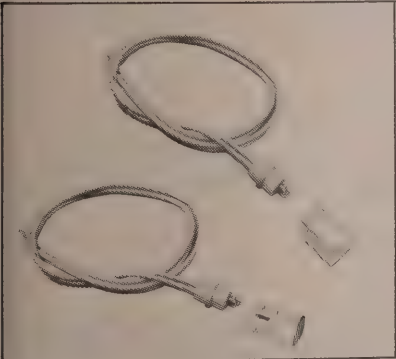
YTP Yellow Transparent
CTP Clear Transparent
BTP Blue Transparent

OEM PRICES

QUANTITY	100	500	1000
SQL 360	20.00/C	17.00/C	14.00/C

All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.

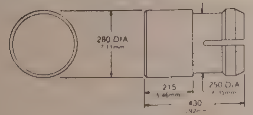
CLIPLITE® CUBELITE®/RD. & SQ. INCANDESCENT INDICATORS



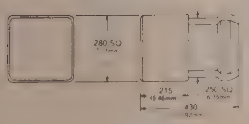
U.S. & For. Pat. Issued & Pend

OUTLINE DRAWINGS

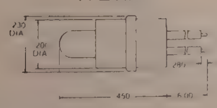
CIF 280



SQI 360



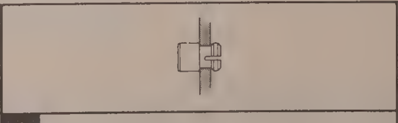
T1 LAMP



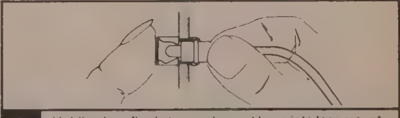
FEATURES

- Installs with finger pressure — no tools required — takes only 6 seconds
- Provides 180 degrees of visability using either transparent or translucent lenses
- Voltages vary from 5 to 28 — a special 5 volt lamp is available for IC compatibility
- Produces a brighter display than LEDs — provides extremely long life.

SIMPLE TWO-STEP INSTALLATION



1 Snap lens into panel hole



2 Holding lens firmly to panel, insert lamp into lens mount from the back. Installs in just 6 seconds.

SPECIFICATIONS

CLIPLITE (CIF 280) — Produced from cellulose acetate butyrate plastic. Round design with flat top using fresnel rings and striated lines. Mounts from the front of the panel in a .250 ± .002 (6.35mm) hole on 3/8" centers. Panel thickness from 1/16" to 1/8". Holes should be deburred but not chamfered.

CUBELITE (SQI 360) — Produced from cellulose acetate butyrate plastic. Square shape with flat top using fresnel rings and striated lines. Single mount in a square punched hole .250 on 3/8" centers. Panel thickness 1/16" to 1/8". Gang mounts in a slotted hole .250 by (.280 X No. of units) minus .030. Panel thickness 1/8". Hole tolerance: .XXX ± .002; Corner Radius 1/64". Holes should be deburred but not chamfered.

LAMP — Aged and selected, fitted with a plastic base and using 6 inch 28 AWG stranded U.L. approved insulated leads. Available from 5 to 28 volts.

SUGGESTED PUNCH SOURCES — Porter Precision Cincinnati OH; Strippet Div. Akron NY; Unipunch Products Inc. Buffalo NY; Wielderman Co. King of Prussia PA

ORDERING CODES

CIF 280 RTL 05 020

MODEL
CIF 280 (CLIPLITE)
SQI 360 (CUBELITE)
COLOR

LAMP NO.

VOLTS	/AMPS
05	020
05	060
14	040
28	024

RTL Red Translucent
GTL Green Translucent
ATL Amber Translucent
WTL White Translucent
BTL Blue Translucent

RTP Red Transparent
ATP Amber Transparent
GTP Green Transparent
YTP Yellow Transparent
CTP Clear Transparent
BTP Blue Transparent

OEM PRICES — LAMP & LENS ASSEMBLY

QUANTITY		1	50	100	500	1000
CIF 280	05 020	1.32	1.21	1.10	95	81
&	05 060	1.25	1.14	1.04	90	77
SQI 360	14 040	1.55	1.41	1.28	1.11	95
	28 024	2.42	2.20	1.98	1.72	1.47

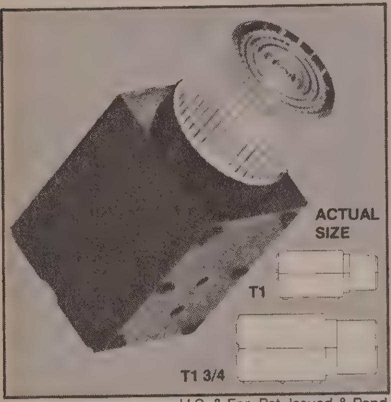
Lens colors can be combined for price advantage per line item only. For higher quantity pricing contact VCC. Prices subject to change without notice

VCC MINIATURE INDICATORS

VISUAL COMMUNICATIONS COMPANY

P.O. BOX 986 EL SEGUNDO, CALIFORNIA 90245 U.S.A. (213) 822-4727

P-C-LITE® PCB MOUNTS FOR T1 & T1 3/4 LEDs

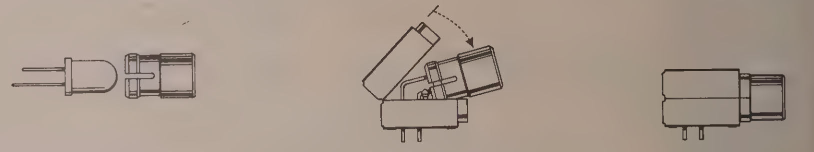

ACTUAL SIZE
T1
T1 3/4

U.S. & For. Pat. Issued & Pend.

FEATURES

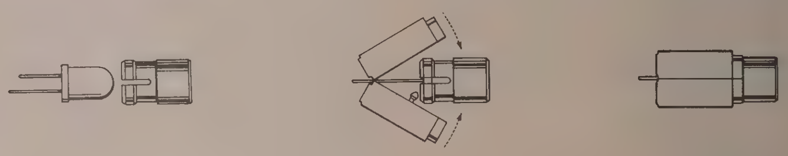
- Wave solders horizontally or vertically without special jigs or fixtures
- Stabilizes LED during packaging and physically protects after assembly
- Mounts flush, recessed or fully extended thru display panel without attachments
- Height compatible with switches and other circuit board mounted components
- Increases LED apparent brightness and viewing angle up to 180 degrees
- Guards against IC damage by electrostatic discharge transmitted thru exposed LED

HORIZONTAL MOUNT



Snap LED into lens — insert LED leads through holes in mount base — close mount, bending leads into position.

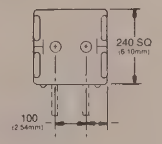
VERTICAL MOUNT

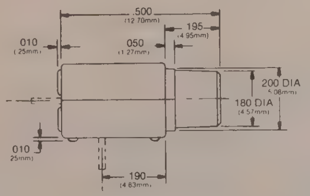


Snap LED into lens — insert LED leads through holes in mount — close mount.

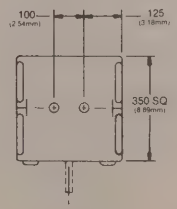
OUTLINE DRAWING

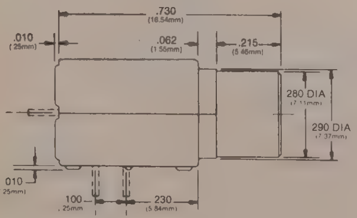
PCL 490


240 SQ
(6.10mm)
100
(2.54mm)


.500
(12.70mm)
195
(4.95mm)
010
(.25mm)
050
(1.27mm)
200 DIA
(5.08mm)
180 DIA
(4.57mm)
010
(.25mm)
190
(4.83mm)

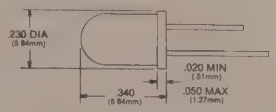
PCR 740


100
(2.54mm)
125
(3.18mm)
350 SQ
(8.89mm)

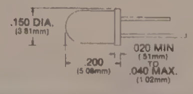

.730
(18.54mm)
.010
(.25mm)
.062
(1.56mm)
.215
(5.46mm)
280 DIA
(7.11mm)
290 DIA
(7.37mm)
010
(.25mm)
100
.25mm
230
(5.84mm)

RECOMMENDED LEDs

T1 3/4


.230 DIA
(5.84mm)
.020 MIN
(.51mm)
.340
(8.64mm)
.050 MAX
(1.27mm)

T1


.150 DIA.
(3.81mm)
020 MIN
(.51mm)
TO
.040 MAX.
(1.02mm)
.200
(5.08mm)

SPECIFICATIONS

BODY — General purpose nylon (black)

LENS — Cellulose acetate butyrate. Flat top design using fresnel rings and striated lines

MOUNTING — P C Board horizontally or vertically on .100 inch hole centers

(PCL 490) — Panel thickness from 1/64″ to 3/16″ thru a 7/32″ (5.56mm) clearance hole

(PCR 740) — Panel thickness from 1/32″ to 9/32″ thru a 5/16″ (7.94mm) clearance hole

Permits full projection to flush mounting of the lens portion thru the panel

LED Standard LEDs. See drawings to left. No attempt should be made to bend a lead with a stepped thickness

ORDERING CODES

PCL 490 RTP

MODEL

PCL 490 (T1 SIZE)
PCR 740 (T1 3/4 SIZE)

COLOR

RTP Red Transparent	YTP Yellow Transparent
ATP Amber Transparent	CTP Clear Transparent
GTP Green Transparent	BTP Blue Transparent

OEM PRICES

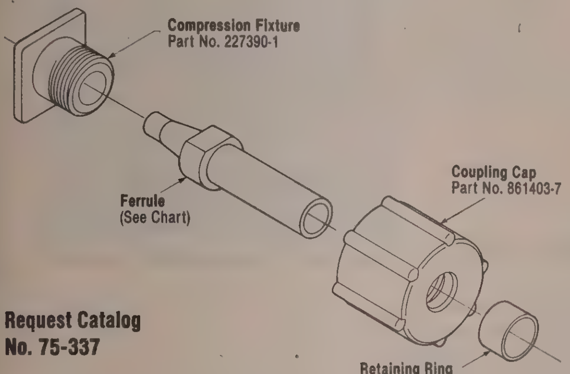
QUANTITY	100	500	1000
PCL 490	34.00/C	28.00/C	22.00/C
PCR 740	36.00/C	30.00/C	24.00/C

All colors can be combined for price advantage per line item. For higher quantity pricing contact VCC. Prices subject to change without notice.

AMP OPTIMATE LFR (Large Fiber Resilient Ferrule) Connectors

For Single Fiber or Packed Bundles 2160 microns (.085) through 410 microns (.016)

Features: ■ Less than 2 dB loss in a connector-to-connector configuration. ■ Terminates to single fiber or bundled fiber cable. ■ Terminates to glass or plastic fiber.



Request Catalog No. 75-337

Note: A connector assembly includes all components illustrated above. Individual components can be supplied.

Dia. over Fiber		Dia. over Cable Jacket		Part Numbers		Ferrule Color
mm	inch	mm	inch	Assembly	Ferrule	
2.16	.085	3.15	.124	1-530530-7	1-530954-7	Violet
0.61	.024	3.15	.124	1-530530-4	1-530954-4	Yellow
1.6	.063	3.12	.123	530530-8	530954-8	Gray
1.17	.046	3.12	.123	530530-1	530954-1	Brown
0.41	.016	3.12	.123	1-530530-1	1-530954-1	Brown
0.64	.025	2.79	.110	1-530530-2	1-530954-2	Red
0.64	.025	2.49	.098	530530-5	530954-5	Green
0.58	.023	2.62	.103	530530-7	530954-7	Violet
1.07	.042	3.12	.123	228671-1**	227686-1*	Brown
1.17	.046	2.29	.090	530530-2	530954-2	Red
0.81	.032	2.29	.090	1-530530-5	1-530954-5	Green
0.53	.021	2.29	.090	530530-4	530954-4	Yellow
0.43	.017	2.29	.090	530530-9	530954-9	White
0.43	.017	1.98	.078	1-530530-0	1-530954-0	Black
1.96	.077	1.96	.077	530530-3	530954-3	Orange
0.64	.025	1.57	.062	1-530530-3	1-530954-3	Orange
0.41	.016	1.57	.062	530530-6	530954-6	Blue

*This ferrule is designed to be used with 1 mm plastic fiber, jacketed cable. Use of epoxy is not required. Termination is done by hot blade technique using AMP cut-off fixture No. 227386-1.

**Compression fixture not included.

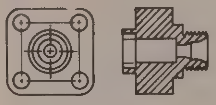
CERTI-CRIMP Hand Tool
Part No. 90364-2

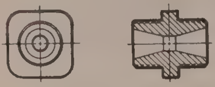
CHAMP Hand Tool
Part No. 220193-1

Optical Waveguide Designers Kit Part No. 530950-1

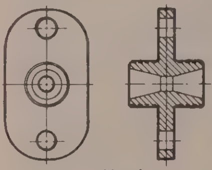
The AMP Optical Waveguide Designers Kit is supplied in a molded plastic case which contains an assortment of emitter and detector bushings, splice bushings, polishing bushings, several sizes of connector ferrules, a polishing plate, a hand tool for terminating fiber optic cable, sample lengths of optical cable and an instruction book.

ADM's (Active Device Mounts)





Free Hanging



Bulkhead

Lens Package for TO-18 or TO-46
Part No. 530564-1

I/O for TO-8
Part No. 227014-1

Press-Fit for TO-18
Part No. 227015-1

Flat Window Package for TO-18 or TO-46
Part No. 530563-1

Molded Lens Package
Part No. 530565-1

Long Cavity for TO-5 or TO-99
Part No. 530524-1

Short Cavity for TO-5 or TO-99
Part No. 530525-1

Free Hanging Connector-to-Connector Coupler
Part No. 227324-1

Flange Mount Connector-to-Connector Coupler
Part No. 227323-1

AMP OPTIMATE DNP (Dry Non-Polish) Fiber Optic Connectors

For 1000 micron plastic fiber cable

AMP OPTIMATE DNP Fiber Optic Connectors provide low cost optical terminations for fiber with a typical data rate and run length of approximately 10 megabits and 20 metres (78.7 feet) respectively. Data rate and length are a function of specific data link design. The connectors are designed for simple assembly; no special tools are needed. The cable is simply cut and stripped of jacketing, pushed through a plug assembly, and excess fiber cut away. There is no adhesive required, thereby facilitating easy field assembly.

Request Catalog No. 81-619

Optical Waveguide Designers' Kit (Dry Non-Polish) Part No. 228084-1

This kit contains a sufficient quantity of field appliable components, five metres of 1000 micron plastic fiber and commonly available tools for achieving high quality terminations. Use the kit in conjunction with appropriate low cost active devices to construct point-to-point, simplex and duplex systems.

Request Catalog No. 80-593

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP, AMP-FIT, OPTIMATE — Trademarks of AMP Incorporated.

AMP
INCORPORATED

AMP OPTIMATE SFR Connectors

(Small Fiber Resilient Ferrule)

For fibers having 125 to 315 micron clad diameters

Features: ■ Low cost ■ Low loss — less than 1 dB, connector-to-connector ■ Repeatable coupling efficiency ■ Terminates fibers down to 125 micron clad diameter ■ Metal threaded cap and retainer construction ■ Accommodates various size cable jackets and various strength members ■ Mechanical crimp retention of cable strength members ■ Sealed optical interface ■ Mates with OPTIMATE ADM's (Active Device Mounts)

Request Catalog No. 78-513

Dimensions		Part Numbers			
			Ferrule		
Fiber Cladding Dia. (μm)	Jacket (mm)	Plug Connector Kit*	Color Code	Number	Metal Retaining Assembly
125	3.8	227285-1	Black	227326-1	227286-1
125	3.8-4.4	227285-2	Black	227326-1	227287-1
125	4.4-5.0	227285-3	Black	227326-1	227288-1
140	3.8	227285-4	Green	227326-3	227286-1
150	3.8	227285-5	Blue	227326-5	227286-1
245	3.8	227285-6	Red	227326-7	227286-1
140	4.4-5.0	227285-7	Green	227326-3	227288-1
230	3.8	227285-8	Yellow	227326-9	227286-1
200	3.8	227285-9	White	1-227326-1	227286-1
140	3.8-4.4	1-227285-0	Green	227326-3	227287-1
230	3.8-4.4	1-227285-1	Yellow	227326-9	227287-1
245	3.8-4.4	1-227285-2	Red	227326-7	227287-1
200	3.8-4.4	1-227285-3	White	1-227326-1	227287-1
315**	3.8	228791-1	Black	228489-1	227286-1

*Kit includes: Ferrule, Metal Retaining Assembly, Compression Fixture, Heat Shrink Tubing and Protective Cap.

**For plastic clad fibers where recladding is required to maintain concentricity.

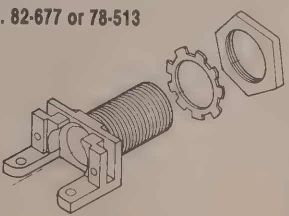
Tooling: Hand Tool No. 220190-1, Die Set No. 220225-1, Cleaving Tool No. 227387-1, Polishing Bushing — .250 length No. 227386-2, .252 length No. 227386-1.

Kits are available for the above SFR Connectors. Request Catalog No. 80-593.

Active Device Mounts (ADM)

Connectors are available for various active devices. Consult AMP Incorporated for specifications.

Request Catalog No. 82-677 or 78-513



Designers' Kits

Kits are available to accommodate cable sizes with a cladding diameter from 125 to 245 microns. Each kit includes ten small fiber connector assemblies for a specific fiber size as well as necessary splice bushings, active device bushings, tooling and accessories.

Kits contain the following connector assemblies:

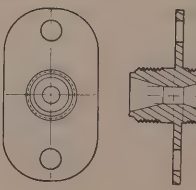
Connector Assembly					
	Diameter Over Jacket				
Cladding Diameter (μm)	mm	inch	Qty.	Connector Part Number	Designers' Kit Part Number
125	3.8	.150	10	227285-1	227385-1
125	3.8-4.4	.150-.173	10	227285-2	227385-2
125	4.4-5.0	.173-.197	10	227285-3	227385-3
140	3.8	.150	10	227285-4	227385-4
150	3.8	.150	10	227285-5	227385-5
245	3.8	.150	10	227285-6	227385-6
140	4.4-5.0	.173-.197	10	227285-7	227385-7
230	3.8	.150	10	227285-8	227385-8
200	3.8	.150	10	227285-9	227385-9
140	3.8-4.4	.150-.173	10	1-227285-0	1-227385-0
230	3.8-4.4	.150-.173	10	1-227285-1	1-227385-1
245	3.8-4.4	.150-.173	10	1-227285-2	1-227385-2
200	3.8-4.4	.150-.173	10	1-227285-3	1-227385-3

All kits contain the following additional components:

Description	Quantity	Part Number
Splice Bushing (Metal)	2	227489-3
Active Device Mount (Fiber-to-Fiber)	2	227240-4
Active Device Mount (TO-46)	2	227657-1
Active Device Mount (Cap)	2	227846-1
Hand Tool	1	220190-1
Crimping Tool Die Set	1	220208-1
Cleaving Tool Assembly	1	227387-1
Steel Polishing Bushing 6.4 [.252] Long	1	227386-1
Steel Polishing Bushing 6.35 [.250] Long	1	227386-2
Lapping Film (30 μm)	2	1-226965-4
Lapping Film (15 μm)	2	1-226965-3
Lapping Film (3 μm)	2	226965-5
Lapping Film (0.3 μm)	2	226965-7
Adhesive (TRA-BOND BC-2133)*	1	—

* A product of Tracon, Inc.

Bulkhead Connector-to-Connector Coupler Part No. 227489-3



Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP, OPTIMATE — Trademarks of AMP Incorporated.

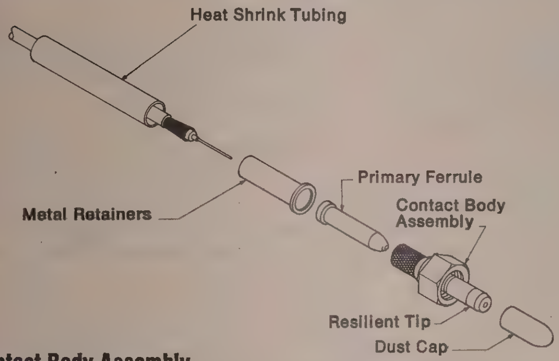
AMP
INCORPORATED

AMP OPTIMATE F-SMA Type Fiber Optic Connectors

For single or packed bundle fiber having 125 to 1140 micron clad diameter.

Features: ■ Accepts a wide variety of cable configurations ■ Resilient tip fiber-centering device is integral to metal body ■ Connector materials meet all requirements of MIL-E-5400 Class 4, 150°C ■ Primary ferrule ensures fiber axial alignment under 0.1° ■ Corrosion resistant construction for low cost performance and repeatability ■ Metal coupling nut and contact body ensure RFI shielding ■ Precision polishing for maximum fiber-to-fiber interface coupling ■ Optional "O" ring available for environmental sealing.

Request Catalog No. 81-617



Contact Body Assembly

Fiber Clad Dia. µm	Body Color	Contact Body Assembly Part Number
125	Black	227992-1
140	Green	227992-2
200	White	227992-3
230	Yellow	227992-4
250	Red	227992-5
300	Blue	227992-6
400	Black	227992-7
500	Green	227992-8
600	White	227992-9
750	Yellow	1-227992-0
1140	Red	1-227992-1

*For environmental sealing, order optional "O" Ring, Part No. 19195-2.

Primary Ferrule

Fiber Size µm	Primary Jacket O.D.	A Dia.	Color	Primary Ferrule Part Number
125-280	0.51 - 1.52	0.28	Black	227993-1
	1.52 - 2.41	0.28	Black	227993-1
	2.41 - 3.05	Contact AMP Incorporated		
280-635	0.51 - 1.52	0.64	Green	227993-2
	1.52 - 2.41	0.64	Green	227993-2
	2.41 - 3.05	Contact AMP Incorporated		
750	—	Contact AMP Incorporated		
1140	305 Max.	—	—	None

Metal Retainers

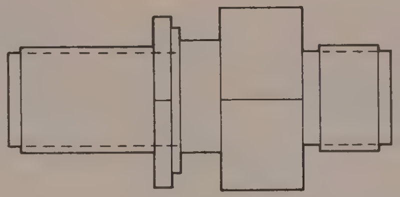
Cable O.D. Range	Style	Eyelet Part Number
3.18 - 3.61	Stepped	227292-2
3.61 - 4.32	Stepped	227293-2
4.32 - 4.9	Straight	227294-2

Retainers are required for all cables with strength members, except where strength members are fiberglass. Retainers are not required for cables without strength members and may not be needed for those with fiberglass strength members.

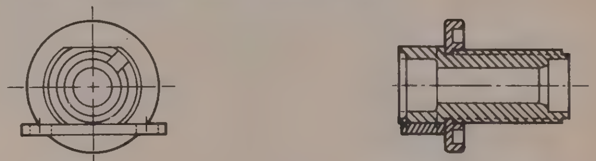
Heat Shrink Tubing

Usage	Size (I.D.)	Part Number
With Retainers	6.35	227270-1
Without Retainers	4.75	227219-1

Bulkhead Connector-to-Connector Coupler Part No. 228052-1
Part No. 228302-1 (with "O" Ring Seal)



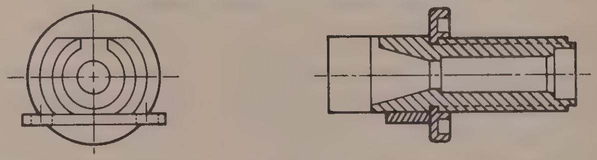
TO-18/TO-46 Active Device Mounts (ADM)



Description	Part Number
TO-18/TO-46, Body	228069-2
TO-18/TO-46, Panel Mount	228071-1†
TO-18/TO-46, PC Board Mount	228073-1
TO-18/TO-46, PC Board/Panel Mount	228075-1*†

*Illustrated above

F.O.A.C. Package Active Device Mounts (ADM)



Description	Part Number
Single Pos. Connector, Body	228060-2
Single Pos. Connector, Panel Mount	228063-1†
Single Pos. Connector, PC Board Mount	228066-1
Single Pos. Connector, PC Board/Panel Mount	228068-1*†

*Illustrated above
†Includes "O" Ring Seal

F-SMA Type Designers' Kits

15 kits are available, each kit covering a specific fiber size/cable O.D. in clad diameters 125 thru 250 microns and cable O.D. from 3.18 thru 4.90 mm. The SMA type connectors included are designed to conform to the proposed NATO and IEC standards for military and instrument applications. Kits can be made available for sizes to 1140 microns.

Request Catalog No. 80-593

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP, OPTIMATE — Trademarks of AMP Incorporated.

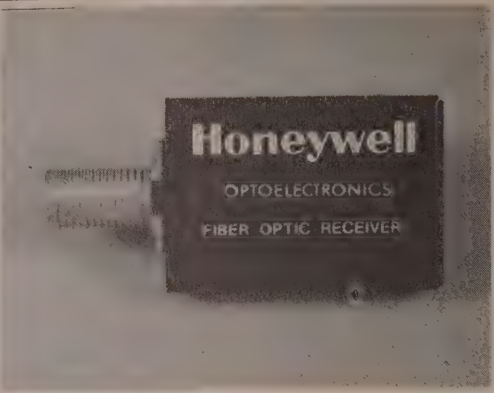
AMP
INCORPORATED

Fiber Optic Modules

10 Mbit/sec., Tri-level mode

The basic version of the receiver MASTERSLICE IC that Honeywell provides in the modules shown in the Table is:

- TRILEVEL TRANSPARENT CODE
  This is the mate to the transmitter IC. In addition to providing a "transparent" link, the receiver IC also includes a signal quality output (TTL) that indicates when the optical signal is good enough to meet 10^{-9} bit error rate.

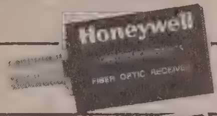
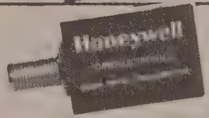


Honeywell
OPTOELECTRONICS INC.
830 EAST ARAPAHO ROAD
RICHARDSON, TEXAS 75081
(214)—234-4271 TELEX 73-0890
TWX 910-867-4757

Features

- –31 dBm sensitivity at 10^{-9} BER (HFM 1010)
- DC to 10 Mb/s NRZ
- 24 dB optical signal range
- Signal quality output
- Low profile for use in 1/2" spaced card racks
- Choice of SMA or ADM optical connectors
- Standard DIP 0.1" lead spacing on 0.6" centers
- Standard TTL output
- Operation on single +5V supply

Receivers

Type	Input power min. P_i (μW)	Connector type	Operating temperature range
 HFM 1010-201	1	SMA	–55 to +125 °C
HFM 1010-202	.8	SMA	
 HFM 2010-221	10	SMA	–55 to +125°C
HFM 2010-222	25	SMA	–55 to +125°C
HFM 2010-223	50	SMA	–55 to +125°C
HFM 2010-224	100	SMA	–55 to +125°C

Note 1: Power output measured out of 10 meters of 100 μm core fiber with NA = 0.25

Fiber Optic Modules

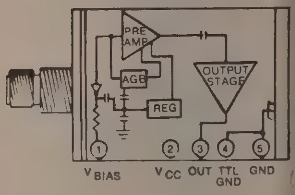
10 Mbit/sec. (Manchester), Bi-level mode

The SPX 4140 Transmitter and SPX 4141 Receiver modules comprise a complete functional optical digital data transmission system. Full internal power supply regulation and automatic gain control are provided allowing adjustment-free operation over the full operating temperature range. TTL buffering is provided for direct logic interface.

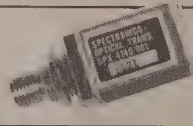
Features

- Transmission distances to 2 km used with matched SPX 4141 Receiver Module
- DC to 10 MHz data rates
- Operation on single +5V supply
- No shielding required
- Versatile mounting options
- Couples to wide variety of fibers
- TTL compatible input

SPX 4140 Transmitter



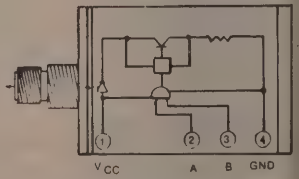
Transmitter

Type	Output power min. P_o (μW)	Connector type	Operating temperature range
 SPX 4140-001	50	SMA	0 to +95 °C
SPX 4140-002	90	SMA	0 to +95 °C
SPX 4140-201	50	SMA	–55 to +125 °C
SPX 4140-202	90	SMA	–55 to +125 °C

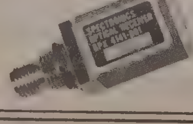
Features

- 10K bits to 10M bit/sec data rates (Manchester)
- No shielding required
- Couples to wide variety of fibers
- Operation on single 5V supply
- Wide dynamic range (28 dB)
- Versatile mounting options
- TTL compatible output
- Matched to SPX 4140 Transmitter Module

SPX 4141 Receiver



Receiver

Type	Input power P_i (μW) min.	max.	Connector type	Operating temperature range
 SPX 4141-001	0.7	250	SMA	0 to +95 °C
SPX 4141-002	0.4	250	SMA	0 to +95 °C
SPX 4141-201	0.7	250	SMA	–55 to +125 °C
SPX 4141-203	0.4	250	SMA	–55 to +125 °C

Honeywell

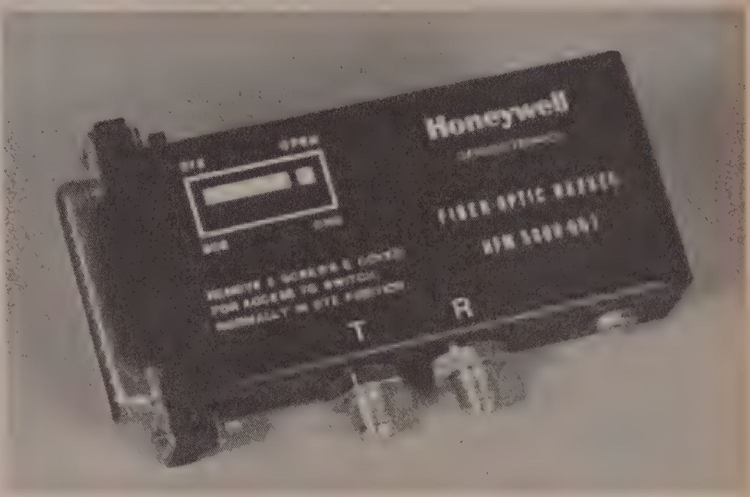
OPTOELECTRONICS INC.
830 EAST ARAPAHO ROAD
RICHARDSON, TEXAS 75081
(214)—234-4271 TELEX 73-0890
TWX 910-867-4757

Fiber Optic Links

RS232C

RS232C fiber optic link: HFM 5000 Series

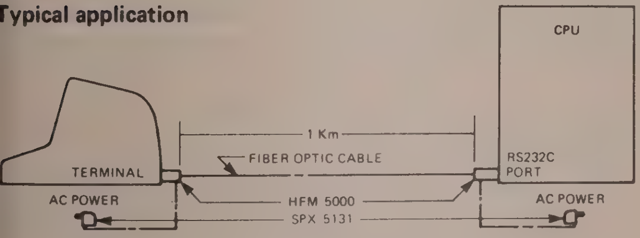
The HFM 5000 series is a plug compatible replacement for most 3 wire EIA RS232C (V24) extension cables providing an effective way of extending cables beyond the 15 meters limit of a standard RS232C.



Features

- Extends RS232C link length to 1.000 meters (3,281 feet)
- Optical isolation of grounds
- EMI/RFI resistant
- Full duplex, asynchronous, DC to 56 Kb/s data rate
- Plugs directly into 25 pin connector on computers, peripherals, etc.
- DCE or DTE switchable
- Power provided by AC power cube or thru 25 pin connector
- Interfaces to standard RS232C Drivers/Receivers
- Complies with FCC class A equipment requirements

Typical application



Standard cable assemblies (Duplex 200 μm, NA = 0.16)

Type	Length (m)	Optical connector
SPX 5132-302	30	AMP # 227846-1
SPX 5132-502	50	AMP # 227846-1
SPX 5132-103	100	AMP # 227846-1
SPX 5132-104	1000	AMP # 227846-1
Note 1		

HFM 5000

Module type	RS232C Connector (D type 25 pin)	Optical connector	Power supply
HFM 5000-001	AMP # 745224-1/male	AMP # 227846-1	SPX 5131- . . .
HFM 5000-002	AMP # 745114-2/female	AMP # 227846-1	SPX 5131- . . .
HFM 5000-003	AMP # 745224-1/male	AMP # 227846-1	Note 3 & 4
HFM 5000-004	AMP # 745114-2/female	AMP # 227846-1	Note 3 & 4
HFM 5000-006	AMP # 745224-1/male	AMPHENOL SMA # 905	SPX 5131- . . .
HFM 5000-007	AMP # 745114-2/female	AMPHENOL SMA # 905	SPX 5131- . . .
HFM 5000-008	AMP # 745224-1/male	AMPHENOL SMA # 905	Note 3 & 4
HFM 5000-009	AMP # 745114-2/female	AMPHENOL SMA # 905	Note 3 & 4

Note 1:
Other cable lengths on request.

Note 2:
Optional RS232C connector configurations on request.

Note 3:
Pin 18 and 25 connected internally to ± 5 V.

Note 4:
Power supply options:
SPX 5131-001: 120 AC/60 Hz US plug
SPX 5131-002: 220 AC/60 Hz US plug
SPX 5131-UK: 220 AC/50 Hz UK plug
SPX 5131-E: 220 AC/50 Hz

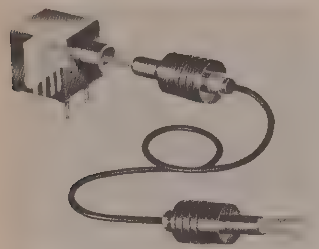
Note 5:
See fig. 60 for Dimensions

INTEROPTICS
ONE OF THE **PURDY** GROUP OF COMPANIES
770 AIRPORT BLVD., BURLINGAME, CALIF. • TEL. (415) 347-7727, TWX 910-374-2353

OPTO/LINK

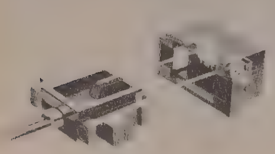
Fiber Optic Data Links

OPTOLINK 100 SERIES



The OPTOLINK 100 Series is a complete simplex digital data link. The design incorporates both the LED (or Photo Diode) and the Driver IC (or Receiver IC) into one package in order to facilitate usage in virtually any type of TTL circuit.

OPTOLINK 200 SERIES



The OPTOLINK 200 Series is a complete full duplex digital data link operating on two separate fibers. The design incorporats both the LED/Receiver and IC and the Photo Diode/Driver IC into one package in order to facilitate usage in virtually any type of TTL circuit.

Features

- High reliability yet low cost
- TTL/STTL/LSTTL compatible
- PC board mountable
- Lightweight and small package
- Easy to install and use "snap-in" connector
- Electrically isolated
- EMI/RFI immune
- DC to 3 MB/s capability
- Transmission up to 30 meters
- Simplex or duplex operating mode

Ordering Information

Part No.	Description
OPTO101	Transmitter
OPTO102	Receiver
OPTO103K	Plug
OPTO104M	Cable
OPTO105*	Assembly Kit
OPTO212	Transceiver
OPTO203K	Plug
OPTO204M	Cable
OPTO205*	Assembly Kit

*OPTO105 and OPTO205 Assembly Kits include Crimp Tool, Polishing Tool, and Polishing Films.

Specifications - Maximum Ratings

Part No.	Item	Symbol	Min.	Max.	Unit
100 Series	Operating temperature	T_{opr}	0	70	° C
OPTO101 Transmitter	Power Supply voltage	V_{CC}	−0.5	7	V
	Input voltage	V_{IH}	−0.5	5.5	V
OPTO102 Receiver	Power supply voltage	V_{CC}	−0.5	7	V
	Low level output current	I_{OL}	–	20	mA
	High level output current	I_{OH}	–	−1	mA

Electrical and Optical Characteristics (T_{opr} = 25° C, $V_{CC} = 5 \pm 0.25V$, λp = 660 nm)

Part No.	Item	Symbol	Min.	Standard	Max.	Unit	Condition
OPTO101 OPTO212* Transmitter	Coupled power to fiber	Pf	−15	−13	−10	dBM	External resistor 150 Ω using OPTO103K w/1 meter of cable
	Wavelength of peak radiant intensity	λp	–	660	–	nm	
	Current consumption	I_{CC}	–	45	65	mA	OPTO101 Transmitter
	High level input voltage	V_{IH}	2.0	–	–	V	
	Low level input current	V_{IL}	–	–	0.8	V	
	High level input current	I_{IH}	–	–	40	µA	$V_{CC} = 5.25V$, $V_{IH} = 2.4V$
	Low level input current	I_{IL}	–	–	−1.6	mA	$V_{CC} = 5.25V$, $V_{IL} = 0.4V$
OPTO102 OPTO212* Receiver	Maximum receivable power	P_{MAX}	−15	−13	–	dBm	BER = 10^{-9}
	Minimum receivable power	P_{MIN}	–	−30	−28	dBm	BER = 10^{-9}
	Current consumption	I_{CC}	–	18	30	mA	OPTO102 Receiver
	High level output voltage	V_{OH}	4.6	–	–	V	$V_{CC} = 4.75V$, $I_{OH} = 60\ \mu A$, $-50\ \mu A$
	Low level output voltage	V_{OL}	–	–	0.4	V	$V_{CC} = 4.75V$, $I_{OL} = 1.2$ mA
OPTO212* Transceiver	Current consumption	I_{CC}	–	63	95	mA	

*OPTOLINK212 Transceiver consists of one Transmitter and one Receiver.

Cable Characteristics

Part No.	Item	Symbol	Min.	Standard	Max.	Unit	Condition
OPTO104M	Numerical aperture	N.A.	–	0.5	–		
	Refractive index profile	Step index, plastic core/clad. Core diameter=.97 mm, clad diameter=1.0 mm					
	Transmission loss		–	0.4	–	dB/m	Measured with 10 m optical fiber length
	Bandwidth		–	60	–	MHz	Optical fiber length 50 m
	Propagation delay time	t_p	–	5	7	ns/m	

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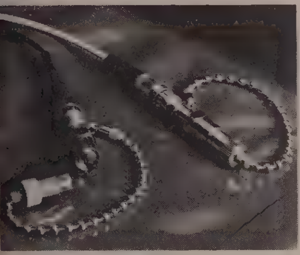
Fiber Optic Connectors

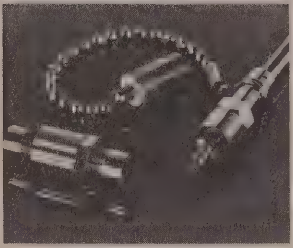


MMS-3
Single Mode

- Low insertion loss, less than 1 dB dry*
- No index matching fluid
- Can accommodate 6, 8, 9 µm core/125 µm clad fiber
- High precision tungsten carbide ferrules
- Hex nut coupling method

*8 µm core, at 1300 nm

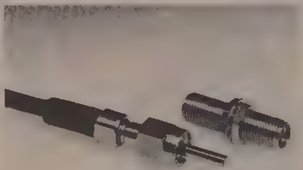
INTEROPTICS$_{TM}$ MMS-3 monomode fiber optic connectors are designed for optimum performance monomode fibers with a cladding diameter of 125 µm. Precision manufacturing techniques allow a tolerance of less than 1 µm on the diameter of the ferrules and the alignment sleeve thus providing an exact alignment of the fiber cladding ends.



GFS-3
Multimode

- Low insertion loss, typically .5 dB dry
- No index matching fluid
- Accommodates any 50/125 or 100/140 µm fiber
- High precision tungsten carbide ferrules
- Hex nut or bayonet coupling

INTEROPTICS$_{TM}$ GFS-3 fiber optic connectors are designed for high performance fibers ranging from 50/125 µm to 100/140 µm in diameter. Precision manufacturing techniques allow a tolerance of 1 µm on the diameter of the ferrules and the alignment sleeve thus providing a perfect alignment of the fiber ends.

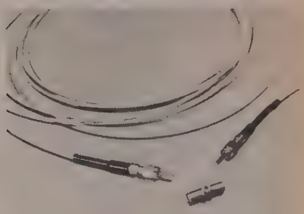


GFS-13/A
Multimode

- Low loss (max. 0.7 dB, typically .5 dB*)
- No index matching fluid
- Accommodates 50/125 or 100/140 µm fiber
- High precision tungsten carbide ferrules
- SMA type coupling

*50/125 µm fiber

INTEROPTICS$_{TM}$ GFS-13/A connectors are designed to meet the requirements of a harsh or military environment. Either 50/125 or 100/140 µm diameter multimode fibers can be terminated. The ferrule and the lining of the adaptor are made of tungsten carbide, an extremely hard metal with a very low coefficient of expansion.



GFS-24/A
SMA Multimode

- Low loss (at least 1.0 dB, typically .6 dB*)
- No index matching fluid
- Accommodates 50/125, 100/140 or 200/230 µm fiber
- High precision tungsten carbide tipped ferrule
- SMA type coupling

*50/125 µm fiber

INTEROPTICS$_{TM}$ GFS-24/A fiber optic connectors are designed to be used to terminate 50/125, 100/140 or 200/230 µm diameter multimode fibers. The ferrule tips are made out of tungsten carbide, an extremely hard metal with a very low coefficient of expansion.

Ordering Information

Type	Description	Buffer Jacket ϕ (mm)	Fiber ϕ (µm) Core/Cladding	MMS-3 Part No.	GFS-3/K Part No.
Connector	Plug w/hex coupling nut & dust cap & chain	1.0	125	HMS-3	
Connector	Same as above except w/Kevlar strain relief	1.0	125	HMS-3S	
Connector	Plug w/hex coupling nut & dust cap & chain	1.0	50/125		HFS-3
Connector	Plug w/hex coupling nut & dust cap & chain	1.0	100/140		HFS-3/140
Connector	Same as above except w/Kevlar strain relief	1.0	50/125		HFS-3/S
Adapter	In-line adapter w/dust cap, for hex nut coupling			MMT-3	
Adapter	In-line adapter w/dust cap, for hex nut coupling				MST-3
Kit	Assembly tooling kit			Z211	Z211
				GFS-13/A	**GFS-24/A**
Connector	Male SMA Connector	1.0	50/125	HFS-13	
Connector	Male SMA Connector	1.0	100/140	HFS-13/140	
Connector	Male SMA Connector	1.0	50/125		HFS-24
Connector	Male SMA Connector	1.0	100/140		HFS-24/140
Connector	Male SMA Connector	1.0	200/230		HFS-24/230
Adapter	In-line adapter			MST-13/A	
Adapter	In-line adapter				MST-24/A
Kit	Assembly tooling kit			Z213	Z212

Characteristics

Mechanical

Lateral misalignment: Not to exceed .8 µm

Angular misalignment: Maintained to less than .5°

Fiber strain relief: Produced by using adhesive to cement the buffer jacket inside the ferrule (up to 4 lbs.) and cementing the Kevlar to the connector (up to 20 lbs.)

Fiber positioning: Provided by mechanical centering and swaging of the cladding with a precision of .8 µm

Optical

Repeatability: The ruggedness and the high precision of both the ferrules and the alignment sleeves guarantees a reproducibility of the insertion loss with ± .15 dB on the same pair and ± .2 dB on any unmatched pair

Environmental

Temperature: An extremely low coefficient at expansion for the ferrule material allows constant performances from -20° C to +80° C.

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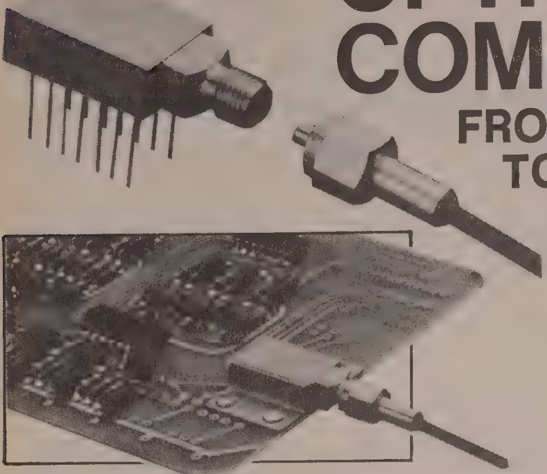
OPTICAL COMMUNICATIONS

FROM OPTO-HYBRIDS TO COMPLETE SYSTEMS



MERET, Inc., a leader in optical communications since 1975, offers a wide range of components, subsystem assemblies and complete turnkey systems for fiber optic and atmospheric communication. Products listed here are available from stock.

OPTO-HYBRIDS EMITTERS/TRANSMITTERS

Part Number	Radiated Power (μW at 100 mA) Total	50μ Fiber	200μ Fiber	Rise Time (ns)	Bandwidth
LIGHT EMITTING DIODES — 800 nm					
ML25	—	15	100	2	dc-150 MHz
TL37	10,000	—	250	10	dc- 35 MHz
TL38	1,000	20	450	10	dc- 35 MHz
ANALOG TRANSMITTERS					
X275-4	10,000	—	250	25	dc- 15 MHz
X288-4	1,000	20	450	6	dc- 40 MHz
X259-20	—	15	100	2	dc-150 MHz
VIDEO TRANSMITTERS					
X285TV	1,000	20	450	25	6 Hz-15 MHz
X288TV	1,000	20	450	6	6 Hz-40 MHz
DIGITAL TRANSMITTERS					
MLT459	—	15	100	2	dc-200 Mbps
MLT458	—	15	100	4	dc- 60 Mbps
MLT478	10,000	—	250	8	dc- 50 Mbps
MLT488	1,000	—	450	8	dc- 50 Mbps

TRANSIMPEDANCE AMPLIFIERS

Part Number	Transimpedance (mV/μA)	Rise Time (ns)	Bandwidth	NEI (pA/√Hz)
MA8309	4	2	dc-200 MHz	2.5
MA8201	130	120	dc- 5 MHz	0.5

ANALOG FIBER OPTIC DATA LINKS

System Number	Transmitter Part No.	Rcvr. Part No.	Bandwidth	Loss Budget (dB) for S/N > 40 dB 50μ	200μ
MDL271-4	X275-4	R1100	dc- 2 MHz	—	−26
MDL288-4	X278-4	R1800	dc-25 MHz	−10	−20
MDL259-20	X259-20	R5900	20 Hz-140 MHz	Note 1	Note 1

VIDEO FIBER OPTIC DATA LINKS

MDL285TV	X285TV	R1150	6 Hz- 8 MHz	−17	−30
MDL288TV	X288TV	R1750	6 Hz-35 MHz	− 7	−20

MULTI-CHANNEL TURNKEY FIBER OPTIC SYSTEMS

MERET can supply complete multi-channel systems in cage rack mount configurations. Using MERET hybrid modules, up to 24 channels of analog or digital transceivers can be housed in a single standard 19-inch cage, together with all necessary decoupling, power supplies, fuses, switches, indicators, and alarms. Applications include multi-channel remote surveillance video systems with digital links for camera control, data communications systems, and RGB video and sync for computer graphics and CAD/CAM. MERET turnkey systems are supplied with ruggedized multi-channel cable, and we can also provide field installation services and customer training.

OPTO-HYBRIDS DETECTORS/RECEIVERS

Part Number	Type	Active Area (mm)	Responsivity (μA/μW)	Rise Time (ns)	Bandwidth	NEP (pW/√Hz)
PIN AND AVALANCHE PHOTODIODES						
TD31	PIN	1.0	0.5	3	dc-100 MHz	0.1
MD33	PIN	2.5	0.6	8	dc- 40 MHz	0.2
TD25	APD	0.5	50	0.5	dc-500 MHz	0.05
ANALOG RECEIVERS						
R1100	PIN	1.0	60*	70	dc- 5 MHz	1.0
R1900	PIN	1.0	2*	3	dc-100 MHz	3.0
R5100	APD	0.5	3,000*	60	dc- 6 MHz	0.05
R5900	APD	0.5	100*	2	dc-150 MHz	0.1
MULTISTAGE VIDEO RECEIVERS						
R1150	PIN	1.0	3,600*	40	6 Hz-10 MHz	1.0
R1750	PIN	1.0	600*	8	6 Hz-40 MHz	2.0
R5750	APD	0.5	20,000*	8	6 Hz-40 MHz	0.1
DIGITAL RECEIVERS						
R1105	PIN	1.0	60*	3	dc- 5 Mbps	3 †
R1155	PIN	1.0	3,600*	3	dc- 5 Mbps	0.2†
R1805	PIN	1.0	5*	3	dc- 35 Mbps	15 †
R5805	APD	0.5	200*	3	dc- 35 Mbps	0.3†
R5908	APD	0.5	50*	3	dc-150 Mbps	1 †

* (mV/μW)
† Threshold (μW)

DIGITAL FIBER OPTIC DATA LINKS

System Number	Transmitter Part No.	Rcvr. Part No.	Data Rate	Loss Budget (dB) for BER < 10^{-9} 50μ	200μ
MDL481	MLT488	R1105	dc- 5 Mbps	−13	−23
MDL4811	MLT488	R1155	dc- 5 Mbps	−24	−34
MDL488	MLT488	R1805	dc- 35 Mbps	− 3	−13
MDL4877	MLT488	R1885	dc- 30 Mbps	−13	−23
MDL4595	MLT459	R5908	dc-150 Mbps	Note 1	Note 1

Note 1: Range limited to 200 meters maximum due to material dispersion. Built-to-order laser systems for distances up to 2 km are available.

ATMOSPHERIC OPTICAL DATA LINKS

System Number	Description	Bandwidth or Data Rate	Beamwidth (Xmtr) (mr)	FOV (Rcvr) (mr)
MDL623TV-200	Video (TV) Transmission up to 200 meters	6 Hz to 6 MHz	7	17
2MDL821-200	Duplex TTL Transmission up to 200 meters	DC to 5 Mbps	10	35
2MDL823-400	Duplex TTL Transmission up to 400 meters	DC to 4 Mbps	7	17
2MDL871RS-100	Duplex RS422 for Wide Dynamic Range; 1 meter to 100 meter (Robotics, etc.)	DC to 1Mbps	20	35

WIDE FOV MINIATURE HYBRID ATMOSPHERIC LINKS

System Number	Description	Bandwidth or Data Rate	Beamwidth (Xmtr) (deg)	FOV (Rcvr) (deg)
MDL675-15	Analog or TV Transmission up to 15 meters	6 Hz to 6 MHz	10	4
MDL870-20	TTL Transmission up to 20 meters*	DC to 500 Kbps	10	100

* External optics can significantly increase the range.

MERET, inc.

Specialists in Optical Communications

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MOTOROLA

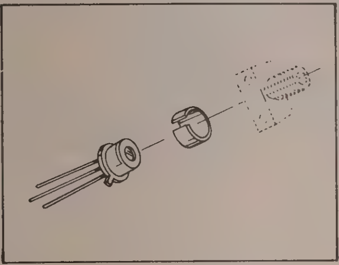
SEMICONDUCTORS

P.O. BOX 20912 • PHOENIX, ARIZONA 85036

FIBER OPTICS
OPTOISOLATORS
OPTOINTERRUPTERS
PRESSURE TRANSDUCERS

FIBER OPTICS

100 MHz Performance
in standard, hermetic TO-52 with silica FO cable.



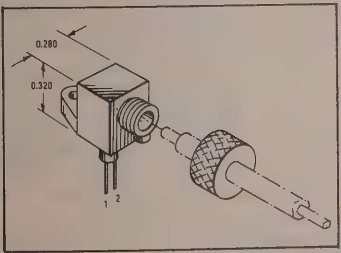
MFOE1202, 820 nm emitter with P_O = 2.4 mW typ

MFOD1100, PIN detector with R = 0.35 µA/µW typ

Other detectors in TO-52:

- MFOD2202 — Transistor
- MFOD2302 — Darlington
- MFOD2404 — 10 Mbaud w/preamp
- MFOD2405 — 40 Mbaud w/preamp

Low Cost, 10 MHz Performance
in FLCS package with large core plastic FO cable.



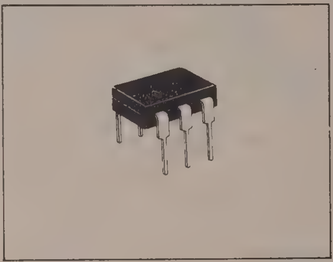
MFOE71, 820 nm emitter with P_{Launch} = 165 µW typ

FLCS detectors include:

- MFOD71 — Fast PIN diode
- MFOD72 — Transistor
- MFOD73 — Darlington

OPTOISOLATORS

All Motorola optoisolators are in the standard 6-pin DIP package with an infrared emitting diode optically coupled to a silicon photodetector.



All are tested and specified to an isolation voltage of 7500 Vac peak. All are UL recognized and VDE approved.

Output functions include:

Transistor
CTR from 2.0 to 225%
$V_{(BR)CEO}$ from 20 to 400 V

Darlington
CTR from 50 to 1000%
$V_{(BR)CEO}$ from 25 to 100 V

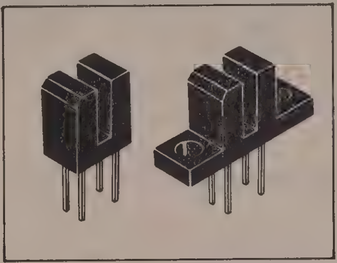
Triac Driver
Peak Blocking Voltage of 250 and 400 V
LED Trigger Current of 5.0 to 30 mA
Zero cross and Random Fire

SCR
Peak Blocking Voltage of 200 and 250 V
LED Trigger Current of 20 to 40 mA

Schmitt Trigger
Threshold Current, ON, of 1.6 to 10 mA
Hysteresis Ratio of 0.75 typ
t_r, t_f of 0.1 µs typ

OPTOINTERRUPTERS

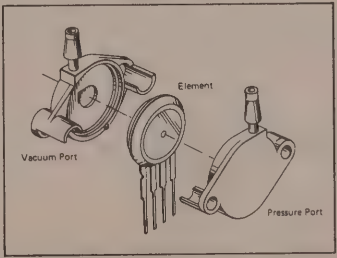
. . . consist of an infrared emitting diode facing a photodetector in a molded plastic housing. A slot in the housing provides a means of interrupting the signal.



Motorola offers several standard housings with a wide selection of detector functions:
Schmitt Trigger, Triac Driver, SCR, Darlington and Transistor

PRESSURE TRANSDUCERS

. . . silicon piezoresistive pressure sensors providing a very accurate and linear voltage output at a low cost.



They are available in four differential pressure ranges, as Differential or Absolute elements or with parts on either or both sides.

	Press. Range (psi)	Linearity (%)
MPX10	0–1.5	±1.0
MPX50	0–7.5	±0.1
MPX100	0–15	±0.1
MPX200	0–30	±0.1

Full Scale Output (typ) varies from 36 mV on the MPX10 to 60 mV on the others.

PHOTODYNE INC.

THE STATE-OF-THE-ART IN OPTICAL INSTRUMENTATION

FIBER OPTIC INSTRUMENTATION

FIBER OPTICS

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
8XE	Fiber Optic Source Driver	Adjustble constant current source from 1mA to 100mA, regulated to 0.25%.	Accepts a variety of Photodyne plug-in LED sources. Longwave and shortwave.
11XE*	Fiber Optic Power Meter	Single function, absolute power in dBm units. Built-in silicon detector, spectrally calibrated at 820 nm. Responsive from 600-1000 nm.	Pocket size, one-button operation with LCD backlight mode.
12XE	Fiber Optic Power Meter	Single function, absolute power in dBm units. Built-in germanium detector, spectrally calibrated at 1300 nm.	Pocket size, one button operation with LCD backlight mode.
22XLC	Fiber Optic Multimeter	Absolute measurements in 'dBm, RCVR A only' mode, direct dB loss measurement in 'dB, RCVR A only' and (A-B) dB, Dual-Mode.	4½ digit custom LCD, Analog o/p directly proportional to the display, IEEE-488 BUS interface capability via Model 488XLI. Uses plug-in sensor heads with spectral range of 400-1800 nm and power range from -80 to 0 dBm. Accepts a variety of plug-in LED sources.
118/128	Loss Test Sets	Field usable Loss Test Sets with separate transmit and receive modules for installed cable. Series 118 for shortwave power, Range -80 to 0 dBm; Series 128 for longwave power, Range -60 to 0 dBm. Readout in dBm. Choices available for either 50/125 or 100/140 fiber and most standard industry connectors.	Tough "tool-box" style instrumentation. Easy to use. 3½ digit back lit LCD readout. Autoranging over 6 to 8 decades.
1100XM	Spectral Analyzer	A precision monochromator for characterizing fiber optic sources in the range: 600 to 1800 nm. Wavelength readout resolution 0.2 nm.	Fiber in, fiber out. Direct wavelength readout. Connects directly to any Photodyne XL radiometer.
1500XP	Optical Waveform Analyzer (820 nm)	Plug-in module operates with any oscilloscope to display optical waveforms proportional to the incident optical power. Measure rise/fall times with response to 2 nanoseconds.	Built-in avalance photodiode with fast response characteristics. Uses Photodyne Fiber Optic Adapters.
1600XP	Optical Waveform Analyzer (1300 nm)	Displays waveform proportional to the incident optical power from DC to 150MHz with maximum 3ns rise and fall time. It responds to wavelengths from 800 nm up to 1600 nm.	Low noise Ge-APD. Sensitive input amplifier. 50 Ohm buffered output.
1800 A/B	Fiber Optic Step Attenuator	Step attenuator in 1 dB increments, range of 0-89 dB.	Low insertion loss V 5dB, typical 3dB.
1950XF/XR	Fiber Optic Continuous Attenuator	Computer calibrated dial for direct readout of attenuation -0 to 70dB. (XF - Field Case, XR - Lab Case).	.05dB resolution, Cal: 800 nm and 1300 nm.
2200XF 2250XF	Fiber Optic Test Set	Absolute measurements in dBm or watts. Direct dB loss measurements or ambient suppression. Multi-wavelength capability. XMTR constant current output for plug-in LED sources.	Ruggedized and portable for field operation. Power range: − 80 to + 6 dBm. Spectral range: 400-1800 nm. Built-in battery pack for portable operation.
5500XF	Optical Time Domain Reflectometer	The 5500 optical pulse echo measurement system utilizes back-scattered light detection to automatically determine the distance to faults, connectors, splices, breaks, and end of fiber, while simultaneously displaying the loss of the connector or splice, as manifested in the optical return signal. This system can measure distance to defects over a range of 5 meters to 20 kilometers with a resolution of 1 meter.	
7700XR 7750XR	Optical Signal Generator	Model 7700XR/7750XR provides calibrated optical test signals for fiber optics systems evaluations. The output is an optical signal that is absolutely calibrated in intensity and wavelength (820 nm), adjustable in frequency from DC to 10MHz, and adjustable in intensity through a 20dB range. The average power output is displayed on a 3½ digit meter. The maximum power output is 50 microwatts into a 50/125 micron fiber. Shortwave (7700). Longwave (7750).	
488XLI	GPIB Interface	Model 488XLI is an IEEE Standard 488-1978 Bus Interface Adapter for the Photodyne XL (XL, XLA, XLC) series of optical instrumentation. Provides 4½ digit accuracy, TALK ONLY and ADDRESSABLE modes, as well as power for the XL instrument. Applications include optical ATE systems, data logging, LED and laser measurements, and a general purpose A/D converter.	

LIGHT MEASUREMENT INSTRUMENTATION

RADIOMETRY/PHOTOMETRY

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
33XLC	Chopped Light Multimeter	Selectable log or linear display units. True AC/DC frequency response.	4½ digit custom LCD, Analog o/p directly proportional to the display, IEEE-488 bus interface capability via Model 488CLI. Uses plug-in sensor heads. Accepts a variety of plug-in LED sources.

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
44XLA	Optical Power Meter	Six decade linear reading -1 nW to 2 mW with Model 150 Sensor Head, 1 mW to 2 Watts with Model 350 Head. Ambient light suppression mode.	Uses interchangeable sensor heads.
88XLA	Radiometer/Photometer	Nine decade linear reading with sensitivity to 1 picowatt and 220-1800 nm wavelength range. Ambient light suppression mode. Autozeroing and autospectral calibration.	Uses interchangeable sensor heads with direct reading in radiometric and photometric units. LCD backlight function.
14XE/19XE	CRT Radiance Meters	Hand-held pocket-type meters ideal for setting up RGB color monitors. May also be used as transfer standards from engineering to manufacturing, and for maintenance. Model 14XE is calibrated in cd/m² (nits) and foot-lamberts; Model 19XE in W/m²/sr.	One hand operation. Rapid and easy measurement, no focusing needed. Direct readout on large 3½ digit back lit LCD. Battery and line operation.
15XE/18XE	Pocket Size Radiometers	Photodyne's small hand-held radiometers will find applications ranging from laser power measurements to fiber optic measurements. Model 15XE covers the spectral range 700 nm to 1800 nm; Model 18XE cover the range 400 nm to 1150 nm. They are battery powered and are supplied in a zipper pouch.	One hand operation. Large 3½ digit LCD with back lighting. Operates from 9 volt battery or line voltage.

LASER/PULSE MEASUREMENTS

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
66XLA	Optical Power/Energy Meter	Six decade linear reading in power and energy, 1 nW to 2 mW and 1 mJ to 2 mJ with Model 150, 1uW to 2 W and 1 uJ to 2 J with Model 350 Head. Spectral range from 220-1800 nm.	Uses interchangeable sensor heads. Applications in radiometry and photometry. Backlight function.

DENSITOMETER/REFLECTOMETER

MODEL	DESCRIPTION	MEASUREMENT FUNCTIONS	SPECIAL FEATURES
99XL	Densitometer/Reflectometer	General purpose densitometer/reflectometer displays in optical density units.	Various transmission and reflection measurement heads are available.

ACCESSORIES

DESCRIPTION	FEATURES
Plug-In Sensor Heads	All Photodyne XL instruments are interchangeable plug-in sensor heads consisting of detector and detector/filter combinations. Broad line of sensors for both radiometric and photometric applications. Specific applications include low-light level measurements, radiometric response, UV, visible light, IR, LED measurements, and CRT evaluation. Spectral calibration data included with every sensor head.
Fiber Optic Adapters	Fiber optic adapters screw onto sensor heads. Available for most fiber optic connectors including AMP, Amphenol, Deutsch, Siecor, ITT Cannon, NEC, etc. Also available are bare fiber adapters.
LED Sources	Plug-in LED sources, longwave and shortwave, are available for use with 8XE, 22XLC, 33XLC, 66XLC instruments. Includes fiber pigtail sources along with mounted fiber optic receptacles. Contact Photodyne for complete current list.

All spectral calibrations are traceable to the National Bureau of Standards (Washington, D.C.). Modern Measurement technology utilizes new Silicon Photodiode Standard Detector and Photodyne's state-of-the-art Spectral Analysis Microcomputer. Each calibration consists of a three page computer printout which includes responsivity data, quantum efficiency, photometric response, and plot of spectral response. Contact factory for special calibration requirements.

* Patents Pending

** Sensor heads not included with Photodyne XL instruments (except 88XLF and 99XL).

PHOTODYNE INC.

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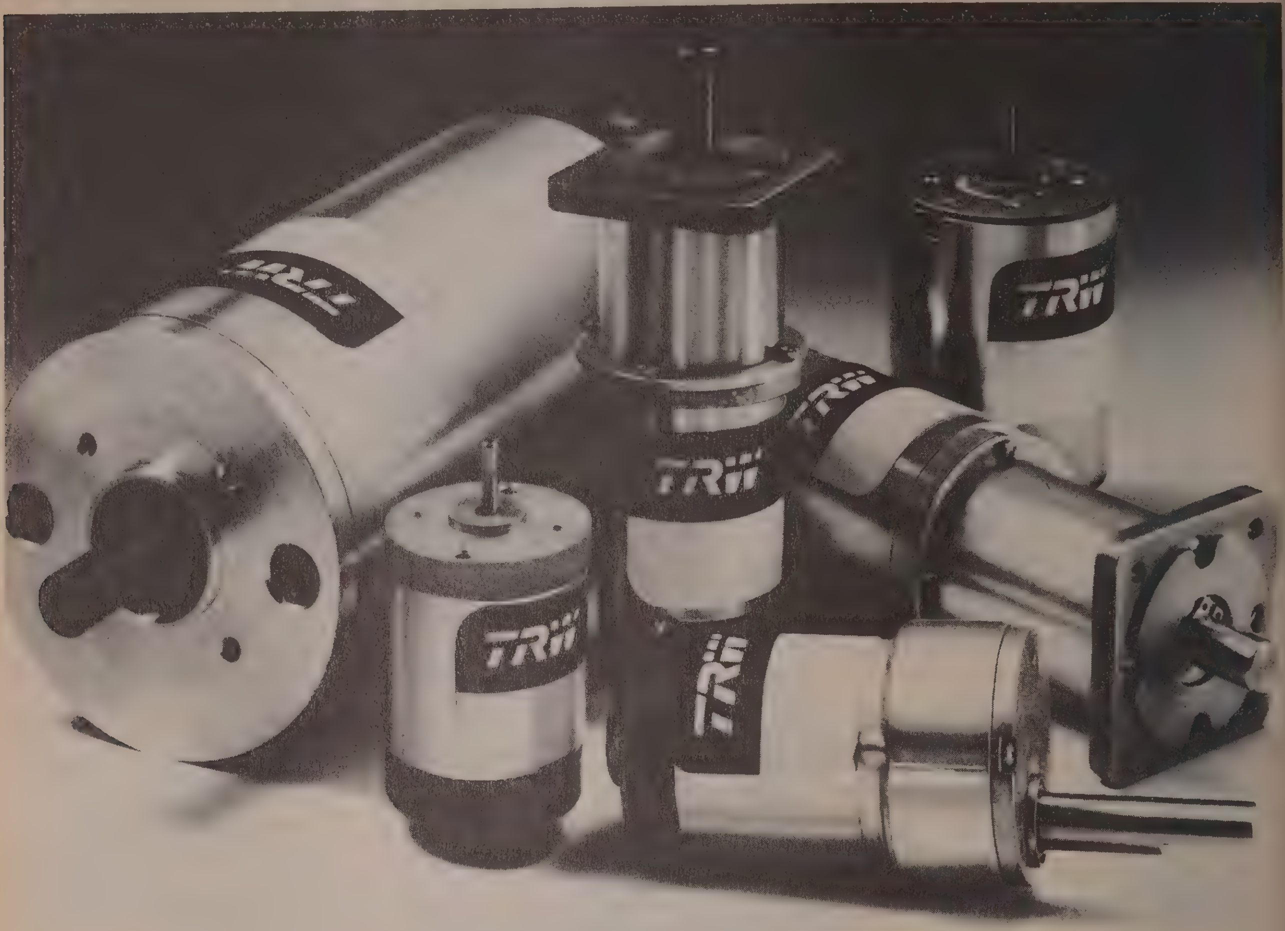
Newbury Park, California 91320 U.S.A.
Phone: (818) 889-8770 (805) 499-3636
Telex: 18-1159

Always a step ahead......



TRW announces a new line of miniature industrial motors to solve your motion problems.

Meet our exclusive, full line of industrial motors. For high performance and reliability . . . here's more power to you.

IM-13 d.c. Motor. Specify TRW d.c. permanent magnet motors. Self-aligning sleeve bearings life-lubricated and withstand a 2 lb. side load.

IM-13 Spur Gearmotor. Precision ground hardened high carbon steel shaft. Six to 24 v.d.c. rated voltage and 1,000 hours nominal continuous duty life.

IM-13 Planetary Gearmotor. Life-lubricated bearings and geartrains are standard. Weight 10 to 17 oz., depending on ratio and motor.

IM-15 d.c. Motor. Corrosion-resistant steel housing cover. Die cast metal end bell. Ceramic magnets tolerate high pulse currents without demagnetizing.

IM-15 Planetary Gearmotor. Gears precision manufactured and heat treated for reliable performance and long life. Precision ground case hardened shaft, optional configurations available.

IM-26 Motor. Our largest-ever industrial motor delivers high efficiency and cool operation with standard windings. Various torque constants available up to 37 oz. in./amp.

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For more information see your TRW distributor. Or contact TRW Motors, Dothan, AL 36303. (205) 983-3542. And ask about TEAM — TRW Electronic Application Marketing — a free computerized service to give you information on precision, miniature motors.

Distributed by Arrow, Hall-Mark, Hamilton/Avnet, Jaco and Pioneer.

TRW

Motor Division
TRW Electronic Components Group

AC, ROTARY, CONTINUOUS ROTATION

INDUCTION, DIRECT DRIVE

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Eastern Air Dvcs.	1141	●					50	60					600	12000			1/300	1/2
IMC Magnetics	1157	●			115	220	60	400	6.50	2700.00	0.10	510.00	3400	18000			1/3000	3
Japanese Products	1158	●				115		60			2.00	27.80	1500	3000			1/250	1/25
Robbins & Myers	1175	●										176.00					1/150	1/3
Shinano Kenshi	1181	●				115	50	60			4.20	27.80						
TRW	1200	●	●	●	27	200	60	400	8.00	65.00	0.05	1.50	500	24000				

INDUCTION, REDUCTION

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Japanese Products	1158	●				115		60			15.00	1500.00	0.9	310			1/250	1/25
Robbins & Myers	1175	●										176.00	0	848			1/150	1/3
Shinano Kenshi	1181	●				115	50	60										
TRW	1200	●	●	●	27	200	60	400	12.00	65.00	0.12	2.50	0	900	4	46656		

SYNCHRONOUS, DIRECT DRIVE

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Bodine	1135	●			115	230	50	60	18.40	188.60	50.00	720.00		72				
Crouzet	1140	●											300	450				
Eastern Air Dvcs.	1141	●					50	60					600	12000			1/300	1/2
IMC Magnetics	1157	●			26	208	50	400	5.70	430.00	0.03	180.00	1800	24000			1/1700	1/3
Japanese Products	1158	●				115		60			0.75	15.30	1800	3600			1/375	1/35
Shinano Kenshi	1181	●			100	115	50	60				11.11	900	3600				
Superior	1182	●	●		120	240	50	60			25.00	1500.00	29	200				

SYNCHRONOUS, REDUCTION

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Airpax	1131	●			12	230	50	60			0.75	1.10	1/1000	720				
Crouzet	1140	●							2.80	5.00	130.00	580.00						
Japanese Products	1158	●				115		60			6.00	1500.00	1	360			1/375	1/35

TORQUE, DIRECT DRIVE

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
IMC Magnetics	1157	●			18	200	50	400	1.30	255.00	0.15	320.00	725	1000				

TORQUE, REDUCTION

Manufacturer	EEM Page 1B•____	Phase			Volts, AC		Freq., Hz		Input, Watts		Torque, Oz. In.		Output, RPM		Ratio, X:1		Rated HP	
		1	2	3	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Japanese Products	1158	●				115		60			2.70	1500.00	Var.	Var.			1/250	1/25

DC, ROTARY, CONTINUOUS ROTATION

BRUSHLESS, DIRECT DRIVE

Manufacturer	EEM Page 1B•____	Volts, DC		Reduction, X:1		Torque, Oz. In.		Speed, RPM		Output, HP		Output, Watts	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Aeroflex	1123												
Airpax	1131	24	48			30.00	700.00						
Buehler	1137	12	48										
Canon	1138					1.90	5.00						
Clifton Precision	1139												
Eastern Air Dvcs.	1141												
Electro-Craft	1143												
IMC Magnetics	1157												
Japanese Products	1158												
Magnetic Technology	1160												
Motor-Tronics	1166												
Motronics	1169												
Pittman	1171												
Robbins & Myers	1175												
Shinano Kenshi	1181												
Sierracin/Magnedyne	1179					15.00	3456.00					74	518
Vernitron	1208	4	38			0.30	148.00					9	502

BRUSHLESS, REDUCTION DRIVE

Manufacturer	EEM Page 1B•____	Volts, DC		Reduction, X:1		Torque, Oz. In.		Speed, RPM		Output, HP		Output, Watts	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Japanese Products	1158												
Magnetic Technology	1160												
Motor-Tronics	1166												
Motronics	1169												

BRUSH TYPE, DIRECT DRIVE

Manufacturer	EEM Page 1B•____	Volts, DC		Reduction, X:1		Torque, Oz. In.		Speed, RPM		Output, HP		Output, Watts	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Airpax	1131	12	24			16.00	16.00						
Buehler	1137					0.10	100.00						
Canon	1138	6	24			.01	20.00						
Clifton Precision	1139												
Eastern Air Dvcs.	1141												
Electro-Craft	1143												
IMC Magnetics	1157												
Japanese Products	1158												
Mabuchi	1159	1	26			.02	49.00	3050.0	21.7k				
Maxon	1163												
Micro Mo	1164	2	48			.01	7.09	5000.0	15k			.1	20
Motor-Tronics	1166												
Motronics	1169												

DC, ROTARY, CONTINUOUS ROTATION (Con't.)

Manufacturer	EEM Page 1B•____	Volts, DC		Reduction, X:1		Torque, Oz. In.		Speed, RPM		Output, HP		Output, Watts	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Pittman	1170												
Portescap	1172												
Robbins & Myers	1175												
Shinano Kenshi	1181												
TRW	1186	6	50			0.10	0.20	5500.0	17500.0			2	5
BRUSH TYPE, REDUCTION DRIVE													
Brevel	1136		12	16.5	762.6	7.00	240.00	4.5	183.0				
Buehler	1137					2.10	429.00						
Canon	1138	6	24	8.0	300.0	0.70	139.00	1.3	600.0				
Clifton Precision	1139												
Eastern Air Dvcs.	1141												
Electro-Craft	1143												
IMC Magnetics	1157												
Japanese Products	1158												
Maxon	1163												
Micro Mo	1164	2	48	3.1	235.1k	2.80	1418.00						
Motor-Tronics	1166												
Motronics	1169												
Pittman	1170												
Portescap	1172												
Robbins & Myers	1175												
Shinano Kenshi	1181												
TRW	1186	6	50	3.8	36.9k	1.00	300.00						
TORQUE, DIRECT DRIVE													
Aeroflex	1123												
Clifton Precision	1139					6.00	2700.00						
Eastern Air Dvcs.	1141												
Electro-Craft	1143												
IMC Magnetics	1157												
Japanese Products	1158												
Magnetic Technology	1160												
Maxon	1163												
Sierracin/Magnedyne	1179					30.01850 lb.-ft.						53	8130

DC, STEPPER

Manufacturer	EEM Page 1B•____	Volts, DC		Holding Torque, Oz. In.		Dynamic Torque, Oz. In.		Degrees/Step		Response, Steps/Sec.	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
ROTARY											
Airpax	1131	3.70	14.00		28			7.50	15.00		900
Bodine	1135	1.30	7.10	50	1125				1.80		
Clifton Precision	1139							0.90	90.00		
Crouzet	1140			3	39				7.50		
Eastern Air Dvcs.	1141			50	400			1.80	90.00		
Japanese Products	1158							0.90	90.00		
Portescap	1172							.0563			
Shinano Kenshi	1181							0.90	3.75		
Superior	1182							0.72	15.00		20k
Vernitech	1207							7.50	90.00	100	1000

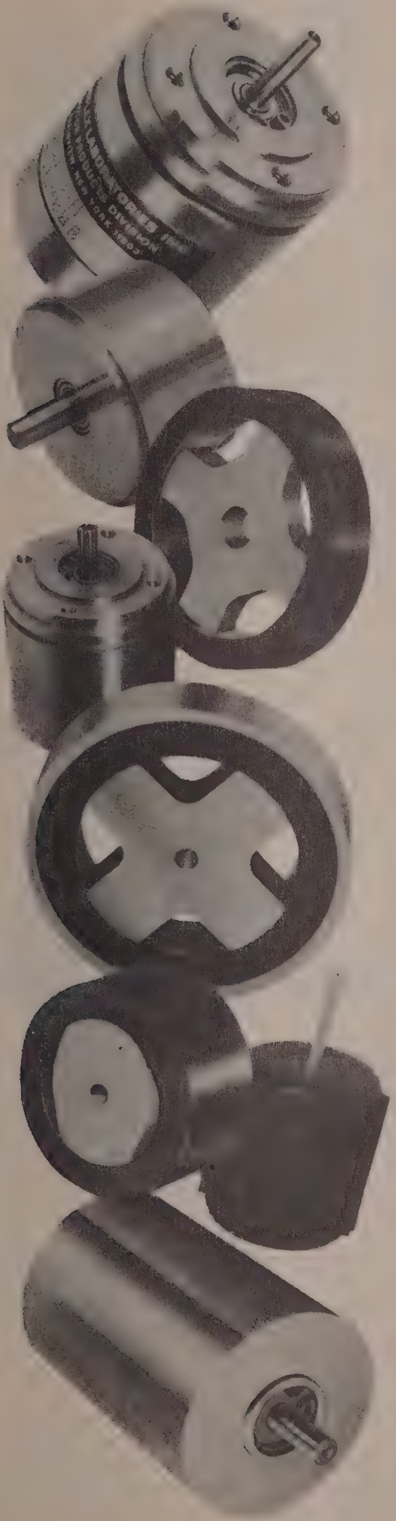
LINEAR

						Linear Force		Travel/Pulse		Travel	
						Oz.	Lbs.	Min. In.	Max. In.	Min. In.	Max. In.
Airpax	1131		12.00			15.00	19.00	.001	.004	0.5	3.0

DC, SERVO, ROTARY

Manufacturer	EEM Page 1B•____	Volts, DC		Torque, Oz. In.		Speed, RPM	
		Min.	Max.	Min.	Max.	Min.	Max.
DIRECT DRIVE							
Bertsch	1132	2.00	36.00	1.30	1013		10k
Electro-Craft	1143						
IMC Magnetics	1157						
Japanese Products	1158						
Magnetic Technology	1161			22.50	1350	143	3055
Motor-Tronics	1166						
Pittman	1170		40.00		24		
Servo-Tek	1177				2		
Vernitech	1207						
REDUCTION DRIVE							
Bertsch	1132	2.00	36.00	1.30	1013		
IMC Magnetics	1157						
Japanese Products	1158						
Servo-Tek	1177				200		

For manufacturers' sales offices, see yellow pages



Aeroflex *brushless dc motors and torquers*

We're more than just a motor company

State-of-the-art design backed by 25 years of engineering and field experience . . . Aeroflex motors and torquers are working, accurately and reliably, in the most difficult military, aerospace and industrial applications. Time and again they have proven how well they can perform in hostile environments on land, sea or in the air . . . in outer space or in the ocean's depths.

Aeroflex fractional and subfractional H.P. brushless D.C. motors offer equal — or better — performance than brush motors, with no compromise in size. They are ideal for those special applications where environment, service life or other brush motor limitations cannot be tolerated. Their high torque-to-inertia ratios, excellent heat transfer characteristics, high efficiencies (75%) and freedom from downtime make them a cost effective choice.

Aeroflex torquers are designed and built for the same demanding kind of use. They're available from 1" O.D. to 24" O.D. in torques from tenths of an oz.-in. to hundreds of ft.-lbs. With designs like this in stock, it's usually a simple matter to meet your application needs.

Should you require a special motor or torquer, we'll work to your specification or help you develop one that meets your need. We can also help you with the electronic drive interface, or even provide the complete electronic/motor assembly.

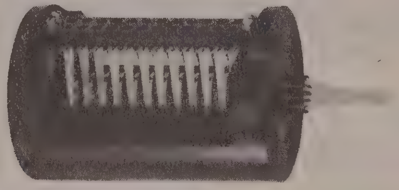
We're more than just a motor company.

For Technical "Hotline" Assistance, Ask for Mike Ruderman.

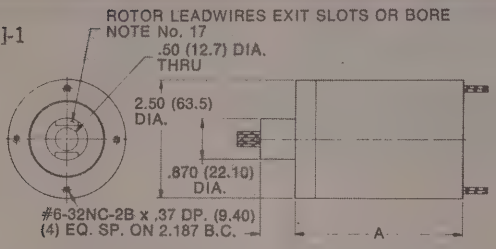
MAGNETIC PRODUCTS DIVISION
AEROFLEX LABORATORIES INC.
SOUTH SERVICE ROAD • PLAINVIEW, LONG ISLAND, N.Y. 11803
TEL.: (516) 694-6700 • TWX: 510-224-6417

airflyte ELECTRONICS CO.

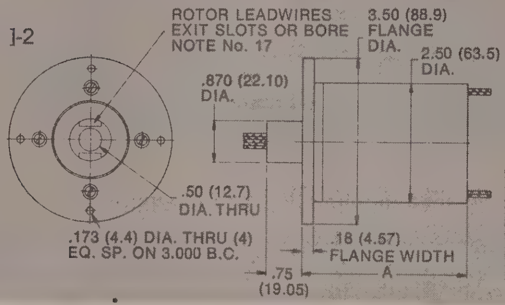
SLIP RING ASSEMBLY/30 RINGS MAX.



CAY-1030-[ ]-1


ROTOR LEADWIRES EXIT SLOTS OR BORE
NOTE No. 17
.50 (12.7) DIA. THRU
2.50 (63.5) DIA.
.870 (22.10) DIA.
#6-32NC-2B x .37 DP. (9.40)
(4) EQ. SP. ON 2.187 B.C.
A

CAY-1030-[ ]-2


ROTOR LEADWIRES EXIT SLOTS OR BORE
NOTE No. 17
3.50 (88.9) FLANGE DIA.
2.50 (63.5) DIA.
.870 (22.10) DIA.
.50 (12.7) DIA. THRU
.173 (4.4) DIA. THRU (4)
EQ. SP. ON 3.000 B.C.
.18 (4.57) FLANGE WIDTH
.75 (19.05)
A

NO. OF RINGS	A
1 THRU 16	4.00 (101.6)
17 THRU 30	5.75 (146.05)

CAY-1030

SPECIFICATIONS

1. Rings: Coin silver
2. Brushes: Silver graphite, two per ring
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Anodized aluminum
5. Housing: Anodized aluminum
6. Torque: .03 in.-lb. per ckt. approx.
7. Speed: Up to 5000 rpm
8. Life: 5000 hrs. at 100 rpm
9. Rotation: Bi-directional
10. Current: 5 amps max. per ring
11. Voltage: 250 Volts DC max.
12. Dielectric Strengths: 500 VRMS (all combinations)
13. Contact Resistance: 10 milliohms max. (excluding wires)
14. Noise: 10 milliohms max.
15. No. of Rings: 30 max.
16. Leadwire: #22 awg, 24″ lg., both ends
17. Rotor leads may exit thru slots provided under bearing or thru bore

ORDERING INFORMATION

CAY-1030- ☐ - ☐
- 1 Without Flange
- 2 With Flange
No. of Rings

SLIP RINGS FOR MILITARY VEHICLES

Airflyte Electronics has experience in the design and manufacture of assemblies for personnel carriers, tanks and other military vehicles. We have built slip rings for periscopes, turrets and commander stations. These assemblies range in size from 6″ or less in outside diameter to slip rings with clearance holes larger than 28″. This type of assembly is characterized by its rugged construction, usually has two high power rings, several low power and up to 50 signal rings. Illustrated are several of the configurations we have built in production quantites.

ENCODERS AND SWITCHES

Airflyte encoders and rotary switches feature drum construction with solid gold alloy conducting segments embedded in epoxy and machined flush. Brushes are multi-strand, spring-temper gold-alloy. As small as Size 5.

ENCODERS

A wide variety of encoders is available: T/B, BCD, Gray, etc. Special encoders may require nominal tooling charges. Encoders can be supplied with built-in logic circuitry. Sizes: 8-33

SWITCHES

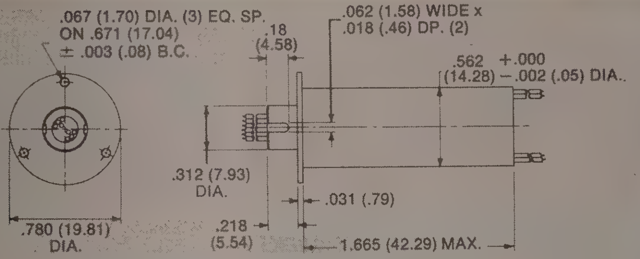
When close accuracy, repeatability and size are important, specify Airflyte rotary switches for timing and positioning applications. Successfully replaces snap action switches and cams. Pre-set to eliminate installation time. Zero hysteresis.

NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

airflyte ELECTRONICS CO.

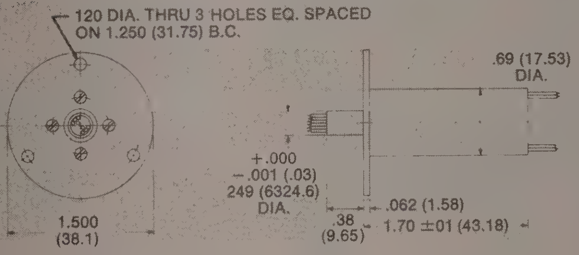
CAPSULE SLIP RING ASSEMBLIES
CAY-604 CAY-245 CAY-110 CAY-140

CAY-604



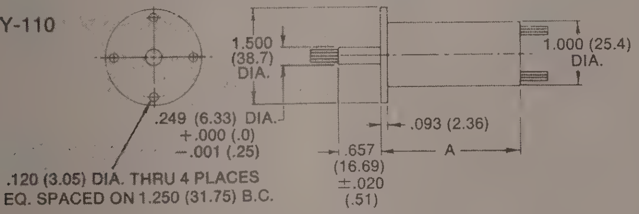
.067 (1.70) DIA. (3) EQ. SP.
ON .671 (17.04)
± .003 (.08) B.C.
.18
(4.58)
.062 (1.58) WIDE x
.018 (.46) DP. (2)
.562 +.000
(14.28) −.002 (.05) DIA.
.312 (7.93)
DIA.
.031 (.79)
.780 (19.81)
DIA.
.218
(5.54)
1.665 (42.29) MAX.

CAY-245



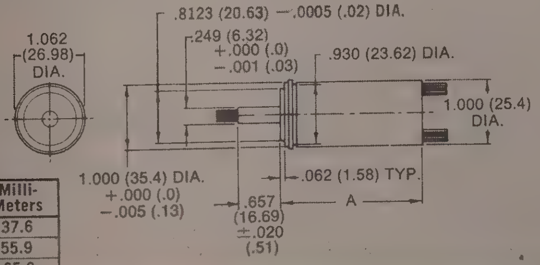
120 DIA. THRU 3 HOLES EQ. SPACED
ON 1.250 (31.75) B.C.
.69 (17.53)
DIA.
+.000
−.001 (.03)
249 (6324.6)
DIA.
.062 (1.58)
.38
(9.65)
1.70 ±01 (43.18)
1.500
(38.1)

CAY-110



1.500
(38.7)
DIA.
1.000 (25.4)
DIA.
.249 (6.33) DIA.
+.000 (.0)
−.001 (.25)
.093 (2.36)
.657
(16.69)
±.020
(.51)
A
.120 (3.05) DIA. THRU 4 PLACES
EQ. SPACED ON 1.250 (31.75) B.C.

CAY-140



.8123 (20.63) −.0005 (.02) DIA.
.249 (6.32)
+.000 (.0)
−.001 (.03)
.930 (23.62) DIA.
1.062
(26.98)
DIA.
1.000 (25.4)
DIA.
1.000 (35.4) DIA.
+.000 (.0)
−.005 (.13)
.062 (1.58) TYP.
.657
(16.69)
±.020
(.51)
A

No. of Rings	Inches "A"	Milli-Meters
4-12	1.48	37.6
13-24	2.20	55.9
25-30	2.56	65.0

Illustrated are four miniature capsules which have found wide use in gyro gimbal and instrument applications. The fully enclosed and tested assemblies feature fine diameter gold alloy brushes mated to compatible gold alloy rings for excellent noise characteristics at low torque levels. Although miniature in size, the assemblies are surprisingly rugged and are able to withstand most military environmentel specifications and the sometimes severe use encountered in the laboratory.

A major aerospace company has successfully tested the assembly to the environmental parameters listed below, proving their ruggedness and reliability. All units are factory tested before shipment and a copy of the test data is available with each unit upon request.

SPECIFICATIONS

MECHANICAL

1. Rings: Gold alloy
2. Brushes: Gold alloy wire, spring temper
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Stainless steel
5. Housing: Anodized aluminum
6. Rotation: Bi-directional

ELECTRICAL

1. Current: Signal level to 1 amp maximum
2. Voltage: Micro-volts to 110 volts rms
3. Dielectric Strength: 500 Volts rms (all combinations)
4. Leadwire: #30 AWG teflon insulated, 15″ long minimum

ENVIRONMENTAL

1. Temperature Shock: +85°C for 1 hour and and immediately transferred to −55°C for 1 hour
2. Shock: 18 shocks, 20 "g" with duration of 11 ±1 ms (MIL-E-5272C, Procedure V)
3. Vibration: MIL-STD-202B, Method 204, test condition B
4. Altitude: 50,000 ft. and −55°C
5. Humidity: MIL-E-5272C, Procedure III (95% R.H. @ 120°F for 360 hours)
6. Noise: ±5 micro-volts per ma after the above tests

ORDERING INFORMATION

CAY-| | - |
No. of Rings
Model

	CAY-604	CAY-245	CAY-110/140
MECHANICAL			
Torque Speed Life	1.0 in.-oz. max. 200 rpm max. 5 x 10^6 revs, min.	0.5 in.-oz. max. (20 ring assembly) 200 rpm max. 10^7 revs. min.	1.0 in.-oz. max. (24 rings) 500 rpm max. 10^8 revs. min.
ELECTRICAL			
Contact Resistance Variation	20 milliohms max. at max. speed	5 milliohms max. at max. speed	5 milliohms max. at max. speed
No. of Rings	40 max.	20 max.	30 max.

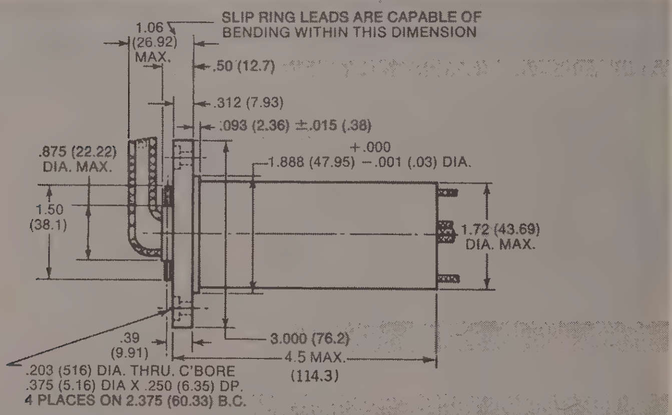
NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

airflyte ELECTRONICS CO.

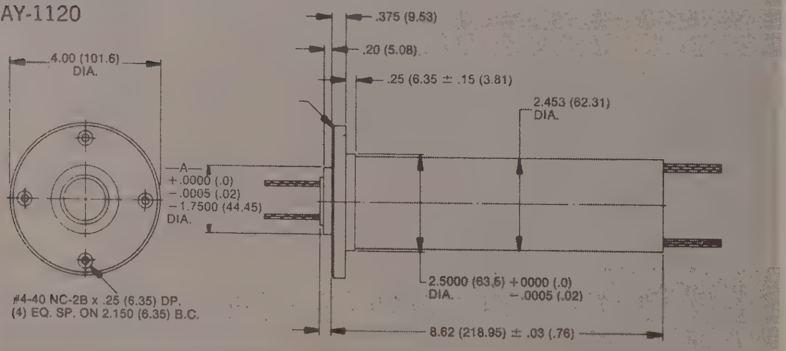
CAPSULE SLIP RING ASSEMBLIES
CAY-150 CAY-1120

These assemblies, specially designed for gyro-rate table and centrifuge applications, have found wide use because of their versatility and compact size. The standard assembly, can be supplied (at slight extra cost) with internally shorted rings for double and triple current ratings, and with single, double and triple shielded wire. Featuring gold alloy wire brushes and compatible gold alloy rings, these assemblies are manufactured from proven production tooling at a very nominal cost. Special assemblies with switching circuits and others with non-standard materials for use in severe environments are available.

CAY-150


1.06
(26.92)
MAX.
SLIP RING LEADS ARE CAPABLE OF BENDING WITHIN THIS DIMENSION
.50 (12.7)
.312 (7.93)
.093 (2.36) ±.015 (.38)
.875 (22.22)
DIA. MAX.
+.000
1.888 (47.95) −.001 (.03) DIA.
1.50
(38.1)
1.72 (43.69)
DIA. MAX.
.39
(9.91)
3.000 (76.2)
4.5 MAX.
(114.3)
.203 (516) DIA. THRU. C'BORE
.375 (5.16) DIA X .250 (6.35) DP.
4 PLACES ON 2.375 (60.33) B.C.

CAY-1120


4.00 (101.6)
DIA.
.375 (9.53)
.20 (5.08)
.25 (6.35 ± .15 (3.81)
2.453 (62.31)
DIA.
—A—
+.0000 (.0)
−.0005 (.02)
−1.7500 (44.45)
DIA.
#4-40 NC-2B x .25 (6.35) DP.
(4) EQ. SP. ON 2.150 (6.35) B.C.
2.5000 (63.5) +0000 (.0)
DIA. −.0005 (.02)
8.62 (218.95) ± .03 (.76)

SPECIFICATIONS

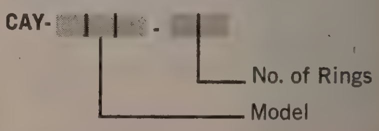
MECHANICAL

1. Rings: Gold alloy
2. Brushes: Gold alloy wire, spring temper
3. Ball Bearings: Stainless steel
4. Shaft: Stainless steel, type 303
5. Housing: Anodized aluminum
6. Rotation: Bi-directional

ELECTRICAL

1. Current: Signal level to 2.0 amps
2. Voltage: 400 vdc maximum
3. Dielectric Strength: 1000 Volts rms (all combinations)
4. Contact Resistance:
   A. Less than 8 milliohms @ 200 rpm
   B. Less than 2 milliohms @ 10 rpm
5. Leadwire: #28 awg 18″ long

ORDERING INFORMATION


CAY-
No. of Rings
Model

	CAY-150	CAY-1120
MECHANICAL		
Torque Speed Life	.125 in.-oz. per ring 600 rpm max. — intermittent 2000 hrs. @ 100 rpm	.18 in.-oz. per ring 100 rpm max. 1000 hrs. @ 100 rpm
ELECTRICAL		
No. of Rings	48 max.	90 max.

NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

airflyte ELECTRONICS CO.

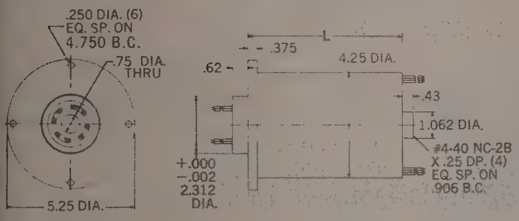
POWER CAPSULE SLIP RING ASSEMBLIES

DAY-705 DAY-710

These slip-rings are built to your order using many standard components which have proven themselves over many years of reliable operation. The "platter-type" design includes one coin silver ring on each side of each molded sub-assembly; and, leaf type silver graphite brushes which are molded in an insulating block and perfectly matched to the face of each ring. Inasmuch as the assemblies are the stack-up type, we are able to custom build them to your specifications—using our standard components—with a very minimum lead time required.

Similar in construction to our DAY-705, this platter type unit features two coin silver rings on each side of each platter for greater package density, and a "through bore" design which can be used for the passage of fluid or gas lines.

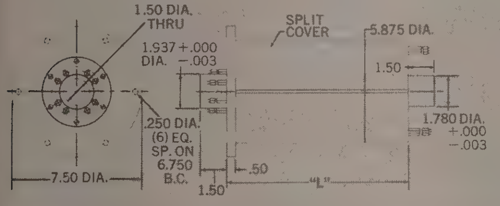
DAY-705


.250 DIA. (6)
EQ. SP. ON
4.750 B.C.
.75 DIA.
THRU
5.25 DIA.
L
.375
.62
4.25 DIA.
.43
1.062 DIA.
#4-40 NC-2B
X .25 DP. (4)
EQ. SP. ON
.906 B.C.
+.000
−.002
2.312
DIA.

DAY-705

No. of Rings	"L" ±.025"	Millimeters
10-20	5.375	136.53
21-40	8.187	207.95
41-60	11.000	279.4
61-80	13.812	350.82
81-100	16.625	422.28
101-120	19.437	493.70
121-140	22.250	565.15
141-160	25.062	636.58

DAY-710


1.50 DIA.
THRU
1.937 +.000
DIA. −.003
SPLIT
COVER
5.875 DIA.
1.50
1.780 DIA.
+.000
−.003
.250 DIA.
(6) EQ.
SP. ON
6.750
B.C.
7.50 DIA.
.50
1.50
"L"

DAY-710

No. of Rings	"L"	Millimeters
10-20	4.725	120.02
21-40	6.700	170.18
41-60	8.675	220.34
61-80	10.650	270-51
81-100	12.625	320.68
101-120	14.600	370.84

SPECIFICATIONS

MECHANICAL

1. Rings: Coin silver
2. Brushes: Silver graphite,
3. Ball Bearings: Stainless steel, shielded
4. Shaft: Anodized aluminum
5. Housing: Anodized aluminum
6. Speed: 500 rpm maximum
7. Rotation: Bi-directional

ELECTRICAL

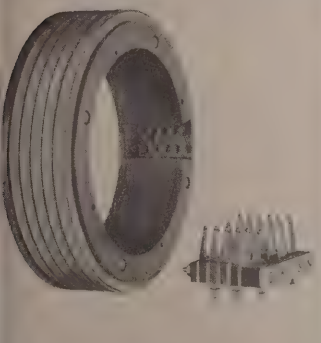
1. Voltage: 0 to 150 Volts AC or DC
2. Dielectric Strength: 500 Volts rms (all combinations)

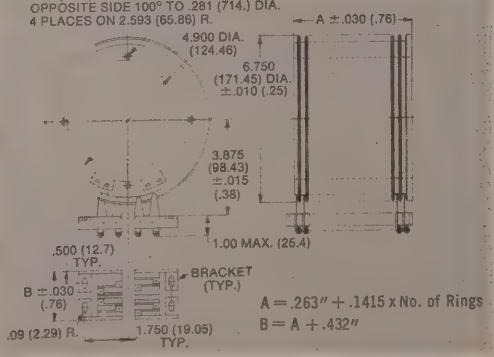
ORDERING INFORMATION

DAY- ☐ ☐ - ☐
No. of Rings
Model

	DAY-705	DAY-710
MECHANICAL		
Torque	½ in.-oz. per circuit	¾ in.-oz. per circuit
Life	3000 hrs. @ 100 rpm	2500 hrs. @ 100 rpm
Current	5 amps max. per circuit	5 amps max. per circuit
Contact Resistance Variation	8 milliohms peak @ max. speed	10 milliohms max.
ELECTRICAL		
No. of Rings	160 max.	120 max.
Leadwire	#24 awg, teflon insulated	#22 awg, teflon insulated

FLAT RING ASSEMBLIES AND MATCHING BRUSH BLOCKS CAY-94




.144 (3.66) DIA. THRU C'SINK
OPPOSITE SIDE 100° TO .281 (714.) DIA.
4 PLACES ON 2.593 (65.86) R.
4.900 DIA.
(124.46)
6.750
(171.45) DIA.
±.010 (.25)
3.875
(98.43)
±.015
(.38)
1.00 MAX. (25.4)
A ±.030 (.76)
.500 (12.7)
TYP.
B ±.030
(.76)
BRACKET
(TYP.)
.09 (2.29) R.
1.750 (19.05)
TYP.
A = .263" + .1415 x No. of Rings
B = A + .432"

Pictured is the CAY-94-11 general purpose slip ring and brush assembly which has found wide use because of its adaptability to any shaft up to 4.9" in diameter, and a "stack-up" feature which allows the engineer to select as many rings as are required (up to 200 or more) for its application. This rugged unit features low noise, long life and is now available from stock.

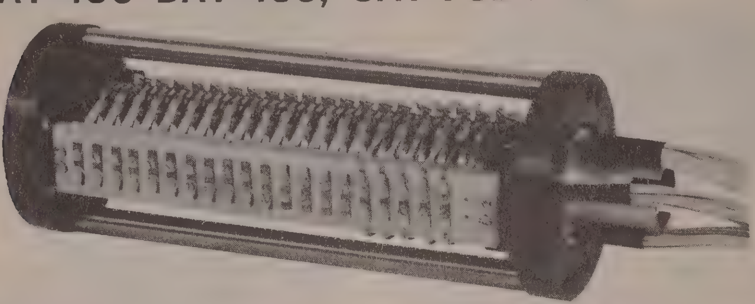
SPECIFICATIONS

1. Rings: Coin silver
2. Brushes: Silver graphite (two per ring)
3. Brush Leafs: Beryllium copper
4. Insulation: Phenolic
5. Leadwire: Available upon request
6. Speed: 750 rpm max.
7. Life: 1000 hours @ 100 rpm
8. Current: 5 amps per ring; 10 amps per ring when 4 brushes are used
9. Voltage: 300 VRMS
10. Dielectric Strength: 500 Volts rms (all combinations)
11. Insulation Resistance: 10 megohms minimum at 500 VDC
12. Noise: The contact resistance change in each circuit shall be less than .005 ohms at maximum speed
13. Units with less than 11 rings have one bracket per brush block

NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

airflyte ELECTRONICS CO.

MULTI-PURPOSE SLIP RING ASSEMBLIES
DAY-490 DAY-499; CAY-731/740



DAY-490 DAY-499

These assemblies, designed for use in commercial equipment, have been used in applications ranging from thermocouples to the transmission of medium power. They feature coin silver rings, silver graphite brushes, convenient terminals on both the slip ring and brush blocks, and a rotor design which allows the leadwires to be exited through the shaft bore, or under the bearing when a shaft clearance hole is required. The wide variety of sizes and configurations available, including "in-between" shaft diameters, allows the designer to select a standard assembly for his application, eliminating time consuming and costly design charges.

CAY-731/CAY-740

For use where bearing mounted assemblies are not practical, the CAY-731/CAY-740 should be specified.

SPECIFICATIONS

MECHANICAL

1. Frame: Anodized aluminum (DAY-490/DAY-499 only)
2. Rings: Coin silver
3. Brushes: Silver graphite, two per ring
4. Leafs: Beryllium copper
5. Insulation: Epoxy or laminated plastic

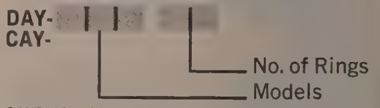
ELECTRICAL

1. Current: 10 amperes per circuit (20 amperes available at extra cost)
2. Voltage: 250 Volts maximum AC or DC
3. Dielectric Strength: 750 Volts rms (all combinations)
4. Insulation Resistance: 50 megohms minimum at 500 VDC
5. Contact Resistance Variation: 10 milliohms maximum at maximum speed
6. No. of rings: 50 maximum

ENVIRONMENTAL

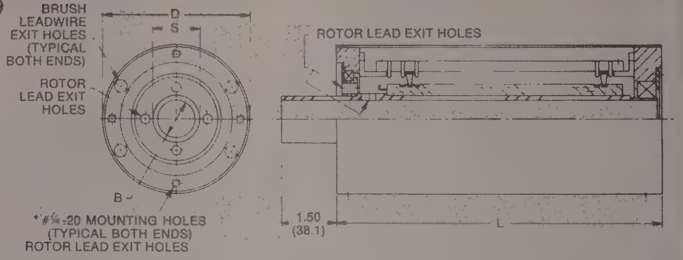
1. Operating temperature: 0 to 250°F
2. Humidity: 95% maximum

ORDERING INFORMATION

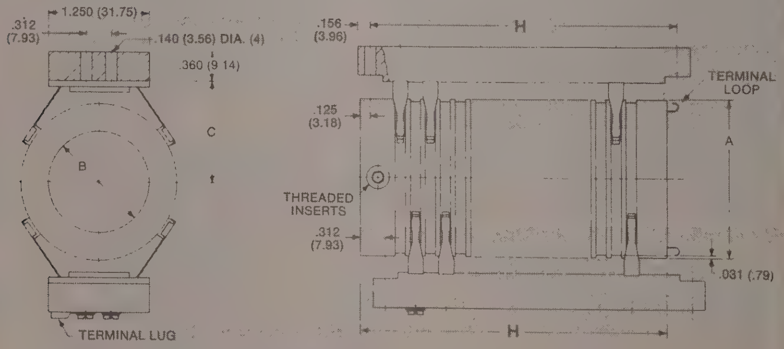


CONSULT FACTORY FOR RING TERMINATION ON DAY-490, DAY-491, DAY-492, CAY-731 THRU CAY-733 AND *MOUNTING HOLE LOCATION FOR ALL TYPES.

DAY-490/499


BRUSH LEADWIRE EXIT HOLES (TYPICAL BOTH ENDS)
D
S
ROTOR LEAD EXIT HOLES
B
*#¼-20 MOUNTING HOLES (TYPICAL BOTH ENDS) ROTOR LEAD EXIT HOLES
ROTOR LEAD EXIT HOLES
1.50 (38.1)
L

DAY-731/740



DAY-490/DAY-499

No. of Rings	Inches "L"	Milli-Meters
6-10	4.88	123.95
11-20	6.75	171.45
21-30	8.63	219.2
31-40	10.50	266.7
41-50	12.38	314.45

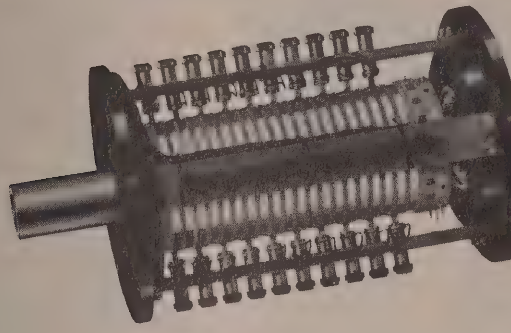
To determine "H" dimension, use the following formula:
"H" = .750 + .1875 x (No. of Rings)

Part No.	Max. Speed RPM	Min. LIFE 10^6 Rev.	Max. Torque Per Ring		DAY-490/DAY-499						CAY-731/CAY-740					
					"B" Dia.		"D" Dia.		"S" Dia.		"A" Dia.		"B" Dia.		"C" Dia.	
			lb.-in.	gm-cm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
DAY-490/CAY-731	5000	50	.21	240	1.00	25.4	4.00	101.6	1.250	31.75	1.875	47.63	1.250	31.75	1.447	36.75
DAY-491-CAY-732	4000	40	.30	350	1.75	44.45	5.00	127.0	2.125	53.98	2.750	69.85	2.125	53.98	1.829	46.46
DAY-492/CAY-733	3000	30	.40	460	2.75	69.85	6.50	165.1	3.125	79.38	3.750	95.25	3.125	79.38	2.281	57.94
DAY-493/CAY-734	2500	25	.50	580	3.75	95.25	7.50	190.5	4.125	104.8	4.875	123.8	4.125	104.8	2.822	71.68
DAY-494/CAY-735	2000	20	.61	700	4.75	120.7	8.50	215.9	5.125	130.2	5.875	149.2	5.250	133.4	3.307	84.00
DAY-495/CAY-736	1500	15	.71	820	5.75	146.1	9.50	241.3	6.125	155.6	7.000	177.8	6.250	158.8	3.857	97.97
DAY-496/CAY-737	1500	15	.82	950	6.75	171.5	10.50	266.7	7.125	181.0	8.000	203.2	7.250	184.2	4.342	110.3
DAY-497/CAY-738	1000	10	.92	1060	7.75	196.9	11.50	292.1	8.125	206.4	9.000	228.6	8.250	209.6	4.837	122.9
DAY-498/CAY-739	1000	10	1.02	1180	8.75	222.3	13.00	330.2	9.125	231.8	10.000	254.0	9.250	235.0	5.332	135.4
DAY-499/CAY-740	750	7.5	1.12	1290	9.75	247.7	14.00	355.6	10.125	257.2	11.000	279.4	10.250	260.4	5.827	148.0

NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

Airflyte ELECTRONICS CO.

MULTI-PURPOSE SLIP RING ASSEMBLIES
POWER SLIP RING/MATCHING CARTRIDGE TYPE BRUSHES CAY-755



CAY-125

A general purpose, off-the-shelf slip ring assembly especially applicable for strain gage and thermocouple measurements where rotating detector circuits must be brought out to stationary measuring equipment.

CAY-755

The standard cartridge, (AHW-16), has been used for many years on our CAY-125 assembly and is now available with the CAY-755 which is also drawn, or individually, for use on any ring which is a minimum of ⅛" wide. The silver graphite brushes, coil springs, caps and holders may be purchased individually or as an assembly and are all available from stock.

SPECIFICATIONS

MECHANICAL

1. Rings: Coin silver
2. Brushes: Spring loaded silver graphite, two per ring
3. Torque: 0.2 in.-lbs. per ring
4. Speed: 5000 rpm maximum
5. Life: 1000 hours minimum @ 500 rpm
6. Rotation: Bi-directional

ELECTRICAL

1. Current: 10 amps per circuit with two brushes per ring
2. Voltage: 0-250 Volts AC or DC
3. Dielectric Strength: 500 Volts rms (all combinations)
4. Contact Resistance Variation: 10 milliohms maximum at maximum speed
5. No. of Rings: 30 maximum

ENVIRONMENTAL

1. Operating Temperature: 0° to 200°F
2. Humidity: 85%

ORDERING INFORMATION

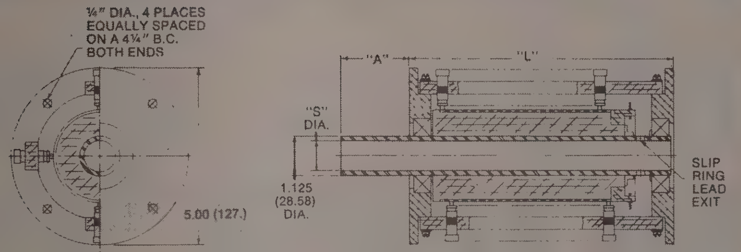
CAY-

Model

No. of Rings

Special Variations

CAY-125

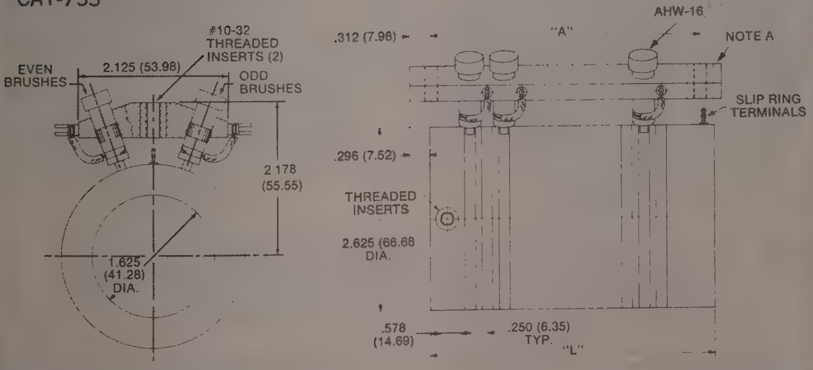

¼" DIA., 4 PLACES EQUALLY SPACED ON A 4¼" B.C. BOTH ENDS
"A"
"L"
"S" DIA.
1.125 (28.58) DIA.
5.00 (127.)
SLIP RING LEAD EXIT

NOTES:

1. To determine "L" dimension use the following formula:

$$\text{"L"} = (2.62'') + \frac{(\text{NO. OF RINGS})}{4}$$

CAY-755


#10-32 THREADED INSERTS (2)
EVEN BRUSHES
2.125 (53.98)
ODD BRUSHES
2 178 (55.55)
1.625 (41.28) DIA.
.312 (7.98)
"A"
AHW-16†
NOTE A
SLIP RING TERMINALS
.296 (7.52)
THREADED INSERTS
2.625 (66.68 DIA.
.578 (14.69)
.250 (6.35) TYP.
"L"

NOTES:

To determine the "L" and "A" dimensions, use the following formulas:

$$\text{"L"} = 1.093 + \frac{(\text{NO. OF CIRCUITS})}{4}$$

$$\text{"A"} = \text{"L"} - .218$$

†Two identical brush blocks are supplied with each CAY-755 assembly.

†REPLACEMENT PARTS

Cartridge Assembly: AHW-16
Spring: AHW-15
Holder: AHW-14
Cap: AHW-13
Silver Graphite Brush: ABR-12-1

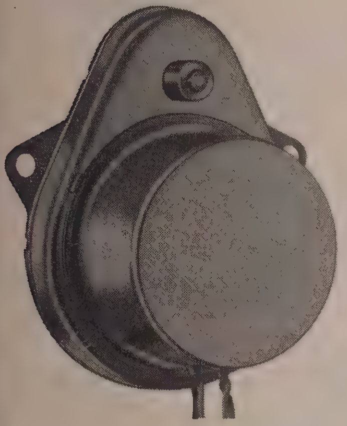
NEW HOOK ROAD, BAYONNE NEW JERSEY 07002 201-436-2230 TWX-710-729-4489

enclosures • capacitors • circuit boards • coils,
chokes, inductors • connectors, electronic • sockets/
terminals • crystals • oscillators • crystal filters
delay lines • panel hardware • displays • lamps/
lights • cooling equipment • filters • generators •
multimeters • panel meters • oscilloscopes • gra
phic recorders • interconnections • microwave
components • [illegible] tors/
drives • batteries • power supplies, dc • power
supplies, ac • [illegible] • relays •
solenoids • resistors • potentiometers/trimmers
controls/rheostats • [illegible] •
switches • [illegible] • transducers/en
coders • transformers • wire & cable • enclosures
capacitors • circuit boards • coils, chokes, induc
tors • connectors, electronic • sockets,/terminals

EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

AC, DC, and Stepper Motors

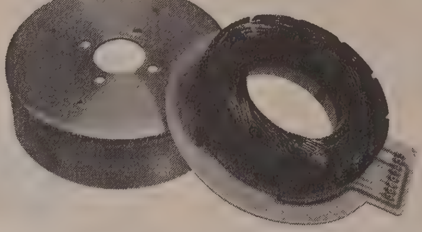


Reversible Synchronous Motors

For commercial/industrial use. 50 or 60 Hz operation; voltages from 12 to 230 Vac. PM rotor, 2-coil windings. Electrically reversible. Rotor speeds 300 rpm at 60 Hz or 720 rpm at 60 Hz. Torque 0.75 oz.-in and 1.1 oz.-in. respectively. Output speeds from 300 rpm to 1/1000 rpm.

81300 Series	300 rpm rotor
S7100 Series	720 rpm rotor

Ask for Reference Sheets CM803 and S7100



Three-phase Brushless DC Motors

Consist of 4-pole permanent magnet field rotors and 3-phase wye-connected stator windings. Electronically commutated servo; Hall cells provided. Shipped as assembly kits. User provides logic, drivers and spindles. Assembled motors with spindles available. Efficiency up to 85%. Stall torques from 30 oz.-in. to 700 oz.-in. Optimum power output. Excellent speed control. No major EMI. Minimum maintenance, long life. Particularly well-suited for rigid and floppy disk drives, phase-locked servo spindle controls and high reliability tape recorders.

L85101 Series	24Vdc
K85301 Series	24Vdc
K85401 Series	24Vdc
K85601 Series	48Vdc

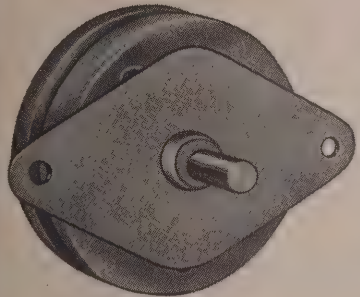
Ask for Reference Sheet CM834

Size 15
Iron Rotor DC Motors

Bidirectional, 2-pole permanent magnet motors designed for speed control and servo applications. Available with voltage ratings of 12 or 24Vdc providing stall torque of 16 oz.-in. All have linear torque speed characteristics with minimum magnetic cogging at low speeds.

K17401—P2 Series	12Vdc
K17401—P3 Series	24Vdc

Ask for Reference Sheet CM827

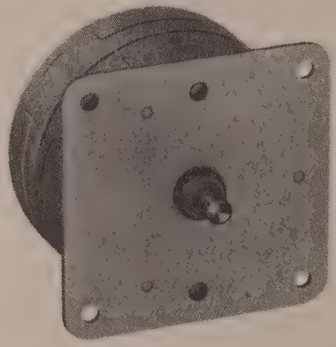


Industrial-Type Stepper Motor

2-phase stator and permanent magnet rotor. Running torque up to 8 oz.-in., holding torque up to 13.7 oz.-in. Running rates to 900 steps/sec. Bidirectional. 5V or 12Vdc. 7° 30′ or 15° step angle. Suitable for use in instrumentation and computer peripherals.

82700 Series	7° 30′ Step angle
83700 Series	15° Step angle

Ask for Stepper Motor Handbook

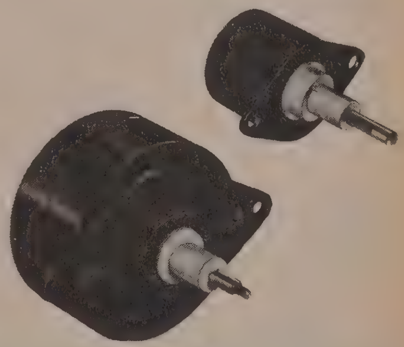


Low-Cost, High Torque Stepper Motor

A bidirectional permanent magnet stepper motor. Standard construction provides unipolar or bipolar operation, a 7° 30′ or 15° step angle and roller or sleeve bearings. Max. torque up to 28 oz.-in. Max. running rate 400 steps/sec. Operating voltages from 3.7Vdc to 14Vdc. Highly effective with long life and efficient utilization of power.

82900 Series	7° 30′ Step angle

Ask for Stepper Motor Handbook



Accurate, Incremental Digital Linear Actuators

These components accurately actuate and control devices that must be "pushed" or "pulled". Linear forces from 15 oz. to 19 lbs. They operate on 12Vdc; offer linear travel of .001″ to .004″ per pulse. Shaft extensions from 0.5″ to 3″.

92100 Series	21 ozs. force
92200 Series	75 ozs. force
92400 Series	19 lbs. force

Ask for Linear Actuator Catalog

AIRPAX®

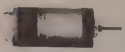
We give you control.

Airpax Corporation,
a North American Philips Company
Cheshire Industrial Park
Cheshire, CT 06410
(203) 272-0301

SERVO COMPONENTS AND SYSTEMS

PRECISION MOTORS

Model 00-30


Model 16-35

Model 28-52

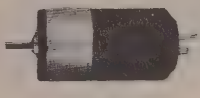
High Efficiency Motors with Torque Ratings from 0.02 oz. in. to 16.6 oz. in.

HIGH LINEARITY TACHS

Model 16-35

Model 00-30

Model 24-45


Model 28-52

Tachometer gradients from 0.4/1000 rpm to 3.0/1000 rpm

MOTOR-GEARHEAD UNITS

Model 00-30-M11

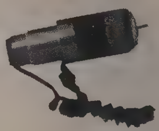
Model 18-M20

Model 24-45-4-40

Output Torque to 40 oz. in.

MOTOR-TACHOMETERS

Model 16G-35


Model 28G-52

For High Performance Closed-Loop Rate and Position Systems

MOTOR SERVO SPECIFICATIONS

MODEL	Peak Torque NmX10-4 (oz. in)	Peak Input Power watts	Electrical T. Constant msec.	Mech. T. Constant msec.	Armature Resistance ohms	Operating Voltage volts	Torque Constant NmX10-4/amp (oz. in./amp)	Back EMF V/1000 RPM	Torque to Inertia rad./sec.² X10³	Friction Torque NmX10-4/amp (oz. in./amp)	Thermal Resistance °C/watt	Mechanical Outline & Weight - oz.	NOTES
00-30-07	1.3 (0.02)	0.25	0.020	–	16.0	2.0	10.4 (0.15)	0.15	–	0.014 (0.002)	30.0	A, A1	M11 GEARHEAD RATIOS 96.4, 176, 249, 358, 487, 649, 916. Peak output torque — 3 oz. in.
00-30-06	1.3 (0.02)	0.25	0.014	–	26.0	2.5	13.5 (0.19)	0.2	–	0.014 (0.002)	30.0		
00-30-05	1.3 (0.02)	0.29	0.011	–	54.0	4.0	17.6 (0.25)	0.2[illegible]	–	0.014 (0.002)	30.0	Motor - 0.25	
00-30-04	1.1 (0.02)	0.27	0.007	–	133.0	6.0	24.4 (0.35)	0.4	–	0.014 (0.002)	30.0	Gearhead - 0.32	
16-24-12	33.0 (0.47)	2.25	0.021	30	4.0	3.0	28.0 (0.36)	0.3	36	0.05 (0.008)	14.0	0.95	Diameter — 0.65′
16-24-10	26.0 (0.37)	2.25	0.021	30	9.0	4.5	54.0 (0.75)	0.5	43	0.05 (0.008)	14.0	0.95	Length — 0.94′
16-24-08	20.0 (0.29)	1.56	0.022	30	23.0	6.0	81.0 (1.12)	0.7[illegible]	35	0.05 (0.008)	14.0	0.95	
16-24-06	33.0 (0.46)	2.48	0.023	30	58.0	12.0	170.0 (2.30)	1.5	29	0.05 (0.008)	14.0	0.95	
16-35-14	25.6 (0.36)	3.3	0.021	30	2.7	3.0	23.0 (0.30)	0.25	36	0.056 (0.008)	14.0	B, B1	M20 GEARHEAD RATIOS 32.7, 65.5, 105, 210, 335, 671, 1037, 2147. Peak output torque—15 oz. in.
16-35-12	30.5 (0.43)	3.8	0.021	30	4.2	4.0	32.0 (0.45)	0.35	43	0.056 (0.008)	14.0		
16-35-10	32.6 (0.46)	3.8	0.022	30	6.6	5.0	43.0 (0.60)	0.4	46	0.056 (0.008)	14.0	Motor - 1.06	
16-35-08	25.0 (0.35)	2.8	0.023	30	13.0	6.0	54.0 (0.75)	0.5	35	0.056 (0.008)	14.0	Gearhead - 0.32	
16-35-06	20.0 (0.29)	1.8	0.022	30	46.0	9.0	103.0 (1.40)	0.9	29	0.056 (0.008)	14.0		
20-08-10	13.2 (0.00)	1.2	–	25	7.3	3.0	36.0 (0.49)	0.38	–	–	–	F –	
20-08-07	15.4 (0.00)	1.4	–	25	26.5	6.0	65.0 (0.88)	0.69	–	–	–	–	
20-08-05	12.[illegible] (0.00)	1.6	–	25	91.0	12.0	130.0 (1.76)	1.38	–	–	–	–	
24M-45-30	143.0 (2.00)	11.3	0.031	20	0.8	3.0	38.0 (0.50)	0.38	40	0.12 (0.017)	3.7	C, C1	H40 GEARHEAD RATIOS 100, 200, 500, 1000, 2000. Peak output torque — 40 oz. in.
24M-45-24	165.0 (2.30)	16.9	0.032	20	1.2	4.5	44.0 (0.60)	0.45	46	0.12 (0.017)	3.7		
24M-45-20	125.0 (1.80)	14.4	0.031	20	2.5	6.0	52.0 (0.70)	0.5	36	0.12 (0.017)	3.7	Motor - 2.7	
24M-45-16	162.0 (2.30)	23.1	0.029	20	3.5	9.0	63.0 (0.85)	0.65	46	0.12 (0.017)	3.7	Gearhead - 1.3	
24M-45-14	220.0 (3.10)	24.0	0.028	20	6.0	12.0	110.0 (1.50)	0.9	62	0.12 (0.017)	3.7		
24M-45-12	175.0 (2.50)	16.1	0.029	20	14.0	15.0	163.0 (2.20)	1.6	50	0.12 (0.017)	3.7		
24M-45-10	190.0 (2.70)	20.6	0.029	20	28.0	24.0	222.0 (3.10)	2.1	54	0.12 (0.017)	3.7		
24M-45-08	157.0 (2.20)	19.9	0.029	20	65.0	36.0	283.0 (3.90)	3.0	44	0.12 (0.017)	3.7		
25-50-30	458.0 (6.50)	45.0	0.031	7	0.8	6.0	61.0 (0.86)	0.6[illegible]	130	0.14 (0.02)	3.7	D	H48 gearboxes available 1. 3 mm output shaft 2. Graphite alloy brushes 3. SECO 5 magnets
25-50-20	470.0 (6.70)	57.6	0.031	9	2.5	12.0	98.0 (1.40)	1.0	128	0.14 (0.02)	3.7		
25-50-16	454.0 (6.40)	64.3	0.028	9	3.5	15.0	106.0 (1.50)	1.2	128	0.14 (0.02)	3.7	Motor - 5.5	
25-50-14	788.0 (11.20)	96.0	0.028	6	6.0	24.0	197.0 (3.80)	2.1	224	0.14 (0.02)	3.7	Gearhead - 1.3	
28-52-30	1168.0 (16.60)	62.1	0.120	20	2.3	12.0	224.0 (3.10)	2.4	47	0.42 (0.06)	3.5	E	H40 gearboxes available 1. Graphite alloy brushes 2. SECO 5 magnets
28-52-20	1013.0 (14.30)	57.6	0.120	20	10.0	24.0	422.0 (5.90)	4.5	41	0.42 (0.06)	3.5	Motor - 5.9 Gearhead - 1.3	

TACHOMETER SPECIFICATIONS

MODEL	Output Gradient volts/1000 rpm	Ripple Output %	Ripple Freq. cycles/rev.	Max. Speed rpm	Rotor Inertia* 10-6	Min. Load Impedance ohms	Friction Torque oz. in.	Linearity %	Mechanical Outline
00-30-40T	0.4	5.0	6	10,000	2	10K	(.002)	2.0	A
16-25-06T	1.0	3.0	10	10,000	10	10K	(.010)	1.5	B
24M-45-48T	3.0	3.0	10	10,000	50	10K	(0.20)	1.0	C

NOTES: Gold Plated commutators and brushes available on all units at additional cost of $2.00 per unit in small quantities.
* Dimensions oz. in sec.²

MOTOR — TACHOMETER SPECIFICATIONS

MODEL	Peak Torque oz. in.	Peak Power Input watts	Electrical T. Constant msec.	Mechanical T. Constant msec.	Armature Resistance ohms	Thermal Resistance °C/watt	Torque Constant gm. cm/oz. in.	Tach Gradient volts/ 1000 rpm	Tach Linearity %	Ripple Output %	Ripple Frequency Hz/rev.	Mechanical Outline
166-10-04	0.5	5.5	0.02	30	6.6	14	0.6	0.4	2.0	5.0	6.0	F

NOTES: 1. The 24-45-XX and 25-50-XX can be supplied with either metal brushes (24M-XX-XX) or graphite alloy brushes (24K-XX-XX).
2. The 25 and 28 Series can be supplied with sintered or ball bearings — standard units contain sintered bearings.
3. All units Hi-Pot tested at 220V rotor to case.

BERTSCH U.S. Sycamore Research Center • 2142F Industrial Court, Vista, CA 92083 • 619-727-7420

SERVO COMPONENTS AND SYSTEMS

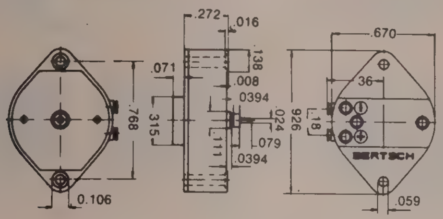
MECHANICAL DATA

CONVERSION FACTORS:

1 mm = 0.0394 in.
1N = 3.597 oz.
1Nm = 141.64 oz. in.
1 kgm² = 141.64 oz. in. s²

1 in. = 25.4 mm
1 oz. = 0.278 N (28 grams)
1 oz. in. = 0.00706 Nm
1°F = 0.556°C (temp. change only)

A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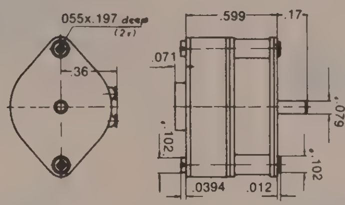
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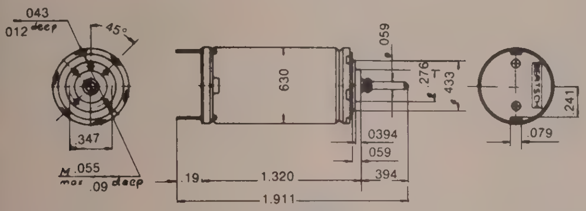
B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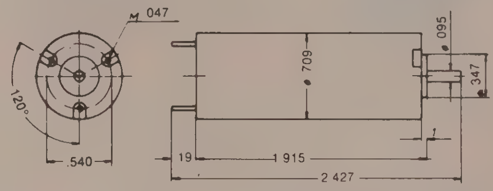
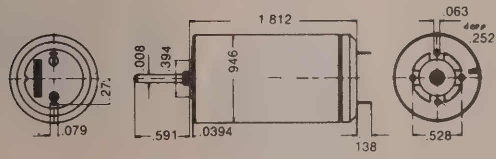
.079

B1


M 047
120°
.540
709
095
347
1
19
1 915
2 427

C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.079
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1 812
946
.591
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138
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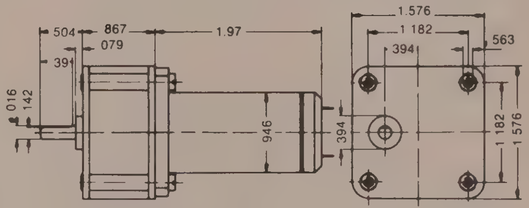
.252
.528

C1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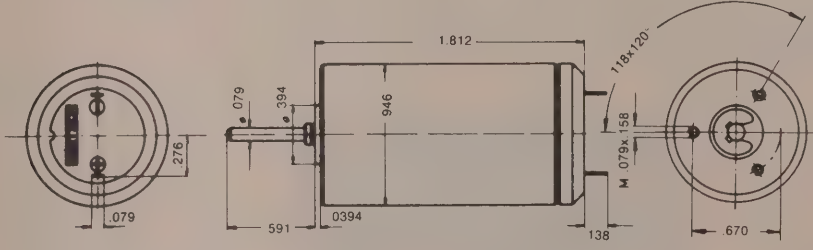
079
1.97
391
016
142
946
394
1.576
1 182
394
563
1 182
1 576

D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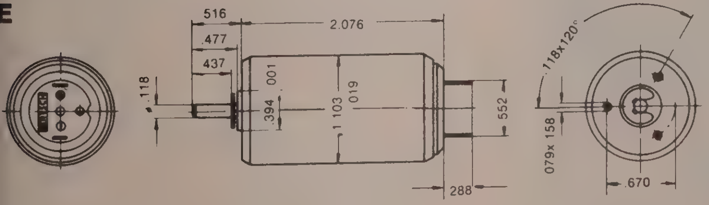
1.812
079
394
946
591
0394
138
118x120°
M .079x.158
.670

E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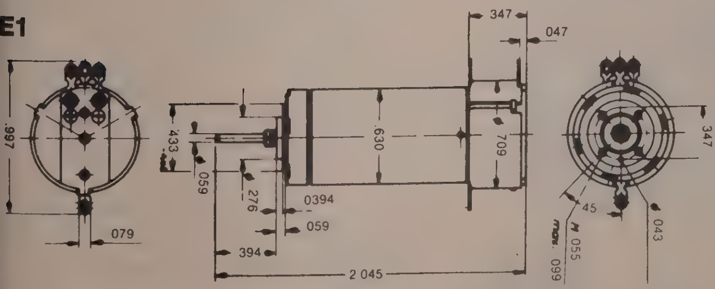
477
437
118
001
394
1 103
019
552
288
118x120°
079x 158
.670

E1


997
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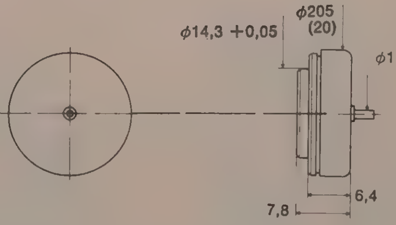
433
059
276
0394
059
394
2 045
630
709
347
047
347
45
M 055
max 099
043

F

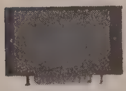

ϕ14,3 +0,05
ϕ205
(20)
ϕ1h6
7,8
6,4

SERVO COMPONENTS AND SYSTEMS

POWER AMPLIFIERS

Model PA-10/0.5

Model PA-10/1.2


Model PA-24/2.0

Optomized for Specific Customer Needs

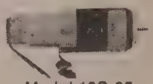
POWER SUPPLIES

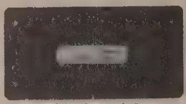
Model PS-25/2

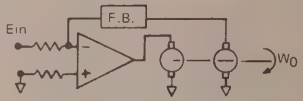
Model PS-1

Modular Designs to fit each customers total system requirements

CLOSED-LOOP RATE SYSTEMS

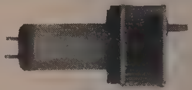

Model 16G-35

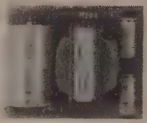

Model 24-3

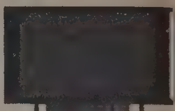


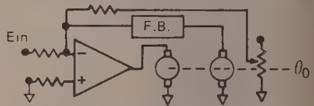
Designs to Customer's Specific Applications

CONTROL SYSTEMS


Model 24G-H40


Model PA 2A-3

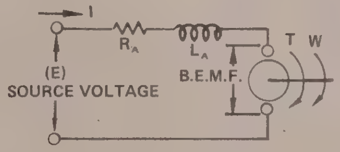

Model P5-1



Complete Systems to Customer Specifications

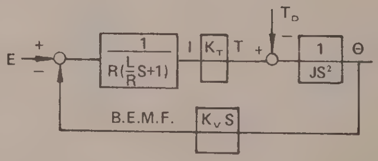
MOTOR EQUATIONS

CIRCUIT



R_A = Armature + Brush Resistance
L_A = Armature Inductance
K_T = Armature Torque Constant (in. oz./amp)
K_V = Motor Back E.M.F. Constant (volts/rpm)
B.E.M.F. = $K_V W$
W = Armature Speed in R.P.M.

SERVO BLOCK DIAGRAM



STEADY STATE EQUATIONS

1. $E = IR_A + K_V W$
2. $T = K_T I$

Substituting for I in equation 1.

3. $E = \frac{T}{K_T} R_A + K_V W$

Transposing:

(a) $W = \frac{E}{K_V} - \frac{T}{K_V K_T} R_A$

(b) $T = [E - K_V W] \frac{K_T}{R_A}$

From the above equations we note that torque speed curves of Bertsch motors are straight lines (linear) with an X (vertical axis = shaft speed) intercept of $W = \frac{E}{K_V}$ and Y (horizontal axis = shaft torque) intercept of $\frac{E}{R_A} K_T$. It should also be noted that the speed regulation capabilities of the motor ($\frac{\delta W}{\delta T}$ E = Constant) is simply equal to $-\frac{R_A}{K_V K_T}$ (rpm/in.-oz.).

TRANSIENT EQUATIONS

The La Place Transform for Bertsch motors is as follows:

$$\frac{\theta}{E} S = \frac{1}{K_V S (\frac{JR_A}{K_V K_T} S + 1)(\frac{L_A}{R_A} S + 1)}$$

$$\frac{JR_A}{K_V K_T} > \frac{L_A}{R}$$

θ = Shaft Angular Position
J = Armature & Load Inertia
R_A – Armature & Source Resistance
L_A = Armature * Source Inductance
T_D = Disturbance Torques
S = La Place Operator

Additional information on Bertsch motor equations and performance characteristics are available upon request.

MOTOR THERMAL EQUATIONS

1. $T_A = T_{AM} + P_L \theta_R$
2. $P_L = I^2 R_A = \frac{T^2}{K^2} R_A$
3. $T_A = T_{AM} + T^2 \frac{R_A}{K^2} \theta_R$

T_A = Armature Temperature
T_{AM} = Ambient Temperature
P_L = Power Losses
θ_R = Motor Thermal Resistance (armature to ambient air)

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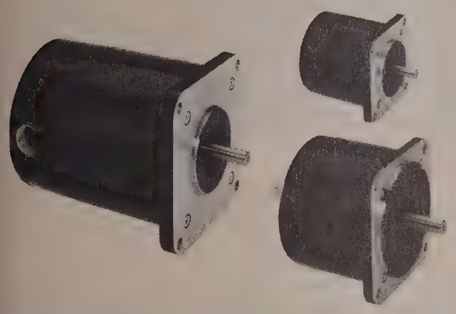
  1. Holding Torque at Stop with D-C Applied
  2. Starts in 16 to 25 Milliseconds
- Twice as much Torque Per Frame Size than Competitive Stocked Brands

Frame Size/ Stack	Bodine 72 RPM Sync	Most Stocked Brand
23/1	50 Oz-in	25 Oz-in
34/1	115 Oz-in	50 or 80 Oz-in
34/2	230 Oz-in	Not stocked
42/1	360 Oz-in	150 or 250 Oz-in
42/2	720 Oz-in	400 or 700 Oz-in

- Designed for Exceptionally Long Life
- Availability from Stock
- UL/CSA Recognized



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- Electronic Damping Optional

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- Enclosed and Chassis

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For Bodine stepper motors and controls ask for Catalog ST.

HY-Sync™, SYNCHRONOUS—115 V.—60 Hz—72 Rpm (50 Hz and 230 V. available)

Size	Model No.		Max. Amps	Phase Shift Network				Rated Torque Oz-In.	Max. Radial Load Lbs.	Max. Axial Load Lbs.	Max. Length In.
	Single Shaft	Dual Shaft		Resistor Ω/W	Resistor Part No.	Capacitor µF/V	Capacitor Part No.				
23 2.3" Dia.	2018	*	.16	300/7	443-40301	1.6/250	494-00051	50	15	25	2.31
	—	*	—	Delayed Introduction				—	15	25	3.31
34 3.4" Dia.	2021	*	.24	500/18	443-63501	2.7/250	494-00066	115	45	75	2.83
	2022	*	.49	200/50	443-72201	5.6/250	494-00069	230	45	75	4.21
42 4.2" Dia.	2024	*	.66	200/80	443-70201	7.5/250	494-00068	360	45	150	5.12
	2025	*	1.64	100/175	443-70012	20/250	494-00067	720	100	150	7.27

STEPPER—(D-C)—1.8°

Size	Model No.		Nominal D-C Volts	Amps/ Phase	Res./ Phase Ohms	Induct./ Phase mH	Holding Torque Oz-In.	Nom. Rotor Inertia Oz-In-Sec^2 Times 10^{-3}	Max. Length In.	Weight Lbs.
	Single Shaft	Dual Shaft								
23 2.3" Dia.	2000	2100	1.3	3.8	0.34	0.59	50	1.5	2.31	1.3
	2009	2109	4.7	1.0	4.7	8.70	50	1.5	2.31	1.3
	2001	2101	1.6	4.7	0.34	0.81	100	3.0	3.31	2.1
	2010	2110	4.8	1.6	3.0	7.07	100	3.0	3.31	2.1
	2002	2102	2.1	4.6	0.46	1.08	150	4.5	4.31	3.0
	2011	2111	3.3	2.9	1.14	2.90	150	4.5	4.31	3.0
34 3.4" Dia.	2003	2103	1.7	4.7	0.37	1.14	150	9.75	2.83	3.5
	2012	2112	2.7	3.1	0.88	2.86	150	9.75	2.83	3.5
	2004	2104	2.4	4.6	0.52	2.25	300	19.5	4.21	6.0
	2013	2113	3.0	4.0	0.75	3.18	300	19.5	4.21	6.0
	2005	2105	2.6	5.5	0.48	2.36	450	28.5	5.60	8.6
	2014	2114	4.3	3.5	1.23	6.58	450	28.5	5.60	8.6
42 4.2" Dia.	2006	2106	2.3	6.1	0.38	3.04	625	54.6	5.12	9.0
	2015	2115	4.2	3.5	1.45	12.48	625	54.6	5.12	9.0
	2007	2107	3.6	6.1	0.59	5.94	1125	110.5	7.27	15.7
	2016	2116	7.1	3.1	2.30	22.93	1125	110.5	7.27	15.7

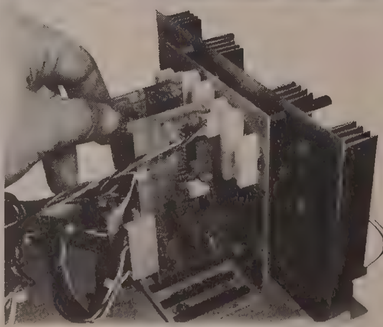
STEPPER CONTROLS**

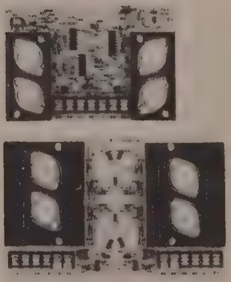
Model No.	Bodine Type	Description
2900	THH-1800C	4 Amp Translator, to 3000 PPS
2901	THD-1810C	8 Amp Translator, to 5000 PPS
2902	THD-1830E	Encased Modular Translator, CMOS or TTL Level Pulses to 15,000 PPS
2903	THD-1850E	Encased Modular Indexer, 7 Digits to 15,000 PPS
2904	THD-1000B	8 Amp Power Driver Module, Accepts 4 CMOS Phase Inputs to 15,000 PPS

* Not normally stocked.

** Non-encased modules to duplicate THD-1830 and 1850 also available.

Damping Cards





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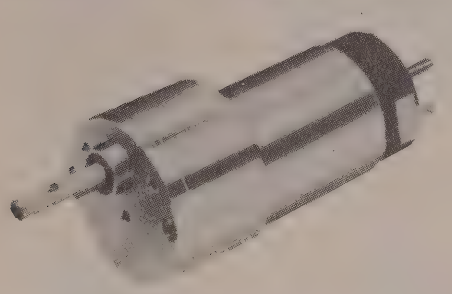
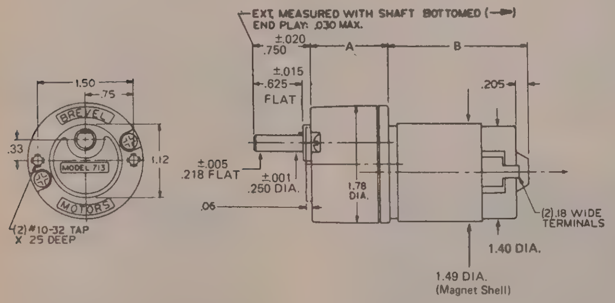
BREVEL MOTORS

Model 713 Stock D.C. Gearmotor



The Model 713 D.C. Gearmotor was designed for low torque applications. The extremely compact gearmotor is ideal for robots, instrumentation, and other uses where space is at a minimum, but quality and reliability is of maximum concern.

Several models of each design are available as stock items from over 100 Brevel Distributors nationwide. . .or Brevel will custom design to fit your applications.

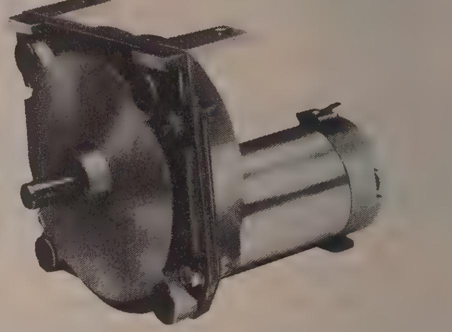

1.50
.75
.33
1.12
BREVEL
MODEL 713
MOTORS
(2)#10-32 TAP X .25 DEEP
EXT. MEASURED WITH SHAFT BOTTOMED (→)
END PLAY: .030 MAX.
±.020
.750
A
B
±.015
.625
FLAT
.205
±.005
.218 FLAT
±.001
.250 DIA.
1.78 DIA.
.06
(2).18 WIDE TERMINALS
1.40 DIA.
1.49 DIA.
(Magnet Shell)

ALL SPECIFICATIONS @ 12V DC

Stock Model No.	No-Load RPM	Starting Torque Lbs.-In.	Nominal Running AMPS	Running Torque Lbs.-In. @ RPM	Dimension		Gear Train Ratio
					A	B	
713-982922	5.8	*103	.75	20.0 – 4.6	1.20	2.31	604.0:1
713-982923	9.4	* 63	.75	20.0 – 5.9	1.20	2.31	374.0:1
713-982924	16.4	* 36	.75	12.0 – 10.0	1.20	2.31	213.0:1
713-982925	26.0	* 22	.75	7.5 – 16.0	1.20	2.31	132.0:1
713-982926	39.8	* 32	1.25	10.8 – 25.0	.93	3.06	75.3:1
713-982927	46.0	14.4	.75	4.8 – 29.0	.93	2.31	75.3:1
713-982928	64.4	20.0	1.25	6.6 – 42.0	.93	3.06	46.6:1
713-982929	112.0	12.7	1.25	4.2 – 73.0	.93	3.06	26.6:1
713-982930	145.6	9.8	1.25	3.2 – 94.5	.93	3.06	20.0:1
713-982931	183.0	7.0	1.25	2.6 – 110.7	.93	3.06	16.5:1

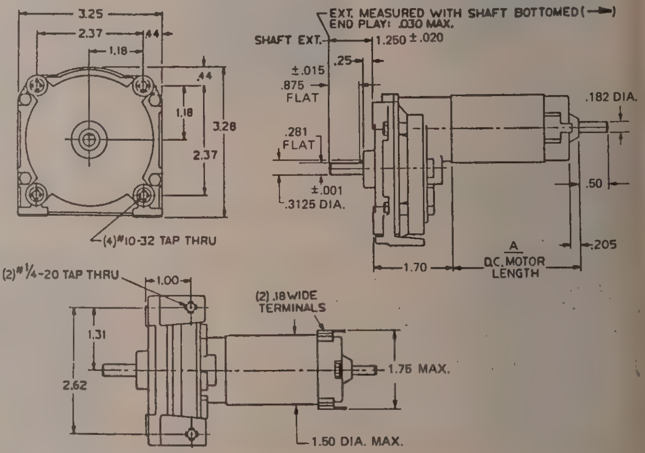
*TORQUE LOAD MUST NOT EXCEED 20 LBS–IN

Model 780 Stock D.C. Gearmotor



The Model 780 D.C. Gearmotor was designed for high torque applications. The rugged Model 780 is ideal for pumps, vending machines, lift mechanisms and other uses where tough reliable operation is demanded.

Several models of each design are available as stock items from over 100 Brevel Distributors nationwide. . .or Brevel will custom design to fit your applications.


3.25
2.37
.44
1.18
.44
1.18
3.28
2.37
(4)#10-32 TAP THRU
EXT. MEASURED WITH SHAFT BOTTOMED (→)
END PLAY: .030 MAX.
SHAFT EXT.
1.250 ±.020
.25
±.015
.875
FLAT
.281
FLAT
±.001
.3125 DIA.
.182 DIA.
.50
.205
1.70
A
D.C. MOTOR LENGTH
(2)#¼-20 TAP THRU
1.00
(2).18 WIDE TERMINALS
1.31
2.62
1.75 MAX.
1.50 DIA. MAX.

ALL SPECIFICATIONS @ 12V DC

Stock Model No.	No-Load RPM	Starting Torque Lbs.-In.	Nominal Running AMPS	Running Torque Lbs.-In. @ RPM	Dimension A	Gear Train Ratio
780-982956	4.5	*240	1.6	120 – 3.0	2.675	762.6:1
780-982957	7.5	*170	1.6	75 – 4.8	2.675	472.0:1
780-982958	12	140	1.6	60 – 7.5	2.675	271.8:1
780-982959	23	70	1.6	30 – 16	2.675	150.5:1
780-982960	34	70	2.5	33 – 20	3.425	97.2:1
780-982961	62	40	2.2	18 – 40	3.425	53.1:1
780-982962	90	27	2.2	13 – 60	3.425	35.4:1
780-982963	175	16	2.0	6.5 – 130	3.425	19.0:1

*TORQUE LOAD MUST NOT EXCEED 150 LBS–IN

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DN 13-
Canon CANON SEIKI JAPAN
FN 30-T13N1B
W/RB 35 1/500
Canon CANON SEIKI JAPAN
AN 30-L41N1B

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PM, HYBRID, and VR STEPPER MOTORS

Computer peripheral drives, office equipment, machine tool drives

. . . with step angles .9°, 1.8°, 1.875°, 3.6°, 15°, 30°, 45°, 90°; .75 inch to 2.3 inch O.D.
Ceramic, Alnico or rare earth magnets

INTEGRAL MOTOR/ENCODER ASSEMBLIES

Computer peripheral drives, office equipment, machine tool drives

Optical encoder resolution to 2500 cycles. Solid-state, gallium arsenide light source, integral assemblies, no assembly or alignment necessary

DC PM HOLLOW SHAFT TORQUE MOTORS

Inertial navigation platforms, aircraft instruments, aircraft controls

. . . with torques from 6 to 2700 oz-in., 1.1 inch to 20 inch O.D. Precision tolerances, gold commutators, high reliability

For further information on Stepper Motors and Brushless DC Motors,
call Jim Chandler at Murphy, NC (704) 837-5115;
for all other motor information,
call Clifton Heights, PA (215) 622-1000.

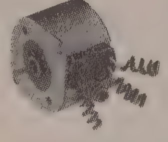
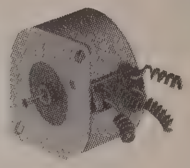
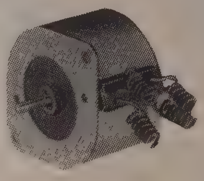
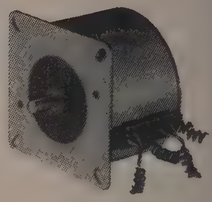
Litton

CLIFTON PRECISION®

MARPLE AT BROADWAY, CLIFTON HEIGHTS, PA. 19018 ▪ (215) 622-1000

Permanent Magnet Motors

Stepper Motors - 7.5° - 2 Phase and 4 Phase

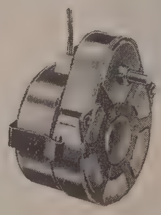
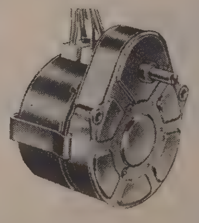
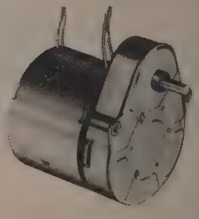
PART NUMBER	**82 910.0**	**82 920.0**	**82 930.0**	**82 940.0**
Stepper Motors				
Diameter	1.4″ (35.5 mm)	2″ (51 mm)	2.25″ (57.5 mm)	2.55″ (65 mm)
Holding Torque (2 Phase)	3.1 in. oz.	8.5 in. oz.	23 in. oz.	39 in. oz.

Reversible Synchronous Motors

Above Stepper Motor sizes are available as Reversible Synchronous Motors (300 or 450 RPM) 82 500 Series

Synchronous Gear Motors (Pear Shape)

- High Torque, instant stop
- Uni-directional or reversible
- Precision double bushing
- Standard round, flatted or knurled shaft
- UL, CSA and most European standards.
- Optional: Dual Voltage, friction or one way clutch, low temperature lubrication, etc.

Rotation	**Uni-Directional**		**Reversible**	
Torque	**Standard Torque**	**High Torque**	**Standard Torque**	**High Torque**
Part Number	**82 344**	**82 334**	**82 474**	**82 494**
Synchronous Gear Motors				
Static Torque **Dynamic Torque** **Running Torque @ 1 RPM** **Power Input**	300 in. oz. 75 in. oz. 155 in. oz. 2.8 w	300 in. oz. 75 in. oz. 580 in. oz. 3.8 w	300 in. oz. 75 in. oz. 440 in. oz. 3.8 w	300 in. oz. 75 in. oz. 130 in. oz. @ 10 RPM 5 w

Also available from Crouzet: ***Shaded Pole Gear Motors***

Crouzet

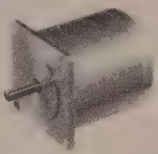
Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

EAD Eastern Air Devices

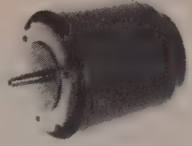
Dept. EM, 1 Progress Dr., Dover, NH 03820 • (603) 742-3330 • TWX (510) 297-4454

STEPPING MOTORS

Sizes 8 through 20 VR and PM stepping motors, 7.5, 10, 15, 22.5, 30, 45, and 90 degree step angles with a wide range of voltage and torque ratings. Heat sinks and mechanical dampers available.



Size 23 (2⁷⁄₃₂″ dia.) and size 34 (3⅜″ dia.) permanent magnet stepping motors with 1.8, 1.875, 2, 2.5, 5, and 7.5 degree step angles. Torque ratings from 50 to 150 oz. in. for size 23, and 150 to 450 oz. in. for size 34.

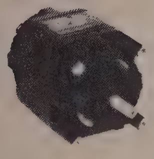


Size 42 (4³⁄₁₆″ dia.) permanent magnet stepping motors with 1.8 degree step angles. Torque ratings from 150 to 400 oz. in.

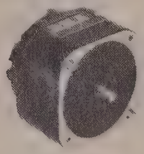
BRUSHLESS DC MOTORS

Motors, fans, blowers. Sub-FHP to ½ HP. To 20,000 rpm. With or without electronic drive circuits.

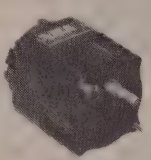
INSTRUMENT MOTORS AND GEAR MOTORS



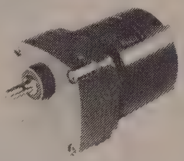
Holtzer Cabot Model M instrument motors with ratings up to 1/20 HP. Available as induction, torque, and synchronous motors in either face or foot mount. Only 2⅞″ sq. Popular for floppy disk drive applications.



Holtzer Cabot Model L & S instrument motors with ratings up to 1/100 HP. Available as servo, polarized synchronous, synchronous, torque, induction, and DC motors. Only 2⁹⁄₁₆″ square.



Holtzer Cabot Model L & S instrument gear motors with ratings through 150 oz. in. Available with gear reductions from 3:1 to 3600:1 in either spur or in helical gearing. Only 2⁹⁄₁₆″ square.



Size 34 (3⅜″ dia.) synchronous and non-synchronous gear motors. Speeds from 2 RPM to 150 RPM. Torque output up to 40 lb. in. For applications that require quiet operation and long life.

Holtzer Cabot right angle gear motors. Up to ⅛ HP in a variety of voltages, either AC or DC. Gear ratios from 6:1 to 1140:1 in either single or double reduction gear reducers.

SYNCHRONOUS AND INDUCTION MOTORS

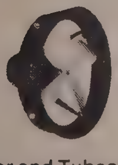
Size 34 (3⅜″ dia.) and 44 (4⅜″ dia.) synchronous and induction motors. 1/300 through ½ HP. 600 to 12,000 RPM. Single or dual speeds, single or dual voltage. 50/60 or 400 Hz.

Size 31 (3⅛″ dia.) and size 39 (3⅞″ dia.) synchronous and induction motors. 1/200 through ½ HP. 600 to 3600 RPM. Single or dual speeds. 50/60 Hz.

TACHOMETER ALTERNATOR

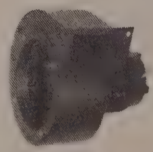
Model J15. Rugged PM design for maintenance free industrial applications. Output 5 volts/1000 RPM. 2.5% max. distortion, 0.1% linearity.

FANS AND BLOWERS



Propeller and Tubeaxial fans. Up to 12″ dia. up to 1500 CFM. The EAD line of axial fans for cooling application is manufactured for continuous duty and efficient air circulation.

Vaneaxial fans. Available in 1½″, 2″, and 4¾″ dia. from 3 to 500 CFM at high static pressures. EAD V-Line fans are small and powerful air moving devices particularly suited to high-density electronic packages.



Centrifugal blowers. From 3 to 2000 CFM, static pressures up to 5″ of water. These centrifugal squirrel cage blowers have general-purpose performance characteristics for systems with medium back pressures.

EAD Motors

HC Holtzer Cabot Instrument Motors

Janette Gear Motors and Reducers

NEED MORE INFORMATION?

USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

When quality and profit are the bottom line... Electro-Craft DC Servo Systems

To produce a quality, profitable product, you must design and engineer a system that performs. A system that is productive, fast, accurate, flexible and reliable. The fundamental basis for quality and profit.

Look to Electro-Craft for "System Solutions".

For more than two decades, Electro-Craft Corporation has set the standard of the industry for the design and production of precision DC Servo Systems. Offering an extensive line of DC Motors and Tachometers, Speed Control Systems, Servo Amplifiers, Digital Positioning Systems and Optical Encoders for the Office and industrial automation markets. Electro-Craft also sets a standard by being the only engineering and manufacturing company offering in-house research and development capabilities to provide "system solutions" for your specific manufacturing problems. System solutions, that when integrated into your engineering plans, provide you with the formula to exceed your bottom line--a quality product with built-in profits.

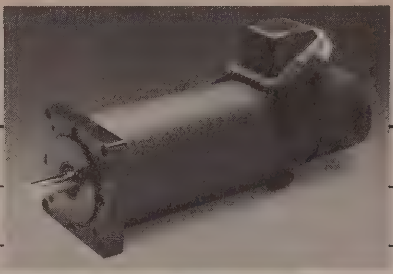
Electro-Craft Capabilities.

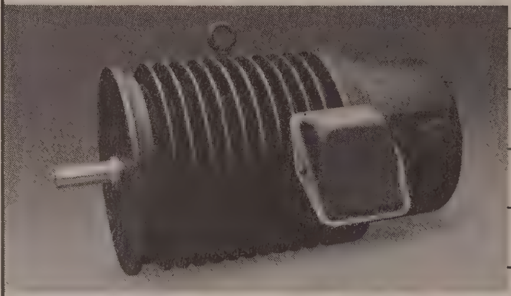
Electro-Craft is a major supplier of DC Servo Systems to the industrial automation market. A vast range of product type and size is demanded to successfully compete in this developing market.

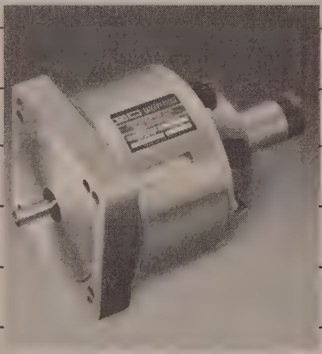
The scope of Electro-Craft's products include four types of motors--iron-core, moving coil, brushless DC and thin-ring brushless DC. This selection of motors ensures that each production application is given the ultimate solution. Every Electro-Craft-built motor has a compatible amplifier for optimum system performance.

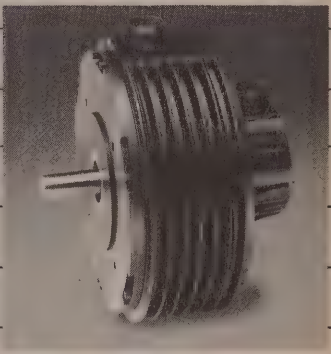
Set your design and manufacturing standard. Then look to Electro-Craft to provide you with precision engineered products for your manufacturing needs.

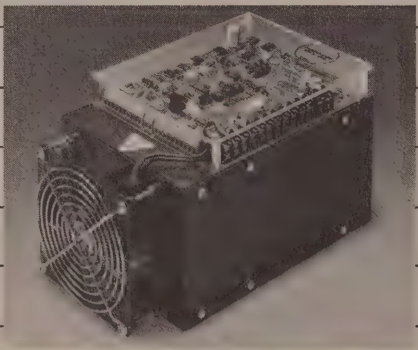
Quality, the ultimate economy.

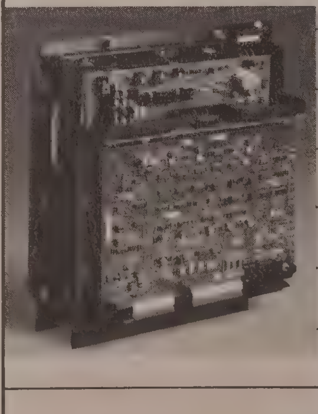






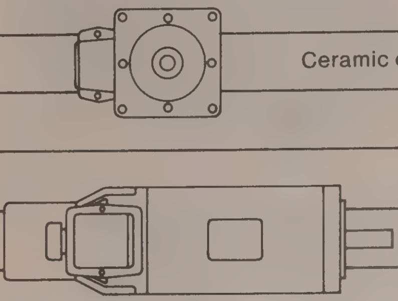






MOTORS

Iron Core Motors



Ceramic or Rare-Earth Magnet

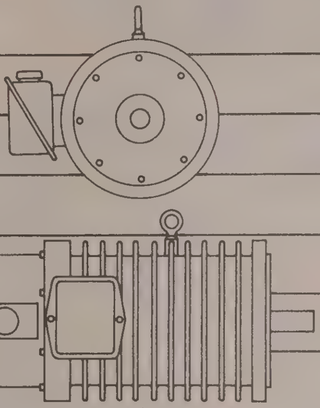
1.5 - 8 in Dia.

20 - 400 W

1 - 475 lb-in

0 - 5000 rpm

Brushless Motors



Rare-Earth Magnet

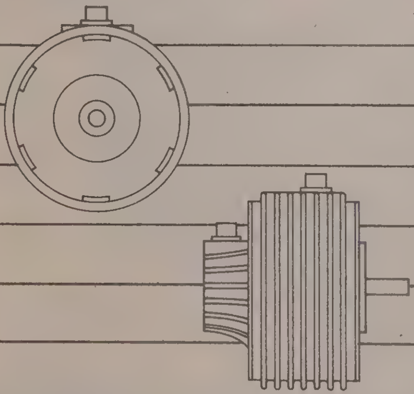
2.5 - 16 in Dia.

100 - 15,000 W

5 - 1000 lb-in

0 - 15,000 rpm

Thin Ring Brushless Motors



Rare-Earth Magnet

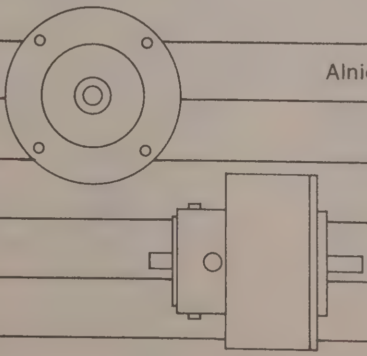
7 - 15 in Dia.

500 - 4000 W

12 - 450 lb-in

0 - 3000 rpm

Moving Coil Motors



Alnico or Rare-Earth Magnet

2.5 - 5.5 in Dia.

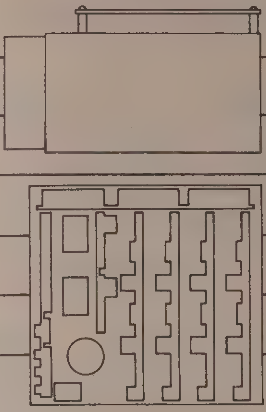
50 - 500 W

20 - 375 oz-in

0 - 5000 rpm

AMPLIFIERS

Linear or PWM



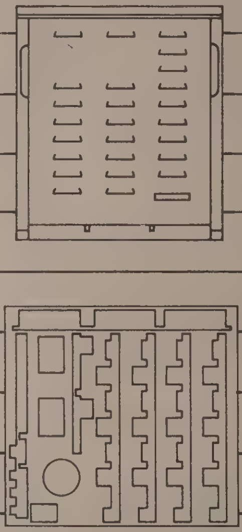
1 - 6 Axis

300 - 7000 W

4 - 48 A

40 - 90 V

PWM



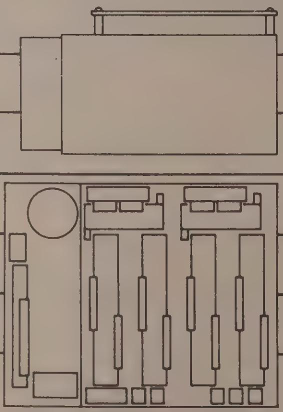
1 - 6 Axis

300 - 17,000 W

4 - 64 A

40 - 270 V

Linear or PWM



1 - 6 Axis

300 - 4000 W

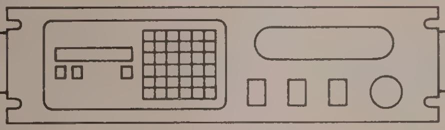
4 - 48 A

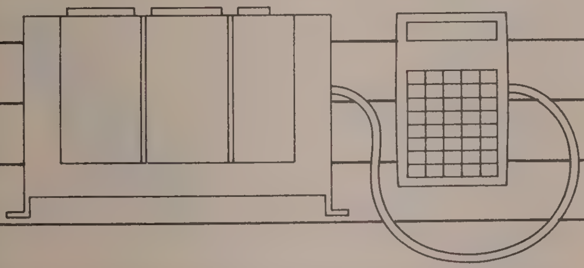
40 - 150 V

CONTROLLERS

Digital Motion Controller

With PC option





Electro-Craft for dependable Customer Sales and Service.

1-800-328-3983

Is your direct line to the Electro-Craft Customer Information Center.

For application assistance in sizing to optimally match your load, or comprehensive information on the complete line of Electro-Craft DC Servo Systems, call our toll-free number. Our staff is there to take your request, find a solution, and get back to you with the right answer.

For direct contact, there is an Electro-Craft Sales Representative in your area ready to help.

When Quality and Profit are your Bottom Line...

EC

ELECTRO-CRAFT
CORPORATION
Standard Product Sales
1600 Second Street South
Hopkins, Minnesota 55343
Telephone - 612/931-2700
Toll-Free - 1-800-328-3983

Applications Assistance
ITT Telex-4310124 or call our
sales office nearest you.

ETI SYSTEMS

MOTORIZED POTENTIOMETERS
DIRECT CURRENT SPECIFICATION CHART

Note: Custom power supplies, servo amplifiers, pulsing circuits and other solid state circuitry available for all motorpots. See SPD15-01 and 6001 (This Section).

FEATURING:

- Motor rpm's from 10,000 to 20,000 rpm (D.C.)
- Precision gear train for output rpm from .04 rpm to 421 rpm.
- Approx: 11 mA operation current
- All metal housings and framework

ALL UNITS HAVE:

- Manual override
- Slip clutch to prevent stop breakage
- Easy assembly and disassembly for different variations if parts are inventoried

See Section 4750 (Variable Resistors) for full specifications on potentiometers.

RPM AVAILABILITY CHART (D.C. MOTORPOTS)

Gear Chart Gear Ratio & Matching Motor	Potentiometer Drive (RPM) ±15%			
	ETM 6-1	ETM 6-2	ETM 12-1	ETM 12-2
ETG 3,45*	4905	3100	5000	3834
ETG 11,8*	1433	900	1465	1120
ETG 41	412	260	421	322
ETG 76	222	140	227	174
ETG 141	120	75	122	94
ETG 262	65	40	65	50
ETG 485	34	22	35	27
ETG 900	19	12	19	14.7
ETG 1,670	10	6.3	10	8
ETG 3,120	5.5	3.3	5.5	4.25
ETG 5,750	3.0	1.8	3.0	2.31
ETG 10,600	1.6	1.0	1.63	1.25
ETG 19,800	.87	.55	.87	.67
ETG 37,000	.46	.29	.50	.36
ETG 68,200	.25	.16	.25	.19
ETG 128,000*	.13	.09	.14	.10
ETG 235,000*	.07	.04	.08	.06

D.C. MOTOR SPECIFICATIONS

D.C. Motor Specifications	ETM 6-1	ETM 6-2	ETM 12-1	ETM 12-2
Nominal Voltage (volts)	6	6	12	12
Power Output- Max (mW)	260	430	330	660
Stall Torque (oz. in.)	.078	.195	.083	.244
No Load Speed +15% (rpm)	18,800	11,900	19,200	14,700
Typical Motor Starting Voltage (mV)	220	130	250	230
Typical Motorpot Starting Voltage (volt)	.8	.8	1.5	1
Approx. Operating Current (mA)	12	11	8	8
Approx. Clutching Current (mA)	20	20	16	20
Armature Inductance (mHENRIES)	250	350	1,200	850
Armature Resistance (ohms)	30	20	109	52
Mechanical Time Constant (millisec)	70	39	75	35

CHART FOR HEAVY DUTY 6, 12, OR 24 VDC MOTOR AND GEAR

Voltage	RPM AT POT CHART								
6 VDC	81	46	26	14	8.2	4.6	2.6	1.5	.4
12 VDC	86	49	27	15	8.7	4.9	2.5	1.55	.48
24 VDC	85	48	27	15	8	4.5	1.5	.8	.5

* Gears noted are non-standard

HOW TO ORDER

(Example):

MC20-1 — 10K, 6 VDC, 10 RPM

MODEL	**RESISTANCE VALUE**
MC20-1	10K
MOTOR VOLTAGE	**POTENTIOMETER RPM**
6 VDC	10 RPM

ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396
DIV: POLARIS ENTERPRISES, INC.

ETI SYSTEMS

MOTORIZED POTENTIOMETERS
DIRECT CURRENT
MULTI-TURN AND SINGLE-TURN WIREWOUND, HYBRID OR CONDUCTIVE PLASTIC

MC20-1

10 Turn Single Gang Potentiometer

Size: ⅞″ dia. x 3½″ long

Motor: 6 or 12 VDC

Gears: See chart

Power: 5 Watts (10 turn)

Pot.: MW20-10 (see Pot. sec. 4750)

Life: 2,000,000 Rev's.

3 or 5 turn pot's. available

MC20-2

10 Turn Multi-Ganged Potentiometer

Size: 1¼″ dia.

Motor: 6 or 12 VDC

Gears: See Chart

Power: 5 Watts (10 turn) (each pot.)

Pot.: MW20-10 (see Pot. sec. 4750)

Life: 2,000,000 rev's.

3 or 5 turn pot's. available

MC20-3

Same as MC20-1 Except with Turns Counting Dial Assembled

Size: 1⅜″

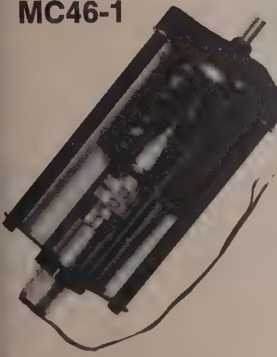
Dial: DA10 (see Pot sec. 4750)

DB10

Turns Counting Dial 1″ x 1.75″

Counts up to 10 turns. Precision gear-driven numbers. Clear plastic window over the numbers protects the mechanism. Rugged, Heavy-duty Construction.

MC46-1



Motor: 6 or 12 VDC

Gears: See chart

Power: 10 Watts

Life: 2,000,000 rev's.

Size: 2″ sq.

Pot.: MW46 (see Pot. sec. 4750)

Multi-turn potentiometer (3, 5 or 10 turns) can be multi-ganged

MC22-¾

Size: 1¼″ Dia.

Motor: 6 or 12 VDC

Gears: See chart

Power: 1 Watt

Pot.: SP22D; Single-turn

Life: 10,000 Rev's.

Wirewound Element MC22-3 or Conductive Plastic MC22-4

ALL MOTORPOTS MAY BE PANEL MOUNTED AND MANUALLY ROTATED.

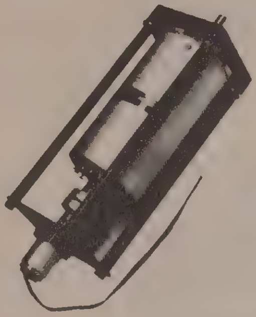
ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396
DIV: POLARIS ENTERPRISES, INC.

ETI SYSTEMS

MOTORIZED POTENTIOMETERS

SPECIAL APPLICATIONS

MC46-2



**5 Amp.
On-Off Switches
Each End of Pot.**

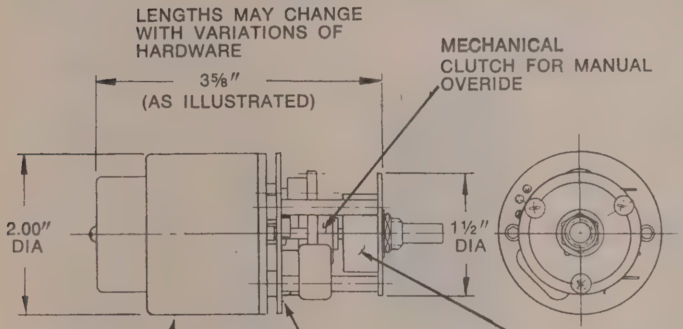
Motor: 6 or 12 VDC
Gears: See chart
Power: 5 Watts
Life: 2,000,000 rev's.
Size: 2″ sq.
Pot.: SMR46
(see Pot. sec. 4750)
Multi-turn potentiometers (3, 5, 10 or 20 turns) can be multi-ganged

MC46-4/5

**Heavy Duty Motor
Higher Torque
Single or Dual Gang**

Motor: 6, 12, or 24 VDC
Gears: See chart
Power: 5 Watts
Life: 2,000,000 Rev's.
Pot.: SMR46
(see Pot. sec. 4750)
Multiturn potentiometers (3, 5, 10 or 20 turns) can be multi-ganged

NEW! AC MOTORPOT-REVERSIBLE


LENGTHS MAY CHANGE WITH VARIATIONS OF HARDWARE
3⅝″ (AS ILLUSTRATED)
MECHANICAL CLUTCH FOR MANUAL OVERIDE
2.00″ DIA
1½″ DIA

POTENTIOMETER (CONSULT ETI FOR VARIATIONS)

STARTING CAPACITOR AND RESISTOR ON CIRCUIT BOARD.*
ALSO INCLUDES DIODE FOR BRAKING. REDUCES COAST WITH POWER OFF.
SPEED RANGES BETWEEN 1 REV./DAY TO: 25 REV./MINUTE SPECIAL ORDER

MOTOR
115 VAC OR 24 VAC REVERSIBLE SYNCHRONOUS HYSTERESIS. UL APPROVED

ASK FACTORY FOR LITERATURE

AC MOTORPOT

OPTIONS AVAILABLE:

Single or multi-turn potentiometers. Film or wirewound elements. Multi section potentiometers.

Snap action limit switches. Special shaft lengths and modifications.

Special circuit modifications.

STANDARD RPM'S AVAILABLE

115 VAC	½	1	2	3	5	8	10	15	20	25
24 VAC	½	1		3		8		15		25

NOTES: (1) Multi-turns may be mounted with all ETI digital or concentric turns counting dials. (2) If capacitor and resistor are mounted by customer elsewhere then circuit board will be deleted and price reduced. Specifications subject to change without notice.

**ETI SYSTEMS
DEPT EM, 215 VIA DEL NORTE • OCEANSIDE, CA 92054
TEL: (619) 757-7770 • TWX: 910-322-1396**
DIV: POLARIS ENTERPRISES, INC.

ETI SYSTEMS

POSITION CONTROL NEW!

ETI SYSTEMS Model 6000 Motorized Position Control Is A Self-Contained, High Performance Servo Control System

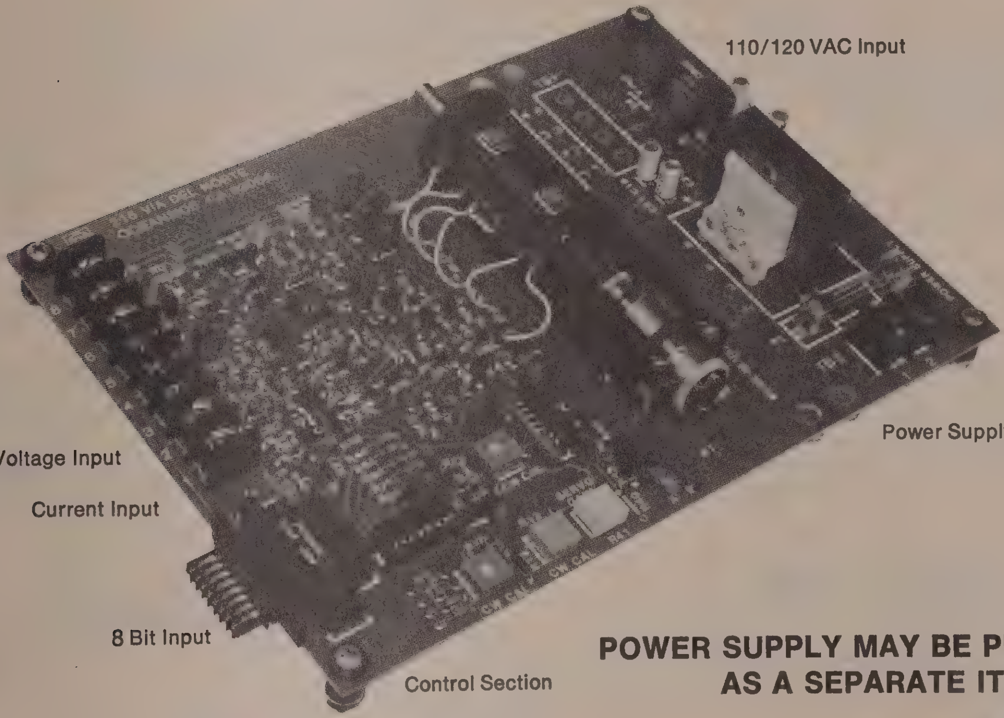
Input control is achieved by one of these modes:

Voltage Input:	0 to 5 or 0 to 10 Volts D.C.
Current Input:	4 to 20 milliamps. This mode has a signal sensor that inhibits control if signal falls below 4 milliamps.
Digital Input:	8 bit with strobe.

Positional accuracy of less than 2% of full scale (less than 1% on some models depending upon motor speed and pot resolution).

Input power to power supply is 110/120 VAC 50/60 Hz at 25 Watts, outputting to control ±15 VDC and +5 VDC regulated.

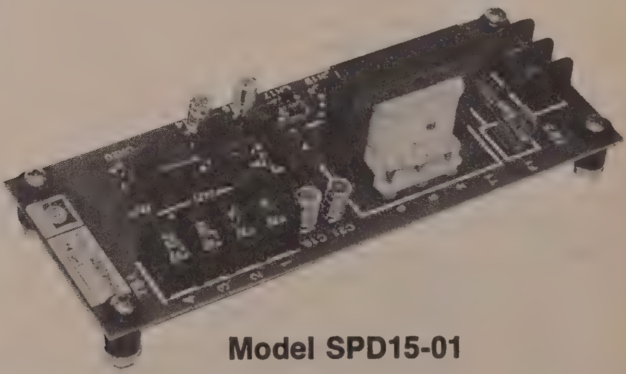
Servo inhibit and run output are available to disable servo control and indicate when motorpot is positioning respectively.



POWER SUPPLY MAY BE PURCHASED AS A SEPARATE ITEM

WHEN ORDERING PLEASE SPECIFY:

INPUT TYPE
POTENTIOMETER ROTATIONAL SPEED
POTENTIOMETER RESISTANCE
POTENTIOMETER ELEMENT
(WIREWOUND OR CONDUCTIVE PLASTIC)



Model SPD15-01

LOW COST

Ask about Model 5500. Same as Model 6000 except, servo inhibit and output run is not included. Available with voltage and current input only. Size is 4″ x 5½″.

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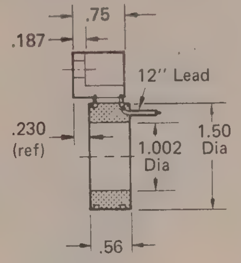
DIV: POLARIS ENTERPRISES, INC.

SLIP RING ASSEMBLIES BEST DELIVERY

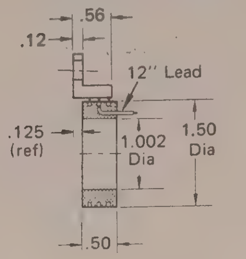
1

SEPARATE ROTOR AND BRUSH BLOCK ASSEMBLY — STOCK DELIVERY

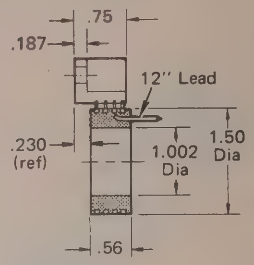
TYPE 1201 – 2 Ring


.75
.187
12" Lead
.230 (ref)
1.002 Dia
1.50 Dia
.56

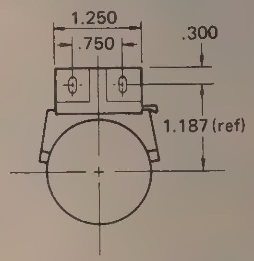
TYPE 1301 – 3 Ring


.56
.12
12" Lead
.125 (ref)
1.002 Dia
1.50 Dia
.50

TYPE 1401 – 4 Ring

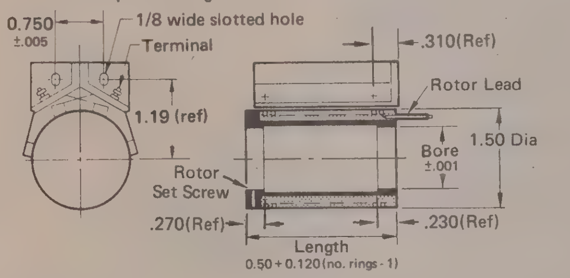

.75
.187
12" Lead
.230 (ref)
1.002 Dia
1.50 Dia
.56

TYPICAL END VIEW


1.250
.750
.300
1.187 (ref)

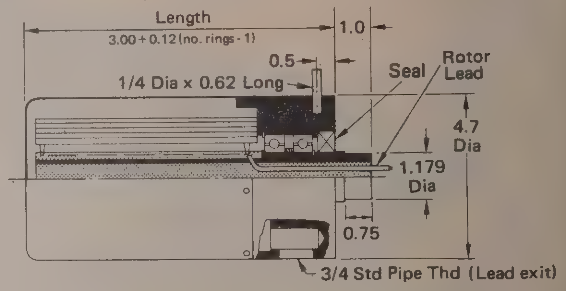
Slip Ring Assembly Type 1057
Separate Rotor and Brush Block

5 amp — 30 rings max — Bore 1.002 dia max


0.750 ±.005
1/8 wide slotted hole
Terminal
1.19 (ref)
Rotor Set Screw
.310(Ref)
Rotor Lead
1.50 Dia
Bore ±.001
.270(Ref)
.230(Ref)
Length
0.50 + 0.120 (no. rings - 1)

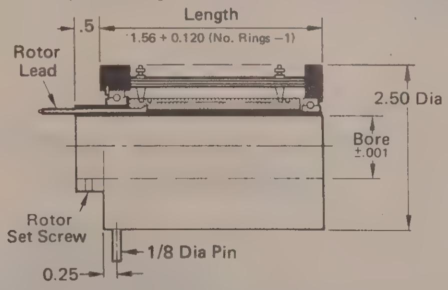
Slip Ring Assembly Type 1302
Sealed Housing

5 amp — 50 rings max — Solid Bore


Length
3.00 + 0.12 (no. rings - 1)
1.0
0.5
1/4 Dia x 0.62 Long
Seal
Rotor Lead
4.7 Dia
1.179 Dia
0.75
3/4 Std Pipe Thd (Lead exit)

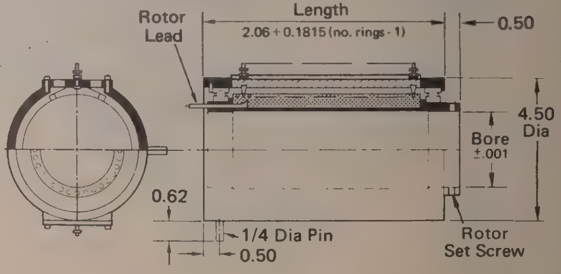
Slip Ring Assembly Type 1186
Rigid Tube Housing — Exposed Stator Terminals

5 amp — 50 rings max — Bore 1.002 dia max


.5
Length
1.56 + 0.120 (No. Rings – 1)
Rotor Lead
2.50 Dia
Bore ±.001
Rotor Set Screw
1/8 Dia Pin
0.25

Slip Ring Assembly Type 1067
Rigid Tube Housing — Exposed Stator Terminals

5 amp — 100 rings max — Bore 2.252 dia max


Rotor Lead
Length
2.06 + 0.1815 (no. rings - 1)
0.50
4.50 Dia
Bore ±.001
0.62
1/4 Dia Pin
0.50
Rotor Set Screw

CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems

RINGS: Coin Silver 5 AMP Rings

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG – 20% C)
Two brushes per ring
Brushes individually removable and replaceable

NOISE: 10 Milliohms dynamic resistance MAX
5 Milliohms MAX with 4 brushes per CKT

HI-POT: 1000 VAC 60 CYCLE for 15 seconds.

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric

COVER: Easily removable for brush and ring inspection

BEARINGS: Shielded or sealed ball bearings

PART NUMBER CODING – Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733

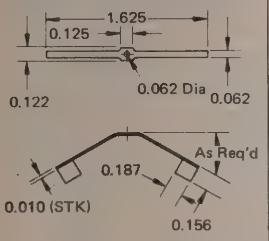
Phone (818) 443-3247 (S. El Monte/Los Angeles)

BRUSH ASSEMBLIES

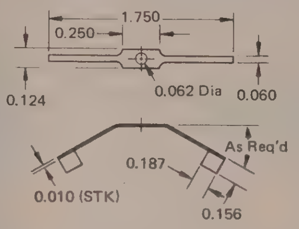
2

LEAF TYPE (BRUSH MATERIAL - FAG 180 LEAF MATERIAL - BeCu) STOCK DELIVERY

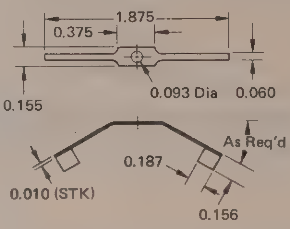
5.0 AMP **DOUBLE BRUSH**
P/N 1103004 **BRUSH .040 WIDE**


1.625
0.125
0.122
0.062 Dia
0.062
As Req'd
0.187
0.010 (STK)
0.156

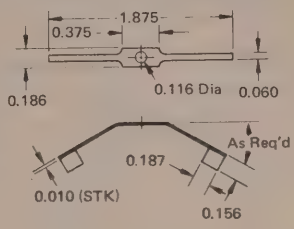
5.0 AMP **DOUBLE BRUSH**
P/N 1050006-13 **BRUSH .040 WIDE**


1.750
0.250
0.124
0.062 Dia
0.060
As Req'd
0.187
0.010 (STK)
0.156

5.0 AMP **DOUBLE BRUSH**
P/N 1050006-5 **BRUSH .040 WIDE**

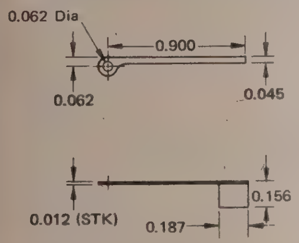

1.875
0.375
0.155
0.093 Dia
0.060
As Req'd
0.187
0.010 (STK)
0.156

5.0 AMP **DOUBLE BRUSH**
P/N 1050006-2 **BRUSH .040 WIDE**

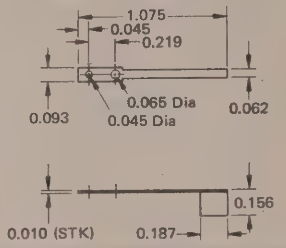

1.875
0.375
0.186
0.116 Dia
0.060
As Req'd
0.187
0.010 (STK)
0.156

"AS REQ'D" ANGLE IN FREE STATE — LEAF WITHOUT BRUSH WOULD TOUCH RING SURFACE

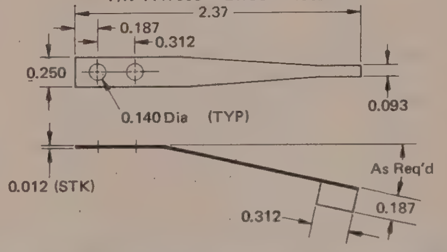
2.0 AMP **SINGLE BRUSH**
P/N 1113007 **BRUSH - .040 WIDE**


0.062 Dia
0.900
0.062
0.045
0.156
0.012 (STK)
0.187

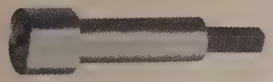
2.0 AMP **SINGLE BRUSH**
P/N 1120051 **BRUSH - .040 WIDE**

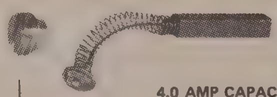

1.075
0.045
0.219
0.093
0.065 Dia
0.045 Dia
0.062
0.156
0.010 (STK)
0.187

5.0 AMP **SINGLE BRUSH**
P/N 1117003 **BRUSH - .062 WIDE**

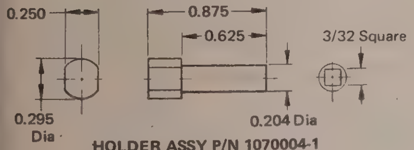

2.37
0.187
0.312
0.250
0.140 Dia (TYP)
0.093
0.012 (STK)
As Req'd
0.187
0.312

PLUNGER TYPE (BRUSH MATERIAL - FAG 180 HOLDER - BRASS) STOCK DELIVERY

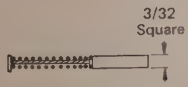




2.5 AMP CAPACITY
3/32" SQUARE BRUSH

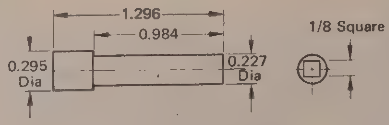

0.250
0.875
0.625
3/32 Square
0.295 Dia
0.204 Dia

HOLDER ASSY P/N 1070004-1
CAP ASSY P/N 1070004-2

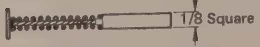


BRUSH ASSY P/N 1072-1

4.0 AMP CAPACITY
1/8" SQUARE BRUSH

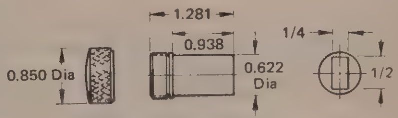

1.296
0.984
1/8 Square
0.295 Dia
0.227 Dia

HOLDER ASSY P/N 1051032-1
CAP ASSY P/N 1051032-2

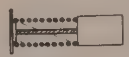


BRUSH ASSY P/N 1072-2

25 AMP CAPACITY
1/4" x 1/2" RECTANGULAR BRUSH


1.281
0.938
1/4
0.850 Dia
0.622 Dia
1/2

HOLDER ASSY P/N 1092006-1
CAP ASSY P/N 1092006-2



BRUSH ASSY P/N 1092003

BRUSH MATERIAL

- Fabricast grade Fag 180, the universal low noise level grade used for all standard brush assemblies.
- Fabricast grade FAG 193, the lowest noise level grade, however, the ring surface speed is limited to 250 SFM.
- Fabricast grade FAG 150, the highest surface speed grade, however, noise levels are compromised.

Grade No.	Composition	Recommended Surface Speed	Carrying Capacity
FAG150	50% silver, 50% graphite	Over 3500 ft. per min.	100 Amps per sq. in.
FAG180	80% silver, 20% graphite	Up to 3500 ft. per min.	250 Amps per sq. in.
FAG193	93% silver, 7% graphite	Up to 250 ft. per min.	300 Amps per sq. in.

WRITE OR PHONE FOR THE FABRICAST CATALOG

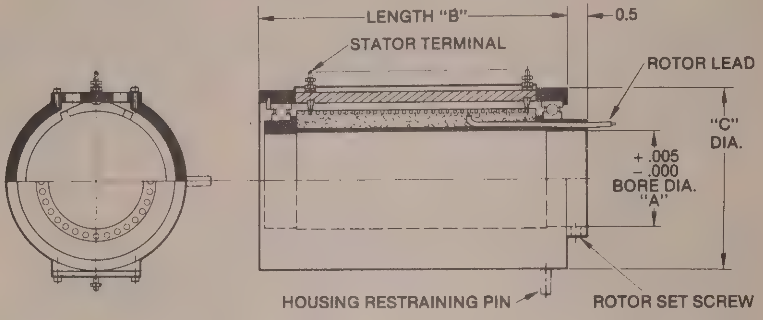
Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

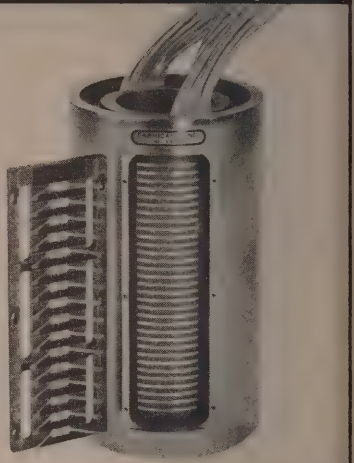
.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733
Phone (818) 443-3247 (S. El Monte/Los Angeles)

SLIP RING ASSEMBLIES SELF—CONTAINED RIGID TUBE HOUSING

DISTINGUISHING CHARACTERISTICS

Rigid one piece housing eliminates bearing alignment problems. Larger section bearings are generally used in these units for a more rugged unit.





TYPE	BORE DIA "A" INCHES		NO. RINGS MAX.	CURRENT AMPS	LENGTH "B" INCHES	HOUSING DIA "C"
	NOMINAL	RANGE				
1230	Solid	–	100		3.50 + .120 (no. rings -1)	2.50
1186	1.000	0 - 1.002	100	5 amp std 2 brushes per ring	1.56 + .120 (no. rings -1)	2.50
1197	1.250	1.0 - 1.252	70		1.56 + .130 (no. rings -1)	3.50
1289	1.500	1.25 - 1.502	100		1.56 + .150 (no. rings -1)	4.00
1067	2.000	1.5 - 2.252	100	10 amp std or lo noise 4 brushes per ring	2.06 + .181 (no. rings -1)	4.50
1420	3.000	2.25 - 3.002	100		1.38 + .181 (no. rings -1)	4.75
1506	3.500	3.0 - 3.502	100		2.88 + .200 (no. rings -1)	6.50
1390	4.000	3.5 - 4.252	100		2.00 + .187 (no. rings -1)	5.75

* RING COMPLEMENT MAY BE LIMITED BY ABILITY TO PASS ROTOR LEADS UNDER BEARINGS.
* FOR 50 AMP STANDARD POWER ASSEMBLIES SEE POWER ASSEMBLY SECTION.
* INSTRUMENT AND 50 AMP POWER CIRCUITS MAY BE CAST ON COMMON SLEEVE.

CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems

RINGS: Coin Silver 5 AMP Rings

BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG – 20% C)
Two brushes per ring
Brushes individually removable and replaceable

NOISE: 10 Milliohms dynamic resistance MAX
5 Milliohms MAX with 4 brushes per CKT

CURRENT: Noted in tabulated block
Rating may be doubled with 4 brushes per CKT

HI-POT: 1000 VAC 60 CYCLE for 15 seconds

ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric

ROTOR LEADS: 5 AMP Leads – 20 GA per MIL-W-16878 TYPE "E"
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends.

HOUSING: One piece tube construction

COVER: Easily removable for brush and ring inspection

BEARINGS: Shielded or sealed ball bearings

PART NUMBER CODING – Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)	Lead Type (Shielded - S / Unshielded - U)
X—	—X—	—X—	—X—	—X

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

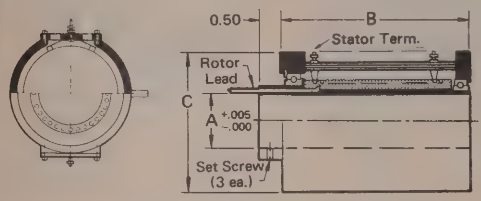
P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733
Phone (818) 443-3247 (S. El Monte/Los Angeles)

SLIP RING ASSEMBLIES SELF-CONTAINED 4

SELF CONTAINED RIGID HOUSING SLIP RING ASSEMBLIES

DISTINGUISHING CHARACTERISTICS

Rigid one piece housing eliminates bearing alignment problems. Bearings are thin section aircraft torque tube type or Kaydon KA series.



REPLACEABLE BRUSH ASSEMBLIES —1000 VAC HYPOT

TYPE	BORE DIA "A," inches		NO. RINGS MAX	CURRENT	LENGTH "B," inches	Housing Dia "C"
	Nominal	Range				
4100	.500	.250 - .502	48	5 amp std 2 brushes per ring	1.19 + .125 (no. rings - 1)	2.00
4150	1.000	.000 - 1.002	64		1.19 + .120 (no. rings - 1)	2.50
4200	1.312	1.000 - 1.312	100		1.19 + .125 (no. rings - 1)	3.00
4237	1.750	1.312 - 1.752	78		1.19 + .130 (no. rings - 1)	3.37
4268	2.000	1.750 - 2.002	100		1.28 + .150 (no. rings - 1)	3.62
4350	2.750	2.250 - 2.752	100	10 amp std or lo noise 4 brushes per ring	1.75 + .150 (no. rings - 1)	4.50
4400	3.250	2.750 - 3.252	100		1.75 + .160 (no. rings - 1)	5.00
4462	3.750	3.250 - 3.752	100		1.75 + .160 (no. rings - 1)	5.50
4500	4.250	3.750 - 4.252	100		1.75 + .187 (no. rings - 1)	6.00
4600	5.250	4.250 - 5.252	79		1.75 + .186 (no. rings - 1)	7.00
4700	6.250	5.250 - 6.252	63		1.75 + .186 (no. rings - 1)	8.00
4800	7.250	6.250 - 7.252	58		1.75 + .187 (no. rings - 1)	9.00
4900	8.750	7.250 - 8.750	58		1.75 + .187 (no. rings - 1)	11.00
1271	1.000	.000 - 2.000	15	50 amp std	3.50 + 1.050 (no. rings - 1)	4.50
1291	3.000	2.000 - 3.252	9	50 amp std	4.50 +.1.120 (no. rings - 1)	6.50

NON-REPLACEABLE BRUSH ASSEMBLIES — 500 VAC HYPOT

TYPE	Nominal	Range	NO. RINGS MAX	CURRENT	LENGTH "B," inches	Housing Dia "C"
4087	.250	.250 - .502	50	3 amp std 2 brushes per ring	.875 + .080 (no. rings - 1)	1.56
4125	.500	.250 - .752	50		.875 + .100 (no. rings - 1)	2.00
4230	2.000	1.500 - 2.002	50		.875 + .080 (no. rings - 1)	3.50

PART NUMBER CODING — Specify fully when ordering

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

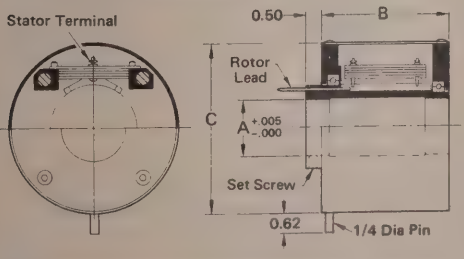
CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems.
RINGS: Coin Silver 5 amp rings. Copper 50 amp rings.
BRUSHES: Silver Graphite Fabricast Grade FAG 180 (80% AG — 20% C) Two brushes per ring. Brushes individually removable and replaceable.
NOISE: 10 Milliohms dynamic resistance max 5 Milliohms max with 4 brushes per ckt.
CURRENT: Noted in tabulated block. Rating may be doubled with 4 brushes per ckt.
HI-POT: See table on left.
ROTOR: One piece steel sleeve. Ring complement vacuum cast on sleeve as unit with epoxy dielectric.
ROTOR LEADS: 5 amp Leads — 20 ga per MIL-W-16878 type "E" 50 amp Leads — 8 ga — Teflon.
HOUSING: One piece tube construction.
COVER: Easily removable for brush and ring inspection.
BEARINGS: Shielded or sealed ball bearings.

SELF CONTAINED COVERED STATOR TERMINAL SLIP RING ASSEMBLIES

DISTINGUISHING CHARACTERISTICS

Bearing Bell and space bar type units best suited for larger bore assemblies.



PART NUMBER CODING — Specify fully when ordering

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

TYPE	BORE DIA "A," inches		NO. RINGS MAX	CURRENT	LENGTH "B," inches	Housing Dia "C"
	Nominal	Range				
1296	.250	.250 - .377	48	5 amp std 2 brushes per ring	1.25 + .110 (no. rings -1)	2.25
1297	.500	.378 - .565	100		1.25 + .120 (no. rings -1)	2.75
1298	1.000	.566 - 1.002	100		1.25 + .120 (no. rings -1)	3.00
1272	1.000	1.000 - 1.750	100		2.00 + .150 (no. rings -1)	5.25
1273	2.000	1.750 - 2.625	100		2.00 + .150 (no. rings -1)	6.25
1274	3.000	2.625 - 3.750	100	10 amp or lo noise 4 brushes per ring	2.00 + .160 (no. rings -1)	7.50
1275	4.000	3.750 - 4.750	48		2.00 + .186 (no. rings -1)	9.00
1276	5.000	4.750 - 5.750	63		2.00 + .186 (no. rings -1)	10.50
1277	6.000	5.750 - 6.750	58		2.00 + .187 (no. rings -1)	12.00
1278	8.000	6.750 - 8.750	58		2.00 + .187 (no. rings -1)	15.00
1282	1.000	1.000 - 1.250	16	50 amp std 100 amp 4 brushes per ring	3.00 + 1.050 (no. rings -1)	8.00
1283	2.000	1.250 - 2.000	16		3.00 + 1.050 (no. rings -1)	9.00
1284	3.000	2.000 - 3.125	9		3.00 + 1.120 (no. rings -1)	10.00
1285	4.000	3.125 - 4.375	8		3.00 + 1.116 (no. rings -1)	11.50
1286	5.000	4.375 - 5.375	10		3.00 + 1.116 (no. rings -1)	12.50
1287	6.000	5.375 - 6.375	10		3.00 + 1.125 (no. rings -1)	13.50
1288	8.000	6.375 - 8.375	10		3.00 + 1.125 (no. rings -1)	16.00

- * RING COMPLEMENT MAY BE LIMITED BY ABILITY TO PASS ROTOR LEADS UNDER BEARINGS .
- * 10 AMP OR LOW NOISE CKT ON TYPES 1296, 1297, 1298, REQUIRE 2 PARALLEL RINGS PER CIRCUIT.
- * INSTRUMENT AND 50 AMP POWER CIRCUITS MAY BE CAST ON COMMON SLEEVE.

CHARACTERISTICS **HOUSING:** Bell, Bell Spacer and Cover type construction. All other characteristics same as for Self Contained Rigid Housing Slip Ring Assembly.

WRITE OR PHONE FOR THE FABRICAST CATALOG

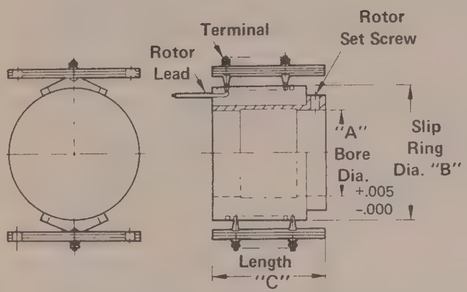
Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

P.O. BOX 3176, 2517 SEAMAN AVENUE, SOUTH EL MONTE, CALIF. 91733
Phone (818) 443-3247 (S. El Monte/Los Angeles)

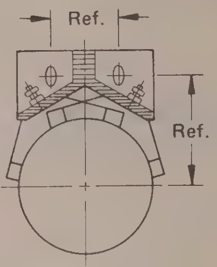
SLIP RING ASSEMBLIES

SEPARATE ROTOR & BRUSH BLOCK

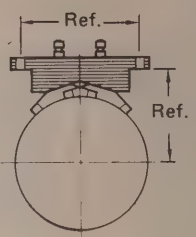
Brush Block Assy
5 AMP STD



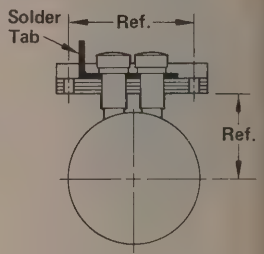
Brush Block Assy
TYPE "A"



Brush Block Assy
TYPE "E"



Brush Block Assy
50 AMP STD



TYPE	BORE DIA "A" INCHES		NO. RINGS MAX.	CURRENT AMPS	SLIP RING DIA "B"	LENGTH "C" INCHES
	NOMINAL	RANGE				
2050	SOLID	000 - .127	18	5 amp std 2 brushes per ring 10 amp std or lo noise 4 brushes per ring	.500	.625 + .125 (no. rings -1)
2087	SOLID	000 - .377	48		.875	.625 + .110 (no. rings -1)
2112	.375	000 - .627	52		1.125	.625 + .125 (no. rings -1)
2150	.750	.625 - 1.002	52		1.500	.625 + .120 (no. rings -1)
2187	1.000	.750 - 1.250	48		1.875	.625 + .125 (no. rings -1)
2200	1.125	.750 - 1.375	80		2.000	.750 + .125 (no. rings -1)
2237	1.250	1.000 - 1.502	78		2.375	.750 + .130 (no. rings -1)
2268	1.500	1.250 - 1.752	107		2.687	1.000 + .150 (no. rings -1)
2350	2.000	1.750 - 2.502	78		3.500	1.000 + .181 (no. rings -1)
2375	2.500	2.370 - 2.875	48		3.750	1.000 + .200 (no. rings -1)
2462	3.000	2.750 - 3.752	100		4.652	1.250 + .160 (no. rings -1)
2500	4.000	3.250 - 4.002	40		5.000	1.250 + .250 (no. rings -1)
2600	5.000	4.000 - 5.002	80		6.000	1.250 + .186 (no. rings -1)
2700	6.000	5.000 - 6.002	63		7.000	1.250 + .186 (no. rings -1)
2800	7.000	6.000 - 7.002	58		8.000	1.250 + .187 (no. rings -1)
2900	8.000	7.000 - 9.002	58		10.000	1.250 + .187 (no. rings -1)
3268	1.000	.750 - 1.187	16	50 amp std 2 brushes per ring	2.687	2.000 + 1.050 (no. rings -1)
3300	1.500	1.187 - 1.500	6		3.000	2.000 + 1.000 (no. rings -1)
3350	2.000	1.500 - 2.000	16		3.500	2.000 + 1.050 (no. rings -1)
3462	3.000	2.000 - 3.125	9		4.625	2.000 + 1.120 (no. rings -1)
3600	4.000	3.125 - 4.500	8		6.000	2.000 + 1.116 (no. rings -1)
3700	5.000	4.500 - 5.500	10		7.000	2.000 + 1.116 (no. rings -1)
3800	6.000	5.500 - 6.500	10		8.000	2.000 + 1.125 (no. rings -1)
3900	7.000	6.500 - 8.500	10		10.000	2.000 + 1.125 (no. rings -1)

CHARACTERISTICS

RINGS: Coin Silver AMP Rings.
Copper 50 AMP Rings.

BRUSHES: Silver Graphite.
Fabricast Grade FAG 180 (80% AG – 20% C)
Two brushes per ring
Brushes individually removable and replaceable.

NOISE: 10 Milliohms dynamic resistance MAX.
5 Milliohms max with 4 brushes per CKT.

CURRENT: Noted in tabulated block.
Rating may be doubled with 4 brushes per ckt.

HI-POT: 1000 VAC 60 cycle for 15 seconds.

ROTOR: One piece steel sleeve.
Ring complement vacuum cast on sleeve as unit with epoxy dielectric.

ROTOR LEADS: 5 AMP Leads – 20 GA per MIL-W-16878 TYPE "E"
50 AMP Leads – 8 GA – Teflon
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends.

BRUSH BLOCK: Glass epoxy laminate.
Optional mounting methods shown.

PART NUMBER CODING – Specify fully when ordering.

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)
X —	X —	X —	X —	X

WRITE OR PHONE FOR THE FABRICAST CATALOG

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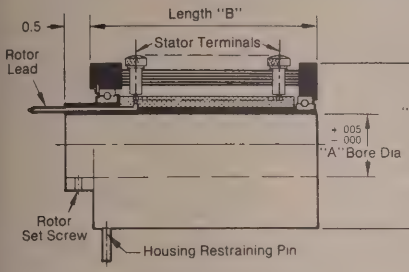
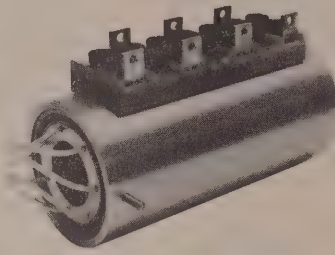
Phone (818) 443-3247 (S. El Monte/Los Angeles)

SLIP RING ASSEMBLIES

POWER ASSEMBLIES


Length "B"
0.5
Stator Terminals
Rotor Lead
"C" Dia
+ .005
− .000
"A" Bore Dia
Rotor Set Screw
Housing Restraining Pin



CHARACTERISTICS

RPM: Rigid one piece housing eliminates bearing alignment problems
RINGS: Copper 50 AMP Rings
BRUSHES: Silver Graphite
Fabricast Grade FAG 180 (80% AG—20% C)
Two brushes per ring
Brushes individually removable and replaceable
CURRENT: Noted in tabulated block
Rating may be doubled with 4 brushes per CKT
HI-POT: 1000 VAC 60 CYCLE for 15 seconds
ROTOR: One piece steel sleeve
Ring complement vacuum cast on sleeve as unit with epoxy dielectric
ROTOR LEADS: 50 AMP Leads — 8 GA — Teflon
Lead exit as shown on most units. Maximum ring complement may require smaller wire or leads to exit both ends
BEARINGS: Shielded or sealed ball bearings

TYPE	BORE DIA "A" INCHES		NO. RINGS MAX	CURRENT	LENGTH "B" INCHES	HOUSING DIA "C"
	NOMINAL	RANGE				
5035 5043 5050 5060	1.625 2.625 3.375 4.062	1.125 - 2.125 2.000 - 3.250 2.750 - 4.000 3.125 - 5.000	15 8 10 10	50 amp std 2 brushes per ring	3.25 + 1.089 (no. rings−1) 3.25 + 1.100 (no. rings−1) 3.25 + 1.125 (no. rings−1) 3.25 + 1.116 (no. rings−1)	4.50 5.50 6.12 7.25
5070 5080 5100 5140	5.250 6.000 7.625 9.500	4.500 - 6.000 5.500 - 6.500 6.750 - 8.500 8.500 - 10.500	8 8 8 6	100 amp 4 brushes per ring	3.25 + 1.116 (no. rings−1) 3.25 + 1.125 (no. rings−1) 3.25 + 1.125 (no. rings−1) 3.75 + 1.250 (no. rings−1)	8.00 9.00 11.00 15.75

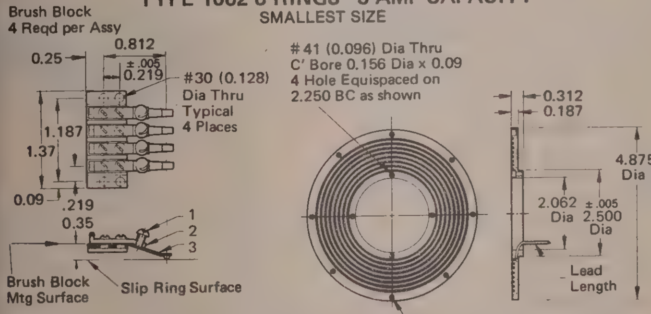
PART NUMBER CODING — Specify fully when ordering

Type	Bore (Inches)	No. Rings	Lead Length (Inches)
X	X	X	X

PANCAKE TYPE SLIP RING ASSEMBLIES

TYPE 1062 8 RINGS - 5 AMP CAPACITY

SMALLEST SIZE

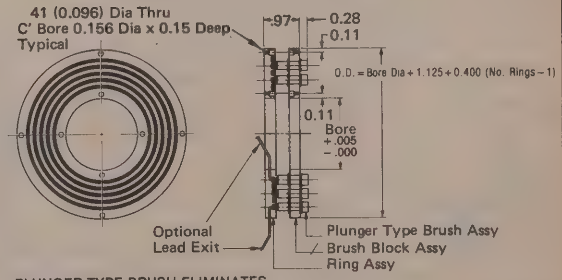

Brush Block
4 Reqd per Assy
0.812
0.25
± .005
0.219
#30 (0.128) Dia Thru Typical 4 Places
1.187
1.37
0.09
.219
0.35
1
2
3
Brush Block Mtg Surface
Slip Ring Surface
#41 (0.096) Dia Thru
C' Bore 0.156 Dia x 0.09
4 Hole Equispaced on
2.250 BC as shown
0.312
0.187
4.875 Dia
2.062 Dia
± .005
2.500 Dia
Lead Length

1 — Pressure Adjust Screw
2 — Term Lug
3 — Beryllium Copper Leaf & Silver Graphite Brush

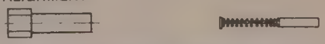
#41 (0.096) Dia Thru
C' Bore 0.156 Dia x 0.09
8 Holes Equispaced on
4.675 BC as shown

TYPE 1650 - 5 AMP CAPACITY

NO. OF RINGS PER CUSTOMER REQ'TS
No Brush Gauging — Easy Assembly

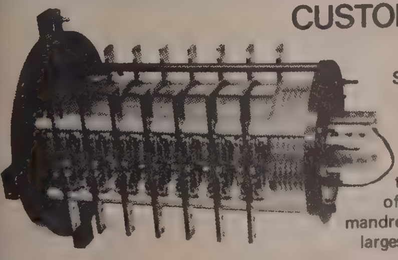

41 (0.096) Dia Thru
C' Bore 0.156 Dia x 0.15 Deep
Typical
.97
0.28
0.11
O.D. = Bore Dia + 1.125 + 0.400 (No. Rings − 1)
0.11
Bore
+ .005
− .000
Optional Lead Exit
Plunger Type Brush Assy
Brush Block Assy
Ring Assy

PLUNGER TYPE BRUSH ELIMINATES BRUSH GAUGING AND ALIGNMENT BY CUSTOMER



HOLDER ASSY P/N 1070004 BRUSH ASSY P/N 1072-1

CUSTOM DESIGNED SLIP RING ASSEMBLIES



CUSTOM 7000 AMP SLIP RING ASSEMBLY

This slip ring assembly, as designed and manufactured by Fabricast, Inc., is used to supply 7000 amperes of current to the rotating mandrel of the world's second largest spin forging machine.

CUSTOM 222 TRACK SLIP RING ASSEMBLY

This slip ring assembly, as designed and manufactured by Fabricast, Inc. was used to complete the electrical circuits to the rotating arm of an astronaut carrying centrifuge.

The unit consists of 50 amp. power, 5 amp. instrumentation and 50 megacycle coaxial modules.

WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. *CUSTOM MANUFACTURERS OF SLIP RING ASSEMBLIES*

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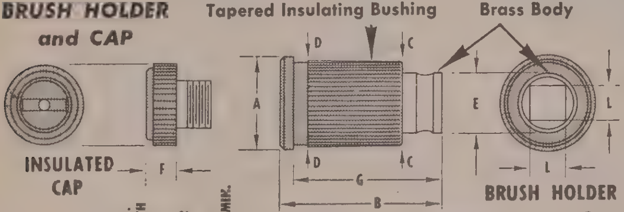
SILVER GRAPHALLOY BRUSHES and BRUSH & SLIP-RING ASSEMBLIES...

GRAPHALLOY BRUSHES

are used on such equipment as... SERVO SYSTEMS • SYNCHROS • CHOPPERS • RADAR • GYROS • INVERTERS • THERMOCOUPLE and STRAIN GAGE CIRCUITS • GUIDED MISSILES • PULSE SYSTEMS • DIGITAL COMPUTERS • WAVE GUIDES • SONAR • TRANSDUCERS • TORQUE INDICATORS

Silver GRAPHALLOY Brushes have been widely used because *of* LOW *and* CONSTANT CONTACT DROP, EXTREMELY LOW ELEC-TRICAL NOISE *and* LONG LIFE. Over 200 grades are now serving in a wide variety of applications. Silver GRAPHALLOY Brushes on ½"-diameter coin silver slip rings have operated successfully in highly critical electrical circuits at speeds up to 100,000 R.P.M. *Our Engineering Department will assist in determining the exact grade of* GRAPHALLOY *for your needs.* Ask for our Brush Inquiry Form 109.

BRUSH HOLDER and CAP



Other Sizes Available

BRUSH HOLDER & CAP NO.	BRUSH SIZE	SUGGESTED MIN. SLIP-RING WIDTH	**MOUNTING HOLE DIAMETER	BRUSH HOLDER TO SLIP RING—MIN.	A	OVERALL LENGTH B	F	C	D	E	G	BROACHED HOLE L
14326	⅛" sq.	3/16"	13/32"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.129"
11509†	5/32" sq.	¼"	13/32"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.160"
11570†	3/16" sq.	¼"	7/16"	1/16"	.484"	⅞"	3/16"	.441"	.451"	.313"	25/32"	.193"
19011†	¼" x 3/16"	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256 x .193"
11527†	¼" sq.	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256"
14292†	⅜" x ¼"	7/16"	43/64"	⅛"	.718"	1 7/16"	¼"	.672"	.682"	.533"	1 5/16"	.382 x .256"
12166†	⅜" sq.	7/16"	13/16"	⅛"	.921"	1 13/16"	¼"	.813"	.828"	.628"	1⅝"	.382"
31392†	½" sq.	9/16"	1⅛"	⅛"	1.237"	1 13/16"	¼"	1.126"	1.141"	.878"	1 9/16"	.503"
35439†	¾" x ½"	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"
35440†	¾" sq.	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"

†Shunts are provided. **Mounting hole diameter for brush holder dimension D.

Request and fill in Brush Inquiry Sheet, Form 109, so that we can supply the proper grade of brush material.

BRUSH ASSEMBLIES

135-10
218-21
135-6

CONTACTS

GRAPHALLOY, because of its inherent non-welding and arc-quenching characteristics, is used widely for contacts. Ask for Data Sheet 950.

BUSHINGS, Oil-free

Replace oil-lubricated bushings in synchros, instruments, timers and missiles.

Advantages: 1) Lower friction at room temperatures. 2) No oil to solidify at low temperatures. 3) No oil to carbonize at prolonged elevated temperatures.

*Ask for Data Sheets 270 and 277 on Miniature Bronze-*GRAPHALLOY *Bushings.*

CONNECTORS (garter springs)

These silver-plated coil spring Connectors make for positive electrical connection to the brass body of the brush holder by snapping into the groove on the holder. The connecting lead can be pre-soldered to the Connector.

GARTER SPRING CONNECTORS	BRUSH SIZE	BRUSH HOLDER NO.
127-9	⅛" sq.	14326
127-9	5/32" sq.	11509
127-10	3/16" sq.	11570
127-14	¼" x 3/16"	19011
127-14	¼" sq.	11527
127-18	⅜" x ¼"	14292
127-20	⅜" sq.	12166
127-24	½" sq.	31392
127-32	¾" x ½"	35439
127-32	¾" sq.	35440

CLUTCH FACINGS and CLUTCH GEAR ASSEMBLIES

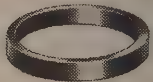
Torque remains same within close operating limits despite changes in temperature and humidity. For instrumentation, guided missiles, constant friction devices.

SLIP RINGS
Solid Coin Silver

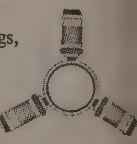
Standard Coin Silver Slip Rings, both *cylindrical* and *flat* types, are illustrated at right. We recommend the cylindrical type rings with three brushes per ring . . . spaced at 120°. The cylindrical type are designed for press fitting over standard steel shafting. The flat type rings are designed for nesting either on an insulated plate or for molding into insulation. Insulated slip rings of either type or slip-ring assemblies can be furnished with leads attached.

No. 168 Series flat type to 20" O.D.

Standard "Flat" rings have ¼" ra dial contact surface and ⅛" radia spacing between adjacent rings.

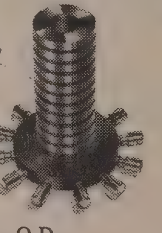


No. 116 Series cylindrical typ to 36" O.D.



Copper Slip Rings, flat or cylindrical, are available.

Model 319 CYLINDRICAL SLIP-RING assembly

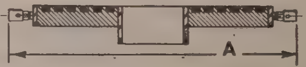


Solid Coin Silver Rings

MODEL	RINGS	LENGTH
319-4	4	2 9/16"
319-6	6	3 5/16"
319-10	10	4 13/16"
319-14	14	6 5/16"

O.D.
Slip-ring 1⅝"
Terminal 4"
Assembly I.D.: .814"/.813"
Range: Same as for Model 399

Model 409 FLAT SLIP-RING assembly



Solid Coin Silver Rings

MODEL	RINGS	OVERALL O.D.—"A"
409-2	2	5½"
409-4	4	7"
409-6	6	8½"
409-10	10	11½"

Hub: O.D. 2"
I.D. 1.753"/ 1.751"
Length 1⅛"
To 5 amps., 125 v.
More rings on application.

SPRING BINDING POSTS
(with or without Insulated Cap)

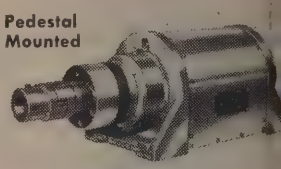
O.D.: ⅜", ½", 17/32"
Lgth.: ⅝", ¾", 25/32"

Also Miniature Spring Type!

19185
22978

Model 399 BRUSH and SLIP-RING assembly

Pedestal Mounted



MODEL	RINGS	bolt slot distances CL to CL WIDTH	LENGTH	**OVERALL LENGTH
399-4	4	4½"	7¾"	13¼
399-6	6	4½"	8½"	14"
399-10	10	4½"	10"	16"
399-14	14	4½"	11½"	18"

Specifications: Width 6½"—Heigh 6½". Shaft CL above base 3¼"
Applications: from strain gage o thermocouple up to 5 amperes 125 volts, 250°F.
Speeds to 5,000 RPM.
Three Silver-GRAPHALLOY Brushe per solid coin silver slip ring.
Extraneous noise level low.
Rugged in design and construction
Readily connected mechanicall and electrically.
Complete coupling provided fo 15/16" shaft.
More rings and higher speeds available upon application.

Write for data sheets

CALL ON OUR OVER 60 YEARS OF DESIGN EXPERIENCE FOR HELP IN SOLVING YOUR BRUSH PROBLEMS!

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FHP motors... precision, power, performance

Whatever your motor requirements, chances are IMC Eastern Division has a pre-engineered design to meet them. If not, we will custom engineer to your exact specifications.

IMC offers a complete range of motor types, sizes and performance characteristics.

Hysteresis synchronous, polarized and reluctance synchronous, induction, torque, and servo motors. 50, 60 400, 800 and 1000 Hz, multi-Hz and variable frequency types. Standard voltages from 13 to 230 V, single, 2 and 3-phase. Models include totally enclosed and open frame designs with or without internal cooling. Base, face, flange and servo mountings. Shafts offset, double-ended, with slots, keyways, tapers, etc. at customer option.

The tables below provide a few typical examples of IMC Eastern Division motor capability. For additional data on these designs, information on your individual requirements, or application engineering assistance, contact us at

imc

IMC MAGNETICS CORP.
EASTERN DIVISION
570 MAIN STREET, WESTBURY, NEW YORK 11590

Tel. (516) 334-7070, TWX 510-222-4469

INDUCTION MOTORS

Motor No. Size	Type	Voltage (VAC)	Frequency (Hz)	Current (A)	Rated Torque (oz-in)	Speed (rpm)	Poles (No.)	H.P. Rated	Power Input (Watts)	Dimensions (Typ.) (inches) Housing O.D.	Dimensions (Typ.) (inches) Housing length
BC905	804	115	400	.075	.18	18000	2	1/350	8	.937	1.178
BC1307	1330	115	400	.16	1.0	10500	4	1/90	17	1.500	1.468
BT1310	1972	200	400	.07	.25	20000	2	1/200	10	1.500	1.768
BC1507	520	115	60	.06	.10	3000	2	1/3000	6.5	1.700	1.703
BC1511	338	115	60	.095	.90	1400	4	1/800	12	1.700	2.103
FBC1615	101	115	400	.70	3.8	8500	4	1/30	75	2.000	3.000
BC2210	1246	115	60	.31	5.0	3300	2	1/60	35	2.750	2.437
BC2210	1382	115	60	.45	7.5	3300	2	1/40	44	2.750	2.437
BC2305	2151	115	60	.065	0.75	1200	4	1/1100	7	2.500	1.500
BC2910	2030	115	60	.28	9.0	1600	4	1/70	30	3.312	3.187
FBC2922	507	115	400	2.6	28.5	7000	6	1/5	300	3.312	5.312
FBC3815	1392	220	60	1.4	64.0	2600	2	1/6	300	4.375	5.718
FBT4525	1635	208	60	4.5	375.0	3400	2	1-1/4	1400	5.375	7.062
FBT4530	1095	208	400	12.0	510.0	5800	8	3	2700	5.375	7.281
FBT4625	1820	208	60	5.0	500.0	3400	2	1.7	1600	5.375	7.062

HYSTERESIS & RELUCTANCE SYNCHRONOUS MOTORS

Motor No. Size	Type	Volts (V)	Frequency (Hz)	Current (Amps)	Rated Torque (oz-in)	Start Torque (oz-in)	Speed (rpm)	Poles (No.)	H. P. Rated	Input Power (Watts)	Dimensions (Typ.) (inches) Housing O.D.	Dimensions (Typ.) (inches) Housing length
BC703H	1787	26	400	.27	.025	.022	24000	2	1/1700	6.9	0.750	0.865
BC905H	1032	26	400	.210	.070	.10	8000	6	1/1800	4.7	0.937	1.178
BC100TH	1316	26	400	.23	.055	.027	8000	6	1/2270	4.7	1.062	1.375
BT1210H	1272	26	60	.28	.38	.59	3600	2	1/730	10.0	1.300	1.707
BC130TH	4.9	115	400	.11	.36	.360	12000	4	1/230	11.0	1.500	1.468
BC1404H	1549	115	400	.05	.16	.11	8000	6	1/780	5.7	1.437	1.363
BC1510H	1954	115	400	.21	.40	.45	8000	6	1/300	15.0	1.700	2.003
FBC1610H	1832	115	400	.24	.90	.6	6000	8	1/350	26.0	2.000	2.500
FBC1615H	633	115	400	1.20	1.9	2.3	12000	4	1/44	98.0	2.000	3.000
BC230TH	1900	115	60	.25	1.5	3.0	3600	2	1/180	28.0	2.500	1.750
FBC2922H	2049	115	60	1.8	35.0	44.0	1800	4	1/16	150.0	3.312	5.312
FBC3825H	2095	115	50	1.9	60.0	86.0	1500	4	1/11	160.0	4.375	6.718
FBC3830H	749	115	60	2.41	74.0	72.0	1800	4	1/8	214.0	4.375	7.218
FBC4530H	2147	115	60	2.8	100.0	150.0	1200	6	1/8	210.0	5.375	7.562
FBT4545H	1691	208	60	3.6	180.0	432.0	1800	4	1/3	430.0	5.375	9.062

TORQUE MOTORS

Motor No. Size	Type	Volts (V)	Frequency (Hz)	Stall Current (Amps)	Stall Torque (oz-in)	No Load Speed (rpm)	Poles (No.)	Stall Watts	No Load Watts	Duty Cycle Class H%	Dimensions (Typ.) (inches) Housing O.D.	Dimensions (Typ.) (inches) Housing length
BT703T	903	18/18	400	.12/.12	.15	6300	6	1.6/1.7	1.3/1.4	cont.	0.750	0.765
BT707T	948	115/33	400	.05/.14	.26	5900	6	3.4/3.0	3.0/2.5	cont.	0.750	1.165
BC907T	1835	115	400	.05	.27	7000	6	5.0	3.6	cont.	1.000	1.496
BT1005T	1687	115/36	400	.05/.16	.66	6200	6	3.4/3.5	1.6/1.5	cont.	1.062	1.175
BT1210T	1273	26	60	.35	1.9	3300	2	15.0	7.9	50	1.300	1.707
BC1307T	162	115	400	.17	1.25	5000	8	19.0	18.0	40	1.500	1.468
BC1311T	330	115	400	.45	3.8	5500	8	60.0	60.0	15	1.500	1.868
BT1406T	599	24/24	60	.24/.24	1.7	1600	4	4.6/4.4	4.7/4.5	cont.	1.437	1.563
BC1507T	96	115	60	.105	2.7	1650	4	12.5	13.0	cont.	1.700	1.703
BC1511T	338	115	60	.088	2.6	1600	4	10.7	10.5	cont.	1.700	2.103
BC1615T	347	115	400	1.4	9.0	10000	4	140.0	92.0	12	1.750	2.703
BT1615T	629	200	400	1.26	19.0	7300	6	290.0	64.0	7	1.750	2.703
BC2210T	1197	24	60	0.67	3.4	725	8	16.0	15.0	cont.	2.750	2.437
BC2929T	440	115	60	1.36	72.0	1100	6	145.0	120.0	30	3.312	5.125
FBC3825T	1208	115	60	1.3	110.0	830	8	142.0	100.0	55	4.375	6.718
FBC3830T	881	115	50	1.8	156.0	900	6	204.0	140.0	40	4.375	7.218
BC4520T	1718	115	60	2.7	250.0	810	8	305.0	220.0	35	5.375	6.562
BC4530T	1777	115	50	4.0	320.0	900	6	370.0	255.0	30	5.375	7.562

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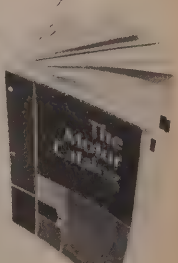

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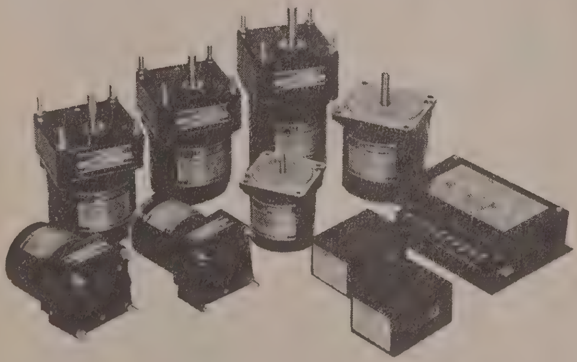

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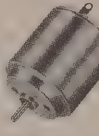

RE-260

RE-280
RC-280
RF-280

SU-020
SH-020
SH-050

FK-130
FK-260
FK-280

RF-260
RK-260

RF-500
RF-520

RD-050
RD-180

FF-180 FK-180

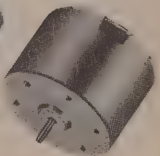
RS-360 RS-375
RS-365 RS-385

RS-395

RS-540 RS-545

RS-550

RS-750


EG-500 EG-520

MOTOR				SIZE		Typical Power Source	Operating Voltage Range	TYPICAL CHARACTERISTICS									Stall Torque
								Winding Code Number	Voltage	NO LOAD		AT MAXIMUM EFFICIENCY					
Series	Group	Type	Model	Outside Diameter (Inch)	Housing Length (Inch)		V		V	Speed RPM	Current AMF	Speed RPM	Current AMP	Torque OZ-IN	Output W	Eff. %	OZ-IN
ECONOMY	STANDARD	RE	RE-140	827	.984	DRY CELL	1.5-3.0	2270	1.5	8,200	0.190	6,250	0.62	0.089	0 40	44 2	0 375
			RE-260	937	1.059		1.5-4.5	2670	3.0	12,500	0.230	10,250	1.03	0.222	1 68	54 1	1 222
			RE-280	953	1.201		1.5-6.0	2865	3.0	9,200	0.155	7,800	0.85	0.278	1 60	62 3	1 81
		SU	SU-020	.709x.374	744		1.0-3 0	09170	3.0	11,800	0 080	8.150	0 18	0 022	0 132	24 6	0 071
	CARBON	RC	RC-280S	953	1 201	DRY CELL BATTERY RECTIFIED A.C.	4 5-12 0	20120	6.0	7,800	0 125	6.450	0 60	0.417	2 00	56 0	2 430
		FK	FK-130S	.791x.594	.988		4.5-20.0	07500	12.0	7,200	0.030	5,350	0.09	0.108	0.43	40.8	0 424
			FK-260S	.953x.720	1.059		4.5-15.0	10350	12.0	7,300	0.036	5,950	0.16	0.244	1.07	56.3	1 32
			FK-280S	.953x.720	1.201		4.5-20.0	10350	12.0	5,700	0.028	4,650	0.13	0.253	0.87	57.5	1 39
		SH	SH-020S	.709x.374	.744		4.5-12.0	09170	6.0	19,000	0.110	13,600	0.28	0.061	0.608	36.8	0 213
			SH-050S	709x.374	.866		4.5-12.0	09170	9.0	23,400	0.105	17,350	0.30	0.090	1.151	42.6	0 347
LOW NOISE	STANDARD	RF	RF-260T	953	1 059		1.0-9.0	3255	1.2	5,700	0.160	4,750	0.800	0.164	0.575	59.9	0 986
			RF-280	953	1 201		1.5-12.0	2485	3.0	7,300	0.115	6,130	0.602	0.236	1.069	59.2	1 472
			RF-500T	1 260	768		1.5-9.0	14430	6.0	3,650	0.024	3,050	0.122	0.196	0.441	60.0	1 194
			RF-520T	1 260	846		1.5-12.0	12580	12.0	4,550	0.018	3,890	0.106	0.278	0.799	62.8	1 917
		RD	RD-050T	.673	9.13		1 5-6 0	09220	4.5	7,600	0.039	5,710	0.118	0.054	0.23	43.5	0 222
			RD-180S	.839	1.142		1 2-12 0	2085	2.4	5,310	0.052	4,530	0.304	0.142	0.476	65.2	0 972
		FF	FF-180S	.803x.606	1 264		1 0-6 0	3534	1 2	7.550	0.220	6.250	1 08	0 179	0 83	63 7	1 06
	CARBON	RK	RK-260S	953	1 059		5.0-15.0	12250	12.0	10,900	0.056	9,030	0.27	0.289	1 925	59 5	1 681
		FK	FK-180S	.803x 606	1 264		4 5-15 0	14150	6 0	7.050	0 060	5.700	0 26	0 197	0 83	53 6	1 04
HEAVY DUTY	CARBON	RS	RS-360S	1.091	1 283	BATTERY RECTIFIED A.C.	4 5-26 0	14250	12 0	7.300	0 090	5 850	0 36	0 556	2 40	55 6	2 81
			RS-365S	1 091	1 283		6 0-26 0	1885	18 0	20.800	0 220	17.000	0 99	0 897	11 3	63 3	4 93
			RS-375S	1 091	1 488		12 0-26 0	2073	24 0	25.800	0 230	21 700	1 21	1 19	19 1	65 8	7 50
			RS-385S	1 091	1 488		12 0-26 0	2073	24 0	22 000	0 180	18 800	1 05	1 27	17 6	69 7	8 68
			RS-395S	1 091	1 831		6 0-26 0	2455	12 0	10 000	0 190	8 400	1 00	1 36	8 4	69 6	8 61
			RS-540	1 406	1 969		3 0-12 0	7516	3 6	19.100	2 85	15 700	13 1	2 19	25 4	53 8	12 3
			RS-545S	1 406	1 969		6 0-26 0	5016	6 0	15.000	1 20	12.600	6 35	2 87	26 8	70 3	18 1
			RS-550S	1 406	2 244		3 6-15 0	7522	6 0	12 400	0 70	11.300	7 34	3 87	32 3	73 3	44 4
			RS-750S	1 661	2 362		4 5-18 0	8027	9 6	18 400	1 8	15.800	11 10	6 76	79 1	73 9	48 6
ELECTRONIC GOVERNOR		EG	EG-500AD-6F	1 429	984	DRY CELL RECTIFIED A.C.	4 2 7 5	18290	6 0	2,400 RPM at 8 G-CM load							
			EG-500AD-9F	1 429	984		6 0-11 0	14430	9 0								
			EG-500AD-2F	1.429	.984		8.4-15.0	12580	12.0								
			EG-520AD-6F	1 429	1 063		4.2-7.5	16340	6.0								
			EG-520AD-9F	1 429	1 063		6 0-11 0	14470	9 0								
			EG-520AD-2F	1 429	1 063		8 4-15 0	12580	12 0								

Magnetic Technology®

High Performance DC Torque Motors

Brush type and Brushless, More than 500 standard models

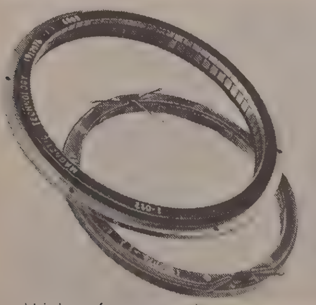
Magnetic Technology® offers designers the broadest standard line of high performance DC torque motors, as well as exotic one-of-a-kind units. These motors are produced to the most exacting reliability and performance standards, and have been proven in aerospace, ground-based and undersea applications.

Magnetic Technology® has paced the industry with developments such as 40 million oz-in/sec² power rate motors, ultra light-weight units for deep space use, 500°F temperature rated motors and compact units for implanted cardiac assist systems.

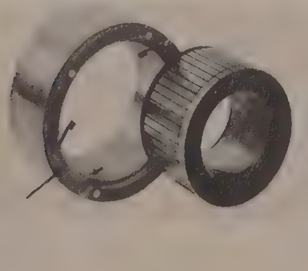
MAGTECH® DC torque motors combine high ratios of torque to power, speed and size with other desirable characteristics such as low electrical time constant and low ripple torque.

Example Specifications

Mag Tech. Part No	1500G-050	1937G-050	2340-077	2813-100	3680-185	6960-195	14000E-300
Peak Torque	15 OZ.IN.	20 OZ.IN.	60 OZ.IN.	90 OZ.IN.	500 OZ.IN.	10 LB.FT.	120 LB.FT
Power @ Tp (watts)	40	56	60	42	110	112	695
No Load Speed (rad/sec)	340	375	134	60	29	7.5	4.0
I.D.	.455	.625	1.250	1.000	1.500	4.500	9 308
O.D. (inches)	1.500	1.937	2.343	2.813	3.680	6.980	14.000
Length (inches)	0.50	0.50	0.77	1.00	1.85	1.95	3.00
Weight (oz.)	2.5	4.2	7.6	18	49	145	850



Typical high performance units



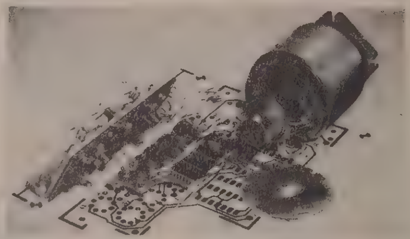
These permanent magnet, armature excited motors are furnished frameless for direct mounting to the driven load without gears. Large bore, minimum width and thin-ring configurations make possible compact system packaging.

Peak torque ratings of standard models range from 7 oz-in. to more than 120 lb-ft., OD's from 1.5 inches to more than 19 inches, and armature bores to more than 10 inches. Special designs may be furnished to meet specific customer requirements.

Brushless motors are continuous rotation type that have advantages over conventional brush-type DC torque motors in some applications.

Example Brushless Specifications

Mag Tech Part No.	1600B-035	2375D-050	3625B-050	3350B-125	11500-082	19300-150
Peak Torque (oz-in)	6	32	45	300	1000	14000
Pwr/Phase (watts)	26	80	25	200	60	680
O D	1 6	2.375	3.625	3.35	11.478	19.30
I D	810	1 250	2.50	1.83	9.75	14.623



Brushless motor and electronics

Magnetic Technology,® a division of Vernitron Corporation, 21001 Kittridge Street, Canoga Park, California 91303. TWX 910-494-1217. Telephone (213) 887-7700.

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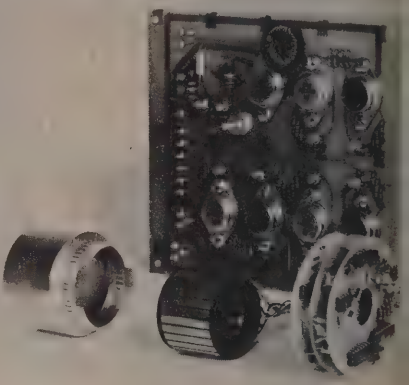
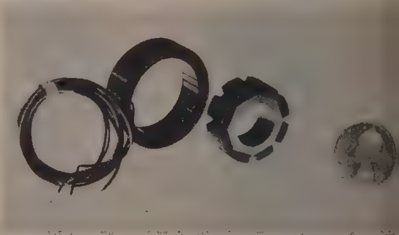
Special Products

Magnetic Technology® also produces linear actuators, and a wide variety of custom devices including the examples below.

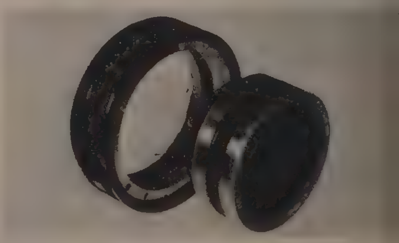


High Efficiency Brushless Motor System. The model 2250-150 operates at 1100 rpm with a 20 oz-in load. The overall system efficiency is above 70% for all input voltages between 18 and 32 volts and at temperatures between −55°C and 85°C.



Rare Earth Brushless DC motor. Special motor developed for use as cardiac assist incorporating rare earth magnets to prevent alteration of motor characteristics in case of over current. Motor designed for maximum efficiency, i.e. lowest temperature rise under continuous load conditions.

Limited Angle Brushless DC Torquers



Precision Motor Tachometer

Magnetic Technology®

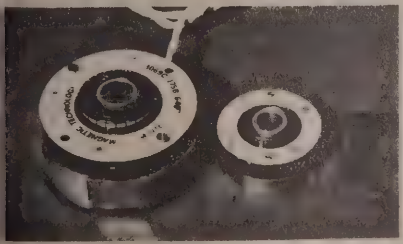
Tachometers

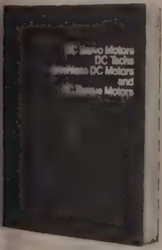
Any of the more than 500 standard MAGTECH® torque motors may be operated as a tachometer generator. In addition, separate product ines of precision tachometers and ndustrial tachometers are available. These range from .05% ripple voltage units usable at rates less than one revolution per day and units with a 50,000:1 dynamic range, to popular industrial units.

These tachometers feature open, frameless configuration for direct drive mounting. The direct mounting without gears eliminates dead zones and inaccuracies that can result from gearing backlash and gear imperfections. Typical characteristics include high voltage gradient, low time constant, high coupling stiffness and resolution, and accuracy at low speeds.

EXAMPLE TACHOMETER SPECIFICATIONS INCLUDING NDUSTRIAL TYPES*

ag. Tech. Part No.	1917-067	2000-100*	3069C-175*	3375C-070	7200-160	15000-248
D.D. (inch)	1.917	2.000	3.069	3.375	7.200	15.75
.D. (inch)	0.624	0.500	0.625	2.249	3.500	9.00
Length (inch)	67	1 00	1 75	68	1 59	2 80
Volts/Krpm	45.1	9.56	31.5	84	1218	6820
Ripple (%)	6	1.5	2	1.5	0.1	0.03
Resistance (Ω)	360	110	75	300	5000	3800
nertia (oz-in-sec²)	0 0013	0 0012	0 011	0 02	0 56	15 9


Typical industrial units



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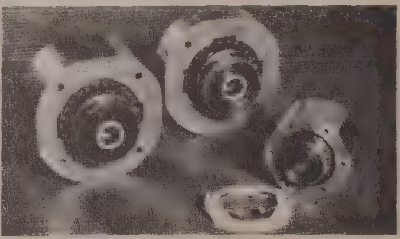
Brushless and Brush-type, Frameless or Housed, Motor-Tach Combinations

Only subtle design, performance and materials variations distinguish these quality, direct drive motors from Magnetic Technology's® established military grade motors. Yet, through volume production they are priced for industrial applications.

Features include fast response, high torque, precise positioning, high tracking accuracy, quiet operation, and relatively low ripple. These DC servo motors utilize a permanent magnetic field for higher efficiency plus a moving iron armature for maximum thermal inertia.

The motors are available in frameless configuration to allow compact packaging and mounting of the armature directly on the driven load. Housed units, with shaft and bearings also are available. Direct coupling to the driven load eliminates the disadvantages of gears and couplings in servo systems. System simplification is possible and excellent system stability results.


Carriage drive motors for printers.

Send for your free copy of our new 162 page product and application guide. Magnetic Technology,® a division of Vernitron Corporation, 21001 Kittridge Street, Canoga Park, California 91303. TWX 910-494-1217. Telephone (213) 887-7700.

Magnetic Technology®

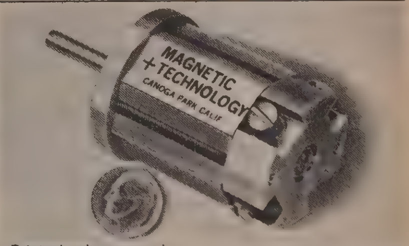
Applications for these units include disc memory systems, card sorters, tape transports and printers, N.C. machine table drives and feedback tachometers.

Continuous rotation brushless units, for constant or variable speed operation, also are available. Electronic drive and control systems can be supplied with these units.

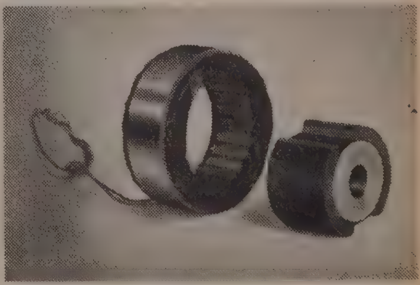
In addition to MAGTECH® industrial servo motors and tachometers, motor-tach combinations can be supplied. A number of standard combinations are available, but virtually any motor and tachometer can be combined to meet drive and tachometer sensitivity requirements. The combination unit is smaller, lighter, easier to mount and generally lower in cost than separate units. These units aid reduction of system resonances.

Example Specifications

Mag Tech Part No.	1310-150	1937D-150	3069-175	3069-237	H5500-550	6002-325
Stall Torque (oz-in)	22 5	50	85	175	1650	1350
Pwr @ Tp @ 25°C (watts)	58	50	67	123	1480	150
Ripple Torque (%)	5	5	6	6	3	10
Elec Time Const (sec)	0 0005	.0006	001	015	003	0 002
No Load Speed (rad/sec)	320	140	105	95	120	15
O.D.	1.375	1.937	3.50	3.069	5.0	6.002
Length	1.50	1.50	2.50	2.37	5.50	3.25



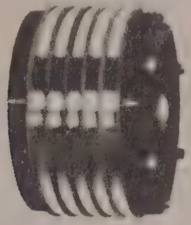
Print wheel servo motor.

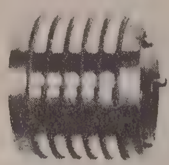

Brushless DC direct drive motor specifically for use in computer peripheral spindle drives — currently in high volume production.

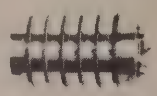
MAUREY
INSTRUMENT CORP.

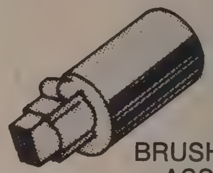
POWER SLIP RINGS — SR2035

Maurey SR2035 standard power slip rings are designed and built for rugged industrial applications. They are being used in wind power generators, packing machinery, chemical processing equipment and in automated applications. They are available in eight standard diameters with suitable bores to fit most equipment. The larger units are available with up to 50 rings. All parts are precision machined or molded. Variation of design and enclosed assemblies with bearings are available upon request.

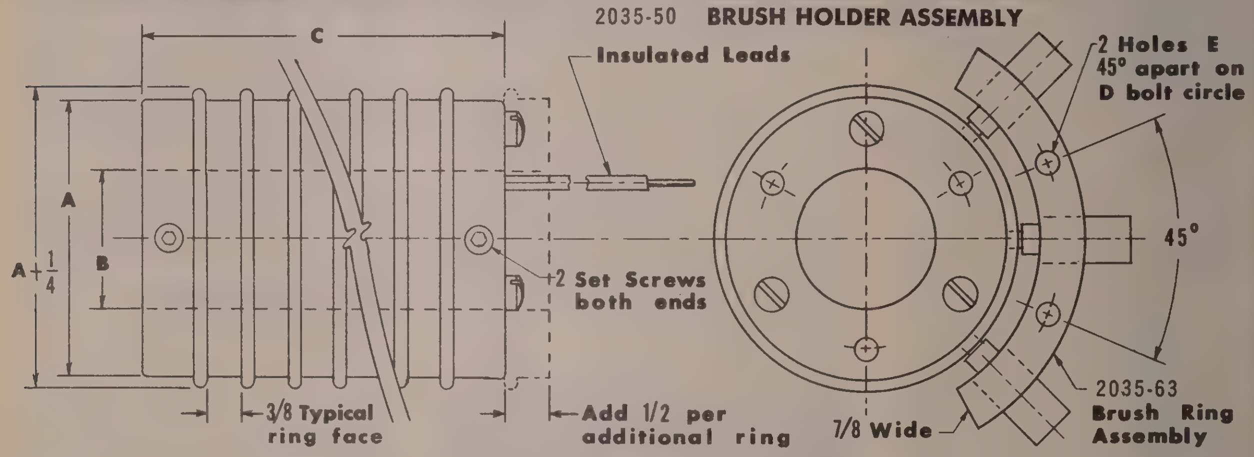








BRUSH HOLDER ASSEMBLY


2035-50 BRUSH HOLDER ASSEMBLY
C
Insulated Leads
2 Holes E 45° apart on D bolt circle
A
B
A + 1/4
+2 Set Screws both ends
45°
3/8 Typical ring face
Add 1/2 per additional ring
7/8 Wide
2035-63 Brush Ring Assembly

SPECIFICATIONS:

1. Number of Conductors: Specify
2. Bore Size: Specify (See Chart I)
3. Ring Diameter: Specify (See Chart I)
4. Leads: Specify length (See Chart III)
5. Current capacity per brush: 7 Amperes
6. Units of similar construction to the SR2035 are available to 75 amps per ring and 10 conductors.

SLIP RING PART NO.
SR2035-4-7-1.50
- BORE DIAMETER
- NO. OF RINGS
- RING DIAMETER
- MODEL NUMBER

BRUSH RING ASSEMBLY PART NO.
2035-63-4-3
- NO. OF BRUSHES
- RING DIAMETER
- BASIC PART NO.

TOTAL AMPERES PER RING	WIRE SIZE	NUMBER OF BRUSHES
30	AWG 8	6
20	AWG 12	3
10	AWG 14	2

CHART III

A RING O.D.	B BORE MIN. TO MAX. +.002/−.000	BRUSH RING ASSEMBLY PART NO.	D BOLT CIRCLE	E HOLE
8.00	1.00 to 6.50	2035-63-8	9.50	.312
7.00	1.00 to 5.50	2035-63-7	9.50	.312
6.00	1.00 to 4.50	2035-63-6	7.50	.312
5.00	1.00 to 3.50	2035-63-5	6.50	.312
4.00	.75 to 2.50	2035-63-4	5.50	.250
3.00	.50 to 1.50	2035-63-3	4.25	.250
2.50	.50 to 1.00	2035-63-2.5	4.25	.250
2.00	.50	2035-63-2	4.25	.250

NO. RINGS	C LENGTH
20	11.25
19	10.75
18	10.25
17	9.75
16	9.25
15	8.75
14	8.25
13	7.75
12	7.25
11	6.75
10	6.25
9	5.75
8	5.25
7	4.75
6	4.25
5	3.75
4	3.25
3	2.75
2	2.25

MAUREY
INSTRUMENT CORPORATION
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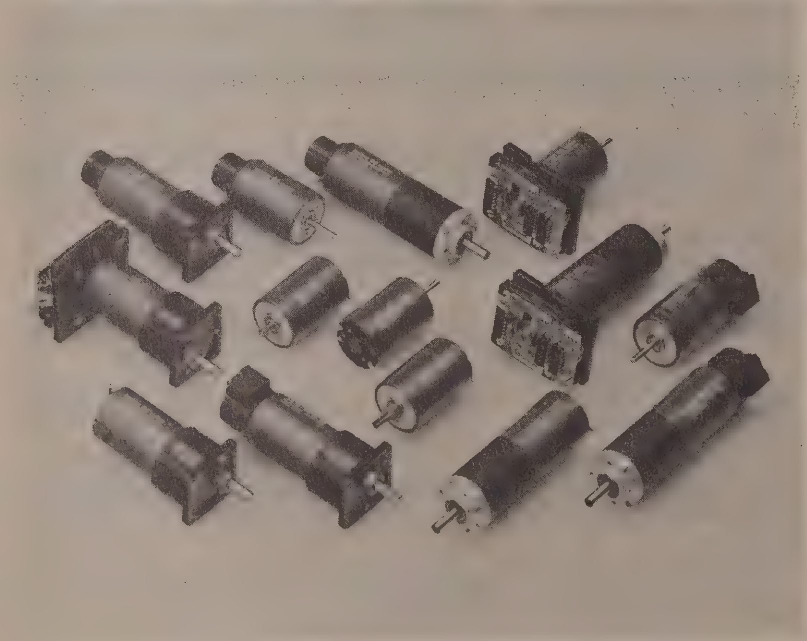
maxon DC motor

maxon DC motor
2434.910-51.215-0.0

first class

maxon, the leader in low inertia miniature DC servo motors, offers the widest selection of ironless DC motors. **maxon's** patented rhombic winding provides maximum response, high efficiency, long life and no cogging.



maxon S-series and SmCobolt motors — when you need maximum performance.

maxon F-series with Ferrite magnets when cost is a major concern.

maxon A-series with Alnico magnets when performance and low cost is required.

Frame sizes from tiny 12 mm to our powerful 70 watt 34 mm.

Gear Motors

maxon offers a wide range of high efficiency spur gear boxes from 16 to 44 mm and a high torque planetary gearboxes with up to 640 oz. in continuous torque.

Encoders/Tachometers

maxon motors are supported by a range of optical encoders and DC tachometers.

maxon DC motor maxon DC motor maxon DC motor maxon DC motor

Complete catalogue available upon request.

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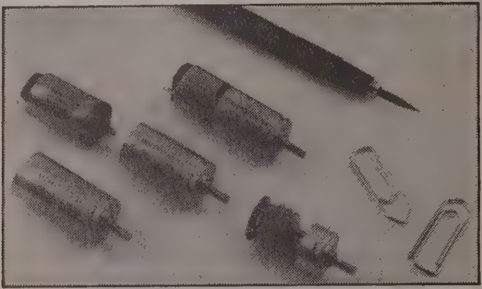
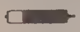
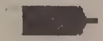
Micro Mo

FAULHABER



MINIMOTOR SA

GEARHEAD STYLE SELECTOR

STYLE	SERIES	OUTSIDE DIAMETER (mm)	OUTSIDE DIAMETER (in)	SHAFT DIAMETER (mm)	SHAFT DIAMETER (in)	RATIOS FROM TO	MAX. CONT. TORQUE (oz-in)	INTERMITTENT TORQUE (oz-in)
	12/3	12	(.472)	2	(.079)	9.17:1-154,368:1	≤ 5.6	≤ 14.1
		FITS MOTOR SERIES 1212 & 1219						
	15/1	17	(.669)	2	(.079)	11.8:1-5752:1	≤ 2.8	≤ 7.1
		FITS MOTOR SERIES 1516 & 1524						
	15/2	16	(.630)	2	(.079)	3.45:1-235,067:1	≤ 4.3	≤ 14.2
		FITS MOTOR SERIES 1516 & 1524						
	15/3	16	(.630)	2	(.079)	6.3:1-235,067:1	≤ 4.3	≤ 14.2
		FITS MOTOR SERIES 1516 & 1524						
	15/5	16	(.630)	3	(.118)	6.3:1-235,067:1	≤ 14.2	≤ 42.6
		FITS MOTOR SERIES 1516, 1524 & 1331						
	16/1	17	(.669)	2	(.079)	11.8:1-5752:1	≤ 2.8	≤ 7.1
		FITS MOTOR SERIES 1616 & 1624						
	16/2	17	(.669)	2	(.079)	3.45:1-235,067:1	≤ 4.3	≤ 14.2
		FITS MOTOR SERIES 1616 & 1624						
	16/3	17	(.669)	2	(.079)	6.3:1-235,067:1	≤ 4.3	≤ 14.2
		FITS MOTOR SERIES 1616 & 1624						
	16/5	17	(.669)	3	(.118)	6.3:1-235,067:1	≤ 14.2	≤ 42.6
		FITS MOTOR SERIES 1616, 1624 & 1331						
	22/2	23.8	(.937)	4	(.157)	3.1:1-983,447:1	≤ 14.2	≤ 56.7
		FITS MOTOR SERIES 2225, 2230 & 2233						
	38/1	38	(1.50)	8	(.315)	14:1-1526:1	≤ 1,418	≤ 2,127
		FITS MOTOR SERIES 3540 & 3557						

ENGEL

- DC Motors to 1 Horsepower.
- Gearmotors to 96 ft-lbs. Torque.
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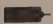
- LOW INERTIA DC SERVO MOTORS
- PRECISION GEARHEADS
- MOTOR-TACHOMETERS
- TACHO-GENERATORS
- OPTICAL ENCODERS-SEE SECTION 5500
- CONTROL SYSTEMS-SEE SECTION 2200

MOTOR STYLE SELECTOR

STYLE	SERIES	CASE DIAMETER (mm)	(in)	OVERALL LENGTH (mm)	(in)	MECH. POWER OUTPUT (W)	MAX. TORQUE (oz.-in)	RECOMMENDED MAX. SPEED (RPM)
MOTORS								
	1212	12	(.47)	12.2	(.48)	0.1	.01	15,000
	FITS GEARHEAD SERIES 12/1 & 12/3							
	1219	12	(.47)	18.7	(.74)	0.45	.11	12,000
	FITS GEARHEAD SERIES 12/1 & 12/3							
	1331	13	(.51)	31.2	(1.23)	2.0	.36	12,000
	FITS GEARHEAD SERIES 15/5 & 16/5							
	1516	15	(.59)	15.8	(.62)	0.3	.07	12,000
	FITS GEARHEAD SERIES 15/1, 15/2, 15/3 & 15/5							
	1524	15	(.59)	23.8	(.94)	0.6	.14	12,000
	FITS GEARHEAD SERIES 15/1, 15/2, 15/3 & 15/5							
	1616	16	(.63)	15.8	(.62)	0.45	.11	12,000
	FITS GEARHEAD SERIES 16/1, 16/2, 16/3 & 16/5							
	1624	16	(.63)	23.8	(.94)	0.9	.21	12,000
	FITS GEARHEAD SERIES 16/1, 16/2, 16/3 & 16/5							
	2017	20	(.79)	17.2	(.68)	0.45	.11	12,000
	2025	20	(.79)	24.8	(.98)	0.9	.21	8,000
	2225	22	(.87)	24.8	(.98)	1.0	.28	8,000
	FITS GEARHEAD SERIES 22/2							
	2230	22	(.87)	30.0	(1.18)	2.0	.36	8,000
	FITS GEARHEAD SERIES 22/2 & 34PG							
	2233	22	(.87)	32.8	(1.29)	2.0	.43	8,000
	FITS GEARHEAD SERIES 22/2 & 34PG							
	2338	23	(.91)	37.6	(1.48)	3.5	.85	8,000
	FITS GEARHEAD SERIES 34PG							
	3540	35	(1.38)	40.0	(1.57)	10.0	3.55	5,000
	FITS GEARHEAD SERIES 34PG							
	3557	35	(1.38)	57.0	(2.24)	15.0	6.38	5,000
	FITS GEARHEAD SERIES 34PG							
	3557K . . . S	35	(1.38)	57.0	(2.24)	20.0	7.09	5,000
	FITS GEARHEAD SERIES 34PG							
GEARMOTORS								
	2020	20	(.79)	20.0	(.79)	0.4	.21 to 1.42	200 to 3,000
	2034	20	(.79)	33.3	(1.31)	0.8	.43 to 1.42	500 to 2,000

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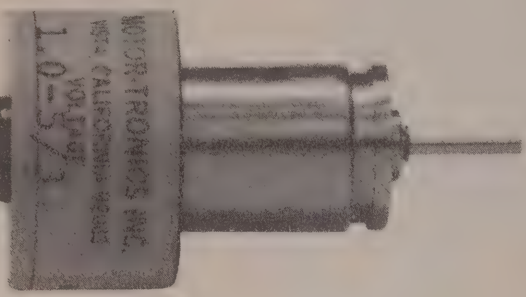
MOTOR-TRONICS, INC.

BRUSHLESS DC MOTORS AND ASSEMBLIES

MODEL 1.0-5/3


MOTOR-TRONICS INC.
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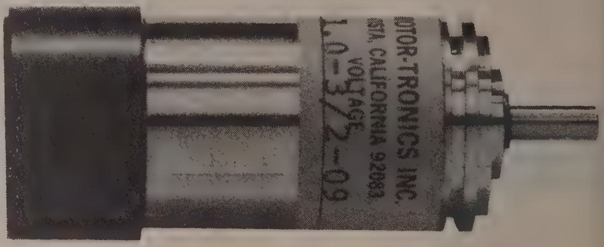
VOLTAGE
1.0-5/3

MOTOR-GEAR HEADS

MODEL 1.0-3/2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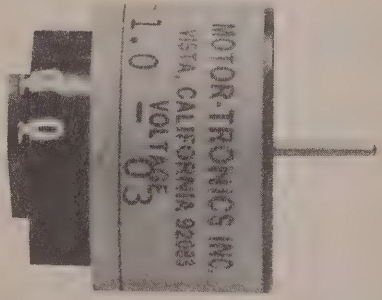
VISTA, CALIFORNIA 92083
VOLTAGE
1.0-3/2-09

MOTOR-GEAR HEADS

MODEL 1.0-03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VOLTAGE
1.0 - 03

MOTOR-TACHS

MODEL 1.0-09

MOTOR-TRONICS INC.
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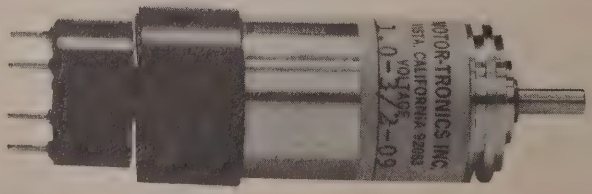
VOLTAGE
03

MOTOR-ENCODERS

MODEL 1.0-3/2-09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VOLTAGE
1.0-3/2-09

MOTOR-GEAR HEAD-ENCODERS

* Also Available — Model 12V-2A Hybrid Servo Electronics

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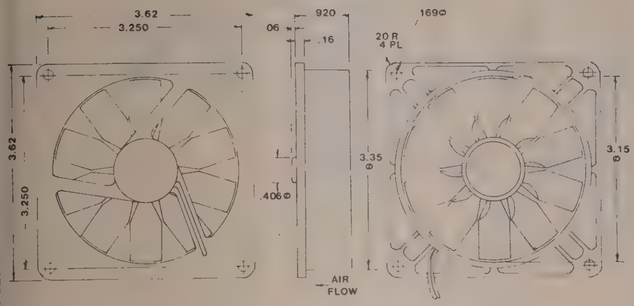
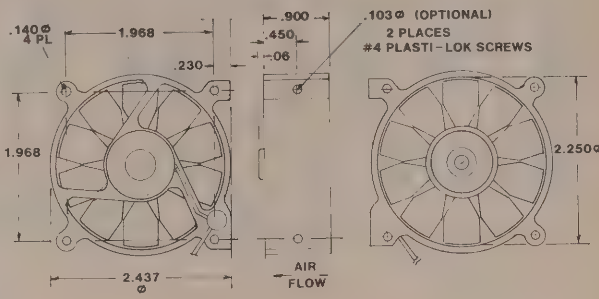
MOTOR-TRONICS, INC.

BRUSHLESS DC MOTORS AND ASSEMBLIES

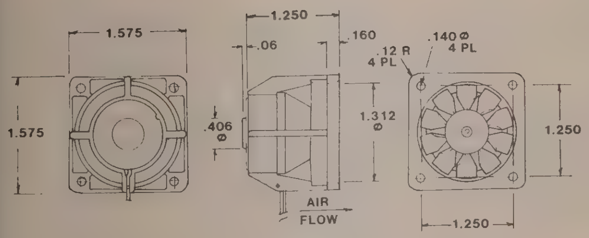
STANDARD-BRUSHLESS FAN
MF-3.15X0.9-25


3.62
3.250
.920
.06
.16
.169⌀
20 R
4 PL
3.62
3.250
3.35 ⌀
.406⌀
3.15 ⌀
AIR
FLOW

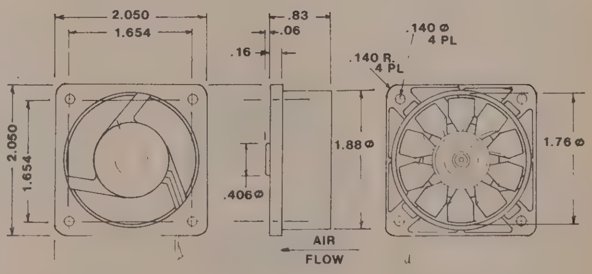
SMALL-ULTRA-THIN FAN
MF-2.4X0.9-15


.140⌀
4 PL
1.968
.230
.900
.450
.06
.103⌀ (OPTIONAL)
2 PLACES
#4 PLASTI-LOK SCREWS
1.968
2.250⌀
2.437
⌀
AIR
FLOW

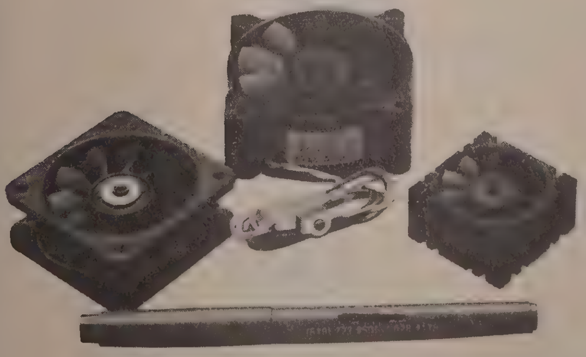
MINIATURE-BRUSHLESS FAN
MF-2.0X0.9-9


1.575
1.575
1.250
.06
.160
.12 R
4 PL
.140⌀
4 PL
.406
⌀
1.312
⌀
1.250
1.250
AIR
FLOW

MICRO-BRUSHLESS FAN
MF-1.6X1.2-6


2.050
1.654
.83
.06
.16
.140⌀
4 PL
.140 R.
4 PL
2.050
1.654
1.88⌀
.406⌀
1.76⌀
AIR
FLOW

TEMPERATURE CONTROLLED FANS
CFM-0.35T-2 20°C<T<50°C



Motor-Tronics line of brushless D.C. fans utilize a true three phase electronic design for maximum efficiency and low noise generation. All rotating assemblies are precision balanced to minimize vibration and extend bearing life. The precision bearing structure contains a lubrication reservoir to extend operational life. Motor-Tronics fans and subassemblies can be specifically designed to meet your requirements.

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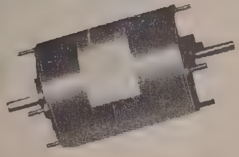
MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

MOTRONICS
CORPORATION



AC MOTORS

HYSTERESIS SYNCHRONOUS
RELUCTANCE SYNCHRONOUS
TORQUE
3 PHASE
CAPACITOR START-INDUCTION RUN
PERMANENT SPLIT CAPACITOR

AVAILABLE IN

- Single- Two- Three or Four Speeds
- Synchronous Speeds 60 Hertz 3600-1800-1200-900-600 rpm
- Any Voltage to 440 Volts
- Single- Two or Three Phase
- 20 to 1000 Hertz
- Ball Bearing

Insulations ClassA—105°C; B—130°C; F—155°C; H—180°C.

H.P. RANGE—UP TO 1/3 • 2 POLE

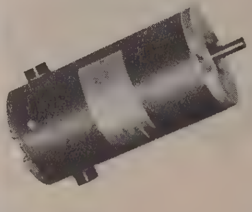
FRAME SIZES—3.4"—3.8"—3.9"
4.3"—4.4"—6.5"

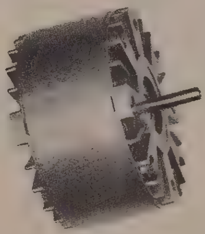
DC MOTORS

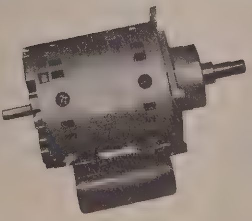
PERMANENT MAGNET
TORQUE
BRUSHLESS
LIMITED ROTATION

HORSEPOWER—1/100 THRU 1/3
CONT. DUTY
—1/100 THRU 1/5 HP
INTERMIT DUTY
HIGH STARTING TORQUE
PEAK TORQUE—700 IN.OZ.
FRAME SIZES—2.3"—3.1"—3.4"—3.6"

PRECISION FRACTIONAL HORSEPOWER MOTORS







- DC PERFORMANCE WITHOUT BRUSHES
- SPEED CONTROLLABLE
- PM MOTOR INSIDE OR OUTSIDE DESIGN
- MAGNETIC OR OPTICAL SENSORS
- 2 PHASE-3 PHASE (Y OR D)
- FRAME SIZES 3.4"—3.8"—3.9"
  4.3"—4.4"—5.3"
- HIGH STARTING TORQUE
- STEP FREE, LINEAR TORQUE OVER A LIMITED ARC WITHOUT COMMUTATION
- POSITIONING FOR DISC HEADS-VALVE ACTUATORS-GENERAL POSITIONING APPLICATORS

BRUSHLESS DC MOTOR

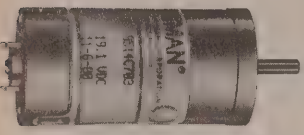
CAT NO	TORQUE CONSTANT	VOLTAGE CONSTANT	VOLTAGE CONSTANT	TERMINAL RESISTANCE	PEAK CURRENT	PEAK TORQUE	INERTIA
	KT	KV	KE	RT(1)	IP	TP	JM
	OZ-IN/AMP	V/R/S	V/KRPM	OHMS	AMPS	OZ-IN	OZ-IN-SEC2
	± 10%	± 10%	± 10%	± 15%	MAX.	MAX.	NOMINAL
34050	5 1	0360	3 77	2 2	7 8	40	002
34130	12.0	0847	8 88	3 0	11 0	130	008
34200	17 0	1201	12 57	3 4	15 0	260	014
38090	9 6	0678	7 10	1 1	7 8	75	02
38200	46 7	3298	34 54	10 3	7 0	325	04
38300	169	1 194	125	63 0	3 3	550	06

BRUSHLESS DC LIMITED ROTATION

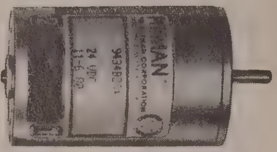
CAT NO	TORQUE CONSTANT	VOLTAGE CONSTANT	VOLTAGE CONSTANT	TERMINAL RESISTANCE	PEAK CURRENT	PEAK TORQUE	INERTIA
	KT	KV	KE	RT(1)	IP	TP	JM
	OZ-IN AMP	V R/S	V KRPM	OHMS	AMPS	OZ IN	OZ IN SEC2
	± 10%	± 10%	± 10%	± 15%	MAX	MAX	NOMINAL
39050	22 0	1555	16 3	9 0	1 8	45	016
39090	21 0	1485	15 5	4 6	3 3	75	020

MOTRONICS CORPORATION • RIVERSIDE INDUSTRIAL PARK, LITTLE FALLS, N.Y. 13365 (315) 823-4050

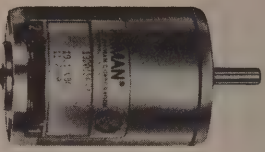
Computer tested



Series 8000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 1.2 in.; 3 lengths to 2.4 in. overall. Stall torques to 12 oz.-in. Mechanical time constants about 21 ms.

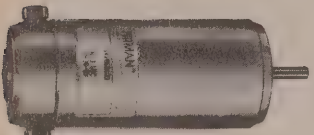


Series 9000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 1.6 in.; 3 lengths to 2.5 in. overall. Stall torques to 41 oz.-in. Mechanical time constants as low as 9.2 ms. (some models).



Series 13000 LO-COG® Servo Motors. 7-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 2.05 in.; 4 lengths to 4.2 in. overall. Stall torques to 126 oz.-in. Mechanical time constants as low as 13.1 ms. (some models).

brush-commutated



Series 14000 Servo Motors. 11-slot armatures. Voltage inputs to about 40 VDC. Nominal O.D. 2.13 in.; 4 lengths to 5.2 in. overall. Stall torques to 286 oz.-in. Mechanical time constants as low as 6.2 ms (some models).

Series GM8700 Gearmotors. Torque to 100 oz.-in. with standard gearing. Uses selected 8000 series servo motor plus spur gearbox. 1.37 in. O.D.; lengths depending on motor and gearbox specification to 3.61 in. overall. Optional torques to 160 oz.-in.

Series GM9400 Gearmotors. Torque to 175 oz.-in. with standard gearing. Uses selected 9000 series servo motor plus spur gearbox. 2.00 in. O.D.; lengths depending on motor and gearbox specification to 3.96 in. overall. Optional torques to 500 oz.-in.

D-C motors

Series 7000 Servo Motors. 13-slot armatures. 4 pole, samarium cobalt fields. Voltage inputs to about 40 VDC. 1 in. x 1.25 in. cross section; 3 lengths to 1.85 in. overall. Stall torques to 24-oz.-in. Mechanical time constants as low as 4.8 ms.

Every Pittman motor is thoroughly tested by a sophisticated computer-controlled instrument array that checks eight vital performance parameters and records the measured values. And every unit is composed of standardized sub-components preassembled to extremely demanding specifications. That's Pittman, applying the latest in mass production techniques to reliable, precision motion control products to assure you of a welcome combination of performance and economy. Choose the motor type you need. Then contact us for complete data and application assistance. Call (215) 256-6601. Or write: **The Pittman Corporation, Harleysville, PA 19438. (TWX: 510-661-8696.)**

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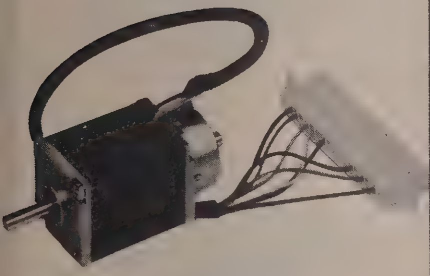
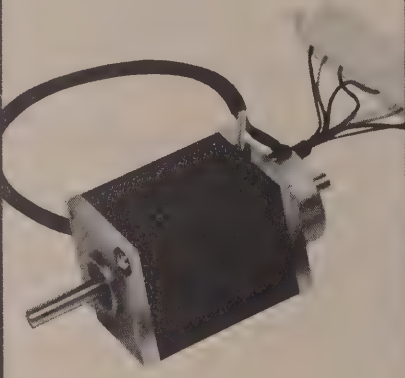
- Negligible magnetic cogging
- Very low winding inductances
- High torque-to-inertia ratios
- Low mechanical time constants
- Very high performance at speeds to 25,000 rpm



SERIES 3000
30mm sq. frame size; lengths of 52.8 and 63.0mm. At 7,200 rpm, longest motor develops 1/15 hp, continuous duty, with normal heat sink.



SERIES 4000
40mm sq. frame size; lengths of 65.4, 72.9 and 80.6mm. At 7,200 rpm, longest motor develops 1/6 hp, continuous duty, with normal heat sink.

SERIES 5000
50mm sq. frame size; lengths of 75.0, 87.7 and 100.4mm. At 7,200 rpm, longest motor develops 1/3 hp, continuous duty, with normal heat sink.

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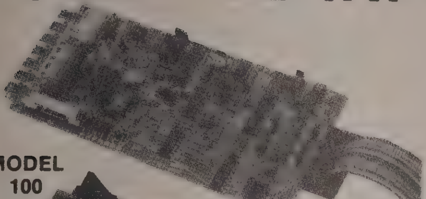
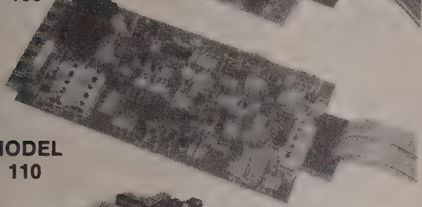
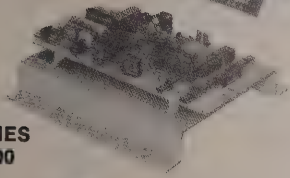
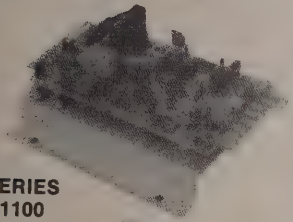
ISOLATED INPUT DC MOTOR CONTROLS


MODEL 100

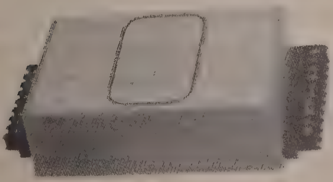

MODEL 110

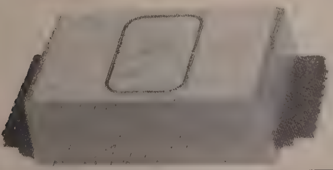

SERIES 1000


SERIES 1100

SERIES 1000-3

SERIES 1100-3


SERIES 10,000


SERIES 11,000

8 Bit Parallel Microprocessor/TTL Compatible
1500 volt isolation ..... or -
Isolated Analog Inputs
1500 volt isolation, voltage or current inputs
Bi-Directional, Regenerative (4 Quadrant) Operation
Controls large inertial loads with fast response
Output Horsepower
3 power ranges control motors from 1/50 HP to 3 HP
Motor Armature Voltage
90, 130 and 180 VDC full scale outputs; 24 VDC also available
Motor Field Voltage
For all PM motors as well as 50 and 100 VDC fields
AC Input Voltage
Nominal 115 VAC or 230 VAC, 47-63 Hz
Isolation Voltage
1500 VDC standard; up to 5000 VDC available
Speed Range
50:1 standard or wider with tach feedback
Adjustments
Full speed, IR comp, torque limit, offset adjust
Ambient Operating Temperature
—20°C to +70°C
Input/Output Connections
Plug removable connectors, solder lugs or ribbon cable, inputs and outputs physically separated
Failsafe Protection
Motor is de-energized if control is not powered
Torque Limiting
Adjustable torque limits, CW and CCW

MODEL NUMBER	INPUT VOLTAGE	HP RANGE	NOTES
100	115 VAC 60 Hz	1/30 HP- 1/8 HP	TTL/Microprocessor Compatible; Board level; low cost for OEM applications
110	115 VAC 60 Hz	1/30 HP- 1/8 HP	Isolated Analog Input; Board level; low cost for OEM applications
100-24	115 VAC 60 Hz	1/30 HP- 1/8 HP	TTL/Microprocessor Compatible; Board level; low cost for OEM applications; 24 VDC output
110-24	115 VAC 60 Hz	1/30 HP- 1/8 HP	Isolated Analog Input; Board level; low cost for OEM applications; 24 VDC output
1000	115/230 60 Hz	1/6 HP- 1 HP	TTL/Microprocessor Compatible; Open Frame Construction
1100	115/230 60 Hz	1/6 HP- 1 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Open Frame Construction
1000-3	115/230 60 Hz	1 HP- 3 HP	TTL/Microprocessor Compatible; Open Frame Construction
1100-3	115/230 60 Hz	1 HP- 3 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Open Frame Construction.
10,000	115/230 60 Hz	1/6 HP- 1 HP	TTL/Microprocessor Compatible; Die Cast Case Construction
11,000	115/230 60 Hz	1/6 HP- 1 HP	Isolated Analog Input; User may select ±100 mv, ±5 VDC, 4-20 ma or 10-50 ma inputs. Die Cast Case Construction

Powr-Ups also manufactures a complete line of Brushless DC Motor Drives. Consult factory for information.

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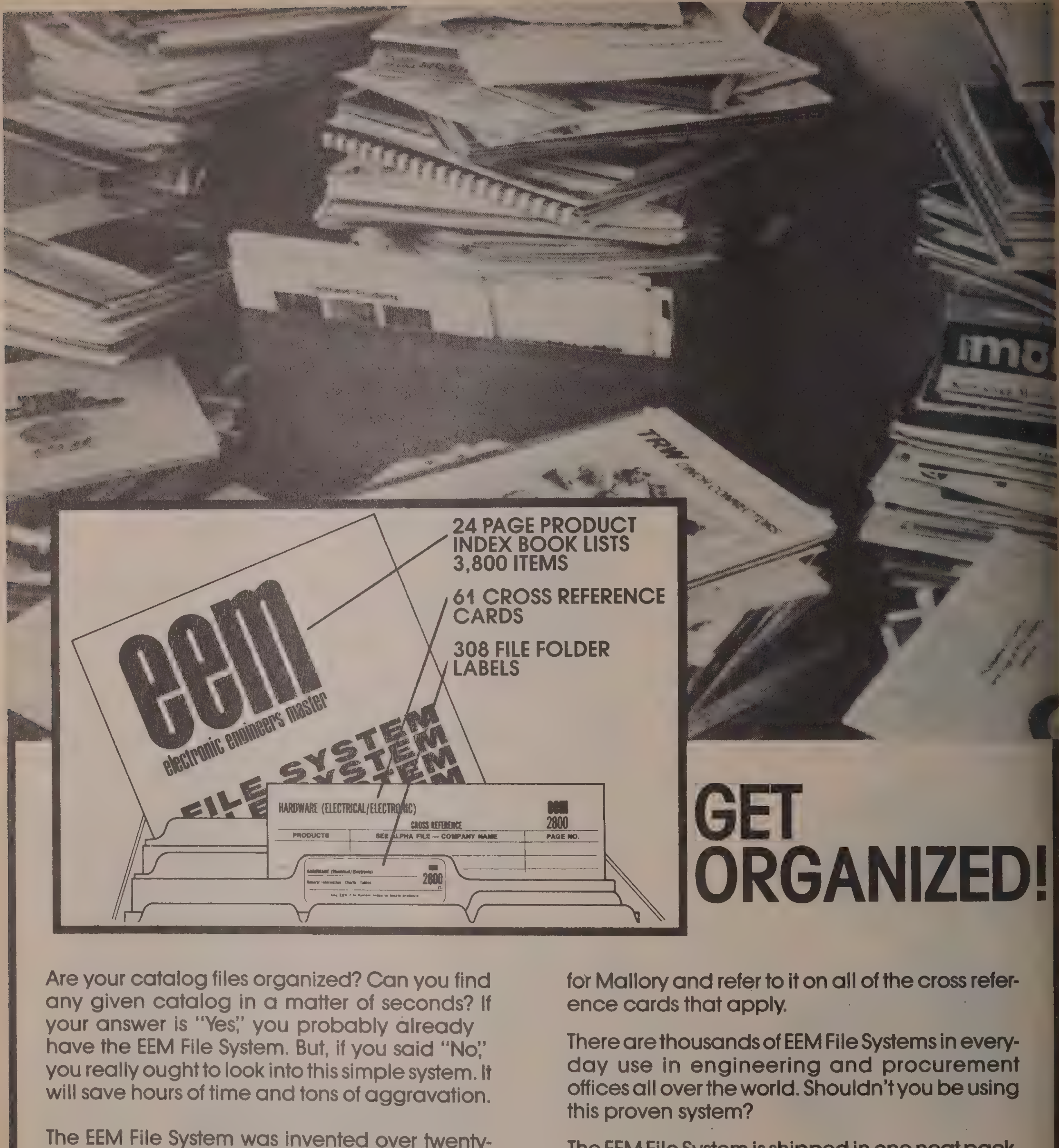
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COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

Tachs, Servomotors, Motor-Generators.

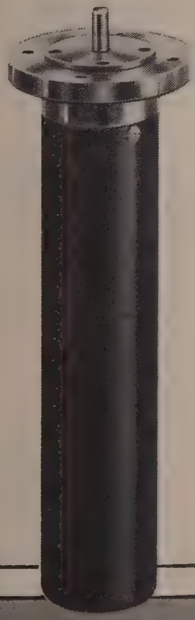
dc tach generators

Servo-Tek tachometer generators are built to last. With silver-alloy commutators, stainless-steel shafts and bearings, brushes designed for 100,000-hour life, temperature compensation, and full factory run-in, our tachs deliver stable, long-term performance. A complete line, encompassing a variety of mechanical and electrical characteristics, is available in regularly-stocked units. Output ratings from 1 to 45 V/1000 rpm.

dc servomotors

Permanent-magnet Servo-Tek servomotors give you maximum performance with minimum maintenance. With silver-alloy commutators, stainless-steel shafts and bearings, heavy Isomid magnet wire on Teflon-insulated armature, extended-life brushes, and aluminum housings, our servomotors are highly reliable and long-lasting. Standard units are available in a wide range of speed, torque (up to 2 oz/in. ungeared, 300 oz/in. with integral gearing), and voltage combinations to suit the individual application.

dc motor-generators



Our dc motor-generators combine high-performance Servo-Tek servomotors with our long-life tachometer generators—both mounted on a common shaft. (Integral spur-type gear reducers are added where required.) Motors are available in any specified voltage, tachs with outputs up to 10 V/1000 rpm, and gear reducers in ratios from 4.3:1 to 7,200:1.

incremental encoder option

The incremental encoder option, available on any Servo-Tek 1.135"-diameter dc tach generator, servomotor, or motor-generator, provides a 3-channel (2 in quadrature and 1 index) LSTTL logic output—adding digital position and direction feedback. Supplied in various incremental outputs from 100 to 512 pulses per revolution, this low-cost option operates on a 5Vdc supply. Comes complete with 2-foot, 10-conductor ribbon cable and polarized connector.

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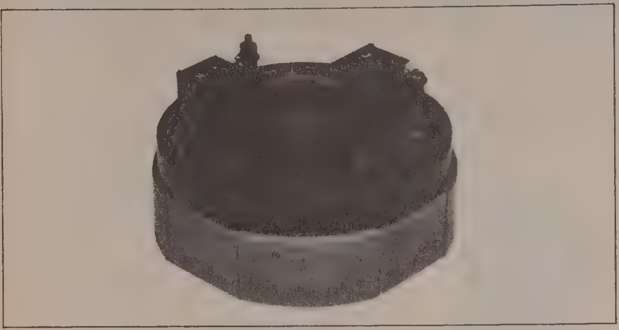
D.C. TACHOMETER GENERATORS



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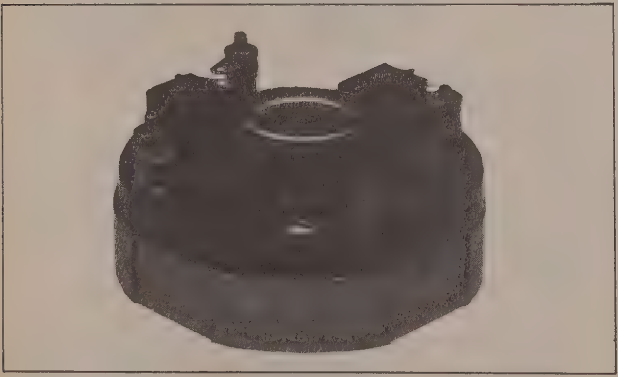
Sierracin Magnedyne

SERIES 707-01



SERIES 435

The D.C. tachometer generator is a servo control device which converts mechanical rotation into an electrical signal. Attached directly to the driving shaft, eliminating the need for gearing, the tachometer functions as a rate reference in rate servo systems and for velocity damping in position servo systems. The high voltage gradient available from these tachometers significantly reduces signal to noise and drift problems and allows higher gain systems providing more precise servo control. The extremely low ripple and high linearity of Sierracin / Magnedyne tachometers have made them the standard of the industry for machine tool control. Frameless units, requiring very little space, offer great flexibility and adaptability in application. Housed models, as well as housed D.C. torque motor/tachometer combinations coupled on a common shaft are also available.

The illustrated frameless models are representative industrial / commercial tachometers. They are supplied with cartridge type brushes for long life and with air stabilized permanent magnet fields which minimizes assembly and disassembly problems.

The center illustration, 707-01, is a separate moving coil tachometer designed for use in applications requiring high quality velocity feedback with minimum system inertia load. Available in 3 volts/1,000 rpm output, inertia is $9X16^{-5}$ oz-in/sec^2 and ripple is 1.5% max (peak to peak). Normally available for delivery from stock.

Larger sizes, up to 12.5″ O.D., with reduced ripple are available for precision applications. Special encapsulated designs to full MIL-SPEC requirements are available in equivalent O.D.'s but with reduced axial length resulting in lighter weight units for aerospace applications.

The basic simplicity of our designs and our production experience have put Sierracin / Magnedyne tachometers in major defense programs, in addition to the many industrial and process control applications.

Rapid prototype deliveries on illustrated models.

TACHOMETERS (FRAMELESS)

MODEL	Kg. (volts/ rad./sec.)	Ripple % Avg. to Pk.	Max. Output Volts	O.D. (in.)	I.D. (in.)	Width (in.)	Weight (lb.)	Inertia (oz.-in.-sec^2)	% Linearity
402-49	0.3	2.0	90	3.070	.625	1.750	1.44	.011	1.0
*435-07	0.1	1.0	36.6	2.000	.5005	1.000	0.44	.0012	1.0
*435-75	0.2	1.0	36.6	2.000	.5005	1.300	0.50	.0017	1.0
256-04	4.0	1.0	210	4.950	1.375	2.000	5	.18	<1.0
224-100	23.4	0.1	200	9.375	5.000	2.937	15	4.2	<0.2
453-01	9.5	0.1	210	7.900	3.500	2.800	12	0.56	<1.0
461-05	38	0.5	380	12.500	10.000	1.966	11.25	6.5	1.0
443-05	0.5	5.0	75	1.937	.6247	.625	0.34	.0011	1.0

*Available in premimum versions with coin silver commutators.

Sierracin/Magnedyne

Dept. EM, 2258 Rutherford Road, Carlsbad, Calif. 92008 • (619) 438-3321

D.C. TORQUE MOTORS

For accurate high torque positioning and speed control.

D.C. BRUSHLESS MOTORS

For unsurpassed reliability, acceleration, and power output capability.

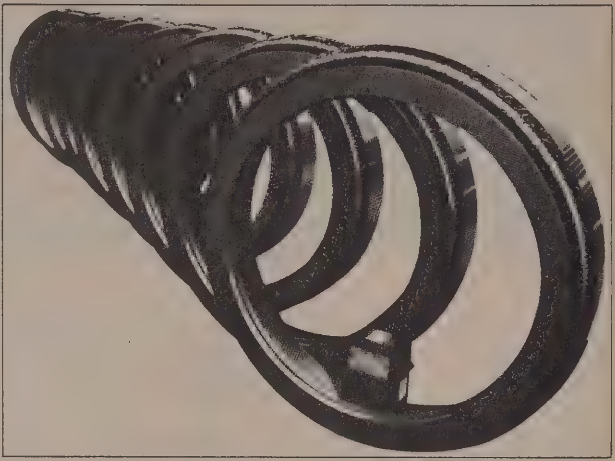
YOUR MOST COMPREHENSIVE AND RELIABLE SOURCE.

Sizes: .750 O.D. to 58″ O.D.

Ratings: 15 oz-in to 6,000 lb-ft Torque

BRUSHLESS MOTOR CONTROLS

Electronic communication and full closed loop speed controls.



SIERRACIN/MAGNEDYNE's standard line of Alnico permanent magnet brush-type D.C. torquers offers over 100 proven designs in an unusually large range of sizes and ratings. High energy, permanent magnets in a unique field structure and an efficient multi-pole armature produce high torque to power and torque to weight ratios.

SEND FOR OUR NEW MOTOR SELECTION CHART TODAY

Sierracin/Magnedyne has always used state-of-the-art technology to meet more demanding performance requirements. Samarium Cobalt magnets, with an energy product over three times that of Alnico, further advances the technical superiority of D.C. torquers and D.C. brushless motors. Overcurrent conditions will not demagnetize SmCo magnets and these motors do not require keepers, simplifying installation procedures. Further advantages are higher torque to power ratios and higher peak torque for equivalent size and weight.

Representative models of Samarium Cobalt torque motors and D.C. brushless motors are listed below.

We can assist with your specific design problems and goals. Our computerized design programs enable rapid response and optimization of your desired parameters. CALL US TODAY (619) 438-3321.

SAMARIUM COBALT TORQUERS

Model	Peak Torque	Power (Watts)	No Load Speed (rad./sec.)	O.D. (in.)	I.D. (in.)	Width (in.)	Weight	Inertia
482-05	30 oz.-in.	53	250	2.780	1.300	.450	3.85 oz.	.006 oz.-in./sec.^{2}
464-01	10.5 lb.-ft.	330	22.4	6.5	3.250	3.780	9.0 lb.	.0056 lb.-ft./sec.^{2}
471-05	30 lb.-ft.	870	20.3	10.000	6.9	2.500	20.3 lb.	.009
490-05	40 lb.-ft.	400	6.9	9.750	5.500	2.425	20.0 lb.	.038
223-17	100 lb.-ft.	2248	15.7	10.625	4.250	6.70	48.0 lb.	.045
476-05	150 lb.-ft.	2082	9.68	13.15	8.850	3.211	29.5 lb.	0.102
232-15	225 lb.-ft.	1600	5.0	26.625	10.350	6.540	200.0 lb.	1.3
232-16	600 lb.-ft.	4200	4.9	20.500	6.562	6.29	130.0 lb.	1.0
491-05	750 lb.-ft.	1254	1.17	29.50	22.000	5.550	200.0 lb.	4.48
244-15	1850 lb.-ft.	8130	3.0	41.000	28.250	6.575	300.0 lb.	9.0

D.C. BRUSHLESS MOTORS (FRAMELESS)

Model	Torque oz.-in.	Power Watts	Phases	O.D.	I.D.	Width
544-01	15	80	2	1.05	.187	.75
561-01	15	74	3	1.05	.156	.9
551-05	20	80	3	1.6	.25	.6
566-05	25	90	3	1.05	.156	1.05
558-05	30	90	3	1.6	.36	.6
563-05	75	144	3	1.8	.9	.8
538-02	100	136	3	2.99	.625	1.1
539-02	120	95	3	2.99	.375	.775
559-01	300	75	3	3.35	1.83	1.3
548-01	300	518	3	1.72	.465	2.75
*564-05	400	220	3	3.5	½″ Shaft	2.74
552-01	800	146	2	5.125	2.99	1.46
549-01	3456	170	3	12.7	7.0	4.5

*Housed motor complete with Hall effect sensors. Other housed versions available, contact the factory.

EEM
PRODUCT
SELECTION
GUIDES

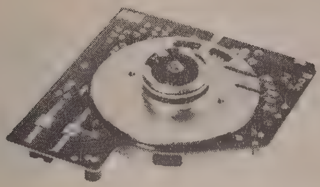
There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

SKC ELECTRIC MOTORS...SKC ELECTRIC MOTORS...SK(

SKC

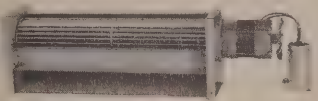
SHINANO KENSHI CORP. (SKC), YOUR ONE COMPLETE SOURCE OF MOTORS. SHINANO KENSHI CO., LTD. IS ONE OF JAPAN'S LARGEST MANUFACTURERS OF ELECTRIC MOTORS.

The FULL LINE of Motors Value Engineered for the DESIGN ENGINEER!



BRUSHLESS DC MOTORS

Inner or outer rotor, 30 mm to 90 mm dia., super precision spindle, integral electronics (optional), hall generator, tach (optional) 2 or 3 phase winding. 25,000 hours life. **Applications:** Precision ball bearing video recorders, Winchester disk drives, floppy disk drives.



TANGENTIAL FANS

100 VAC, 50 HZ or 60 HZ, 4 to 7 cubic meter/minute flow volume 17.25 inch max length (including motor). **Applications:** Copy machines, printers, space heaters.

INDUCTION MOTORS

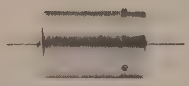
Shaded pole, capacitor-run, with and without gearhead, 50 HZ and 60 HZ, 115 VAC, 60, 70, 80, 90, and 120 mm dia., starting torque 300 to 2000 g-cm gearheads for all sizes. **Applications:** Copy machines, fan and blower drive, space heater, water pump, typewriter.

STEPPING MOTORS

Industry standard 39 mm (size 17), 57 mm (size 23) frames. Popular step angles, 0.9°, 1.8°, 3.6°, 3.75°. Hybrid, bifilar, 3% accuracy, precision ball bearings, state of the art performance. **Applications:** Floppy disk drives, rigid disk drives, printers, plotters, medical equipment, office automation machine.

HYSTERISIS SYNCHRONOUS MOTOR

100 VAC or 115 VAC, 50 HZ and 60 HZ, 78 mm and 85 mm dia., 900, 1800 or 3600 RPM, pullout torque to 800 gm cm, with or without cooling fan. **Applications:** Capstan drive, tape deck, video disk drive, floppy disk drive, turntables.



CORELESS DC MOTORS

Low cost, high speed and acceleration, low inertia, frame sizes 12 mm to 50 mm. Starting torque 8.5 to 1400 g-cm. Frequency generator, 5, 6, 12, 24 or 48 pulse/Rev (optional). **Applications:** Cassette recorders, office equipment, calculator, small printers.

PANEL FAN

80 mm square, 40 mm depth, industry standard mounting, 115 VAC or 230 VAC, 50 HZ or 60 HZ, 42 DB max noise, 5 year endurance. 18 CFM to 36 CFM air flow (0.6 to 1 cubic meter). **Applications:** Computer Peripheral, office equipment, video recorders, medical equipment.

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North Hollywood, CA 91605
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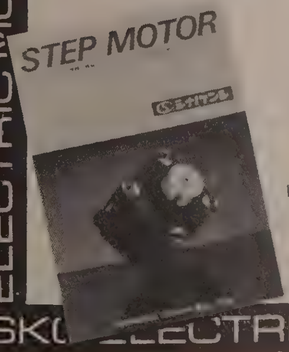
FAX: 818-764-6845



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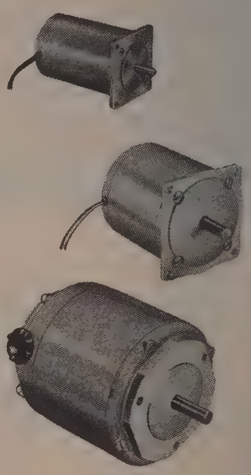
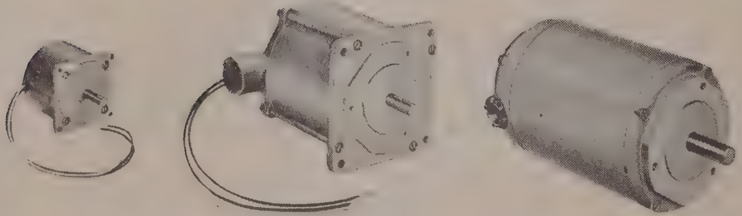
SLO-SYN® *Synchronous / Stepping Motors*

M SERIES SLO-SYN STEPPING MOTORS – Permanent magnet stepping motors that provide high torque-per-pound and torque-to-inertia ratios and can be driven at rates above 20,000 steps per second with low power input. Standard drives available for rates to 10,000 steps per second with higher rates available on special order. Motors have Class B insulation and can be operated at ambient temperature range of −40°C to +65°C. Continuous duty temperature rise is 65°C. Standard M Series SLO-SYN motors are offered in step angles of 0.72°, 1.8°, 2.5°, 5° and 15° with choice of either ±5% or precision ±3% accuracies noncumulative. The step angles can be electronically halved using appropriate half step drives. Holding torque ratings from 53 to 3000 oz-in are available. The motors have no brushes, ratchets or gears and use shielded ball bearings to insure reliability and long life.

DAMPED MOTORS – Standard viscous damped motors and special order motors having integrally mounted Lanchester dampers are available.

SPECIAL DUTY TYPES – For special duty applications, inquire for available double-end shaft, high temperature, vacuum, radiation resistant, militarized, 8-lead/terminal, and encoder stepping motors.





SLO-SYN SYNCHRONOUS MOTORS – Permanent magnet a-c motors having extremely rapid starting, stopping and reversing characteristics and a slow basic shaft speed of 72 rpm synchronous with a line frequency of 60 hertz. These types need only a single-pole, three-position switch for complete forward, reverse and "off" control. No excessive inrush current when energized because starting and operating current are nearly identical. Can be completely stalled without overheating and with no harmful effects on components. Start or stop in less than 5° of shaft rotation; no need for mechanical or electrical braking. When used with an auxiliary high speed motor, the SLO-SYN motor can remain coupled to the load and safely overdriven. Phase shifting resistor and capacitor must be used when operating from a single-phase source but not from two-phase. All standard motors are rated for continuous duty at maximum ambient temperature of 65°C. All models have Class B insulation.

REPRESENTATIVE AC MOTORS

TYPE	MAXIMUM AMPERES	TORQUE (Oz-In)	MAXIMUM MOMENT OF INERTIA OF A RIGIDLY ATTACHED LOAD (Lb-In²)
120 Volts, 50/60 hertz, 1 Phase, 28.8 RPM at 60 hertz			
LS50	0.2	40	0.5
120 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz			
● TS25	0.2	25	0.12
● TS50	0.3	50	0.25
120 Volts, 50/60 hertz, 1 Phase, 72 RPM at 60 hertz			
● SS25	0.1	25	0.15
● SS50	0.3	50	0.5
● SS150	0.4	150	1.5
SS150M†	0.4	150	1.5
● SS250	0.6	250	3
● X250‡	0.6	250	3
● SS400	0.6	400	4.5
X1000‡	3.0	1000	9
X1500	3.0	1500	12
240 Volts, 50/60 hertz, 1 Phase, 200 RPM at 60 hertz			
TS52	0.2	50	0.25
240 Volts, 50/60 hertz, 1 Phase, 72 RPM at 60 hertz			
SS52	0.2	50	0.5
SS152	0.2	150	1.5
SS252	0.4	250	3
X252‡	0.4	250	3
SS402	0.4	400	4.5
X1002‡	1.5	1000	9

† Militarized.

‡ Explosion-proof.

● **Available off-the-shelf from distributor stock**

THE SUPERIOR ELECTRIC COMPANY

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SLO-SYN® Stepping Motor Controls

SLO-SYN Stepping Motor Controls meet the need for controls that are easily interfaced with minicomputers and microprocessors and allow system design flexibility.

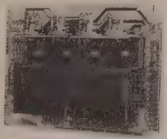
NEW MODULYNX™ MOTION CONTROLS – *Offer a modular, building block approach to step motor control system design. Each system function is on a separate circuit card to permit selection of only the cards necessary to provide features required. Some available cards include a 200 W driver, 1/10 and 1/16 microstep, digital indexer, and an IEEE 488 interface. Inquire about complete offering.*

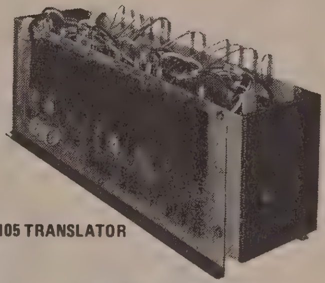
SLO-SYN® TRANSLATORS – Convert pulses from a minicomputer, microprocessor or other pulse source into the switching sequence needed for bidirectional control of SLO-SYN Stepping Motors. Stepping rate, direction and number of steps taken are controlled by external logic. The translator will drive the motor one step for each pulse received from the external source. **Translator Modules** are printed circuit boards which contain the sequencing and switching logic for stepping motor control and are used where the control must be installed on a circuit card rack in the users equipment. The STM101 Translator Module will drive a SLO-SYN motor at rates to 1000 full steps per second and the STM103 provides rates to 3000 full steps or 6000 half steps per second. Both types require a separate power supply. The SLO-SYN Power Supplies listed on this page are recommended. **Open-Chassis Translator** type TB105 includes the power supply as well as sequencing and switching logic and will drive a SLO-SYN motor at rates to 5000 full steps or 10,000 half steps per second. **Packaged Translator** types ST101, ST103 and ST105 contain all needed power supply, sequencing and switching circuits and are mounted in attractive, sturdy cabinets. Maximum speed is 1000 full steps per second for the ST101, 3000 full steps or 6000 half steps per second for the ST103, and 5000 full steps or 10,000 half steps per second for the ST105. **High Power Translators** types TC600 and TM600 provide rates to 10,000 full steps or 20,000 half steps per second. The TC600 consists of three printed circuit boards and requires an external power supply. The TM600 is an open chassis unit with an integral power supply.

SLO-SYN® BUFFERED TRANSLATORS – Accept pulses from a fixed high rate or a random rate pulse source and automatically ramp the pulse rate to accelerate and decelerate the motor. A buffered translator will drive a motor one step for each pulse received from the external source. **Type BUF105** is an open chassis model which will operate a SLO-SYN Stepping Motor at rates to 5000 full steps or 10,000 half steps per second. **The SB105** is similar, but is installed in a cabinet designed for bench, shelf or 19-inch (483mm) rack.

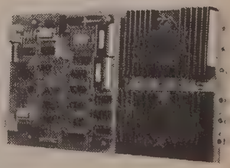
SLO-SYN® PRESET INDEXERS – Provide control of step rate, direction and distance without external logic. They incorporate oscillators and counting circuits to provide the pulses and keep track of the number of pulses given to the motor. **SLO-SYN Preset Indexer Modules** are printed circuit boards containing the needed logic but not including the power supply. These units are used where the control is to be mounted in a circuit card rack in the users equipment. A SLO-SYN Power Supply is recommended, but other supplies which meet the power specifications of the specific Preset Indexer Module can be used. The PIM151 Preset Indexer Module provides stepping rates to 1000 full steps per second and the PIM153 offers stepping rates to 3000 full steps or 6000 half steps per second. Both types are directed by external switches. The PIM153 also permits count selection using voltage levels. **Open-Chassis Type TBM155** will drive a SLO-SYN Motor at rates to 5000 full steps or 10,000 half steps per second. Index count and other control functions can be generated using external switches or voltage levels. Acceleration and deceleration can be adjusted to match the characteristics of the motor and load. **Packaged Types ST151, SP153A, and SP155A** are mounted in attractive cabinets which allow mounting on a bench or shelf or in a 19-inch (483mm) rack. All three can be directed from switches on their front panels. The SP153A and SP155A can also be controlled from external switches or voltage levels. Speed capabilities range up to 5000 full steps or 10,000 half steps per second. **A Switch Kit** is available which provides the BCD logic switch and other switches needed for controlling modular and open-chassis preset indexers. Can also provide external control of packaged models.

SLO-SYN® POWER SUPPLIES – Open-chassis, base-mounting power supplies for use with SLO-SYN Translator Modules and Preset Indexer Modules. The module can be installed remote from the power supply or can be mounted on the power supply chassis to form a single unit. Models are available for operation from 120 VAC or from 220/240 VAC power.

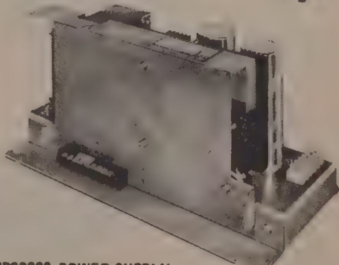

STM101 TRANSLATOR MODULE


TBM105 TRANSLATOR

SB105 BUFFERED TRANSLATOR


PIM153 PRESET INDEXER MODULE

SP153A PRESET INDEXER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AC/DC precision from Portescap Transicoil

Motion control requirements come in all types, shapes, and sizes. So do custom components and controls from Portescap Transicoil. We work from customer drawings or performance specs to produce precision parts of the highest quality in virtually any quantity. Get in touch if you have a requirement for any of the following:

Synchros and Resolvers (Standard Type)

Brush-type, hairspring, and flexible lead brushless synchros and resolvers, sizes 5 through 23.

"True" Brushless Resolvers

Transformer brushless resolver and synchros, sizes 8 through 18.

AC Servo Motors

A complete line of AC induction servo motors, sizes 5 through 23.

Instrument Torquers and Torquer-Pots

Size 9 instrument torquers and torquer-pots for aircraft instrumentation.

DC Motors

A complete line of DC motors for commercial applications, sizes from 1.2" to 2.25" in diameter.

Sub-Contract Manufacturing

Total capabilities for cost effective design and production of electro-mechanical components, servo assemblies, and control "boxes."

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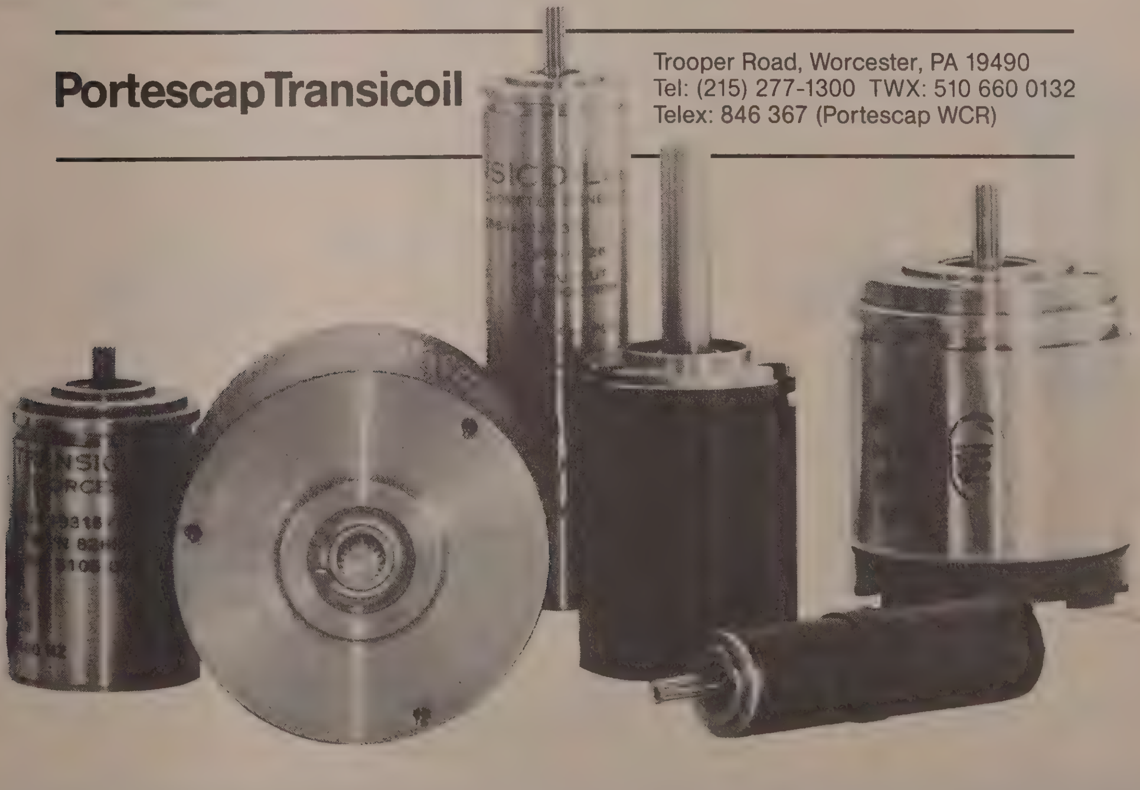
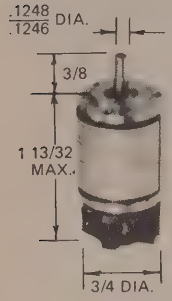
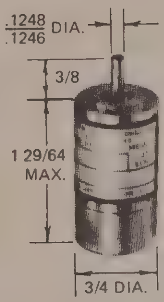


D.C. 3/4″ Dia. Permanent Magnet Motors and Planetary Gearmotors

TRW

Type SD
Basic Motor



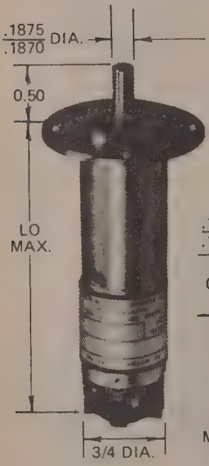


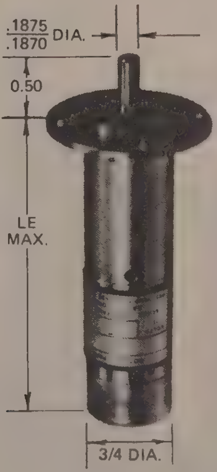
Type SD d.c. motors are designed to meet the requirements of MIL-M-8609; however, designs exceeding this specification to meet customer controlled applications are common. A variety of standard windings are available to provide a wide range of speed and torque characteristics.

Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque max. rated (oz. in.)	Torque nominal stall (oz. in.)	Current max. no load (amps)	Current max. rated load (amps)	Current nominal stall (amps)	Part Number open 136A207 Armature Dash Number	Part Number enclosed 136A208 Armature Dash Number
6	14,500-17,500	0.20	1.50	.360	0.78	3.0	-17	-17
6	12,000-14,000	0.28	1.20	.290	0.78	2.2	-16	16
6	9,000-10,500	0.32	0.90	.210	0.60	1.4	-15	-15
12	13,000-15,500	0.22	1.60	.170	.38	1.50	-14	-14
12	9,500-11,000	0.37	0.80	.120	.37	0.93	-13	-13
12	8,500-10,000	0.25	0.60	.105	.26	0.70	-12	-12
27	15,500-18,500	0.17	1.80	.085	.17	1.15	-1	-1
27	13,000-16,000	0.22	1.50	.075	.17	0.85	-2	-2
27	10,000-12,500	0.31	1.20	.060	.17	0.48	-3	-3
27	9,000-10,500	0.31	0.90	.050	.14	0.30	-4	-4
27	7,000- 8,500	0.24	0.80	.045	.08	0.21	-5	-5
50	13,000-15,500	0.26	0.90	.040	.10	0.22	-7	-7
50	11,500-13,500	0.31	1.10	.035	.10	0.26	-6	-6
50	11,000-13,000	0.26	0.75	.032	.08	0.18	-8	-8
50	8,000- 9,500	0.18	0.50	.025	.05	0.08	-9	-9
50	7,000- 8,300	0.15	0.45	.022	.04	0.07	-10	-10
50	5,500- 6,500	0.11	0.35	.018	.03	0.05	-11	-11

Type SD
Planetary Gearmotors





This small size, lightweight gearmotor is comprised of a ¾″ Type SD motor coupled with a precision planetary geartrain. The combination provides smooth, dependable performance and maximum output torque in the smallest possible space. It is designed to provide a military quality gearmotor of exceptionally compact size.

Standard Part Numbers and Data

Speed Reduction Ratio	Maximum Continuous Torque (oz. in.)	Torque Multiplier Ratio	LO Max.	LE Max.	Standard Part Numbers Prefix* open type	Standard Part Numbers Prefix* enclosed type
3.82:1	1.0	3.1	2 3/8″	2 13/32″	168A247	168A249
5.77:1	1.5	4.6			168A248	168A250
14.58:1	3.0	9.3	2 39/64″	2 41/64″	168A204	168A223
22.03:1	4.5	14			168A205	168A224
33.28:1	7.0	21			168A206	168A225
55.66:1	10	28	2 25/32″	2 13/16″	168A207	168A226
84.11:1	14	43			168A208	168A227
127.1:1	21	65			168A209	168A228
192:1	30	93			168A210	168A229
321:1	45	130	2 61/64″	2 63/64″	168A211	168A230
485:1	70	200			168A212	168A231
733:1	100	300			168A213	168A232
1108:1	150	450			168A214	168A233
1853:1	200	600	3 1/8″	3 5/32″	168A215	168A234
2799:1	300	900			168A216	168A235
4230:1	300	1400			168A217	168A236
6391:1	300	2100			168A218	168A237
10689:1	300	2800	3 19/64″	3 21/64″	168A219	168A238
16150:1	300	4200			168A220	168A239
24403:1	300	6400			168A221	168A240
36873:1	300	9700			168A222	168A241

Max. Cont. Torque: The values in this column are based upon geartrain strength and capability for 1000 hrs. minimum life.
Max. rated torque of motor selected x torque multiple ratio must not exceed these values.
Max. Intermitten Torque = 2 x Max. Cont. Torque.
Momentary Stall Torque = 5 x Max. Cont. Torque.
Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ratio x 100.

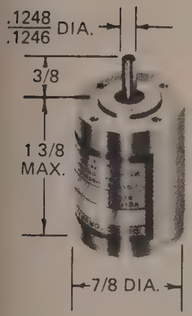
***How to Order:**

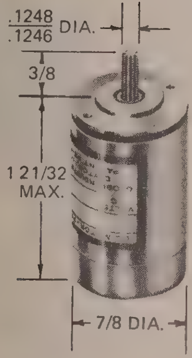
The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

D.C. 7/8″ Dia. Permanent Magnet Motors and Planetary Gearmotors

TRW

Type SS
Basic Motor





The Types SS d.c. motor are specifically designed as a component for precision airborne accessory equipment, but may be applied to a variety of other applications where size an weight are important considerations. Type SS motors can be made with different windings to produce a variety of characteristics. Weight 2 oz.

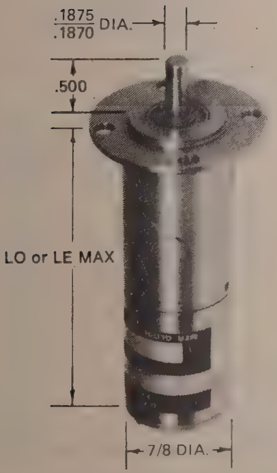
Standard Part Numbers and Data

	Part Number Prefix*	
Open Housing	**Tapped Hole Mount**	**Servo Mount**
Plain Shaft	41A100	41A499
*Pinion Shaft	41A552	41A677
Enclosed Housing		
Plain Shaft	41A119	41A678
*Pinion Shaft	41A676	41A679

Voltage (v.d.c.)	Speed no load (rpm)	Torque		Current			Armature Dash No.*
		max. rated (oz. in.)	nominal stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nominal stall (amps)	
6	11,000-13,500	0.28	1.6	.46	1.00	4.1	-17
6	8,000-11,000	0.38	1.3	.37	1.00	2.7	-16
12	13,500-17,000	0.22	2.0	.27	.54	3.2	-15
12	10,000-13,000	0.33	1.7	.21	.54	1.9	-14
27	17,000-20,000	0.17	2.9	.15	.26	2.4	-13
27	15,000-18,000	0.20	2.5	.14	.25	1.7	-12
27	12,000-15,000	0.25	2.0	.11	.24	1.15	-1
27	10,000-13,000	0.31	1.6	.10	.23	0.76	-2
27	8,000-10,500	0.45	1.3	.08	.23	0.48	-3
27	6,500- 9,000	0.45	1.0	.07	.20	0.32	-4
27	5,500- 7,500	0.36	0.82	.055	.15	0.21	-5
50	10,200-12,500	0.32	0.97	.05	.13	0.23	-7
50	8,600-11,000	0.42	1.20	.055	.13	0.26	-6
50	6,100- 7,500	0.38	0.54	.03	.09	0.12	-9

*Std. Pinion is 13 teeth 120 pitch.

Type SS
Planetary Gearmotors



Standard Part Numbers and Data

Speed Reduction Ratio	Max. Continuous Torque (oz. in.)	Torque Multiplier Ratio	Standard Part Number Prefix*			
			enclosed type		open type	
			dimension LE	part no. prefix	dimension LO	part no. prefix
3.82:1	1.0	3.1	2 9/16″	43A197	2 17/64″	43A196
5.77:1	1.5	4.6		43A200		43A199
14.58:1	3.0	9.3	2 25/32″	43A140	2 1/2″	43A100
22.03:1	4.5	14		43A141		43A101
33.28:1	7.0	21		43A142		43A102
55.66:1	10	28	2 61/64″	43A143	2 43/64″	43A103
84.11:1	14	43		43A144		43A104
127.1:1	21	65		43A145		43A105
192:1	30	93		43A146		43A106
321:1	45	130	3 1/8″	43A147	2 27/32″	43A107
485:1	70	200		43A148		43A108
733:1	100	300		43A149		43A109
1108:1	150	450		43A150		43A110
1853:1	200	600	3 9/32″	43A151	3″	43A111
2799:1	300	900		43A152		43A112
4230:1	300	1400		43A153		43A113
6391:1	300	2100		43A154		43A114
10689:1	300	2800	3 29/64″	43A155	3 11/64″	43A115
16150:1	300	4200		43A156		43A116
24403:1	300	6400		43A157		43A117
36873:1	300	9700		43A158		43A118

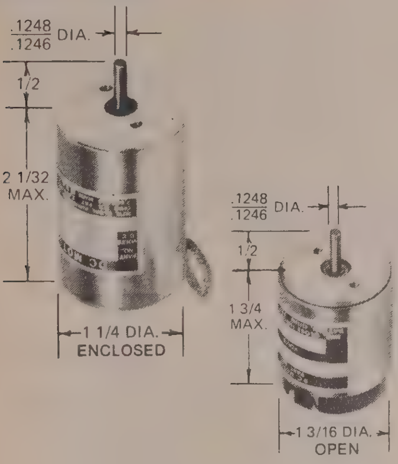
Max. Cont. Torque: The values in this column are based upon geartrain strength and capability for 1000 hrs. minimum life. Max. rated torque of motor selected x torque multiplier ratio must not exceed these values.
Max. Intermittent Torque = 2 x Max. Cont. Torque.
Momentary Stall Torque = 5 x Max. Cont. Torque.
Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ratio x 100

***How to Order**

The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

D.C. 1-1/4" Dia. Permanent Magnet Motors

Type MM Basic Motor



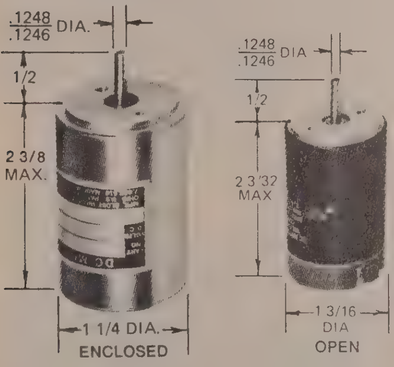
These d.c. motors are specifically designed for use in airborne equipment, missiles, and commercial applications where a combination of small size, reliability, and high torque is desired.

Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque		Current			Standard Part Numbers*			
							open type		enclosed type	
		max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nom. stall (amps)	plain shaft	pinion**	plain shaft	pinion**
4	16,000-19,000	.25	4.9	1.5	2.4	21.	3A998-23	3A1524-23	3A1002-23	3A1525-23
6	18,900-22,500	.5	7.4	1.2	2.3	24.9	3A998-14	3A1524-14	3A1002-14	3A1525-14
6	15,600-18,600	.85	5.8	1.0	2.3	16.3	3A998-6	3A1524-6	3A1002-6	3A1525-6
6	12,000-14,000	.75	4.6	.80	2.0	9.9	3A998-5	3A1524-5	3A1002-5	3A1525-5
12	18,000-21,400	.5	7.4	.56	1.2	11.8	3A998-24	3A1524-24	3A1002-24	3A1525-24
12	14,500-17,000	.7	5.9	.50	1.2	7.5	3A998-3	3A1524-3	3A1002-3	3A1525-3
12	12,400-14,700	.75	4.6	.40	1.2	5.1	3A998-21	3A1524-21	3A1002-21	3A1525-21
12	11,000-13,000	1.0	4.6	.35	1.2	4.6	3A998-4	3A1524-4	3A1002-4	3A1525-4
24	19,200-22,800	.35	7.4	.30	.60	6.3	3A998-7	3A1524-7	3A1002-7	3A1525-7
24	16,000-19,000	.6	5.8	.25	.60	3.8	3A998-1	3A1524-1	3A1002-1	3A1525-1
24	11,500-14,000	1.0	4.6	.18	.60	2.1	3A998-2	3A1524-2	3A1002-2	3A1525-2
24	10,700-12,700	1.0	3.6	.17	.60	1.6	3A998-8	3A1524-8	3A1002-8	3A1525-8
24	9,600-11,400	1.0	2.9	.15	.50	1.1	3A998-22	3A1524-22	3A1002-22	3A1525-22
24	8,000-10,000	1.0	2.9	.13	.45	0.93	3A998-10	3A1524-10	3A1002-10	3A1525-10
24	6,000- 7,000	.8	2.3	.08	.30	0.55	3A998-11	3A1524-11	3A1002-11	3A1525-11
50	14,300-17,000	.7	4.8	.11	.30	1.3	3A998-25	3A1524-25	3A1002-25	3A1525-25
50	9,500-11,500	1.0	3.8	.07	.30	0.71	3A998-16	3A1524-16	3A1002-16	3A1525-16
50	8,000-10,000	1.0	3.0	.07	.20	0.50	3A998-12	3A1524-12	3A1002-12	3A1525-12
50	6,700- 8,000	.8	2.4	.05	.16	0.30	3A998-15	3A1524-15	3A1002-15	3A1525-15
50	4,600- 5,500	.8	1.9	.04	.12	0.20	3A998-13	3A1524-13	3A1002-13	3A1525-13

**Std. Pinion is 10 teeth 96 pitch.

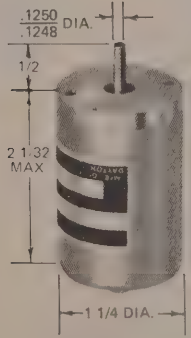
Type LL Basic Motor



Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque		Current			Part Number*	
		max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nom. stall (amps)	open type	enclosed type
6	15,600-18,500	1.0	8.7	1.4	2.7	22.4	3A999-23	3A1003-23
6	12,500-14,500	1.3	8.7	1.1	2.4	17.7	3A999-14	3A1003-14
6	10,000-12,200	1.6	6.9	.95	2.6	11.6	3A999-6	3A1003-6
6	7,600- 9,400	1.6	5.5	.70	2.0	7.0	3A999-5	3A1003-5
12	11,500-14,000	1.1	8.7	.52	1.7	8.4	3A999-24	3A1003-24
12	9,000-11,000	1.7	6.9	.42	1.2	5.3	3A999-3	3A1003-3
24	16,000-19,000	.75	11.0	.36	1.0	1.3	3A999-21	3A1003-21
24	14,400-17,000	.85	11.0	.32	.85	6.5	3A999-4	3A1003-4
24	12,000-14,500	1.0	8.7	.28	.80	4.5	3A999-7	3A1003-7
24	10,400-12,300	1.1	6.9	.23	.75	3.0	3A999-1	3A1003-1
24	7,400- 8,900	1.6	5.5	.17	.70	1.7	3A999-2	3A1003-2
24	6,900- 8,200	1.8	4.3	.16	.65	1.2	3A999-8	3A1003-8
24	6,200- 7,400	1.8	3.4	.14	.60	0.89	3A999-22	3A1003-22
24	5,200- 6,200	1.2	3.4	.12	.45	0.74	3A999-10	3A1003-10
50	7,600- 9,400	1.5	5.7	.09	.25	0.92	3A999-11	3A1003-11
75	14,000-17,000	1.0	8.6	.10	.29	1.6	3A999-25	3A1003-25
75	9,000-11,000	1.7	6.8	.07	.29	0.85	3A999-16	3A1003-16
75	8,000-10,000	1.8	5.4	.06	.26	0.60	3A999-12	3A1003-12
75	6,500- 8,000	1.2	4.3	.05	.20	0.37	3A999-15	3A1003-15
75	4,500- 5,300	1.0	3.4	.04	.10	0.23	3A999-13	3A1003-13

Type JM Basic Motor



Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque		Current			Part Number*
		max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nom. stall (amps)	
6	11,200-13,700	1.20	8.2	.70	3.50	15.4	178A100-1
6	9,100-11,100	1.50	6.5	.55	2.80	9.9	178A100-2
6	7,500- 9,200	1.80	5.2	.44	2.40	6.3	178A100-3
12	11,200-13,700	1.20	8.2	.35	1.45	8.0	178A100-4
12	9,500-11,600	1.40	6.5	.28	1.40	5.1	178A100-5
12	7,500- 9,200	1.60	5.2	.23	1.15	3.2	178A100-6
27	13,700-16,700	1.10	9.9	.18	0.80	4.5	178A100-7
27	10,500-13,000	1.60	7.9	.14	0.75	2.8	178A100-8
27	8,700-10,600	1.70	6.2	.12	0.70	1.8	178A100-9
27	7,000- 8,600	1.80	5.0	.09	0.55	1.2	178A100-10
50	10,500-13,000	1.80	7.1	.08	0.40	1.4	178A100-11
50	8,200-10,000	1.90	5.6	.06	0.35	.88	178A100-12
50	6,500- 8,000	1.80	4.5	.05	0.26	.56	178A100-13
50	5,200- 6,300	2.10	3.5	.04	0.25	.36	178A100-14
115	9,500-11,600	1.90	6.7	.03	0.18	.52	178A100-15
115	7,500- 9,200	1.90	5.3	.03	0.14	.33	178A100-16
115	6,000- 7,500	1.90	4.2	.02	0.11	.21	178A100-17
115	4,800- 5,800	1.20	3.4	.02	0.09	.14	178A100-18

***How to Order**

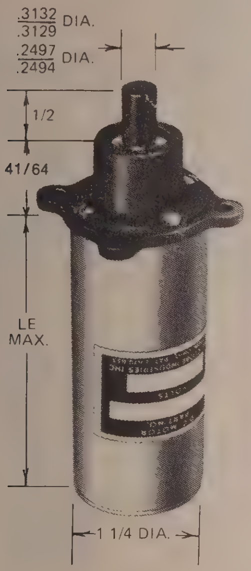
The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

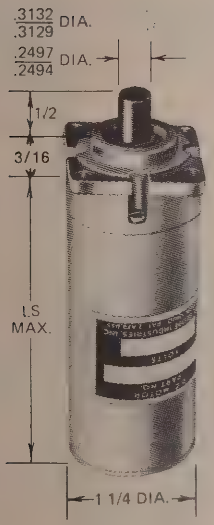
D.C. 1-1/4″ Dia. Permanent Magnet Planetary Gearmotors

TRW

Type MM, LL, JM Planetary Gearmotors

These planetary gearmotors provide torques to 1,250 oz. in. and are designed for use in airborne equipment, missiles and other applications where reliability and miniature size are governing factors.





*How to Order

The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

Type MM — Standard Part Numbers and Data

Speed Reduction Ratio	Maximum Continuous Torque (oz. in.)	Torque Multiplier Ratio	Part Number Prefix*				Dim. LE	Dim. LS
			Eared Flange		Square Flange			
			5/16″ shaft	1/4″ shaft	5/16″ shaft	1/4″ shaft		
4.33 5.29	6 7	3.5 4.2	5A493 5A495	5A2290 5A2291	5A494 5A496	5A2310 5A2311	2.437	2.891
18.78 27.94	20 29	12 17	5A537 5A539	5A2292 5A2293	5A538 5A540	5A2312 5A2313	2.437	2.891
81.37 121.00 147.70	70 105 128	41 62 75	5A541 5A543 5A545	5A2294 5A2295 5A2296	5A542 5A544 5A546	5A2314 5A2315 5A2316	2.562	3.016
352.60 524.60 639.90 780.60	247 366 445 544	145 215 262 320	5A547 5A549 5A551 5A553	5A2297 5A2298 5A2299 5A2300	5A548 5A550 5A552 5A554	5A2317 5A2318 5A2319 5A2320	2.828	3.281
1528.00 2273.00 3382.00 4126.00	850** 1250** 1250** 1250**	500 740 1100 1350	5A555 5A557 5A559 5A561	5A2301 5A2302 5A2303 5A2304	5A556 5A558 5A560 5A562	5A2321 5A2322 5A2323 5A2324	3.203	3.656
6621.00 9851.00 12016.00 17879.00 21808.00	1250** 1250** 1250** 1250** 1250**	1730 2580 3150 4700 5700	5A563 5A565 5A567 5A569 5A571	5A2305 5A2306 5A2307 5A2308 5A2309	5A564 5A566 5A568 5A570 5A572	5A2325 5A2326 5A2327 5A2328 5A2329	3.344	3.797

Type LL — Standard Part Numbers and Data

Speed Reduction Ratio	Maximum Continuous Torque (oz. in.)	Torque Multiplier Ratio	Part Number Prefix*				Dim. LE	Dim. LS
			Eared Flange		Square Flange			
			5/16″ shaft	1/4″ shaft	5/16″ shaft	1/4″ shaft		
4.33 5.29	6 7	3.5 4.2	5A497 5A499	5A2330 5A2331	5A498 5A500	5A2350 5A2351	2.781	3.234
18.78 27.94	20 29	12 17	5A501 5A503	5A2332 5A2333	5A502 5A504	5A2352 5A2353	2.781	3.234
81.37 121.00 147.70	70 105 128	41 62 75	5A505 5A507 5A509	5A2334 5A2335 5A2336	5A506 5A508 5A510	5A2354 5A2355 5A2356	2.928	3.375
352.60 524.60 639.90 780.60	247 366 445 544	145 215 262 320	5A511 5A513 5A515 5A517	5A2337 5A2338 5A2339 5A2340	5A512 5A514 5A516 5A518	5A2357 5A2358 5A2359 5A2360	3.187	3.641
1528.00 2273.00 3382.00 4126.00	850** 1250** 1250** 1250**	500 740 1100 1350	5A519 5A521 5A523 5A525	5A2341 5A2342 5A2343 5A2344	5A520 5A522 5A524 5A526	5A2361 5A2362 5A2363 5A2364	3.562	4.016
6621.00 9851.00 12016.00 17879.00 21808.00	1250** 1250** 1250** 1250** 1250**	1730 2580 3150 4700 5700	5A527 5A529 5A531 5A533 5A535	5A2345 5A2346 5A2347 5A2348 5A2349	5A528 5A530 5A532 5A534 5A536	5A2365 5A2366 5A2367 5A2368 5A2369	3.687	4.141

Type JM — Standard Part Numbers and Data

Speed Reduction Ratio	Maximum Continuous Torque (oz. in.)	Torque Multiplier Ratio	Part Number Prefix*				Dim. LE	Dim. LS
			Eared Flange		Square Flange			
			5/16″ shaft	1/4″ shaft	5/16″ shaft	1/4″ shaft		
4.33 5.29	6 7	3.5 4.2	311A292 311A293	311A294 311A295	311A296 311A297	311A298 311A299	2.437	2.891
18.78 27.94	20 29	12 17	311A201 311A203	311A237 311A239	311A202 311A204	311A238 311A240	2.437	2.891
81.37 121.00 147.70	70 105 128	41 62 75	311A205 311A207 311A209	311A241 311A243 311A245	311A206 311A208 311A210	311A242 311A244 311A246	2.562	3.016
352.60 524.60 639.90 780.60	247 366 445 544	145 215 262 320	311A211 311A213 311A215 311A217	311A247 311A249 311A251 311A253	311A212 311A214 311A216 311A218	311A248 311A250 311A252 311A254	2.828	3.281
1528.00 2273.00 3382.00 4126.00	850** 1250** 1250** 1250**	500 740 1100 1350	311A219 311A221 311A223 311A225	311A255 311A257 311A259 311A261	311A220 311A222 311A224 311A226	311A256 311A258 311A260 311A262	3.203	3.656
6621.00 9851.00 12016.00 17879.00 21808.00	1250** 1250** 1250** 1250** 1250**	1730 2580 3150 4700 5700	311A227 311A229 311A231 311A233 311A235	311A263 311A265 311A267 311A269 311A271	311A228 311A230 311A232 311A234 311A236	311A264 311A266 311A268 311A270 311A272	3.344	3.797

**1/4″ dia. shaft units limited to 600 oz. in. maximum continuous duty torque. Use 5/16″ dia. shaft if torque requirements exceed this value.

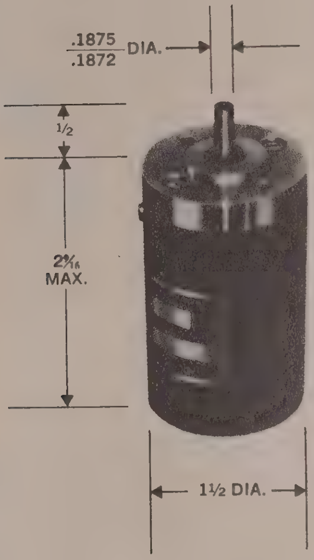
Max. Cont. Torque: The values in this column are based upon geartrain strength and capability for 1000 hrs. minimum life.
Max. rated torque of motor selected x torque multiplier ratio must not exceed these values.
Max. Intermittent Torque = 2 x Max. Cont. Torque.
Momentary Stall Torque = 5 x Max. Cont. Torque.
Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ratio x 100.

MOTOR DIVISION, TRW ELECTRONIC COMPONENTS GROUP, 2275 STANLEY AVE., DAYTON, OH 45404, (513) 228-3171 • RT. 6, Box M-30A, DOTHAN, AL 36303, (205) 983-3542

D.C. 1-1/2″ Dia. Permanent Magnet Motors

TRW

Type BD Basic Motor

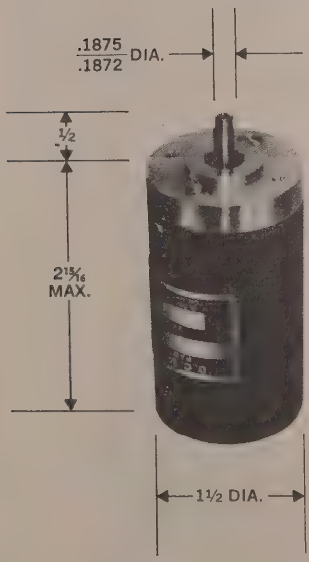


Type BD d.c. motors are designed to missile and aircraft standards. Twenty-one standard armature windings provide a large number of speed and torque characteristics in a comprehensive range of voltages. Units for operations at other voltages can be made available.

Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque max. rated (oz. in.)	Torque nom. stall (oz. in.)	Current max. no load (amps)	Current Max. rated load (amps)	Current nom. stall (amps)	Standard Part No.*
6	13,000-15,500	1.7	24	1.60	4.5	55.0	100A104-2
6	10,000-12,000	2.3	19	1.30	4.6	35.0	100A104-3
6	8,000- 9,500	3.2	15	.97	4.6	22.0	100A104-4
12	12,500-14,500	1.8	24	.76	2.3	27.0	100A104-5
12	10,000-12,000	2.4	19	.60	2.3	17.0	100A104-6
12	8,000- 9,500	3.2	15	.49	2.3	11.0	100A104-7
27	14,000-16,500	1.6	27	.39	1.0	15.0	100A104-8
27	11,000-13,000	2.0	22	.30	1.0	9.8	100A104-9
27	9,000-10,500	2.8	17	.24	1.0	6.4	100A104-10
27	7,000- 8,500	3.6	14	.20	1.0	3.9	100A104-11
50	10,500-12,500	2.1	20	.16	.5	4.6	100A104-12
50	8,000- 9,500	2.8	16	.13	.5	2.9	100A104-13
50	6,500- 8,000	3.7	13	.10	.5	1.8	100A104-14
50	5,000- 6,000	3.5	10	.08	.4	1.2	100A104-15
115	13,000-15,500	1.6	18	.09	.3	2.3	100A104-16
115	11,000-13,000	2.2	14	.07	.3	1.5	100A104-17
115	9,000-10,500	2.8	11	.06	.3	0.95	100A104-18
115	7,000- 8,500	3.6	9	.05	.3	0.61	100A104-19
115	6,000- 7,000	2.9	7	.04	.2	0.40	100A104-20
115	4,500- 5,500	2.7	6.5	.04	.2	0.26	100A104-21

Type BL Basic Motor



Type BL d.c. motors are designed to aircraft and missile quality standards Twenty-one standard armature windings provide a large number of speed-torque characteristics at various voltages. Units for operation at other voltages can be made available.

Standard Part Numbers and Data

Voltage (v.d.c.)	Speed no load (rpm)	Torque max. rated (oz. in.)	Torque nom. stall (oz. in.)	Current max.* no load (amps)	Current max. rated load (amps)	Current nom. stall (amps)	Standard Part No.*
6	10,000-12,500	3.3	37	1.50	5.2	62.0	100A108-1
6	8,500-10,500	4.0	29	1.20	5.2	45.0	100A108-2
6	6,500- 8,000	5.0	23	.93	5.1	28.0	100A108-3
12	10,000-12,500	3.3	37	.71	2.6	36.0	100A108-4
12	8,500-10,500	4.4	29	.56	2.7	22.0	100A108-5
12	6,500- 8,000	5.0	23	.44	2.8	14.0	100A108-6
27	11,500-14,000	2.9	42	.36	1.4	20.0	100A108-7
27	8,500-10,500	3.7	33	.28	1.4	12.0	100A108-8
27	7,000- 9,000	5.0	27	.22	1.4	8.0	100A108-9
27	5,500- 7,000	6.0	21	.18	1.4	5.2	100A108-10
50	8,500-10,500	3.8	31	.15	.72	5.9	100A108-11
50	6,500- 8,000	5.0	25	.12	.74	3.7	100A108-12
50	5,500- 7,000	6.5	20	.09	.73	2.4	100A108-13
50	4,500- 5,500	7.5	16	.075	.66	1.5	100A108-14
50	3,500- 4,500	6.0	12.5	.055	.43	0.94	100A108-15
115	8,500-10,500	4.2	22	.065	.34	1.9	100A108-16
115	7,000- 9,000	5.0	17	.055	.40	1.2	100A108-17
115	5,500- 7,000	5.0	14	.045	.28	0.77	100A108-18
115	4,500- 5,500	4.2	11	.035	.19	0.50	100A108-19
115	4,000- 5,000	3.5	8.8	.030	.14	0.33	100A108-20
115	3,000- 4,000	2.9	8.1	.025	.10	0.21	100A108-21

* No Load Currrent Values shown are for motor only. If gear reducer is attached, the No Load Current will increase 12%.

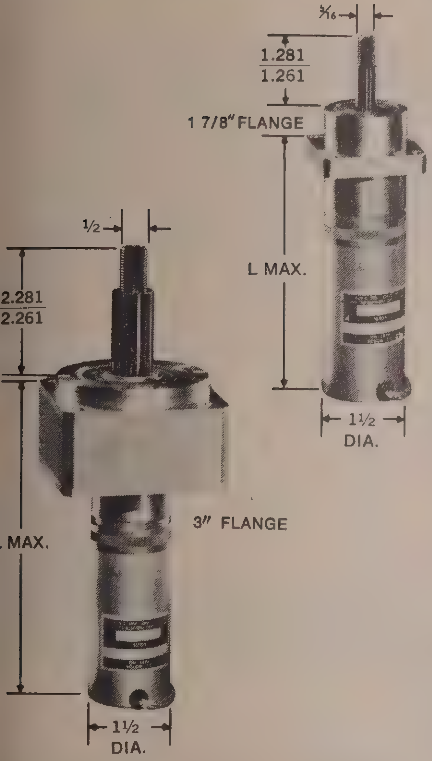
*How to Order

The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

D.C. 1-7/8″ & 3″ Flange Planetary Gearmotors D.C. 2-1/4″ Dia. Permanent Magnet Motors

TRW

Type BD, BL Planetary Gearmotors



TRW's 1⅞″ and 3″ diameter planetary geartrains provide high torque outputs in a small package. Coupled to the Type BD or BL motor, they are ideal for business machinery, machine tools, aircraft, and missile applications.

1⅞″ Flange — Standard Part Numbers and Data

Speed Reduction Ratio	Torque Multiplier	Max. Cont. Rating (lb. in.)	Type BD		Type BL	
			"L" max.	Part No. Prefix	"L" max.	Part No. Prefix*
3.81:1	3.5	1.1	3.34	102A152	3.72	102A170
5.54:1	5.1	1.6		102A153		102A171
14.5 :1	13	4.1	3.53	102A156	3.91	102A174
21.1 :1	19	6.0		102A157		102A175
30.7 :1	27	8.6		102A158		102A176
55.3 :1	47	14.6	4.09	102A160	4.47	102A178
80.4 :1	68	21.0		102A161		102A179
117.0 :1	99	31.0		102A162		102A180
170.0 :1	144	45.0		102A163		102A181
211.0 :1	171	53.0	4.28	102A189	4.66	102A199
306.0 :1	248	77.0		102A190		102A200
445.0 :1	360	100.0		102A191		102A201
647.0 :1	524	100.0		102A192		102A202
941.0 :1	762	100.0		102A193		102A203

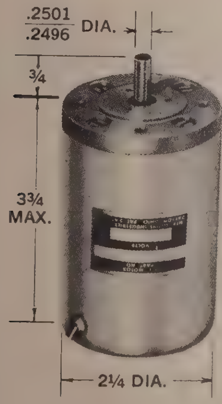
3″ Flange — Standard Part Numbers and Data

Speed Reduction Ratio	Torque Multiplier	Max. Cont. Rating (lb. in.)	Type BD		Type BL	
			"L" max.	Part No. Prefix	"L" max.	Part No. Prefix*
306:1	248	77	5⅜	102A929	5¾	102A939
445:1	360	112		102A930		102A940
647:1	524	164		102A931		102A941
941:1	762	238		102A932		102A942
1166:1	896	280	5³⁵⁄₆₄	102A933	5⁵⁹⁄₆₄	102A943
1696:1	1305	407		102A934		102A944
2466:1	1900	550		102A935		102A945
3584:1	2760	550		102A936		102A946
5211:1	4000	550		102A937		102A947

NOTE: Shaft spline details available from factory. For prototype use, TRW/Globe will broach holes in customer's parts.

Max. Cont. Torque: The values in this column are based upon geartrain strength and capability for 1000 hrs. minimum life. Max. rated torque of motor selected x torque multiplier ratio must not exceed these values.
Max. Intermittent Torque = 2 x Max. Cont. Torque.
Momentary Stall Torque = 5 x Max. Cont. Torque.
Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ratio x 100.

Type GRP Basic Motor



Type GRP precision permanent magnet d.c. motors provide extremely high output and efficiency for their frame size. This unit is designed to meet the requirements of MIL-M-8609; however, designs exceeding this specification to meet customer controlled applications are common. Various standard armature windings make it possible to furnish a wide range of speed and torque characteristics.

Standard Part Numbers and Data

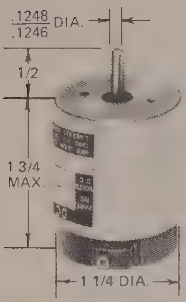
Voltage (v.d.c.)	Speed no load (rpm)	Torque		Current			Standard Part No.*
		max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nominal stall (amps)	
6	4,700-5,300	8.0	40	2.00	7.0	45.0	166A100-4
12	6,300-7,000	8.0	54	1.34	6.0	47.0	166A100-5
12	4,700-5,300	12.0	50	1.00	5.8	28.0	166A100-6
27	8,500-9,500	10.0	99	0.80	3.4	40.0	166A100-7
27	6,500-7,300	13.0	96	0.62	3.4	25.0	166A100-8
27	5,300-5,900	16.0	89	0.50	3.3	16.0	166A100-9
27	4,200-4,800	16.0	72	0.40	2.7	10.0	166A100-10
50	6,300-7,100	14.0	107	0.32	1.9	11.8	166A100-11
50	4,900-5,500	14.5	83	0.25	1.5	7.5	166A100-12
50	3,900-4,400	15.0	66	0.20	1.2	4.7	166A100-13
115	7,300-8,100	12.0	123	0.16	0.90	6.8	166A100-14
115	5,900-6,500	15.5	99	0.14	0.85	4.4	166A100-15
115	4,700-5,300	16.0	80	0.12	0.70	2.8	166A100-16
115	3,700-4,100	15.0	62	0.09	0.50	1.8	166A100-17
115	3,000-3,400	14.5	51	0.07	0.45	1.2	166A100-18
115	2,400-2,700	14.0	41	0.06	0.35	0.8	166A100-19

*How to Order

The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

D.C. 1-1/4″ Dia. Permanent Magnet Motors

Type CMM Basic Motor

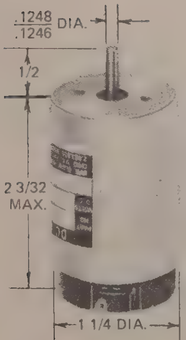


Type CMM motors are designed for applications which require small size, reliability and high torque. Planetary geartrains are available in a wide range of speed reductions. Type CMM motors are commercial versions of TRW militar motors and have the same performanc characteristics.

Standard Part Numbers and Data

		Torque		Current			Standard Part Numbers*
Voltage (v.d.c.)	Speed no load (rpm)	max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nom. stall (amps)	front face mount
4	16,000-19,000	.25	4.9	1.5	2.4	21	235A106-23
6	18,900-22,500	.5	7.4	1.2	2.3	24.9	235A106-14
6	15,600-18,600	.85	5.8	1.0	2.3	16.3	235A106-6
6	12,000-14,000	.75	4.6	.80	2.0	9.9	235A106-5
12	18,000-21,400	.50	7.4	.56	1.2	11.8	235A106-24
12	14,500-17,000	.70	5.9	.50	1.2	7.5	235A106-3
12	12,400-14,700	.75	4.6	.40	1.2	5.1	235A106-21
12	11,000-13,000	1.0	4.6	.35	1.2	4.6	235A106-4
24	19,200-22,800	.35	7.4	.30	.60	6.3	235A106-7
24	16,000-19,000	.60	5.8	.25	.60	3.8	235A106-1
24	11,500-14,000	1.0	4.6	.18	.60	2.1	235A106-2
24	10,700-12,700	1.0	3.6	.17	.60	1.6	235A106-8
24	9,600-11,400	1.0	2.9	.15	.50	1.1	235A106-22
24	8,000-10,000	1.0	2.9	.13	.45	0.93	235A106-10
24	6,000- 7,000	.8	2.3	.08	.30	0.55	235A106-11
50	14,300-17,000	.7	4.8	.11	.30	1.3	235A106-25
50	9,500-11,500	1.0	3.8	.07	.30	0.71	235A106-16
50	8,000-10,000	1.0	3.0	.07	.20	0.50	235A106-12
50	6,700- 8,000	.8	2.4	.05	.16	0.30	235A106-15
50	4,600- 5,500	.8	1.9	.04	.12	0.20	235A106-13

Type CLL Basic Motor



Type CLL motors are designed for applications which require small size, reliability and high torque. Planetary geartrains are available in a wide range of speed reductions. Type CLL motor are commercial versions of TRW mil tary motors and have the same perform ance characteristics.

Standard Part Numbers and Data

		Torque		Current			
Voltage (v.d.c.)	Speed no load (rpm)	max. rated (oz. in.)	nom. stall (oz. in.)	max. no load (amps)	max. rated load (amps)	nom. stall (amps)	Standard Part No.*
6	15,600-18,500	1.0	8.7	1.4	2.7	22.4	313A102-23
6	12,500-14,500	1.3	8.7	1.1	2.4	17.7	313A102-6
6	10,000-12,200	1.6	6.9	.95	2.6	11.6	313A102-6
6	7,600- 9,400	1.6	5.5	.70	2.0	7.0	313A102-5
12	11,500-14,000	1.1	8.7	.52	1.7	8.4	313A102-24
12	9,000-11,000	1.7	6.9	.42	1.2	5.3	313A102-3
24	16,000-19,000	.75	11.0	.36	1.0	7.3	313A102-21
24	14,400-17,000	.85	11.0	.32	.85	6.5	313A102-4
24	12,000-14,500	1.0	8.7	.28	.80	4.5	313A102-7
24	10,400-12,300	1.1	6.9	.23	.75	3.0	313A102-1
24	7,400- 8,900	1.6	5.5	.17	.70	1.7	313A102-2
24	6,900- 8,200	1.8	4.3	.16	.65	1.2	313A102-8
24	6,200- 7,400	1.8	3.4	.14	.60	0.89	313A102-22
24	5,200- 6,200	1.2	3.4	.12	.45	0.74	313A102-10
50	7,600- 9,400	1.5	5.7	.09	.25	0.92	313A102-11
75	14,000-17,000	1.0	8.6	.10	.29	1.6	313A102-25
75	9,000-11,000	1.7	6.8	.07	.29	0.85	313A102-16
75	8,000-10,000	1.8	5.4	.06	.26	0.60	313A102-12
75	6,500- 8,000	1.2	4.3	.05	.20	0.37	313A102-15
75	4,500- 5,300	1.0	3.4	.04	.10	0.23	313A102-13

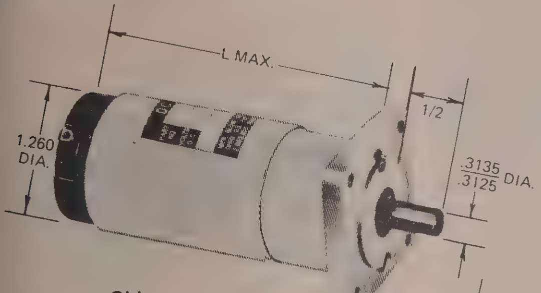
***How to Order**

The complete motor part number consists of the standard part number prefix, shown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the sam type basic motor part number table, mu be used, with the selected speed redu tion ratio.

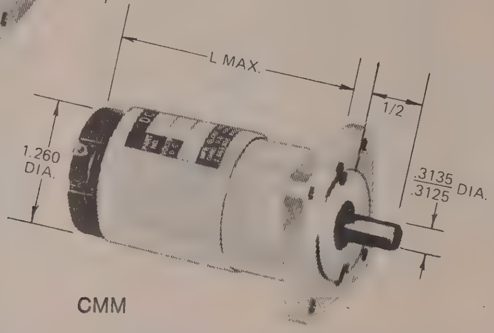
D.C. 1-1/4″ Dia. Permanent Magnet Planetary Gearmotors

TRW

Type CMM, CLL Planetary Gearmotors



CLL



CMM

Type CLL and CMM gearmotors are of the same high quality construction as TRW MM and LL gearmotors and provide the same outstanding performance characteristics although NOT designed to meet MIL-specs for environmental protection. These gearmotors are specifically designed for application where small size, reliability and high torque are desired.

Type CMM and CLL gearmotors are rugged, high-quality units combining Type CMM and CLL commercial motors with a proven planetary geartrain offering 83 standard speed reduction ratios from 4:1 to 46,656:1 with maximum continuous torque from 3.0 to 1250 oz. in. Since the geartrain is of modular design, literally thousands of special ratios can be furnished.

Standard Part Numbers and Data

Speed Reduction Ratio	Torque Multiplier	Max. Cont. Torque (oz. in.)	Type CMM Gearmotor		Type CLL Gearmotor		Speed Reduction Ratio	Torque Multiplier	Max. Cont. Torque (oz. in.)	Type CMM Gearmotor		Type CLL Gearmotor	
			dim. "L"	Part. No.*	dim. "L"	Part No.*				dim. "L"	Part. No.*	dim. "L"	Part No.*
4:1	3.0	5.1	2.86	317A102	3.22	319A100	2,500:1	815	1250	3.81	317A144	4.16	319A142
5:1	3.8	6.5	2.86	317A103	3.22	319A101	2,880:1	940	1250	3.81	317A145	4.16	319A143
6:1	4.5	7.7	2.86	317A104	3.22	319A102	3,000:1	980	1250	3.81	317A146	4.16	319A144
16:1	10	17	3.11	317A105	3.45	319A103	3,125:1	1020	1250	3.81	317A147	4.16	319A145
20:1	13	22	3.11	317A106	3.45	319A104	3,456:1	1130	1250	3.81	317A148	4.16	319A146
24:1	15	26	3.11	317A107	3.45	319A105	3,600:1	1170	1250	3.81	317A149	4.16	319A147
25:1	16	27	3.11	317A108	3.45	319A106	3,750:1	1220	1250	3.81	317A150	4.16	319A148
30:1	19	32	3.11	317A109	3.45	319A107	4,096:1	1070	1250	4.03	317A151	4.39	319A149
36:1	23	39	3.11	317A110	3.45	319A108	4,320:1	1410	1250	3.81	317A152	4.16	319A150
64:1	33	56	3.34	317A111	3.69	319A109	4,500:1	1470	1250	3.81	317A153	4.16	319A151
80:1	41	70	3.34	317A112	3.69	319A110	5,120:1	1340	1250	4.03	317A154	4.39	319A152
96:1	49	83	3.34	317A113	3.69	319A111	5,184:1	1690	1250	3.81	317A155	4.16	319A153
100:1	51	87	3.34	317A114	3.69	319A112	5,400:1	1760	1250	3.81	317A156	4.16	319A154
120:1	61	104	3.34	317A115	3.69	319A113	6,144:1	1610	1250	4.03	317A157	4.39	319A155
125:1	64	109	3.34	317A116	3.69	319A114	6,400:1	1680	1250	4.03	317A158	4.39	319A156
144:1	74	126	3.34	317A117	3.69	319A115	6,480:1	2110	1250	3.81	317A159	4.16	319A157
150:1	77	131	3.34	317A118	3.69	319A116	7,680:1	2010	1250	4.03	317A160	4.39	319A158
180:1	92	156	3.34	317A119	3.69	319A117	7,776:1	2530	1250	3.81	317A161	4.16	319A159
216:1	110	187	3.34	317A120	3.69	319A118	8,000:1	2100	1250	4.03	317A162	4.39	319A160
256:1	105	179	3.58	317A121	3.92	319A119	9,216:1	2390	1250	4.03	317A163	4.39	319A161
320:1	130	221	3.58	317A122	3.92	319A120	9,600:1	2520	1250	4.03	317A164	4.39	319A162
384:1	157	167	3.58	317A123	3.92	319A121	10,000:1	2620	1250	4.03	317A165	4.39	319A163
400:1	164	279	3.58	317A124	3.92	319A122	11,520:1	3010	1250	4.03	317A166	4.39	319A164
480:1	197	335	3.58	317A125	3.92	319A123	12,000:1	3140	1250	4.03	317A167	4.39	319A165
500:1	205	349	3.58	317A126	3.92	319A124	12,500:1	3280	1250	4.03	317A168	4.39	319A166
576:1	235	401	3.58	317A127	3.92	319A125	13,824:1	3620	1250	4.03	317A169	4.39	319A167
600:1	246	418	3.58	317A128	3.92	319A126	14,400:1	3780	1250	4.03	317A170	4.39	319A168
625:1	256	435	3.58	317A129	3.92	319A127	15,000:1	3940	1250	4.03	317A171	4.39	319A169
720:1	295	502	3.58	317A130	3.92	319A128	15,625:1	4100	1250	4.03	317A172	4.39	319A170
750:1	306	520	3.58	317A131	3.92	319A129	17,280:1	4520	1250	4.03	317A173	4.39	319A171
864:1	352	598	3.58	317A132	3.92	319A130	18,000:1	4710	1250	4.03	317A174	4.39	319A172
900:1	370	629	3.58	317A133	3.92	319A131	18,750:1	4910	1250	4.03	317A175	4.39	319A173
1,024:1	334	568	3.81	317A134	4.16	319A132	20,736:1	5430	1250	4.03	317A176	4.39	319A174
1,080:1	442	757	3.58	317A135	3.92	319A133	21,600:1	5660	1250	4.03	317A177	4.39	319A175
1,280:1	416	707	3.81	317A136	4.16	319A134	22,500:1	4900	1250	4.03	317A178	4.39	319A176
1,296:1	530	901	3.58	317A137	3.92	319A135	25,920:1	6790	1250	4.03	317A179	4.39	319A177
1,536:1	500	850	3.81	317A138	4.16	319A136	27,000:1	7070	1250	4.03	317A180	4.39	319A178
1,600:1	522	887	3.81	317A139	4.16	319A137	31,104:1	8150	1250	4.03	317A181	4.39	319A179
1,920:1	625	1063	3.81	317A140	4.16	319A138	32,400:1	8500	1250	4.03	317A182	4.39	319A180
2,000:1	652	1108	3.81	317A141	4.16	319A139	38,880:1	10200	1250	4.03	317A183	4.39	319A181
2,304:1	750	1250	3.81	317A142	4.16	319A140	46,656:1	12200	1250	4.03	317A184	4.39	319A182
2,400:1	780	1250	3.81	317A143	4.16	319A141							

How to Order

he complete motor part number consists of the standard part number prefix, hown on the standard part number and data tables, plus the armature dash number. For gearmotors, each of the basic motor windings (dash no.), in the same type basic motor part number table, must be used, with the selected speed reduction ratio.

D.C. 1-3/16″ Permanent Magnet Motors, Type IM-13 Basic Motor

Type IM-13 Basic Motor

Special order options:

- Geartrain
- EMI filters
- Stud mounting

Type IM-13 d.c. motors are designed for high-volume, low-cost production. Typical applications include tape decks, business machines, computer peripherals, audio-visual, automotive, medical, recreational, and other industrial equipment.

Specifications

Rated Voltage: 6 to 24 v.d.c.

Weight: 4.4 oz. (405A6002 & 6008) 5.5 oz. (405A6003 & 6009)

Inertia: See table.

Shaft: Precision ground and hardened stainless steel. Variations available: length, flats, pinions, gears.

Magnets: Ceramic. These tolerate high pulse current without demagnetizing.

Bearings: 405A6002 & 6003. Self-aligning sleeve bearings are life-lubricated and withstand a 2 lb. side load and have .003″ to .040″ end play.

Bearings: 405A6008 & 6009. Pre-loaded ball bearings.

Cover: Corrosion-resistant steel housing.

End Bells: Die cast metal.

Mounting: Standard mounting is by tapped holes in motor face.

Leads: AWG 22, 8″ long, 105°C PVC, with strain relief.

Life: 1,000 hours nominal continuous duty at rated voltage.

Winding Temperature Rise: See table.

Maximum Winding Temperature: 130°C.

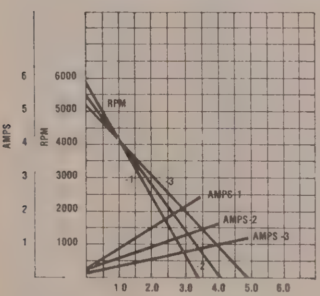
Electrical Time Constant: 1.0 milliseconds.

When You Order

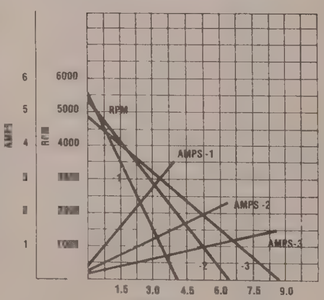
**** Part Number.** Units shown above are standard and may be ordered by part number. Consult TRW Motors for variations in mechanical or electrical performance to suit specific applications.

Typical Performance

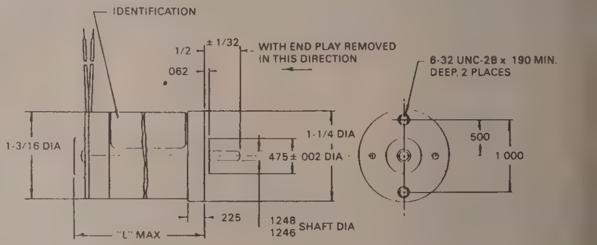
Part Nos. 405A6002 and 6008



Part Nos. 405A6003 and 6009



Dimensions



"L" MAX. 405A6002 & 6008 = 1-27/32″
"L" MAX. 405A6003 & 6009 = 2-5/32″

When red lead is (+) and black lead is (–), rotation is CCW viewing shaft end. Reverse polarity for CW rotation.

Standard Part Numbers and Data

Voltage (v.d.c.)	Speed ±800 No Load (rpm)	Current No Load (max. amps)	Rated Torque (oz. in.)	Current at Rated Torque (max. amps)	Inertia X 10-4 (oz. in sec.²)	Temp.* Rise (°C/watt)	Torque Constant (oz. in./amp)	Resistance ±15% (ohms)	Part Number**
Sleeve Bearings									
6	5000	0.320	1.0	1.4	1.4	15	1.5	1.9	405A6002-1
12	5400	0.175	1.50	0.7	1.4	15	2.8	7.5	405A6002-2
24	5600	0.100	1.7	0.6	1.4	15	5.4	25	405A6002-3
6	5300	0.350	2.1	2.4	2.1	11	1.3	1.8	405A6003-1
12	5400	0.175	2.5	1.25	2.1	11	2.7	4.7	405A6003-2
24	5600	0.125	3.0	0.7	2.1	11	6.8	18.5	405A6003-3
Ball Bearings									
6	5000	0.320	1.1	1.4	1.4	15	1.5	1.9	405A6008-1
12	5400	0.175	1.7	0.7	1.4	15	2.8	7.5	405A6008-2
24	5600	0.100	1.9	0.6	1.4	15	5.4	25	405A6008-3
6	5300	0.350	2.3	2.4	2.1	11	1.3	1.8	405A6009-1
12	5400	0.180	2.7	1.25	2.1	11	2.7	4.7	405A6009-2
24	5600	0.115	3.3	0.7	2.1	11	6.8	18.5	405A6009-3

* Winding temp rise measured when mounted to 8″ x 8″ x ¼″ Alum plate. Multiply by 1.4 when mounted to a heat insulator.

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D.C. 1-3/16″ Permanent Magnet Spur Gearmotors

Type IM-13 Spur Gearmotor

Type IM-13 d.c. Spur Gearmotors are designed for high-volume, low-cost production. Typical applications include busines machines, computer peripherals, audio-visual, automotive, medical, recreational, and other industrial equipment.

Specifications

Rated Voltage: 6 to 24 v.d.c.

Weight: 7-10 oz.

Inertia: See table.

Shaft: Precision ground hardened high carbon steel. Variations available: length, flats, pinions, gears.

Magnets: Ceramic. These tolerate high pulse currents without demagnetizing.

Bearings: Self-aligning sleeve bearings are life-lubricated.
* Ball bearing motors are available.

Cover: Corrosion-resistant steel housing.

End Bells: Die cast metal.

Mounting: Standard mounting is by tapped holes in motor face.

Leads: AWG 22, 8″ long, 105°C PVC, with strain relief.

Life: 1,000 hours nominal continuous duty at rated voltage.

Winding Temperature Rise: See table.

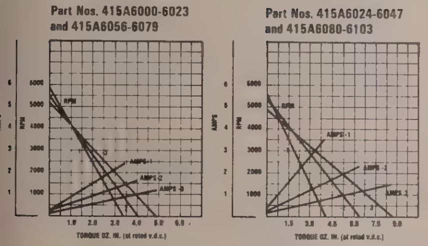
Maximum Winding Temperature: 130°C.

Electrical Time Constant: 1.0 milliseconds.

When You Order

**** Part Number.** Units shown above are standard and may be ordered by part number. Consult TRW Motors for variations in mechanical or electrical performance to suit specific applications. Complete part number consists of the basic part number followed by the armature dash number.

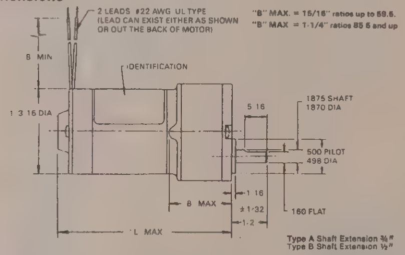
Typical Motor Performance



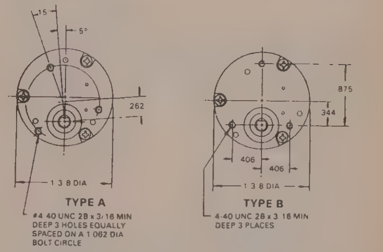
Part Nos. 415A6000-6023 and 415A6056-6079

Part Nos. 415A6024-6047 and 415A6080-6103

Dimensions



2 LEADS #22 AWG UL TYPE (LEAD CAN EXIST EITHER AS SHOWN OR OUT THE BACK OF MOTOR)
"B" MAX. = 15/16" ratios up to 59.5.
"B" MAX = 1-1/4" ratios 85 5 and up
B MIN
IDENTIFICATION
1 3 16 DIA
5 16
1875 SHAFT
1870 DIA
500 PILOT
498 DIA
1 16
B MAX
± 1/32
1/2
160 FLAT
L MAX
Type A Shaft Extension ¾″
Type B Shaft Extension ½″



15°
5°
262
1 3 8 DIA
TYPE A
#4 40 UNC 2B x 3/16 MIN DEEP 3 HOLES EQUALLY SPACED ON A 1 062 DIA BOLT CIRCLE
875
344
406
406
1 3 8 DIA
TYPE B
4-40 UNC 2B x 3 16 MIN DEEP 3 PLACES

When red lead is (+) and black lead is (−), rotation is CCW viewing shaft end
Reverse polarity for CW rotation

Standard Part Numbers and Data

Speed Reduction Ratio	Maximum Cont. Torque	Torque Mult. Ratio	Short Stack Motor Dim. "L"	Short Stack Motor Type A Part No.**	Short Stack Motor Type B Part No.**	Long Stack Motor Dim. "L"	Long Stack Motor Type A Part No.**	Long Stack Motor Type B Part No.**
3.97	8.4	3	2 9/16	415A6000	415A6056	2 7/8	415A6024	415A6080
5.1	10.8	3.8	2 9/16	415A6001	415A6057	2 7/8	415A6025	415A6081
6.67	14.4	5	2 9/16	415A6002	415A6058	2 7/8	415A6026	415A6082
7.7	16.5	5.8	2 9/16	415A6003	415A6059	2 7/8	415A6027	415A6083
11.02	20.9	7.6	2 9/16	415A6004	415A6060	2 7/8	415A6028	415A6084
14.1	26.3	9.6	2 9/16	415A6005	415A6061	2 7/8	415A6029	415A6085
18.52	34.6	12.6	2 9/16	415A6006	415A6062	2 7/8	415A6030	415A6086
21.4	39.9	14.3	2 9/16	415A6007	415A6063	2 7/8	415A6031	415A6087
30.62	46.7	19	2 9/16	415A6008	415A6064	2 7/8	415A6032	415A6088
39.2	59.9	24.4	2 9/16	415A6009	415A6065	2 7/8	415A6033	415A6089
51.44	60.0	26.1	2 9/16	415A6010	415A6066	2 7/8	415A6034	415A6090
59.5	60.0	30.2	2 9/16	415A6011	415A6067	2 7/8	415A6035	415A6091
85.05	60.0	48.5	2 13/16	415A6012	415A6068	3 3/16	415A6036	415A6092
109.2	60.0	62.2	2 13/16	415A6013	415A6069	3 3/16	415A6037	415A6093
142.89	60.0	81.5	2 13/16	415A6014	415A6070	3 3/16	415A6038	415A6094
165.4	60.0	94.3	2 13/16	415A6015	415A6071	3 3/16	415A6039	415A6095
236.3	60.0	125.2	2 13/16	415A6016	415A6072	3 3/16	415A6040	415A6096
303.2	60.0	160.7	2 13/16	415A6017	415A6073	3 3/16	415A6041	415A6097
369.9	60.0	210.4	2 13/16	415A6018	415A6074	3 3/16	415A6042	415A6098
459.4	60.0	243.5	2 13/16	415A6019	415A6075	3 3/16	415A6043	415A6099
656.3	60.0	328.2	2 13/16	415A6020	415A6076	3 3/16	415A6044	415A6100
842.2	60.0	421.1	2 13/16	415A6021	415A6077	3 3/16	415A6045	415A6101
1102.5	60.0	551.3	2 13/16	415A6022	415A6078	3 3/16	415A6046	415A6102
1276.1	60.0	638	2 13/16	415A6023	415A6079	3 3/16	415A6047	415A6103

Voltage (v.d.c.)	Speed ±800 No Load (rpm)	Current No Load (max. amps)	Rated Torque (oz. in.)	Current at Rated Torque (max. amps)	Inertia X 10-4 (oz. in. sec.²)	Temp.* Rise (°C/watt)	Torque Constant (oz. in./amp)	Resistance ±15% (ohms)	Armature Dash Number**
Motor data 415A6000-6023 and 415A6056-6079									
6	5000	0.320	1.0	1.4	1.4	15	1.5	1.9	−1
12	5400	0.175	1.50	0.7	1.4	15	2.8	7.5	−2
24	5600	0.100	1.7	0.6	1.4	15	5.4	25	−3
Motor data 415A6024-6047 and 415A6080-6103									
6	5300	0.350	2.1	2.0	2.1	11	1.3	1.8	−1
12	5400	.175	2.5	1.25	2.1	11	2.7	4.7	−2
24	5600	.125	3.0	0.7	2.1	11	6.8	18.5	−3

Winding temp rise measured when mounted to 8″ x 8″ x ¼″ Alum plate. Multiply by 1.4 when mounted to a heat insulator.

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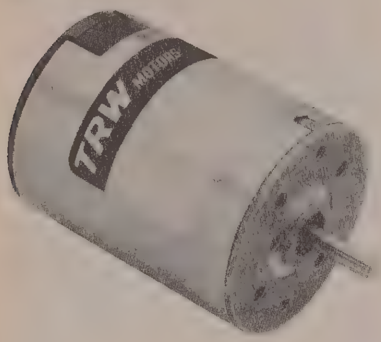
D.C. 1-1/2″ Permanent Magnet Motors

Type IM-15 Basic Motor



Type IM-15 d.c. motors are designed for high-volume, low-cost production. Typical applications include tape decks, business machines, computer peripherals, audio-visual, automotive, medical, recreational, and other industrial equipment.

Special order options:

- Geartrain
- EMI filters
- Integral AC tachometer generators
- Stud mounting

Specifications

Rated Voltage: 6 to 24 v.d.c.

Weight: 8.5 oz. (403A6005 & 6007)
10.5 oz. (403A6006 & 6008)

Inertia: See table.

Shaft: Precision ground and hardened stainless steel. Variations available: length, flats, pinions, gears.

Magnets: Ceramic. These tolerate high pulse currents without demagnetizing.

Bearings: 403A6005 & 6006. Self-aligning sleeve bearings are life-lubricated and withstand a 2 lb. side load and have .003″ to .040″ end play.

Bearings: 403A6007 & 6008. Pre-loaded ball bearings.

Cover: Corrosion-resistant steel housing.

End Bell: Die cast metal.

Mounting: Standard mounting is by tapped holes in motor face.

Brush Holder: Precision molded Diallyl Phthalate.

Leads: 2 leads #20 AWG, UL approved, 8″ min. long (lead can exit either as shown or out the back of motor).

Life: 1,000 hours nominal continuous duty at rated voltage.

Winding Temperature Rise: See table.

Maximum Winding Temperature: 130°C.

Electrical Time Constant: 1.0 milliseconds.

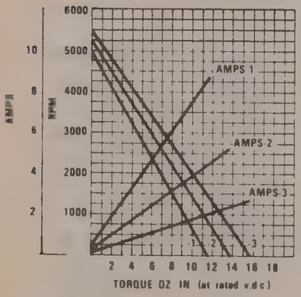
Mechanical Time Constant: Less than 25 milliseconds.

When You Order

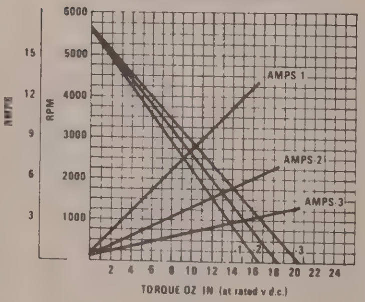
**** Part Number.** Units shown above are standard and may be ordered by part number. Consult TRW motors for variations in mechanical or electrical performance to suit specific applications.

Typical Performance

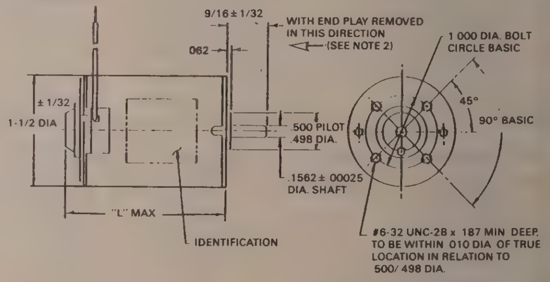
Part Nos. 403A6005 and 6007



Part Nos. 403A6006 and 6008



Dimensions


9/16 ± 1/32
062
WITH END PLAY REMOVED IN THIS DIRECTION (SEE NOTE 2)
1 000 DIA. BOLT CIRCLE BASIC
45°
90° BASIC
± 1/32
1-1/2 DIA
.500 PILOT .498 DIA.
.1562 ± 00025 DIA. SHAFT
"L" MAX
IDENTIFICATION
#6-32 UNC-2B x 187 MIN DEEP, TO BE WITHIN 010 DIA OF TRUE LOCATION IN RELATION TO 500/ 498 DIA.

"L" MAX. 403A6005 & 6007 = 2.266″
"L" MAX. 403A6006 & 6008 = 2.547″

When red lead is (+) and black lead is (–), rotation is CW viewing shaft end. Reverse polarity for CCW rotation.

Note: Please consult TRW Motors on the details of your motion requirements prior to preparing spec control prints.

Standard Part Numbers and Data

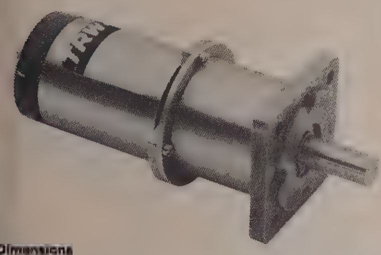
Voltage (v.d.c.)	Speed ±800 No Load (rpm)	Current No Load (max. amps)	Rated Torque (oz. in.)	Current at Rated Torque (max. amps)	Inertia X 10-4 (oz. in. sec.^{2})	Temp.* Rise (°C/watt)	Torque Constant (oz. in./amp)	Resistance ±15% (ohms)	Part Number**
Sleeve Bearings									
6	4800	0.5	3.0	3.0	4.75	8.5	1.4	0.7	403A6005-1
12	5200	0.25	3.5	1.6	4.75	8.5	2.7	2.6	403A6005-2
24	5500	0.165	4.0	1.0	4.75	8.5	5.5	8.3	403A6005-3
6	5500	0.6	4.0	4.0	6.0	7.0	1.3	0.45	403A6006-1
12	5500	0.3	4.5	2.2	6.0	7.0	2.7	1.7	403A6006-2
24	5700	0.175	5.0	1.2	6.0	7.0	5.5	6.2	403A6006-3
Ball Bearings									
6	5000	0.25	3.5	3.2	4.75	8.5	1.4	0.7	403A6007-1
12	5400	0.150	4.0	1.8	4.75	8.5	2.7	2.6	403A6007-2
24	5600	0.08	4.5	1.0	4.75	8.5	5.5	8.3	403A6007-3
6	5800	0.4	4.5	4.0	6.0	7.0	1.3	0.45	403A6008-1
12	5600	0.2	5.0	2.3	6.0	7.0	2.7	1.7	403A6008-2
24	5700	0.1	5.5	1.3	6.0	7.0	5.5	6.2	403A6008-3

* Winding temp rise measured when mounted to 8″ x 8″ x ¼″ Alum plate. Multiply by 1.4 when mounted to a heat insulator.

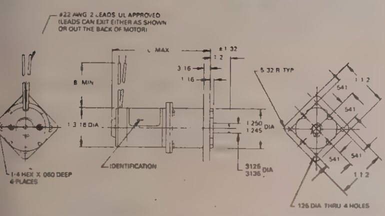
D.C. 1-3/16″ Permanent Magnet Gearmotors

TRW

Type IM-13 Planetary Gearmotor



Dimensions



When red lead is (+) and black lead is (–), rotation is CCW viewing shaft end everse polarity for CW rotation.

Note. Please consult TRW Motors on the details of your motion requirements rior to preparing spec control prints.

Special order options:
- EMI filters
- Ball Bearing Motors

Type IM-13 d.c. planetary gearmotors are designed for high-volume, low-cost production. Typical applications include tape decks, business machines, computer peripherals, audio-visual, automotive, medical, recreational, and other industrial equipment where high torque and lower speeds are needed.

Specifications

Rating: 3.0 to 1250 oz. in.

Voltage: 6 to 24 v.d.c.

Weight: 10 to 17 oz., depending on ratio and motor.

Gears: Precision manufactured and heat treated for reliable performance and long life.

Backlash: Varies with ratio, but average backlash is 3°.

Cover: Corrosion-resistant steel housing.

Bearings: Motor shaft and geartrain output shaft: life-lubed sleeve bearing. Ball bearing motor option is listed on charts. (Motor only not output shaft.)

Lubrication: Life-lubricated bearings and geartrains are standard. Consult TRW Motors about special lubricants for temperature extremes.

Shaft: Precision ground case-hardened steel. Variations available: length, smaller diameter, flats, pinions, gears, holes (through or tapped), threaded ends and tapers.

Note: Type of steel used may vary with above variations.

Leads: AWG-22, 8″ long, 105°C PVC with strain relief.

Mounting: Four holes & pilot are standard.

Life: 1000 hours depending upon ratio & load.

When You Order

*** Part Number.** Units described are standard and may be ordered by part number. Complete part number consists of the basic part number followed by the armature dash number. Consult TRW Motors for other voltages and variations for special applications.

Standard Part Numbers and Data

	SHORT STACK MOTOR				LONG STACK MOTOR		
Ratio	Torque Multi-plier	Part Number	Max. Continuous Torque Oz. In.	"L" Max.	Part Number	Max. Continuous Torque Oz. In.	"L" Max.
4	3.0	407A6000	10	3.000	407A6166	10	3.310
5	3.8	407A6001	13	3.000	407A6167	13	3.310
6	4.5	407A6002	16	3.000	407A6168	16	3.310
16	10	407A6003	35	3.240	407A6169	35	3.550
20	13	407A6004	45	3.240	407A6170	45	3.550
24	15	407A6005	52	3.240	407A6171	52	3.550
25	16	407A6006	56	3.240	407A6172	56	3.550
30	19	407A6007	66	3.240	407A6173	66	3.550
36	23	407A6008	80	3.240	407A6174	80	3.550
64	33	407A6009	115	3.473	407A6175	115	3.783
80	41	407A6010	143	3.473	407A6176	143	3.783
96	49	407A6011	171	3.473	407A6177	171	3.783
100	51	407A6012	178	3.473	407A6178	178	3.783
120	61	407A6013	213	3.473	407A6179	213	3.783
125	64	407A6014	224	3.473	407A6180	224	3.783
144	74	407A6015	259	3.473	407A6181	259	3.783
150	77	407A6016	269	3.473	407A6182	269	3.783
180	92	407A6017	322	3.473	407A6183	322	3.783
216	110	407A6018	385	3.473	407A6184	385	3.783
256	105	407A6019	367	3.706	407A6185	367	4.016
320	130	407A6020	455	3.706	407A6186	455	4.016
384	157	407A6021	549	3.706	407A6187	549	4.016
400	164	407A6022	574	3.706	407A6188	574	4.016
480	197	407A6023	689	3.706	407A6189	689	4.016
500	205	407A6024	717	3.706	407A6190	717	4.016
576	235	407A6025	822	3.706	407A6191	822	4.016
600	246	407A6026	861	3.706	407A6192	861	4.016
625	256	407A6027	896	3.706	407A6193	896	4.016
720	295	407A6028	1032	3.706	407A6194	1032	4.016
750	306	407A6029	1071	3.706	407A6195	1071	4.016
864	352	407A6030	1230	3.706	407A6196	1230	4.016
900	370	407A6031	1250	3.706	407A6197	1250	4.016
1024	334	407A6032	1169	3.940	407A6198	1169	4.250
1080	442	407A6033	1250	3.706	407A6199	1250	4.016
1280	416	407A6034	1250	3.940	407A6200	1250	4.250
1296	530	407A6035	1250	3.706	407A6201	1250	4.016
1536	500	407A6036	1250	3.940	407A6202	1250	4.250
1600	522	407A6037	1250	3.940	407A6203	1250	4.250
1920	625	407A6038	1250	3.940	407A6204	1250	4.250
2000	652	407A6039	1250	3.940	407A6205	1250	4.250
2304	750	407A6040	1250	3.940	407A6206	1250	4.250
2400	780	407A6041	1250	3.940	407A6207	1250	4.250

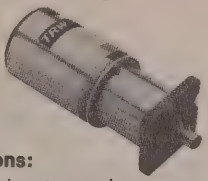
dd armature dash number for voltage -1 = 6v, -2 = 12v, -3 = 24v.
r complete motor performance data see Bulletin E-2110.

	SHORT STACK MOTOR				LONG STACK MOTOR		
Ratio	Torque Multi-plier	Part Number	Max. Continuous Torque Oz. In.	"L" Max.	Part Number	Max. Continuous Torque Oz. In.	"L" Max.
2500	815	407A6042	1250	3.940	407A6208	1250	4.250
2880	940	407A6043	1250	3.940	407A6209	1250	4.250
3000	980	407A6044	1250	3.940	407A6210	1250	4.250
3125	1020	407A6045	1250	3.940	407A6211	1250	4.250
3456	1130	407A6046	1250	3.940	407A6212	1250	4.250
3600	1170	407A6047	1250	3.940	407A6213	1250	4.250
3750	1220	407A6048	1250	3.940	407A6214	1250	4.250
4096	1070	407A6049	1250	4.175	407A6215	1250	4.482
4320	1410	407A6050	1250	3.940	407A6216	1250	4.250
4500	1470	407A6051	1250	3.940	407A6217	1250	4.250
5120	1340	407A6052	1250	4.175	407A6218	1250	4.482
5184	1690	407A6053	1250	3.940	407A6219	1250	4.250
5400	1760	407A6054	1250	3.940	407A6220	1250	4.250
6144	1610	407A6055	1250	4.175	407A6221	1250	4.482
6400	1680	407A6056	1250	4.175	407A6222	1250	4.482
6480	2110	407A6057	1250	3.940	407A6223	1250	4.250
7680	2010	407A6058	1250	4.175	407A6224	1250	4.482
7776	2530	407A6059	1250	3.940	407A6225	1250	4.250
8000	2100	407A6060	1250	4.175	407A6226	1250	4.482
9216	2390	407A6061	1250	4.175	407A6227	1250	4.482
9600	2520	407A6062	1250	4.175	407A6228	1250	4.482
10000	2620	407A6063	1250	4.175	407A6229	1250	4.482
11520	3010	407A6064	1250	4.175	407A6230	1250	4.482
12000	3140	407A6065	1250	4.175	407A6231	1250	4.482
12500	3280	407A6066	1250	4.175	407A6232	1250	4.482
13824	3620	407A6067	1250	4.175	407A6233	1250	4.482
14400	3780	407A6068	1250	4.175	407A6234	1250	4.482
15000	3940	407A6069	1250	4.175	407A6235	1250	4.482
15625	4100	407A6070	1250	4.175	407A6236	1250	4.482
17280	4520	407A6071	1250	4.175	407A6237	1250	4.482
18000	4710	407A6072	1250	4.175	407A6238	1250	4.482
18750	4910	407A6073	1250	4.175	407A6239	1250	4.482
20736	5430	407A6074	1250	4.175	407A6240	1250	4.482
21600	5660	407A6075	1250	4.175	407A6241	1250	4.482
22500	5900	407A6076	1250	4.175	407A6242	1250	4.482
25920	6790	407A6077	1250	4.175	407A6243	1250	4.482
27000	7070	407A6078	1250	4.175	407A6244	1250	4.482
31104	8150	407A6079	1250	4.175	407A6245	1250	4.482
32400	8500	407A6080	1250	4.175	407A6246	1250	4.482
38880	10200	407A6081	1250	4.175	407A6247	1250	4.482
46656	12200	407A6082	1250	4.175	407A6248	1250	4.482

D.C. 1-1/2″ Permanent Magnet Gearmotors

TRW

Type IM-15 Planetary Gearmotor



Special order options:

- Integral tachometer generators
- Ball bearing motors

Type IM-15 d.c. planetary gearmotors are designed for high-volume, low-cost production. Typical applications include tape decks business machines, computer peripherals, audio-visual, automotive, medical, recreational, and other industrial equipment where high torque and lower speeds are needed.

Specifications

Rating: 9.0 to 1250 oz in.

Voltage: 6 to 24 v.d.c.

Weight: 14 to 21 oz., depending on ratio and motor.

Gears: Precision manufactured and heat treated for reliable performance and long life.

Backlash: Varies with ratio, but average backlash is 3°.

Cover: Corrosion-resistant steel housing.

Bearings: Motor shaft and geartrain output shaft, life-lubed sleeve bearing. Ball bearing motors available.

Lubrication: Life-lubricated bearings and geartrains are standard. Consult TRW Motors about special lubricants for temperature extremes.

Shaft: Precision ground case-hardened steel. Variations available: length, smaller diameter, flats, pinions, gears, holes (through or tapped), threaded ends and tapers.

Note: Type of steel used may vary with above variations.

Leads: AWG-22, 8 inches long, 105°C PVC, with strain relief.

Mounting: Four holes & pilot are standard.

Life: 1000 hours depending upon ratio & load.

When You Order

**** Part Number.** Units described are standard and may be ordered by part number. Complete part number consists of the basic part number followed by the armature dash number. Consult TRW Motors for other voltages and variations for special applications.

Standard Part Numbers and Data

SHORT STACK MOTOR					LONG STACK MOTOR		
Ratio	Torque Multiplier	Part Number	Max. Continuous Torque Oz. In.	"L" Max.	Part Number	Max. Continuous Torque Oz. In.	"L" Max.
4	3.0	409A6012	10	3.626	409A6178	10	3.905
5	3.8	409A6013	13	3.626	409A6179	13	3.905
6	4.5	409A6014	16	3.626	409A6180	16	3.905
16	10	409A6015	35	3.865	409A6181	35	4.144
20	13	409A6016	45	3.865	409A6182	45	4.144
24	15	409A6017	52	3.865	409A6183	52	4.144
25	16	409A6018	56	3.865	409A6184	56	4.144
30	19	409A6019	66	3.865	409A6185	66	4.144
36	23	409A6020	80	3.865	409A6186	80	4.144
64	33	409A6021	115	4.098	409A6187	115	4.377
80	41	409A6022	143	4.098	409A6188	143	4.377
96	49	409A6023	171	4.098	409A6189	171	4.377
100	51	409A6024	178	4.098	409A6190	178	4.377
120	61	409A6025	213	4.098	409A6191	213	4.377
125	64	409A6026	224	4.098	409A6192	224	4.377
144	74	409A6027	259	4.098	409A6193	259	4.377
150	77	409A6028	269	4.098	409A6194	269	4.377
180	92	409A6029	322	4.098	409A6195	322	4.377
216	110	409A6030	385	4.098	409A6196	385	4.377
256	105	409A6031	367	4.331	409A6197	367	4.610
320	130	409A6032	455	4.331	409A6198	455	4.610
384	157	409A6033	549	4.331	409A6199	549	4.610
400	164	409A6034	574	4.331	409A6200	574	4.610
480	197	409A6035	689	4.331	409A6201	689	4.610
500	205	409A6036	717	4.331	409A6202	717	4.610
576	235	409A6037	822	4.331	409A6203	822	4.610
600	246	409A6038	861	4.331	409A6204	861	4.610
625	256	409A6039	896	4.331	409A6205	896	4.610
720	295	409A6040	1032	4.331	409A6206	1032	4.610
750	306	409A6041	1071	4.331	409A6207	1071	4.610
864	352	409A6042	1230	4.331	409A6208	1230	4.610
900	370	409A6043	1250	4.331	409A6209	1250	4.610
1024	334	409A6044	1169	4.564	409A6210	1169	4.843
1080	442	409A6045	1250	4.331	409A6211	1250	4.610
1280	416	409A6046	1250	4.564	409A6212	1250	4.843
1296	530	409A6047	1250	4.331	409A6213	1250	4.610
1536	500	409A6048	1250	4.564	409A6214	1250	4.843
1600	522	409A6049	1250	4.564	409A6215	1250	4.843
1920	625	409A6050	1250	4.564	409A6216	1250	4.843
2000	652	409A6051	1250	4.564	409A6217	1250	4.843
2304	750	409A6052	1250	4.564	409A6218	1250	4.843
2400	780	409A6053	1250	4.564	409A6219	1250	4.843
2500	815	409A6054	1250	4.564	409A6220	1250	4.843
2880	940	409A6055	1250	4.564	409A6221	1250	4.843
3000	980	409A6056	1250	4.564	409A6222	1250	4.843
3125	1020	409A6057	1250	4.564	409A6223	1250	4.843
3456	1130	409A6058	1250	4.564	409A6224	1250	4.843
3600	1170	409A6059	1250	4.564	409A6225	1250	4.843
3750	1220	409A6060	1250	4.564	409A6226	1250	4.843
4096	1070	409A6061	1250	4.797	409A6227	1250	5.076
4320	1410	409A6062	1250	4.564	409A6228	1250	4.843
4500	1470	409A6063	1250	4.564	409A6229	1250	4.843
5120	1340	409A6064	1250	4.797	409A6230	1250	5.076
5184	1690	409A6065	1250	4.564	409A6231	1250	4.843
5400	1760	409A6066	1250	4.564	409A6232	1250	4.843
6144	1610	409A6067	1250	4.797	409A6233	1250	5.076
6400	1680	409A6068	1250	4.797	409A6234	1250	5.076
6480	2110	409A6069	1250	4.564	409A6235	1250	4.843
7680	2010	409A6070	1250	4.797	409A6236	1250	5.076
7776	2530	409A6071	1250	4.564	409A6237	1250	4.843
8000	2100	409A6072	1250	4.797	409A6238	1250	5.076
9216	2390	409A6073	1250	4.797	409A6239	1250	5.076
9600	2520	409A6074	1250	4.797	409A6240	1250	5.076
10000	2620	409A6075	1250	4.797	409A6241	1250	5.076
11520	3010	409A6076	1250	4.797	409A6242	1250	5.076
12000	3140	409A6077	1250	4.797	409A6243	1250	5.076
12500	3280	409A6078	1250	4.797	409A6244	1250	5.076
13824	3620	409A6079	1250	4.797	409A6245	1250	5.076
14400	3780	409A6080	1250	4.797	409A6246	1250	5.076
15000	3940	409A6081	1250	4.797	409A6247	1250	5.076
15625	4100	409A6082	1250	4.797	409A6248	1250	5.076
17280	4520	409A6083	1250	4.797	409A6249	1250	5.076
18000	4710	409A6084	1250	4.797	409A6250	1250	5.076
18750	4910	409A6085	1250	4.797	409A6251	1250	5.076
20736	5430	409A6086	1250	4.797	409A6252	1250	5.076
21600	5660	409A6087	1250	4.797	409A6253	1250	5.076
22500	5900	409A6088	1250	4.797	409A6254	1250	5.076
25920	6790	409A6089	1250	4.797	409A6255	1250	5.076
27000	7070	409A6090	1250	4.797	409A6256	1250	5.076
31104	8150	409A6091	1250	4.797	409A6257	1250	5.076
32400	8500	409A6092	1250	4.797	409A6258	1250	5.076
38880	10200	409A6093	1250	4.797	409A6259	1250	5.076
46656	12200	409A6094	1250	4.797	409A6260	1250	5.076

BASIC MOTOR DATA (more data in Bn. E-2410)

409A6012-6094 (Short Stack Motors)

Arm. Dash #	Voltage (v.d.c.)	Speed ±800 No Load (rpm)	Current No Load (max amps)	Rated Torque (oz. in.)**	Current at Rated Torque (max. amps)
-1	6	4800	.6	3.0	3.0
-2	12	5200	.35	3.5	1.6
-3	24	5400	.2	4.0	1.0

409A6178-6260 (Long Stack Motors)

Arm. Dash #	Voltage (v.d.c.)	Speed ±800 No Load (rpm)	Current No Load (max amps)	Rated Torque (oz. in.)**	Current at Rated Torque (max. amps)
-1	6	5500	.75	4.0	4.0
-2	12	5500	.4	4.5	2.2
-3	24	5500	.25	5.0	1.2

** Maximum continuous rated torque values are based upon motor temperature rise considerations. Starting or impact loads greater than ten times the torque multiplier (or 1500 oz. in.) could result in gear or shaft damage. Maximum gear life will occur at loads of 3.5 x torque multiplier or less.

MOTOR DIVISION, TRW ELECTRONIC COMPONENTS GROUP, 2275 STANLEY AVE., DAYTON, OH 45404, (513) 228-3171 • RT. 6, Box M-30A, DOTHAN, AL 36303, (205) 983-3542

D.C. 2.6″ Dia. Permanent Magnet Motors

Type IM-26

Type IM-26 d.c. motors offer high efficiency and cool operation. Perfect for demanding industrial applications such as computer peripherals and machine tools. Various torque constants available up to 32 oz. in./amp.

Special order options:

- EMI filters.
- Stainless steel shafts.
- Optical tachometers.
- Different voltages, performance or length.
- (4) pole option.
- plastic brush holder.

Specifications

rated voltage: 12 to 115 v.d.c.

weight: 4.5 lb. max.

inertia: See table.

shaft: Hardened high carbon steel. Variations available: length, flats, pinions, gears.

magnets: Ceramic. These tolerate high pulse currents without demagnetizing. (2) pole construction

bearings: Pre-loaded ball bearings.

cover: Corrosion-resistant steel housing.

end bell: Die cast metal.

mounting: Standard mounting is by tapped holes in motor face.

brush holder: Cartridge replaceable style.

terminals: Tab terminals mate with AMP Faston 187 series receptacles. Leads optional.

life: 1,000 hours minimum nominal continuous duty at rated voltage.

winding temperature rise: 6.25°C/watt, measured when mounted to 8″ x 8″ x ¼″ aluminum plate. Multiply by 1.4 when mounted to heat insulator.

maximum winding temperature: 130°C.

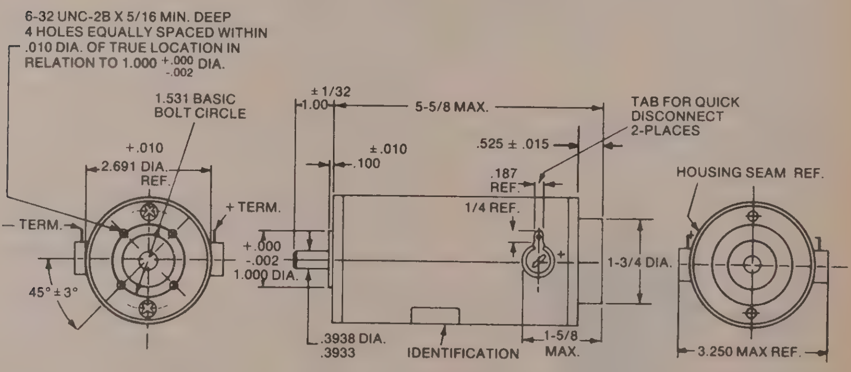
electrical time constant: 3 to 5 milliseconds. Nominal.

mechanical time constant: 25 milliseconds. Nominal.

When You Order

*** * Part Number.** Units shown above are standard and may be ordered by part number. Consult TRW Motors for variations in mechanical or electrical performance to suit specific applications.

Dimensions


6-32 UNC-2B X 5/16 MIN. DEEP
4 HOLES EQUALLY SPACED WITHIN
.010 DIA. OF TRUE LOCATION IN
RELATION TO 1.000 +.000 -.002 DIA.
1.531 BASIC
BOLT CIRCLE
+.010
2.691 DIA.
REF.
+ TERM.
— TERM.
45° ± 3°
± 1/32
1.00
5-5/8 MAX.
±.010
.100
+.000
-.002
1.000 DIA.
.3938 DIA.
.3933
IDENTIFICATION
.525 ± .015
.187
REF.
1/4 REF.
1-5/8
MAX.
TAB FOR QUICK
DISCONNECT
2-PLACES
1-3/4 DIA.
HOUSING SEAM REF.
3.250 MAX REF.

When + terminal is positive and — terminal is negative, rotation is CCW viewing shaft end. Bi-directional operation permissable.

Note: Please consult TRW Motors on the details of your motion requirements prior to preparing spec control prints.

tandard Part Numbers and Data*

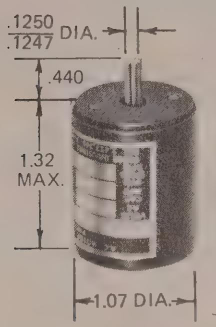
VOLTAGE (VDC)	SPEED +10% NO LOAD (RPM)	CURRENT NO LOAD (MAX AMPS)	RATED TORQUE (OZ. IN.)	CURRENT AT RATED TORQUE (MAX AMPS)	SPEED AT RATED TORQUE +10% (RPM)	INERTIA X 10-4 (OZ. IN. SEC.²)	TORQUE CONSTANT (OZ. IN/AMP)	RESISTANCE +15% (OHMS)	PART NUMBER * *
30	1200	.22	35	1.37	900	141.5	32	6.51	413A6001-1
24	1425	.32	43	2.40	1190	141.5	22	2.01	413A6001-2
24	3525	.77	18	2.80	3425	141.5	9.1	.32	413A6001-3
12	2875	1.26	29	6.67	2725	141.5	5.6	.12	413A6001-4
24	2200	0.55	30	2.8	2000	141.5	14	0.8	413A6001-5
115	3300	0.2	20	0.8	3100	141.5	44	7.8	413A6001-6
115	2200	0.15	40	0.8	1800	141.5	67	19	413A6001-7
115	1300	0.10	45	0.8	1000	141.5	108	50	413A6001-8

dditional windings for different voltages and speeds are available. Contact your TRW distributor or the factory for further details.

OTOR DIVISION, TRW ELECTRONIC COMPONENTS GROUP, 2275 STANLEY AVE., DAYTON, OH 45404, (513) 228-3171 • RT. 6, Box M-30A, DOTHAN, AL 36303, (205) 983-3542

A.C. 1″ Dia. Hysteresis Synchronous and Induction Planetary Gearmotors

Type SC Basic Motor



Type SC a.c. motors are available in many variations. Motors are wound a) three-phase, two or four pole or b) single-phase, two, four, or six pole. Type SC motors are designed to meet the requirements of MIL-M-7969.

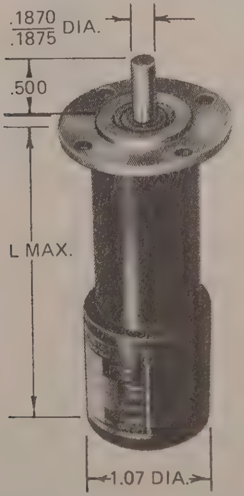
Hysteresis Synchronous — Standard Part Numbers and Data

Voltage (vac)	Freq. (Hz)	Poles	Phase	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd) (wvac)	Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part. No.
27	400	2	1		Black	1.50 100	24,000	.16	.16	11	11	53A1000-2
27	400	2	3		Black	Not Req'd	24,000	.13	.13	11	11	53A1001-2
27	400	4	1		Green	1.50 100	12,000	.16	.16	12	12	53A1002-2
27	400	4	3		Green	Not Req'd	12,000	.20	.20	11	11	53A1003-2
27	400	6	1	White	Gray	1.50 100	8,000	.10	.10	12	12	53A111-2
115	400	2	1		Black	0.068 300	24,000	.16	.16	11	11	53A1005-2
115	400	2	3		Black	Not Req'd	24,000	.13	.13	11	11	53A1006-2
115	400	4	1		Green	0.068 300	12,000	.16	.16	12	12	53A1007-2
115	400	4	3		Green	Not Req'd	12,000	.20	.20	11	11	53A1008-2
115	400	6	1	Black	Gray	0.22 300	8,000	.10	.10	15	15	53A107-2
115	60	2	1	White		2.00 200	3,600	.07	.07	8	8	53A118-2
115	60	4	1	Red		2.00 200	1,800	.07	.07	12	12	53A338-2
115	60	6	1	Black		2.50 200	1,200	.05	.04	9	9	53A117-2
200	400	2	3		Black	Not Req'd	24,000	.13	.13	11	11	53A1010-2
200	400	4	3		Green	Not Req'd	12,000	.20	.20	11	11	53A1011-2

Induction — Standard Part Numbers and Data

Voltage (vac)	Freq. (Hz)	Poles	Phase	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd) (wvac)	Sync. Speed (rpm)	Max. Rated Load @ Sync. Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part. No.
27	400	2	1		Black	1.25 100	21,000	.20	.20	9	12	53A1000-1
27	400	2	3		Black	Not Req'd	21,000	.30	.30	7	13	53A1001-1
27	400	4	1		Green	1.50 100	10,000	.25	.25	13	13	53A1002-1
27	400	4	3		Green	Not Req'd	10,000	.30	.30	11	13	53A1003-1
27	400	6	1	White	Gray	1.50 100	6,000	.20	.20	10	12	53A111-1
115	400	2	1		Black	0.100 300	21,000	.20	.20	9	12	53A1005-1
115	400	2	3		Black	Not Req'd	21,000	.30	.30	7	13	53A1006-1
115	400	4	1		Green	0.068 300	10,000	.25	.25	13	13	53A1007-1
115	400	4	3		Green	Not Req'd	10,000	.30	.30	11	13	53A1008-1
115	400	6	1	Black	Gray	0.22 300	6,000	.12	.12	14	14	53A107-1
115	60	2	1	White		2.00 200	2,500	.10	.10	8	8	53A118-1
115	60	4	1	Red		2.00 200	1,000	.05	.05	12	12	53A338-1
115	60	6	1	Black		2.50 200	500	.05	.05	11	11	53A117-1
200	400	2	3		Black	Not Req'd	21,000	.30	.30	7	13	53A1010-1
200	400	4	3		Green	Not Req'd	10,000	.30	.30	11	13	53A1011-1

Type SC Planetary Gearmotors



This extremely small size and lightweight gearmotor consists of a Type SC a.c. motor and a precision planetary geartrain. The combination provides smooth, dependable performance and maximum output torque in the smallest possible space.

Type SC gearmotors are designed to meet MIL-M-7969.

Hysteresis Synchronous — Standard Part Numbers and Data

Voltage (vac)	Freq. (Hz)	Poles	Phase	Lead Color B	Lead Color C	Lead Color Var.	Phasing Capacitor (mfd) (wvac)	Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Min. Pull Up Torque (oz. in).	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part No.*
27	400	2	1			Blk	1.25 100	24,000	.16	.16	11	11	59A1002
27	400	2	3			Blk	Not Req'd	24,000	.13	.13	11	11	59A1004
27	400	4	1			Grn	1.5 100	12,000	.16	.16	12	12	59A1006
27	400	4	3			Grn	Not Req'd	12,000	.20	.20	11	11	59A1008
115	400	2	1			Blk	0.068 300	24,000	.16	.16	11	11	59A1012
115	400	2	3			Blk	Not Req'd	24,000	.13	.13	11	11	59A1014
115	400	4	1			Grn	0.068 300	12,000	.16	.16	12	12	59A1016
115	400	4	3			Grn	Not Req'd	12,000	.20	.20	11	11	59A1018
115	400	6	1	Blk	Gry		0.22 300	8,000	.10	.10	15	15	59A109
200	400	2	3			Blk	Not Req'd	24,000	.13	.13	11	11	59A1022
200	400	4	3			Grn	Not Req'd	12,000	.20	.20	11	11	59A1024
115	60	2	1		White		2.00 200	3,600	.07	.07	8	8	59A113
115	60	6	1		Blk		2.50 200	1,200	.05	.05	9	9	59A112

Induction — Standard Part Numbers and Data

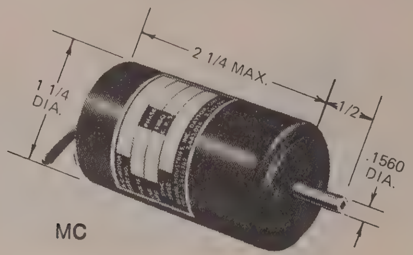
Voltage (vac)	Freq. (Hz)	Poles	Phase	Lead Color B	Lead Color C	Lead Color Var.	Phasing Capacitor (mfd) (wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque (oz. in).	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part No.*
27	400	2	1			Blk	1.50 100	21,000	.20	.20	9	12	59A1001
27	400	2	3			Blk	Not Req'd	21,000	.30	.30	7	13	59A1003
27	400	4	1			Grn	1.5 100	10,000	.25	.25	13	13	59A1005
27	400	4	3			Grn	Not Req'd	10,000	.30	.30	11	13	59A1007
115	400	2	1			Blk	0.10 300	21,000	.20	.20	9	12	59A1011
115	400	2	3			Blk	Not Req'd	21,000	.30	.30	7	13	59A1013
115	400	4	1			Grn	0.068 300	10,000	.25	.25	13	13	59A1015
115	400	4	3			Grn	Not Req'd	10,000	.30	.30	11	13	59A1017
115	400	6	1	Blk	Gry		0.22 300	6,000	.12	.12	14	14	59A110
200	400	2	3			Blk	Not Req'd	21,000	.30	.30	7	13	59A1021
200	400	4	3			Grn	Not Req'd	10,000	.30	.30	11	13	59A1023

***How to Order**

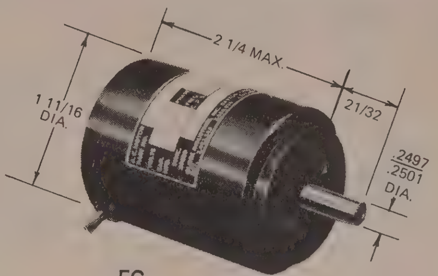
To specify gearmotors, select the standard part number prefix from the standard part number and data table, plus the speed reduction ratios from the Type SS Planetary Gearmotor chart. Request Bulletin B-1732 for complete details.

A.C. 1-1/4″ & 1-11/16″ Dia. Hysteresis Synchronous and Induction Motors

TRW



MC



FC

Type MC Basic Motor

Type MC motors are designed to meet the requirements of MIL-M-7969.

Hysteresis Synchronous — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color	Phasing Capacitor (mfd)	Phasing Capacitor (w.v.a.c.)	Sync Speed (rpm)	Max. Rated Load @ Sync Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Normal Rated Load	Part No. Tapped Hole Mount
115	60	2	1	White	1.00	200	3,600	.70	.50	12	12	18A108
115	60	4	1	Black	1.00	200	1,800	.65	.50	12	12	18A107
115	60	6	1	Yellow	1.00	200	1,200	.50	.40	12	12	18A437
115	400	2	1	Black	0.18	350	24,000	.80	.55	23	33	18A1003-2
115	400	2	3	Black	Not Required		24,000	.80	.80	20	30	18A1004-2
115	400	4	1	Green	0.082	500	12,000	.65	.45	17	20	18A1005-2
115	400	4	3	Green	Not Required		12,000	.85	.85	16	21	18A1006-2
115	400	6	1	Gray	0.15	400	8,000	.45	.25	16	18	18A250
200	400	2	3	Black	Not Required		24,000	.80	.80	20	30	18A1008-2
200	400	4	3	Green	Not Required		12,000	.75	.75	14	18	18A1009-2

nduction — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color	Phasing Capacitor (mfd)	Phasing Capacitor (w.v.a.c.)	Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part No. Tapped Hole Mount
115	400	2	1	Black	0.18	350	21,000	1.0	.8	16	32	18A1003-1
115	400	2	3	Black	Not Required		22,000	1.5	1.5	16	40	18A1004-1
115	400	4	1	Green	0.082	500	10,000	1.0	1.0	17	28	18A1005-1
115	400	4	3	Green	Not Required		10,500	1.5	1.5	14	28	18A1006-1
200	400	2	3	Black	Not Required		22,000	1.5	1.5	16	40	18A1008-1
200	400	4	3	Green	Not Required		10,500	1.5	1.5	14	28	18A1009-1

Type FC Basic Motor

Type FC motors are available with a wide variety of performance characteristics and are designed to meet the characteristics of MIL-M-7969.

Hysteresis Synchronous — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (w.v.a.c.)	Sync Speed (rpm)	Max. Rated Load @ Sync Speed (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part No. Tapped Hole Mount
115	60	2	1	White	Yellow	3.0	200	3,600	1.0	1.0	20	20	75A121-2
115	60	4	1	White	Green	2.0	200	1,800	1.0	1.0	11	12	75A120-2
115	60	6	1	White	Gray	1.5	200	1,200	0.8	0.8	20	20	75A119-2
115	400	2	1		Black.	0.22	400	24,000	1.0	1.0	28	40	75A1003-2
115	400	2	3		Black.	Not Required		24,000	1.0	1.0	23	37	75A1004-2
115	400	4	1		Green	0.12	500	12,000	1.0	1.0	19	24	75A1005-2
115	400	4	3		Green	Not Required		12,000	1.2	1.2	21	26	75A1006-2
115	400	6	1	Black	Gray	1.3	200	8,000	0.8	0.8	35	45	75A107-2
200	400	2	3		Black	Not Required		24,000	1.0	1.0	24	38	75A1008-2
200	400	4	3		Green	Not Required		12,000	1.2	1.2	21	28	75A1009-2

nduction — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color B	Variable Lead Color C	Phasing Capacitor (mfd)	Phasing Capacitor (w.v.a.c.)	Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque (oz. in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part No. Tapped Hole Mount
115	60	2	1	White	Yellow	3.0	200	3,000	1.4	1.4	18	20	75A121-1
115	60	4	1	White	Green	2.0	200	1,300	1.0	1.0	11	12	75A120-1
115	60	6	1	White	Gray	1.5	200	600	1.0	1.0	15	17	75A119-1
115	400	2	1		Black	0.22	400	21,500	1.5	0.8	19	50	75A1003-1
115	400	2	3		Black	Not Required		22,500	2.5	2.5	10	65	75A1004-1
115	400	4	1		Green	0.12	500	10,000	1.5	1.5	15	31	75A1005-1
115	400	4	3		Green	Not Required		11,000	2.5	2.5	12	40	75A1006-1
200	400	2	3		Black	Not Required		22,500	2.5	2.5	10	65	75A1008-1
200	400	4	3		Green	Not Required		11,000	2.5	2.5	12	40	75A1009-1

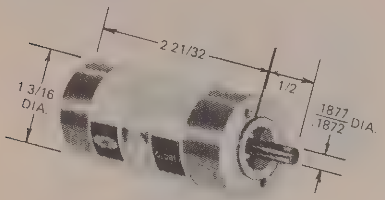
How to Order

The complete motor part number con-
ists of the standard part number shown
or gearmotors. See the following pages.

A.C. 1-3/16″ & 1-1/4″ Dia. Hysteresis Synchronous & Induction Planetary Gearmotors

TRW

Type CMC Basic Motor



Type CMC motors are designed to meet requirements for extremely compact high-performance synchronous motors in high-quality industrial/commercial products. They are ideally suited to such applications as dictating machines, recorders, business machines, industrial timers, tools, and controls.

Thermosetting plastic encapsulation provides protection against shock and vibration and is impermeable to dirt and moisture.

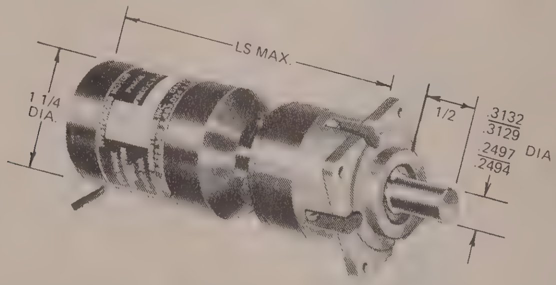
Induction versions and units for operation at other voltages and frequencies can be provided. Single phase operation requires a phasing capacitor (not furnished by TRW).

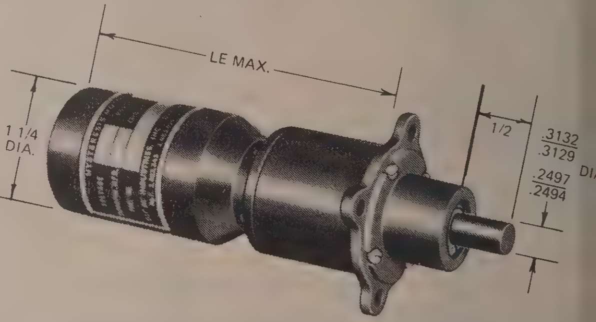
Standard Part Numbers and Data

Voltage, (v.a.c.)	Frequency (Hz)	Phase	Speed (rpm)	Torque		Current max. (amps)	Power Input max. (watts)	Capacitor		Standard* Part No.
				max. start (oz. in.)	max sync. (oz. in.)			(mfd)	(w.v.d.c.)	
115	60	1	3,600	.70	.70	.12	11	1.2	400	144A110-2
115	60	1	1,800	.75	.75	.12	10	1.2	400	144A110-4

Type MC Planetary Gearmotors

These small, lightweight gearmotors consist of Globe Type MC hysteresis synchronous or induction motors and a precision planetary geartrain. Type MC planetary gearmotors are designed to meet all applicable MIL-specs including high and low temperature and complete environmental protection requirements.





Hysteresis Synchronous — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color	Phasing Capacitor (mfd)	(wvac)	Motor Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts)		Standard Part Number Prefix*					
												Even Ratio		Odd Ratio			
										No Load	Normal Rated Load	eared flange	square flange	square flange		square flange	
												¼″ shaft	¼″ shaft	¼″ shaft	5/16″ shaft	¼″ shaft	5/16″ shaft
115	60	2	1	White	1.00	200	3,600	.70	.50	12	12	33A603	33A613	33A648	33A513	33A643	33A638
115	60	4	1	Black	1.00	200	1,800	.65	.50	12	12	33A604	33A614	33A649	33A514	33A644	33A639
115	60	6	1	Yellow	1.00	200	1,200	.65	.40	12	12	33A1214	33A1215	33A1217	33A1216	33A1219	33A1218
115	400	6	1	Gray	0.15	400	8,000	.45	.25	16	18	33A1208	33A1209	33A1211	33A1210	33A1213	33A1212

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color	Phasing Capacitor (mfd)	(wvac)	Motor Sync. Speed (rpm)	Normal Rated Load @ Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts)		Standard Part No. Prefix*			
												All Ratios			
										No Load	Normal Rated Load	eared flange		square flange	
												¼″ shaft	5/16″ shaft	¼″ shaft	5/16″ shaft
115	400	2	1	Black	.18	350	24,000	.80	.55	23	33	33A2008	33A2108	33A2208	33A2308
115	400	2	3	Black	Not Req'd		24,000	.80	.80	20	30	33A2010	33A2110	33A2210	33A2310
115	400	4	1	Green	0.082	500	12,000	.65	.45	17	20	33A2012	33A2112	33A2212	33A2312
115	400	4	3	Green	Not Req'd		12,000	.85	.85	16	21	33A2014	33A2114	33A2214	33A2314
200	400	2	3	Black	Not Req'd		24,000	.80	.80	20	30	33A2018	33A2118	33A2218	33A2318
200	400	4	3	Green	Not Req'd		12,000	.75	.75	14	18	33A2020	33A2120	33A2220	33A2320

Induction — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Variable Lead Color	Phasing Capacitor (mfd)	(wvac)	Motor Min. Speed @ Rated Load (rpm)	Normal Rated Load (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max. Power (watts)		Standard Part Number Prefix*			
												All Ratios			
										No Load	Normal Rated Load	eared flange		square flange	
												¼″ shaft	5/16″ shaft	¼″ shaft	5/16″ shaft
115	400	2	1	Black	.18	350	21,000	1.0	0.8	16	32	33A2007	33A2107	33A2207	33A2307
115	400	2	3	Black	Not Req'd		22,000	1.5	1.5	16	40	33A2009	33A2109	33A2209	33A2309
115	400	4	1	Green	0.082	500	10,000	1.0	1.0	17	28	33A2011	33A2111	33A2211	33A2311
115	400	4	3	Green	Not Req'd		10,500	1.5	1.5	14	28	33A2013	33A2113	33A2213	33A2313
200	400	2	3	Black	Not Req'd		22,000	1.5	1.5	16	40	33A2017	33A2117	33A2217	33A2317
200	400	4	3	Green	Not Req'd		10,500	1.5	1.5	14	28	33A2019	33A2119	33A2219	33A2319

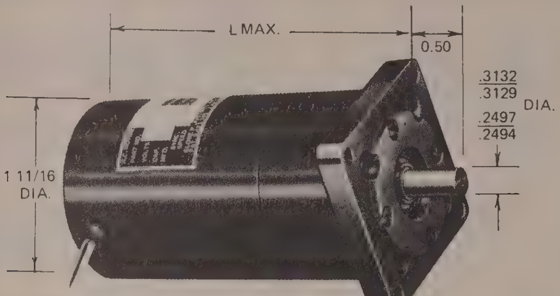
***How to Order**

To specify gearmotors, select the standard part number prefix from the data table, plus the even speed reduction ratio or the odd speed reduction ratio from the following page.

A.C. 1-11/16″ Dia. Hysteresis Synchronous and Induction Planetary Gearmotors

TRW

Type FC



Type FC planetary gearmotors offer 83 even and 18 odd ratios ranging from 4:1 to 46,656:1. Special geartrains are available with ratios up to 17,000,000:1.

Hysteresis Synchronous — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Lead Color		Phasing Capacitor		Motor Sync. Speed (rpm)	Normal Rated Load Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in)	Max Power (watts)		Standard Part No. Prefix*		
													Odd Ratio		Even Ratio
				B	C	(mfd)	(wvac)				No Load	Normal Rated Load	¼″ shaft	5/16″ shaft	¼″ shaft
115	60	2	1	White	Yellow	3.0	200	3,600	1.0	1.0	20	20	83A510	83A116	83A138
115	60	4	1	White	Green	2.0	200	1,800	1.0	1.0	11	12	83A509	83A115	83A137
115	60	6	1	White	Gray	1.5	200	1,200	.8	.8	20	20	83A508	83A114	83A136
115	400	6	1	Black	Gray	1.3	200	8,000	.8	.8	35	45	83A113	83A108	83A122

Voltage	Frequency (Hz)	Poles	Phase	Lead Color			Phasing Capacitor		Motor Sync. Speed (rpm)	Normal Rated Load Sync. Speed (oz. in.)	Motor Min. Pull Up Torque (oz. in.)	Max Power (watts)		Standard Part No. Prefix*	
														All Ratios	
				B	C	D	(mfd)	(wvac)				No Load	Normal Rated Load	¼″ shaft	5/16″ shaft
115	400	2	1		Black		0.22	400	24,000	1.0	1.0	28	40	83A1008	83A1108
115	400	2	3		Black		Not Required		24,000	1.0	1.0	23	37	83A1010	83A1110
115	400	4	1		Green		0.12	500	12,000	1.0	1.0	19	24	83A1012	83A1112
115	400	4	3		Green		Not Required		12,000	1.2	1.2	21	26	83A1014	83A1114
200	400	2	3		Black		Not Required		24,000	1.0	1.0	24	38	83A1018	83A1118
200	400	4	3		Green		Not Required		12,000	1.2	1.2	21	28	83A1020	83A1120

Induction — Standard Part Numbers and Data

Voltage	Frequency (Hz)	Poles	Phase	Lead Color			Phasing Capacitor		Motor Min. Speed @ Rated Load (rpm)	Rated Load (oz. in.)	Min. Pull Up Torque (oz. in.)	Max Power (watts)		Standard Part No. Prefix*	
														All Ratios	
				B	C	D	(mfd)	(wvac)				No Load	Normal Rated Load	¼″ shaft	5/16″ shaft
115	400	2	1		Black		0.22	400	21,500	1.5	.8	19	50	83A1007	83A1107
115	400	2	3		Black		Not Required		22,500	2.5	2.5	10	65	83A1009	83A1109
115	400	4	1		Green		0.12	500	10,000	1.5	1.5	15	31	83A1011	83A1111
115	400	4	3		Green		Not Required		11,000	2.5	2.5	12	40	83A1013	83A1113
200	400	2	3		Black		Not Required		22,500	2.5	2.5	10	65	83A1017	83A1117
200	400	4	3		Green		Not Required		11,000	2.5	2.5	12	40	83A1019	83A1119

Dimensions — Even Ratios

Speed Reduction Ratio	Dimension		Dim. "L"	Speed Reduction Ratio	Dimension		Dim. "L"
	LE	LS			LE	LS	
4:1	2.87	3.28	3.190	720:1	3.28	3.68	3.594
5:1	2.87	3.28	3.190	750:1	3.28	3.68	3.594
6:1	2.87	3.28	3.190	864:1	3.28	3.68	3.594
16:1	2.87	3.28	3.190	900:1	3.28	3.68	3.594
20:1	2.87	3.28	3.190	1,024:1	3.65	4.06	3.964
24:1	2.87	3.28	3.190	1,080:1	3.28	3.68	3.594
25:1	2.87	3.28	3.190	1,280:1	3.65	4.06	3.964
30:1	2.87	3.28	3.190	1,296:1	3.28	3.68	3.594
36:1	2.87	3.28	3.190	1,536:1	3.65	4.06	3.964
64:1	3.02	3.42	3.325	1,600:1	3.65	4.06	3.964
80:1	3.02	3.42	3.325	1,920:1	3.65	4.06	3.964
96:1	3.02	3.42	3.325	2,000:1	3.65	4.06	3.964
100:1	3.02	3.42	3.325	2,304:1	3.65	4.06	3.964
120:1	3.02	3.42	3.325	2,400:1	3.65	4.06	3.964
125:1	3.02	3.42	3.325	2,500:1	3.65	4.06	3.964
144:1	3.02	3.42	3.325	2,880:1	3.65	4.06	3.964
150:1	3.02	3.42	3.325	3,000:1	3.65	4.06	3.964
180:1	3.02	3.42	3.325	3,125:1	3.65	4.06	3.964
216:1	3.02	3.42	3.325	3,456:1	3.65	4.06	3.964
256:1	3.28	3.68	3.594	3,600:1	3.65	4.06	3.964
320:1	3.28	3.68	3.594	3,750:1	3.65	4.06	3.964
384:1	3.28	3.68	3.594	4,096:1	3.78	4.18	4.099
400:1	3.28	3.68	3.594	4,320:1	3.65	4.06	3.964
480:1	3.28	3.68	3.594	4,500:1	3.65	4.06	3.964
500:1	3.28	3.68	3.594	5,120:1	3.78	4.18	4.090
576:1	3.28	3.68	3.594	5,184:1	3.65	4.06	3.964
600:1	3.28	3.68	3.594	5,400:1	3.65	4.06	3.964
625:1	3.28	3.68	3.594	6,144:1	3.78	4.18	4.099

Dimensions — Odd Ratios

Speed Reduction Ratio	Torque Multiplier	Gear Train Max. Cont. Rating (oz. in.)	Dimension		Dim. "L"
			LE	LS	
4.33:1	3.2	5.4	2.87	3.28	3.190
5.28:1	4	6.8	2.87	3.28	3.190
18.78:1	12	20	2.87	3.28	3.190
27.94:1	17	29	2.87	3.28	3.190
81.37:1	41	70	3.02	3.42	3.325
121.1:1	62	105	3.02	3.42	3.325
147.7:1	75	128	3.02	3.42	3.325
352.6:1	145	247	3.28	3.68	3.594
524.6:1	215	366	3.28	3.68	3.594
639.9:1	262	445	3.28	3.68	3.594
780.6:1	320	544	3.28	3.68	3.594
1,528:1	500	850‡	3.66	4.06	3.964
2,273:1	740	1250‡	3.66	4.06	3.964
3,382:1	1100	1250‡	3.66	4.06	3.964
4,126:1	1350	1250‡	3.66	4.06	3.964
6,621:1	1730	1250‡	3.78	4.18	4.099
9,851:1	2580	1250‡	3.78	4.18	4.099
12,016:1	3150	1250‡	3.78	4.18	4.099
17,879:1	4700	1250‡	3.78	4.18	4.099
21,808:1	5700	1250‡	3.78	4.18	4.099

‡¼ O.D. shafts are limited to 600 oz. in.

Max. Cont. Torque: The values in this column are based upon geartrain strength and capability for 1000 hrs. minimum life. Max. rated torque of motor selected x torque multiplier ratio must not exceed these values.

Max. Intermittent Torque = 2 x Max. Cont. Torque.

Momentary Stall Torque = 5 x Max. Cont. Torque.

Minimum Efficiency = Torque Multiplier Ratio divided by Speed Reduction Ration x 100.

*How to Order

To specify gearmotors, select the standard part number prefix from the data table, plus the even or odd speed reduction ratio desired. For higher ratios consult factory.

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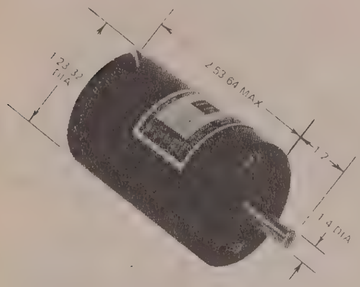
A.C. 1-23/32" Dia. Hysteresis Synchronous and Induction Motors

Type CFC Basic Motor



Type CFC motors are totally enclosed for dirt and moisture resistance, and have life-lubricated bearings. Induction versions, units for operation at other voltages and frequencies, and integral planetary geartrains are available. Single phase operation requires a phasing capacitor (not furnished by TRW).

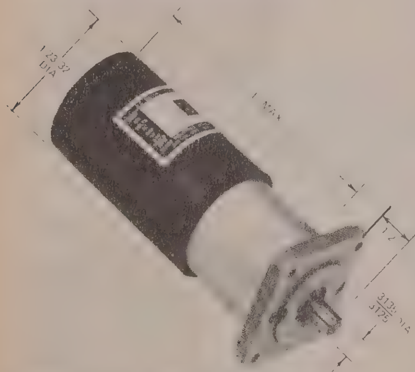
Hysteresis Synchronous — Standard Part Numbers and Data

Voltage (v.a.c.)	Freq. (Hz)	Ph.	Capacitor (mfd)	Capacitor (v.a.c.)	Speed No Load (rpm)	Speed Rated Load (rpm)	Torque Rated Load (oz. in.)	Torque Stall (oz. in.)	Power No Load (watts)	Power Rated Load (watts)	Standard Part No.
115	60	1	1.0	200	3600		1.40	1.80	14	15	138A201-2
115	60	1	1.0	200	1800		2.00	2.25	16	17	138A201-4
115	60	1	1.5	200	1200		1.20	1.50	15	16	138A201-6

Induction — Standard Part Numbers and Data

Voltage (v.a.c.)	Freq. (Hz)	Ph.	Capacitor (mfd)	Capacitor (v.a.c.)	Speed No Load (rpm)	Speed Rated Load (rpm)	Torque Rated Load (oz. in.)	Torque Stall (oz. in.)	Power No Load (watts)	Power Rated Load (watts)	Standard Part No.
115	60	1	1.0	200	3500	3000	1.5	2.5	14	15	138A202-2
115	60	1	3.5	200	1700	1550	.75	3.8	16	17	138A202-4
115	60	1	1.5	200	1000	800	.5	2.0	15	16	138A202-6

Type CFC Planetary Gearmotors Commercial Motors



Type CFC planetary gearmotors are lightweight a.c. commercial/industrial units designed to provide performance and size advantages of military gearmotors in lower cost package. Both hysteresis synchronous and induction versions can be provided with any of 83 standard planetary geartrains with speed reduction ratios from 4:1 to 46,656:1, and torques to 1250 oz. in.

Hysteresis Synchronous — Standard Part Numbers and Data

Voltage (v.a.c.)	Freq. (Hz)	Ph.	Capacitor (mfd)	Capacitor (v.a.c.)	Speed Rated Load (rpm)	Speed No Load (rpm)	Torque Rated Load (oz. in.)	Torque Stall (oz. in.)	Power No Load (watts)	Power Rated Load (watts)	Standard Part No.
115	60	1	1.0	200	3600		1.40	1.80	14	15	230A395
115	60	1	3.5	200	1800		2.00	2.25	16	16	230A396
115	60	1	1.5	200	1200		1.20	1.50	15	16	230A397

Induction — Standard Part Numbers and Data

Voltage (v.a.c.)	Freq. (Hz)	Ph.	Capacitor (mfd)	Capacitor (v.a.c.)	Speed No Load (rpm)	Speed Rated Load (rpm)	Torque Rated Load (oz. in.)	Torque Stall (oz. in.)	Power No Load (watts)	Power Rated Load (watts)	Standard Part No.
115	60	1	1.0	200	3000		1.5	2.5	14	16	230A398
115	60	1	3.5	200	1550		.75	3.8	16	17	230A399
115	60	1	1.5	200	800		.5	2.0	15	16	230A400

Low slip-high torque units available on special request.

Performance Characteristics

Speed Reduction Ratio	Dim "L"	Gearmotor Output Speeds 3,600 rpm Input	Gearmotor Output Speeds 1,800 rpm Input	Gearmotor Output Speeds 1,200 rpm Input
4:1	4.01	900.0	450.0	300.0
5:1	4.01	720.0	360.0	240.0
6:1	4.01	600.0	300.0	200.0
16:1	4.25	225.0	112.5	75.0
20:1	4.25	180.0	90.0	60.0
24:1	4.25	150.0	75.0	50.0
25:1	4.25	144.0	72.0	48.0
30:1	4.25	120.0	60.0	40.0
36:1	4.25	100.0	50.0	33.33
64:1	4.48	56.25	28.12	18.75
80:1	4.48	45.00	22.50	15.00
96:1	4.48	37.50	18.75	12.50
100:1	4.48	36.00	18.00	12.00
120:1	4.48	30.00	15.00	10.00
125:1	4.48	28.80	14.40	9.60
144:1	4.48	25.00	12.50	8.333
150:1	4.48	24.00	12.00	8.000
180:1	4.48	20.00	10.00	6.666
216:1	4.48	16.66	8.333	5.555
256:1	4.68	14.06	7.031	4.687
320:1	4.68	11.25	5.625	3.750
384:1	4.68	9.375	4.687	3.125
400:1	4.68	9.000	4.500	3.000
480:1	4.68	7.500	3.750	2.500
500:1	4.68	7.200	3.600	2.400
576:1	4.68	6.250	3.125	2.083
600:1	4.68	6.000	3.000	2.000
625:1	4.68	5.760	2.880	1.920

Output Torque = Torque Multiplier x Motor Torque.

Torque Multiplier = Reduction Ratio x Efficiency.

Torque Max. Cont. Rating Refers to Max. Cont. Duty Rating of Geartrain.

Speed Reduction Ratio	Dim. "L"	Gearmotor Output Speeds** 3,600 rpm Input	Gearmotor Output Speeds** 1,800 rpm Input	Gearmotor Output Speeds** 1,200 rpm Input
720:1	4.68	5.000	2.500	1.666
750:1	4.68	4.800	2.400	1.600
864:1	4.68	4.166	2.083	1.388
900:1	4.68	4.000	2.000	1.333
1,024:1	4.95	3.515	1.757	1.172
1,080:1	4.68	3.333	1.666	1.111
1,280:1	4.95	2.812	1.406	0.938
1,296:1	4.68	2.777	1.388	0.926
1,536:1	4.95	2.343	1.171	0.781
1,600:1	4.95	2.250	1.125	0.750
1,920:1	4.95	1.875	0.937	0.625
2,000:1	4.95	1.800	0.900	0.600
2,304:1	4.95	1.562	0.781	0.521
2,400:1	4.95	1.500	0.750	0.500
2,500:1	4.95	1.440	0.720	0.480
2,880:1	4.95	1.250	0.625	0.417
3,000:1	4.95	1.200	0.600	0.400
3,125:1	4.95	1.152	0.576	0.384
3,456:1	4.95	1.041	0.520	0.347
3,600:1	4.95	1.000	0.500	0.333
3,750:1	4.95	0.960	0.480	0.320
4,096:1	5.18	0.879	0.439	0.293
4,320:1	4.95	0.833	0.417	0.278
4,500:1	4.95	0.800	0.400	0.267
5,120:1	5.18	0.703	0.352	0.234
5,184:1	4.95	0.694	0.347	0.231
5,400:1	4.95	0.667	0.333	0.222
6,144:1	5.18	0.586	0.293	0.195

Speed Reduction Ratio	Dim. "L"	Gearmotor Output Speeds** 3,600 rpm Input	Gearmotor Output Speeds** 1,800 rpm Input	Gearmotor Output Speeds** 1,200 rpm Input
6,400:1	5.18	0.563	0.281	0.188
6,480:1	4.95	0.556	0.278	0.185
7,680:1	5.18	0.469	0.234	0.156
7,776:1	4.95	0.463	0.231	0.154
8,000:1	5.18	0.450	0.225	0.150
9,216:1	5.18	0.391	0.195	0.130
9,600:1	5.18	0.375	0.182	0.125
10,000:1	5.18	0.360	0.180	0.120
11,520:1	5.18	0.313	0.156	0.104
12,000:1	5.18	0.300	0.150	0.100
12,500:1	5.18	0.288	0.144	0.096
13,824:1	5.18	0.260	0.130	0.087
14,400:1	5.18	0.250	0.125	0.083
15,000:1	5.18	0.240	0.120	0.080
15,625:1	5.18	0.230	0.115	0.077
17,280:1	5.18	0.208	0.104	0.069
18,000:1	5.18	0.200	0.100	0.067
18,750:1	5.18	0.192	0.096	0.064
20,736:1	5.18	0.183	0.087	0.058
21,600:1	5.18	0.167	0.083	0.056
22,500:1	5.18	0.160	0.080	0.053
25,920:1	5.18	0.139	0.069	0.047
27,000:1	5.18	0.133	0.067	0.044
31,104:1	5.18	0.116	0.058	0.039
32,400:1	5.18	0.111	0.056	0.037
38,880:1	5.18	0.093	0.046	0.031
46,656:1	5.18	0.077	0.039	0.026

***How to Order**

To specify gearmotors, select the standard part number prefix from the data table, plus speed reduction ratio desired.

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MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES
TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code **3**•1103
Batteries, Product Selection Guide **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide **2**•1003
Capacitors, Basic Formulas **1A**•1093
Capacitors, Miniglossary **1A**•1069
Capacitors, Product Selection Guide **1A**•1003
Circuit Boards (Printed), Product Selection Guide **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide **1A**•1219
Connectors, Miniglossary **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **1A**•1309
Delay Lines, Product Selection Guide **1A**•1445
Discrete Semiconductors, Product Selection Guide **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide **1B**•1021
EBCDIC Code **3**•1153
Encapsulation, Miniglossary **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **2**•1801
Filters, Product Selection Guide **1A**•1577
Instruments, Graphic Recording, Product Selection Guide **3**•1381
Instruments, Panel Meters, Product Selection Guide **3**•1321
Instruments, Test & Measuring, Product Selection Guide **3**•1182
Interconnection Systems, Product Selection Guide **2**•1873
Keyboards & Keypads, Product Selection Guide **1B**•1759
Microwave Components, Product Selection Guide **1A**•1685
Military Qualified Products Lists **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide **1B**•1121
Opto Semiconductors, Miniglossary **1B**•1218
Oscilloscopes, Product Selection Guide **3**•1361
Panel Hardware, Product Selection Guide **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **1A**•2017
Power Supplies, Miniglossary **3**•1455
Power Supplies, AC, Product Selection Guide **3**•1815
Power Supplies, DC, Product Selection Guide **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **1B**•1255
Relay Contact Forms **1B**•1317
Relays, Electromechanical, Miniglossary **1**•**B**1292
Relays, Product Selection Guide **1B**•1289
Resistor Color Codes **1A**•1791
Resistors, Product Selection Guide **1A**•1789
Servo Components, Miniglossary **3**•1935
Solenoids, Product Selection Guide **1B**•1481
Switches, Product Selection Guide **1B**•1499
Thyristors/High Power Diodes, Miniglossary **1A**•1652
Transducers & Encoders, Product Selection Guide **1B**•1827
Transformers, Product Selection Guide **1A**•2115
Wire & Cable, Product Selection Guide **2**•1935

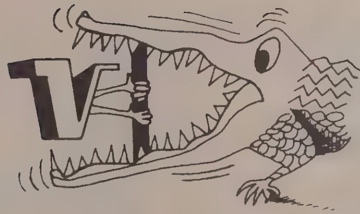
If you want to move it

,

control it,

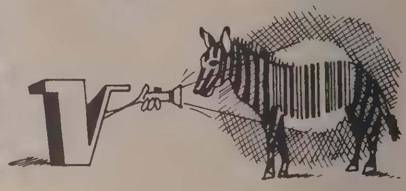
sense it

,



stop it,

or scan it



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That is, if you're looking for instrument motors, optical and contacting shaft angle encoders, rotary and linear potentiometers, potentiometric pressure transducers, industrial precision brakes or clutches, or laser scanning motors, we'll probably have just what you're looking for. Just look on the opposite page. And if you *don't* find what you want, call Vernitech, give us the particulars, and we'll make it for you.

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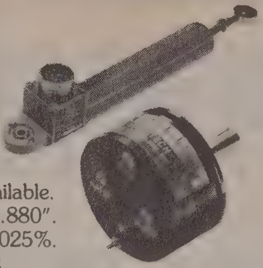
POTENTIOMETERS



employing Vernitech's unique conductive film and precious metal wipers... respond to wiper motions as small as .000005".

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Linear, non-linear, sine/cosine available.
Sizes 0.5", L 0.5" to Dia 5.0", L 1.880".
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to –250KΩ.

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10 to 100 turns available.
Sizes Dia 0.5", L 1.5" to Dia 2.0", L 2.625".
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Electrical stroke lengths 1" to 60".
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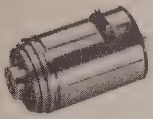
CLUTCHES AND BRAKES



(electromagnetic)

hundreds of models and sizes available from stock.

Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

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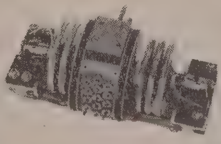

potentiometer type,

featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types. Also available with high overpressure capability.

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Speeds 100 to 48,000 rpm.
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Viscous damped — sizes 8, 10, 11, 15, 18.
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Inertially damped — sizes 8, 11, 15, 18.
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SHAFT ANGLE ENCODERS

featuring precision chrome on glass discs for highest accuracy.

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VOE 05 — Dia. 0.500", 0.820" L. To 256 pulses
VOE 11 — Dia. 1.062", L. 1.80". To 1024 pulses
VOE 015 — Dia. 1.510", L. 0.88". To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500" dia., L. 1.08" 127-256 pulses
VOE 023 — Dia. 2.25", L. 80". To 1250 pulses (modular)
VOE 23 — Dia. 2.250", L. 1.875". To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250" L. 1.875". To 600 pulses
VOE 25 — Dia. 2.500", L. 2.500". To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

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Economy Series VSD/VRD. Precision Series VSDH/VRDH Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

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VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8" red LED display. Display accuracy ±6' arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output.
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VERNITRON CONTROL COMPONENTS

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vernitorq™ BRUSHLESS DC TORQUE MOTORS

VERNITORQ^{TM} BRUSHLESS DC TORQUE MOTORS

Brushless, direct drive, limited rotation motors available in two and four pole configurations, frameless or housed, for precise positioning, actuation and infinite control. Available with Alnico or air stabilized samarium cobalt magnets for ease of handling and assembly. All units are toroidally wound and encapsulated in a high temperature medium through a precision transfer molding process.

Vernitorq motors feature:

- Quick response
- Wide angular excursion
- Hi torque, lo input power
- Infinite resolution
- No slot effect

In addition to the above features, "Vernitorq" motors are friction free, explosion-proof, and offer no electrical or mechanical noise. They are ideally suited for such typical applications as:

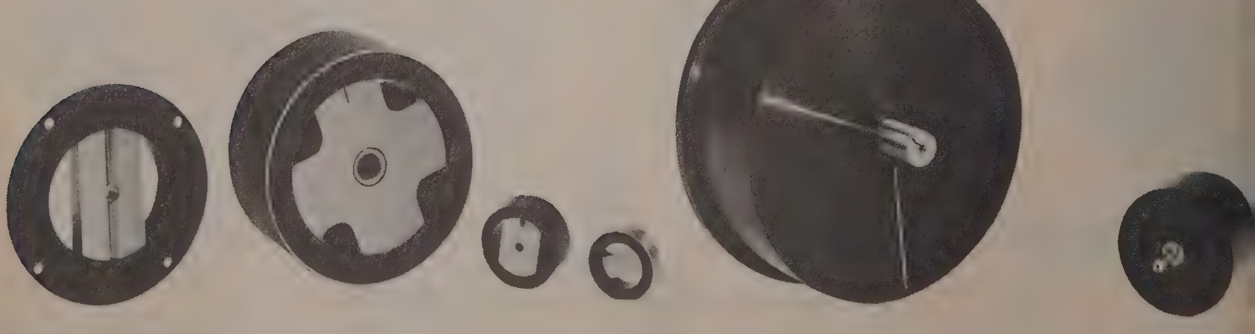
- Mirror positioning in infra-red/thermal imaging systems
- Tension control on hi speed printers
- Missile safe/arm actuation systems
- Disc drive head positioners
- Open/close valve actuators
- Medical scanning equipment
- Camera control mechanisms

"Vernitorq" motors are optimally designed to enhance system performance.

Vernitron Control Components is also a primary source of synchros, resolvers, Torqsyn® Remote Positioners, & electromechanical assemblies and indicator packages.

Vernitron Type Number	Peak Torque (Oz-in)	Power @ Peak Torque (Watts)	Continuous Torque (Oz-in)	Power @ Continuous Torque (Watts)	Input @ Continuous Torque (Volts)
③ VBTM 9-A	3.0	44	0.8	3.5	5.1
VBTM10-A	1.3	21	0.5	2.4	12.0
VBTM10-B	6	128	1.5	8	37.5
VBTM10-D	1.3	17	0.5	2.4	11.5
VBTM10-E	1.3	17	0.3	0.9	5.0
VBTM10-G	6	115	1.4	8.2	6
③ VBTM10-K	1.8	9	1.2	4.0	5.3
① VBTM10-L ③	14.5	500	1.7	6	10
③ VBTM10-M	1.8	9	1.2	4.0	6.7
③ VBTM10-N	1.8	21	0.6	2.4	10
VBTM12-B	4.5	40	0.9	1.5	4
VBTM15-A	5	28	2.8	9	24
VBTM17-B	6.7	70	2.8	12	25
VBTM17-C	18	55	8	11	11.5
VBTM18-A	12	67	4	8	15
VBTM18-B	18	75	8	14	13
VBTM23-B	25	63	7	5	7
③ VBTM23-D	25	76	5	3.1	7.0
③ VBTM23-E	13	20	8.6	9.0	6.0
③ VBTM23-E-1	13.5	19	8.1	7.0	9.0
VBTM23-F	37	71	17.0	15.0	3.2
③ VBTM23-G	37	35	24.0	15.0	12.4
VBTM33-A	80	210	26	22	25
VBTM33-B	55	60	27	14.6	10.8
VBTM34-B	130	278	40	27	16
VBTM34-C	130	327	40	31	6.6
VBTM34-D	83	80	40	18.5	11.4
VBTM34-E-1	250	280	70	30	7.5
VBTM34-F	130	278	40	27	16
VBTM34-H	80	180	60	55	12
VBTM34-J	80	180	45	42	20.8
② VBTM39-A	40	90	30	37	25.7
VBTM40-A	160	136	57	26	18
③ VBTM52-B	708	502	148.0	23.0	10.0

① Check with factory regarding duty cycle ② Flanged O.D. ③ Samarium cobalt uni



VERNITRON CONTROL COMPONENTS

a Division of Vernitron Corporation

1601 Precision Park Lane ▪ San Diego, California 92073 ▪ (619) 428-5581 TWX: 910-322-1862

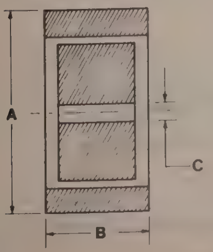
vernitorq™ BRUSHLESS DC TORQUE MOTORS

Torque Sensitivity (Oz-in/amp)	DC Resistance (Ohms)	Angular Excursion (Degrees)	Back EMF (Volt/rad/sec)	Elect Time Constant (msec)	Rotor Inertia (Oz-in-sec²)	Viscous Damping Zero Source Impedance (Oz-in/rad/sec)	DIMENSIONS (Inches) A	B	C	Weight (Oz)	Typical Torque Curve	Vernitron Type Number
1.30	8.3	± 40	0.009	0.10	0.024×10^{-3}	0.144×10^{-2}	0.870	0.700	0.125	1.4	X	③ VBTM 9-A
2.5	60	± 60	0.018	0.3	0.018×10^{-3}	0.075×10^{-2}	1.000	0.350	0.125	0.8	X	VBTM10-A
7.8	175	± 60	0.055	0.4	0.018×10^{-3}	0.25×10^{-2}	1.000	0.700	0.125	1.4	X	VBTM10-B
2.4	56	± 60	0.018	0.3	0.018×10^{-3}	0.075×10^{-2}	0.961	0.350	0.125	0.8	X	VBTM10-D
1.6	25	± 60	0.010	0.4	0.018×10^{-3}	0.064×10^{-2}	0.961	0.350	0.125	0.8	X	VBTM10-E
1.2	4.6	± 35	0.008	0.26	0.052×10^{-3}	0.2×10^{-2}	0.961	0.700	0.125	1.5	Z	VBTM10-G
1.60	7.0	± 40	0.011	0.12	0.079×10^{-3}	0.258×10^{-2}	1.00	0.700	0.125	1.6	X	③ VBTM10-K
2.9	16.7	± 40	0.016	0.13	0.115×10^{-3}	0.277×10^{-2}	1.000	1.000	0.125	2.3	X	① VBTM10-L ③
2.14	11.9	± 40	0.015	0.1	0.079×10^{-3}	0.271×10^{-2}	1.00	0.700	0.125	1.6	X	③ VBTM10-M
2.5	40.0	± 20	0.018	0.3	0.018×10^{-3}	0.11×10^{-2}	1.00	0.350	0.125	0.8	X	③ VBTM10-N
2.25	9.2	± 60	0.017	0.3	0.17×10^{-3}	0.44×10^{-2}	1.178	0.610	0.125	2.2	Z	VBTM12-B
7.5	62	± 25	0.055	0.22	0.37×10^{-3}	0.68×10^{-2}	1.500	0.500	0.125	3	Y	VBTM15-A
5.7	50	± 60	0.040	0.6	0.55×10^{-3}	0.45×10^{-2}	1.631	0.700	0.187	4	X	VBTM17-B
8.4	12.0	± 25	0.059	0.16	0.84×10^{-3}	4.1×10^{-2}	1.634	0.700	0.250	4	Y	VBTM17-C
8	30	± 60	0.060	0.6	0.69×10^{-3}	1.6×10^{-2}	1.717	0.939	0.187	3.9	X	VBTM18-A
7.5	12	± 25	0.053	0.2	0.67×10^{-3}	3.3×10^{-2}	1.717	0.700	0.250	5	Y	VBTM18-B
10	10	± 30	0.070	1.2	1.76×10^{-3}	7×10^{-2}	2.270	0.720	0.250	8	X	VBTM23-B
11.7	16	± 30	0.08	1.85	1.33×10^{-3}	6×10^{-2}	2.27	0.720	0.250	8.0	X	③ VBTM23-D
5.9	4.1	± 45	0.042	1.54	1.33×10^{-3}	6×10^{-2}	2.27	0.720	0.250	8.0	X	③ VBTM23-E
10.8	12.0	± 50	0.076	1.58	1.33×10^{-3}	6.9×10^{-2}	2.27	0.720	0.250	8.0	X	③ VBTM23-E-1
9.0	4.1	± 15	0.063	3.1	1.4×10^{-3}	14×10^{-2}	2.27	0.900	0.250	8.5	Z	VBTM23-F
20.0	10.5	± 13	0.143	1.0	2.5×10^{-3}	27.8×10^{-2}	2.27	0.900	0.250	9.0	Y	③ VBTM23-G
27	24	± 60	0.190	1.8	8×10^{-3}	23×10^{-2}	3.250	1.025	0.376	24	X	VBTM33-A
20	8	± 60	0.150	2	6.2×10^{-3}	37.5×10^{-2}	3.300	0.850	0.250	22	X	VBTM33-B
24	9.5	± 60	0.169	3.2	22×10^{-3}	43×10^{-2}	3.400	1.510	0.250	28.8	X	VBTM34-B
8.5	1.4	± 60	0.062	1.1	22×10^{-3}	37.6×10^{-2}	3.400	1.510	0.250	38	X	VBTM34-C
24.6	7	± 25	0.174	1	13×10^{-3}	62×10^{-2}	3.375	0.725	0.375	16	Y	VBTM34-D
17	1.3	± 15	0.120	0.9	40×10^{-3}	160×10^{-2}	3.400	1.510	0.375	42	Y	VBTM34-E-1
24	9.5	± 60	0.169	3.2	22×10^{-3}	43×10^{-2}	3.400	1.510	0.315	28.8	X	VBTM34-F
13	2.6	± 30	0.093	3	8.4×10^{-3}	47×10^{-2}	3.400	1.125	0.472	21.5	X	VBTM34-H
22.5	10.4	± 60	0.158	2	8.4×10^{-3}	34×10^{-2}	3.375	1.125	0.627	25	X	VBTM34-J
21	18	± 40	0.150	3	5.6×10^{-3}	18×10^{-2}	3.812	0.630	0.250	14	X	② VBTM39-A
40	9	± 10	0.282	1.08	44×10^{-3}	125×10^{-2}	4.000	0.850	0.875	30.9	Y	VBTM40-A
67.0	4.5	± 25	0.473	7.0	120×10^{-3}	704×10^{-2}	5.25	1.70	0.700	88.0	Y	③ VBTM52-B

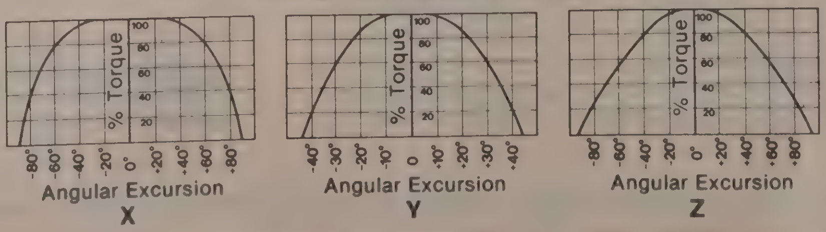
BRUSHLESS DC TACHOMETERS

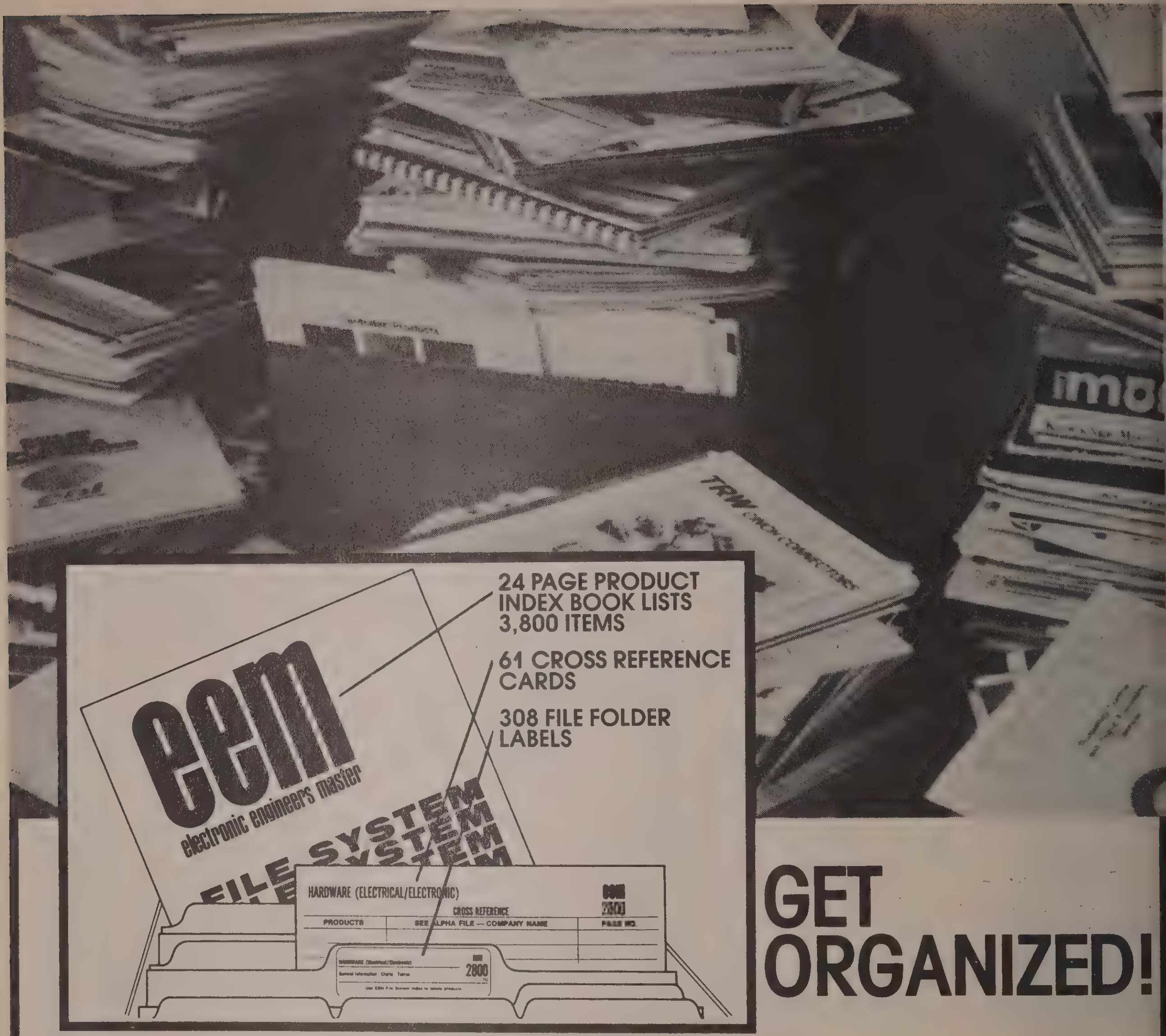
VERNITRON TYPE NUMBER	OUTPUT SENSITIVITY (Volts/rad/sec)	DC RESISTANCE (Ohms)	ANGULAR EXCURSION (Degrees)	ROTOR INERTIA (Oz – in – sec²)	DIMENSIONS (Inches) A	B	C	WEIGHT (Oz)
VBTG-17-A	0.39	980	± 25	0.67×10^{-3}	1.634	0.700	0.250	4 max
VBTG-23-A	0.40	340	± 25	1.76×10^{-3}	2.270	0.720	0.250	8 max
① VBTG-32-A	0.50	2500	± 50	2.2×10^{-3}	3.125	0.500	0.250	6 max
VBTG-15-A1	0.028 cos θ	45	± 65	0.08×10^{-3}	1.500	0.750	0.1875	3.7 max

① Flanged O D



TYPICAL PERFORMANCE CURVES

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PHOTOSENSORS • PHOTODIODES

LOW NOISE, RED-ENHANCED, SILICON PLANAR DIFFUSED PHOTODIODES

From the world leader in Photodiodes, the PH Series. Designed for optimized performance in the red region of the spectrum. Provide linear response over 7 decades of incident power range. In 5 standard sizes. Hermetic packaging in TO cans.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J @ 0 Volts nf	Typ RC Rise Time 10-90% (ns) 50 ohm load @ −10V	Spectral Response
11PH18M	TO18	.0094	.5	2.0	100	80	1000	400	.10	11.0	Curve III†
22PH18M	TO18	.0230	1.0	4.0	50	40	400	200	.23	30.0	Curve III†
33PH05M	TO5	.0510	2.0	8.0	20	15	175	100	.48	55.0	Curve III†
44PH05M	TO5	.1700	5.0	10.0	10	8	60	30	1.60	175.0	Curve III†
68PH08M	TO8	.5400	50.0	100.0	7	5	20	10	4.20	460.0	Curve III†

FAST RESPONSE SILICON PLANAR DIFFUSED PHOTODIODES

Designed for fast risetime applications, the PS Series provide optimized response with linearity over a wide incident power range. Applications include photovoltaic and photoconductive use as in fiber optics, optical encoders, process control, photocopiers and flash detection. Call ASEC for special requirements. All PS Series are supplied in hermetically sealed TO packages for maximum reliability.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J −10V nf	Typ RC Rise Time 10-90% (ns) 50 ohm load @ 0V	Spectral Response
11PS18M	TO18	.0094	.5	1.0	160	125	200	100	8.00	7.5	Curve III‡
22PS18M	TO18	.0230	.9	2.5	120	80	100	50	20.00	8.0	Curve III‡
33PS05M	TO5	.0510	3.0	7.0	70	50	60	30	30.00	10.0	Curve III‡
44PS05M	TO5	.1700	8.0	18.0	30	20	30	15	150.00	11.0	Curve III‡
68PS08M	TO8	.4090	35.0	70.0	15	10	10	4	360.00	40.0	Curve III‡

HIGH SPEED, BLUE-ENHANCED SILICON PLANAR DIFFUSED PHOTODIODES

Designed for maximum response in the blue portion of the spectrum. For currency changers, pollution control and similar applications.

Type No.	Outlines	Effective Photosensor Surface cm²	Dark Rev Current I_{DR} @ −1V nA	Dark Rev Current I_{DR} @ −10V* nA	Reverse Brk Voltage V_{BR} Typ Volts	Reverse Brk Voltage V_{BR} Min Volts	Source Impedance R_{SO} Typ MΩ	Source Impedance R_{SO} Min MΩ	Junction Capacitance C_J @ 0 Volts pf	Typ RC Rise Time 10-90% (ns) 50 ohm load @ 0V	Spectral Response
22BH18M	TO18	.023	5.0	20.0	120	80	100	50	50.00	5.5	Curve I**
33BH05M	TO5	.051	8.0	20.0	60	40	60	30	95.00	10.5	Curve I**
44BH05M	TO5	.170	20.0	40.0	30	15	30	15	270.00	30.0	Curve I**

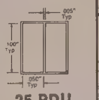
SPECIAL HIGH SPEED SILICON PIN PHOTODIODES

For use in the 600-900 nm range of the spectrum where minimum risetime and maximum response are needed. For use in telecommunications links. Supplied in a sealed TO5 can. Available without seal when fiberoptic must be butted against active area.

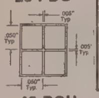
Type No.	Outlines	Effective Photosensor Surface cm²	Max Dark Rev Current I_{DR} @ −50V	Reverse Brk Voltage V_{BR} Volts	Source Impedance R_{SO} Meg-Ohm	Junction Capacitance C_J @ −50V pf	Rise Time 10-90% 50 ohm load @ −50V ns
AS101	TO5	.036	10na	100	250	16	1.0

DUAL & QUAD ELEMENT SILICON PHOTOSENSORS

Unique devices designed for use in Laser positioning and other null applications which require detection of the relative position of a light spot. Supplied in TO5 packages. See terminal arrangements in drawing below.



25 PDU



45 PQU

Parameter	25 PDU Dual (TO5) Min.	25 PDU Dual (TO5) Typ	25 PDU Dual (TO5) Max	45 PQU QUAD (TO5) Min.	45 PQU QUAD (TO5) Typ	45 PQU QUAD (TO5) Max
Responsivity @ 632.8 nm(AW)	0.35	0.4		0.35	0.4	
Responsivity @ 890 nm (A/W)	0.45	0.5		0.45	0.5	
Dark Reverse @ 1V (nA)		1 nA	10 nA		1 nA	10 nA
Dark Reverse @ 10V (nA)		5 nA	100 nA		2 nA	50 nA
Source Resistance Mohm (per element)	30	50		45	80	
Capacitance @ OV (pf per element)	60		100	30		50
NEP @ 900 nm, 1 KHz, 10V (W/Hz½)		8×10^{-14}			5×10^{-14}	
Uniformity (1 mm Spot Diameter)		±2%	±5%		±2%	±5%
Interelement leakage @ 1V (na)		1 nA	5 nA		1 nA	5 nA
Risetime @ 0V, 50 ohm load		11 ns			11 ns	

MULTI-ELEMENT SILICON PHOTOSENSORS

ASEC supplies a wide variety of custom multi-element photodiode arrays in both chip form or mounted in DIP packages.

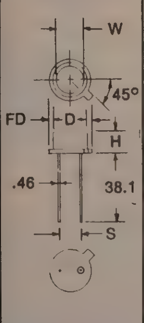
Reference Number	Chip Size cm²	Active Area cm²	No. of Elements	Pitch cm	Gap cm	R_{SH} Mohm	Capacitance nf	Dark Current @ −10 mV pA
ASE 1000	1.26 x .24	.259	8	.159	.025	100	.2	100
ASE 1050	2.52 x .24	.0259	16	.159	.025	100	.2	100
ASE 2000	2.53 x .45	.024	16	.158	.038	50	.1	200
ASE 2050	3.77 x .424	.047	16	.235	.039	150	.1	33
ASE 3000	4.02 x .427	.052	16	.254	.058	200	.125	50
ASE 3050	5.04 x .24	.0259	32	.159	.025	100	.2	100
ASE 4000	2.15 x .762	.034	32	.063	.008	1000	.5	10
ASE 4050	2.21 x 1.14	.021	3 x 5	.241	.038	2	.2	500

MECHANICAL DATA (MM)

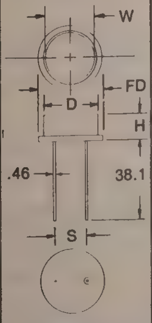
DIM.	T018	T05	T08
W	4.1	6.7	10.9
FD	5.4	9.1	14.0
D	4.7	8.3	12.4
H	5.1	4.6	5.6
S	2.5	5.1	7.5

NOTES:
** Minimum Spectral Responsivity at 550 nm = .33 A/W. Allow 8% reduction in responsivity for transmission through glass.
‡ Minimum responsivity at 950 nm = .56 A/W. Allow 8% reduction for transmission through glass.
† Minimum spectral response @ 950 nm = .53 A/W. Allow 8% reduction for transmission through glass window.
* Dark Reverse Current: Use −10V or $V_{BR/2}$ where applicable.

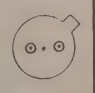
TO5/TO18



TO8/TO9

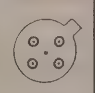


25PDU05M



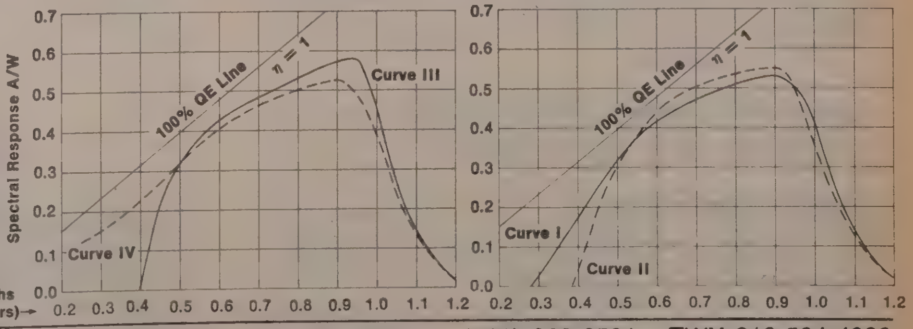
TO5

45PQU05M



TO5

SPECTRAL RESPONSE (A/W) VS. WAVELENGTH (μm)



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Ask your local Centronic representative to quote your next requirement, or **CALL (201) 233-7200** and ask for an applications engineer.

SINGLE ELEMENT HIGH PERFORMANCE PHOTODIODES

Type No.	Active Area mm^2 (circular)	Dark Current @ 30VnA
OSD 1	1	5
OSD 5	5	30
OSD 50	50	350
OSD 100	100	800

Add the following suffix to Type No. for selected optimized wavelength response

Suffix	Optimized Wave Length	mm	Typical Resp A/W	Vop Max Volts	Rise Time Vmax
—0	General Purpose	0.9	0.52	30	15ns
—1	UV/Blue	0.25	0.08	10	20ns
—2	Red	0.63	0.38	60	10ns
—3	IR	0.9	0.62	100	10ns
—4	1.06	1.06	0.55	180	20ns

HIGH SPEED, HIGH PERFORMANCE PHOTODIODES

Type No.	Cap. pF @ Vop Max.	Vop Max. Volts	Typical Dark Current nA	Risetime ns	Typical Resp. @ Optimized Wavelength	Optimized Wavelength μm
OSD†I-3 HSA	8.5	80	5	1	0.40 A/W	0.9
OSD†I-4 HSA*	3.0	100	10	10	0.25	1.06
OSD†I-4 HSA**	2.5	180	10	15	0.38	1.06
BPX 65	3.5	50	1 (<5)	1 (<5)	0.55	0.85
BPX 66	3.5	50	0.15 (<0.3)	0.5 (<1)	0.55	0.85

† Isolated version available (suffix R2) *35% Q.E. at 1064 μm **50% Q.E. at 1064 μm

HYBRIDS
(Detector & Amplifier Combinations)

Type No.	Active Area mm^2	Rise-time μs	Typical NEP (Noise Equiv. Power) @ Wave-length μm	Typical NEP (Noise Equiv. Power) W. Hz$^{-1/2}$	Minimum Responsivity mV/μW/cm^2 @ Wavelength μm 0.25	0.43	0.63	0.9	1.06
GENERAL PURPOSE									
OSI-5J	5	30	0.25	4×10^{-11}	15	60	–	–	–
OSI-5K	5	30	0.9	2×10^{-12}	–	30	160	250	–
OSI-5L	5	30	1.06	4×10^{-12}	–	–	–	220	130
HIGH SPEED									
OSI-1J HSA	1	.05	0.25	6.3×10^{-11}	0.06	0.24	–	–	–
OSI-1K HSA	1	.05	0.9	3.8×10^{-12}	–	0.1	0.6	1.0	–
OSI-1L HSA	1	.05	1.06	5.4×10^{-12}	–	–	–	1.0	0.7

Spectral Responses J — UV and Blue optimized L — 1.06 μ optimized
K — General Purpose 350 — 1150 nm

HIGH PERFORMANCE PHOTOVOLTAIC DETECTORS (High Blue Sensitivity)

PHOTOVOLTAIC DETECTORS (High Blue Response)

Type No.	Min. Responsivity @ 0.45 μm A/W	Max. Response Time (@ 0 V) μs	Min. Dynamic Resistance MΩ	Typical Capacitance (@ 0 V) pF	Min. Breakdown Volts (10 μA)	Typical I_D @ 0 V nA	Typical NEP (Noise (Equiv. Power) @ 0.45 μm
OSD 1-5	0.15	1	100	40	10	0.2	6×10^{-14}
OSD 5-5	0.15	1	40	150	10	0.5	7×10^{-10}
OSD 50-5	0.15	1	1.5	1500	10	1	2×10^{-13}
OSD 100-5	0.15	1	1	2500	10	2	2×10^{-13}

QUADRANTS & BI-CELLS

Type No.	Nom. Active Area (Total) mm^2	Dia. Active Area mm	Metallurgical Sep. of Elements†† mm	Typical Dark Cur. per Element nA @ Vop 30 V	Typical NEP (Noise Equiv. Power) @ 0.9 μm W. Hz$^{-1/2}$
QD 7-0	7	3	0.2	10	1.0×10^{-13}
QD 50-0	50	8	0.2	100	3.3×10^{-13}
QD 100-0	100	11	0.2	300	5.0×10^{-13}
QD 320-0	320	20	0.3	1000	1.0×10^{-12}

-0 is General Purpose Response Also available in -1, -2, -3, -4 and -5 (photovoltaic) responses
†† Optical separation is typically 50% of metallurgical for λ = 1.06 μm

Type No.	Vop (V) Typ.	Isc (μA) Typ.	EV (Lux.)	I_L A/W	λ p (nm)	No. of Elements	Total Active Area mm^2
HPI-0814	0.35		1.000	0.4	780	4	1.2 x 1.2
HPI-0750	0.35		1.000	0.4	780	8	—
HPI-0114	0.35		1.000	0.4	780	1	1.2 φ
PN-4-150	0.4		1.000	0.35	850	4	1.5 x 1.5
PN-4-23	0.4		1.000	0.35	850	4	4.1 x 8.1
CD-33H-4D	0.4	14	1.000	—	930	4	2.5 x 2.5
CD-33H-2D	0.4	30	1.000	—	930	2	6 x 3

(Ta = 25°C)

EYE RESPONSE DETECTORS, HYBRID & PHOTODIODES

EYE RESPONSE DETECTORS

Type No.	Active Area mm^2	Typical Capacitance @ 0 V pF	Min. Dynamic Impedance @ 0 V MΩ	Min. Breakdown Volts (10 μA)	Response Time @ 0 V μs	Min. Responsivity (Tungsten 2856 K) nA. Lux^{-1}	Typical Equiv. Noise Illumination @ 0 V Lux. Hz$^{-1/2}$
OSD 1-E	1	50	100	10	1	0.3	4×10^{-5}
OSD 5-E	5	200	40	10	1	1.5	1.3×10^{-5}
BPW 21	7.5	1000	10	10	3.5	7	1×10^{-5}
OSD 50-E	50	2000	1	10	1	15	8×10^{-6}
OSD 100-E	100	4000	0.5	10	1	30	6×10^{-6}

EYE RESPONSE HYBRID

Type No.	Active Area mm^2	Typical Response Time μs	Maximum Output Noise mV rms	Typical NEP Lux. Hz$^{-1/2}$	Minimum Responsivity (Tungsten 2856 K) mV-Lux^{-1}
OSI 5-E	5	30	1	7×10^{-4}	15

LOW COST EYE RESPONSE PHOTODIODES

Type No.	Vop (V) Typ.	Ish (μA) Typ.	Ev (Lux)	I_D (pA) Typ.	V_R (V)	C_J (pF) Typ.	Topr (°C)	Area mm^2
BP-2BC	0.32	0.11	100	4	1	450	−20 ~ +60	0.97
BP-5BC	0.32	0.28	100	6	1	650	−20 ~ +60	2.4

λ=500 — 600 nm, p = 560 nm, Ta = 25°C.

PARALLEL & SCANNED ARRAYS
(High Performance Multi-Element)

PARALLEL

Type No.	Active Elements No.	Active Elements Format	Active Elements Lgth. mm	Active Elements Width mm	Active Elements Sep. (Met.) mm	Typical Dark Cur. Per Element @ Vop 10V nA	Typical NEP (Noise Equiv. Power) @ 0.9 μm	Guard Ring
LD 2-5	2	2 x 1	2	0.5	0.05	5	7×10^{-14}	
LD 20-5	20	20 x 1	4	0.9	0.05	20	1.4×10^{-13}	✓
MD 25-5	25	5 x 5	3	3	0.1	70	2.6×10^{-13}	✓
MD 100-5	100	10 x 10	1.4	1.4	0.1	20	1.4×10^{-13}	✓

-5 is Photovoltaic Responses. Also available in -0, -1, -2, -3, -4 responses.

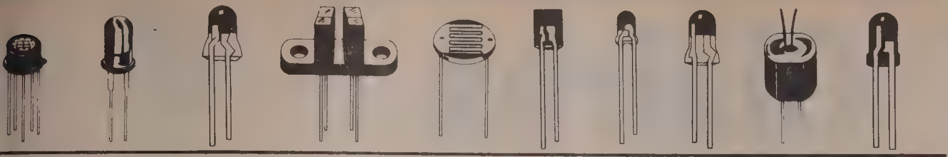
SELF SCANNED ARRAYS

Type No.	No. of Elements	Spacing μm	Notes
4000 Series	50 to 256	100	Voltage or recharge
7000 Series	50 to 256	100	OCR Type
8000 Series	256, 512	13 μm x 3.3 mm	Spectroscopic uses
M Series	256 to 1024	25	recharge only
2D1 Series	64 x 64	75	recharge only

All are in 16 or 24 pin DIP packages

GERMANIUM IR PHOTODETECTORS

Type No.	Active Area mm^2	Breakdown Voltage V	Id μA	Cj Pf	QE %	Peak Response nm	Response Range nm	Pkg.
CGP-0.3	.3	15	<4	3	60	1.55	1.1 — 1.8	TO-8
CGP-1.0	1	25	<6	18	60	1.55	1.1 — 1.8	TO-8
CGP-3.0	3	25	<10	65	60	1.55	1.1 — 1.8	TO-8



CENTRONIC

PHOTO INTERRUPTERS

Type No.	I_F (mA)	Absolute Maximum Ratings V_R (V)	P_O (mW)	V_{CEO} (V)	I_C (mA)	P_C (mW)	Topr (°C)	V_F (V) Max. I_F = 20mA	I_R (μA) Max. V_R = 5V	I_{CEO} (μA) Max. V_{CE} = 10V
SG-27N	100	20	150	–	–	150	−20 ~ +80	1.5	10	–
SG-11FKT	50	5	100	30	20	100	−20 ~ +85	1.5	20	0.4
SD-ICL$_3$K	30	3	70	25	50	70	−25 ~ +70	2.8	15	1.0
SG-11FK	50	3	50	40	100	300	−20 ~ + 85	1.4	20	1.0
SG-23FC	60	6	100	30	100	150	−40 ~ +100	1.5	1	1.0

(Ta = 25°C)

PHOTODARLINGTONS

Type No.	Absolute Maximum Ratings V_{CEO} (V)	P_C (mW)	Topr (°C)	I_{CEL} (mA) Min.	(mA) Max.	V_{CE} (V)	E_V (Lux.)	I_{CEO} (μA) Max.	V_{CE} (V)	Δθ (deg.) Typ.	λ p (nm) Typ.	λ (nm) Typ.
PTR-1ML	25	300	−25 ~ +100	5	–	5	20	1 0	5	±70	830	500 ~ 1000
PTR-1F	25	100	−30 ~ +85	5	–	5	20	1.0	5	±80	830	500 ~ 1000
PT-7L	25	150	−20 ~ +65	5	–	5	200	1.0	10	±18	830	500 ~ 1000
PT-23F	30	150	−40 ~ +100	5	–	5	200	1.0	25	±35	830	500 ~ 1000

(Ta = 25 C)

LOW COST PHOTOVOLTAIC DIODES

Type No.	Ish (μA) Typ.	I_D (μA) Max.	C_J (pF) Typ.	Active Area (mm^2)	Outside Dimension (mm)	Notes
S-15S	32	1.0	320	4.4	1.5 x 5.7	Tin Coated Cu Wire 0.18ϕ x 50 mm
S-19S	25	1.0	300	3.5	1.9 x 4.0	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-27S	80	1.0	750	10.78	2.7 x 6.0	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-26S	92	1.0	1200	10.65	2.6 x 7.6	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-550S	130	1.5	1600	15.75	5.0 x 5.0	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-652S	670	1.5	9400	103.35	6.5 x 20.0	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-60H	400	2.0	5500	61.25	6.0 x 13.0	Polyurethane Coated Cu Wire
SP-651V	330	2.0	4500	50.35	6.5 x 10.0	Vinyl Tube Coated Wire (7/0, 12ϕ)
SP-113V	1300	2.0	17,000	196.95	11.3 x 20.0	Vinyl Tube Coated Wire (7/0, 12ϕ)
SP-10S	590	2.0	7000	90.16	10.1 x 10.1	Tin Coated Cu Wire 0.18ϕ x 50 mm
SP-R20	2000	2.0	30,000	314.0	20.5 x 20.5	Active Area: Ring Type

Ev = 1000 Lux, Vr = 1v, λp = 830 nm (typ.), Ta = 25°C.

LOW COST PHOTODIODES

Type No.	Vop (V) Typ.	Ish (μA) Typ.	I_D (μA) Typ.	C_J (pF) Typ.	Δθ (deg) Typ.	t rise time μsec	Topr (°C)	Active Area mm^2	Package
SP-2ML	0.38	25	1.0	230	±70	0.2	−20 ~ +80	2.8	TO-18 Epoxy Resin
SP-45ML	0.38	160	2.0	1000	±70	2.0	−20 ~ +80	15.5	TO-5 Epoxy Resin
SP-2K	0.38	20	1.0	230	±50	0.2	−25 ~ +100	2.8	TO-18 Hermetic Seal
SP-8K	0.40	300	5.0	3900	±60	10	−25 ~ +100	47.1	TO-8 Hermetic Seal
SP-3MHL	0.39	150	1.0	600	±58	0.6	−20 ~ +80	7.2	TO-5 Epoxy Resin
SP-55C	0.40	115	3.0	1500	±90	5.0	−10 ~ +60	–	–

V_R = 10V, Ev = 1000 Lux, λ = 500 − 1000 nm, λ p = 830 nm, Ta = 25°C.

HIGH SPEED, LOW COST PHOTODIODES

Type No.	Vop (V) Typ.	Ish (μA) Typ.	I_D (μA) Typ.	C_J (pF) Typ.	Δθ (deg) Typ.	t rise time μsec	Topr (°C)	Active Area mm^3	Package
SP-7L	0.38	5	50	40	±16	20	−10 ~ +70	0.45	Epoxy Resin
SP-ICL$_3$	0.35	10	50	40	±50	–	−25 ~ +70	0.5	Ceramic Epoxy Resin
SP-1ML	0.38	12	50	50	±60	12	−20 ~ +80	0.49	TO-18 Epoxy Resin
HP-3MLRII*	0.30	60	100	175	±70	–	−20 ~ + 80	7.2	TO-5 Epoxy Resin
HP-3K	0.32	65	100	175	±55	65	−25 ~ +100	7.2	TO-5 Hermetic Seal

Ev = 1000 Lux, V_R = 10V, λ = 500 — 1000 nm, λp = 830 nm, Ta = 25°C.
* λ = 700 — 1000 nm, Yp = 900 nm.

PIN PHOTODIODES

Type No.	Vop (V) Typ.	Isc (μA) Typ.	Ev (Lux)	Chip size (mm x mm)	λ^p (nm) Typ.	Δθ (deg) Typ.	λ (nm)	Topr (°C)	Package
HPI-1K	0.35	10	1,000	1.2 x 1.2	830	±50	500 ~ 1,000	−25 ~ +100	TO-18
HPI-2C	0.35	10	1,000	1.3 x 2.0	830	±70	500 ~ 1,000	−20 ~ +70	
HPI-2CR11	0.30	8	1,000	1.3 x 2.0	900	±70	700 ~ 1,000	−20 ~ +70	

(Ta = 25°C)

PHOTOTRANSISTORS (NPN)

Type No.	Absolute maximum ratings V_{CEO} (V)	P_C (mW)	Topr (°C)	I_{CEL} (mA) Min.	(mA) Max.	V_{CE} (V)	E_V (Lux)	I_{CEO} (μA) Max.	V_{CE} (V)	Δθ (deg) Typ.	λp (nm) Typ.	λ (nm) Typ.
SPA-1MLA	40	100	−25 ~ +100	2.0	6	10	500	1.0	10	±70	830	500 ~ 1000
SPA-1KLA	40	100	−35 ~ +125	8.0	17	10	500	1.0	10	±18	830	500 ~ 1000
ST-ICL$_3$H	40	75	−25 ~ +75	0.5	2.4	3	1000	1.0	10	±50	800	500 ~ 950
ST-23F	30	150	−40 ~ +100	0.5	–	5	1000	1.0	25	±35	830	500 ~ 1000
ST-SKLT	50	100	−45 ~ +125	0.7	–	5	1000	1.0	30	±12	830	500 ~ 1000
SPA-1MLAR1	40	100	−25 ~ +100	2.0	–	10	500	1.0	10	±70	900	700 ~ 1000
SPA-1MLBR1	40	100	−25 ~ +100	2.0	–	10	500	1.0	10	±70	900	700 ~ 1000

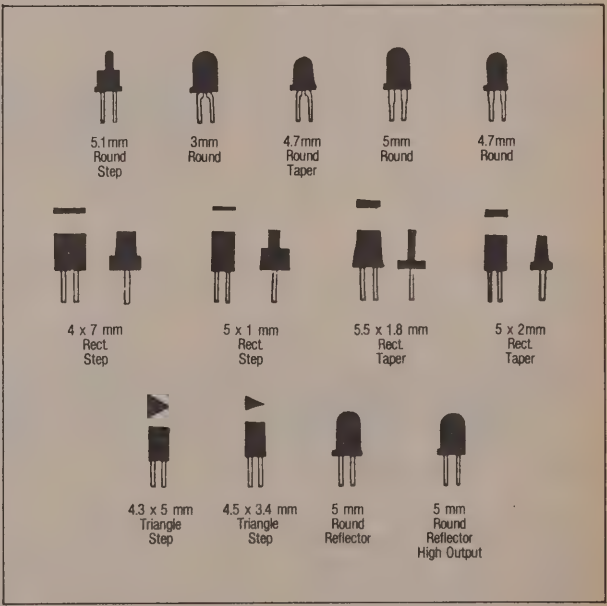
(Ta = 25°C)

VISIBLE LED's (Red, Orange, Yellow, Green)

OPERATING CHARACTERISTIC (Ta = 25 Degree C)							
Parameter	Condition	Red	Red(GaP)	Green	Yellow	Orange	Unit
Vf Forward Voltage (TYP)	IF=20mA	1.7	2.1	2.2	2.2	2.2	V
Vf Forward Voltage (MAX)	IF=20mA	2.0	2.8	2.8	2.8	2.8	V
Ir Reverse Current	Vr=5v	100	100	100	100	100	μA
P Wave Length at Peak Emission	IF=20mA	655	695	565	585	635	nm
Special Line Half-Width	IF=20mA	35	25	25	25	25	nm

ABSOLUTE MAXIMUM RATING (Ta= 25 Degree C)						
Parameter	Red(GaAsp)	Red(GaP)	Green	Yellow	Orange	Unit
Reverse Voltage Min.	3	5	5	5	5	V
Average Forward Current	20	20	30	30	30	mA
Power Dissipation	100	120	105	105	105	mW
Operation Temp Range	−40 to 80 degree C					
Storage Temp. Range	−40 to 100 degree C					
Lead Solder Temperature (1.6 mm From Body) 230 Degree C For 5 Second						

Typical luminous intensities are 0.4 to 2.5 MCD at 20mA. Those with −H suffix are 1.5 to 15 MCD at 20mA.
Also available LED strips and arrays.
All LED's available diffused, clear, or water clear



INFRARED LED's

Type No.	Absolute maximum ratings I_F (mA)	V_R (V)	P (mW)	Topr (°C)	P_o (mW) Typ.	I_F (mA)	V_F (V) Max.	I_F (mA)	λ (nm) Typ.	Δ θ (deg) Typ.	Package
EL-1ML$_2$	100	6	170	−25 ~ +100	2.7	50	1.5	50	940	±32	TO-18 Epoxy Resin
EL-1KL$_2$	100	6	200	−40 ~ +100	6.0	100	1.7	100	940	±5	TO-18 Hermetic Seal
EL-1K$_3$	100	6	200	−40 ~ +100	4.0	100	1.7	100	940	±36	TO-18 Hermetic Seal
EL-SKLT	100	6	100	−45 ~ +100	0.7	50	1.5	50	940	±12	Hermetic Seal
EL-1CL$_3$	40	4	70	−20 ~ +65	1.8	40	1.5	40	940	±53	Ceramic, Epoxy Resin
EL-1L$_1$	100	5	100	−30 ~ +100	20.0	100	1.7	100	940	±10	Epoxy Resin
EL-1L$_2$	100	5	100	−30 ~ +100	15.4	100	1.7	100	940	±30	Epoxy Resin

Complete product specifications are also available for: CdS and CdSe detectors; Opto-Couplers; Photodiode Arrays; Self-Scanning Photodiode Arrays; Solar Cells; Photomultipliers and Custom Electro-Optics Design.

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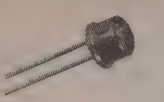
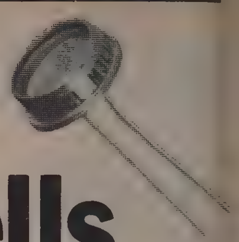
CENTRONIC



Clairex Photoconductive Cells



Part No.	Diam. X Length (inches)	Resistance @ 2 ftc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL5M9M	.55 X .18	11K	1:1000	250	2000 500[1]
CL709L	.36 X .18	28K		100	125
CL909L	.21 X .15	100K		100	50

Type 9 CdS, peak spectral response 5500 angstroms combines high speed with extreme temperature stability and high linearity.

CL5M3	55 X .18	7.2K	1 10,000	250	2000 500[1]
CL603	.25 X .5	133K		300	75
CL603A	.25 X .5	75K		300	75
CL603AL	.25 X 5	3.5K		170	75
CL703	.36 X .18	133K		300	125
CL703A	.36 X .18	67K		300	125
CL703L	36 X 18	2 7K		100	125
CL903	.21 X .15	133K		250	50
CL903A	21 X .15	67K		250	50
CL903L	21 X .15	6 0K		100	50

Type 3 CdSe, peak spectral response 7350 angstroms, fast response, and verv high light-to-dark resistance ratio. Can be used for high speed switching or counting. Sensitive to near infra red. For use with incandescent or neon lamps.

CL5M4	55 X 18	1.5K	1 400	250	2000 500[1]
CL5M4L	.55 X .18	0.25K		170	2000 500[1]
CL604	25 X 5	30K		300	75
CL604L	25 X .5	1 5K		170	75
CL704	36 X .18	30K		300	125
CL704L	.36 X .18	0 6K		100	125
CL904	21 X 15	30K		250	50
CL904L	.21 X .15	2K		100	50

Type 4 CdSe, peak spectral response 6900 angstroms, lowest resistance photocells available. Can be used for "on-off" applications when low resistance is desired. For use with incandescent or neon lamps.

CL5M5	.55 X .18	9K	1 100	250	2000 500[1]
CL5M5L	.55 X .18	1.5K		170	2000 500[1]
CL605	.25 X .5	166K		300	75
CL605L	.25 X .5	7.5K		170	75
CL705	.36 X .18	166K		300	125
CL705L	.36 X 18	3.3K		100	125
CL905	.21 X .15	166K		250	50
CL905L	.21 X .15	10K		100	50

Type 5 CdS, peak spectral response 5500 angstroms (closely matches the human eye), most stable, lowest memory photocell available. Can be used in light measuring applications and precision low speed switching. For use with incandescent, fluorescent or neon lamps.

CL705HL	.36 X .18	28K	1:1000	100	125
CL905HLL	.21 X .15	15K		60	50
CL905HL	.21 X .15	100K		100	50
CL905HN	.21 X .15	700K		100	50

Type 5H CdS, peak spectral response 5500 angstroms (closely matches the human eye). Combines high speed, stability, linearity. and uniform color temperature response. Footnote 1. with and without heat sink.

Part No.	Diam. X Length (inches)	Resistance @ 2 ftc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL707H	.36 X .18	500K	1:1000	300	125
CL707HM	.36 X .18	100K		250	125
CL907H	.21 X .15	600K		250	50
CL907HN	.21 X .15	300K		100	50
CL907HL	.21 X .15	24K		100	50

Type 7H CdS peak Spectral response 6200 angstroms. Very fast decay time coupled with low resistance and high linearity. Ideal for beam breaking applications.

CL5M7	.55 X .18	7.2K	1:300	250	2000 500[1]
CL607	.25 X .5	133K		300	75
CL707	.36 X .18	133K		300	125
CL707L	.36 X .18	2.7K		100	125
CL907	.21 X .15	133K		250	50
CL907N	.21 X .15	66K		100	50

Type 7 CdS, peak spectral response 6150 angstroms, moderate speed and ratio. Can be used in general beam breaking applications. For use with incandescent, neon or fluorescent lamps.

Part No.	Diam. X Length (inches)	Resistance @ 2 fc ± 33-1/3%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)	Type
CL703/2	.36 X .18	50K	1:10,000	300	125	3 CdSe
CL703L/2	.36 X .18	6.5K	1:10,000	100	125	3 CdSe
CL704/2	.36 X .18	17K	1:400	300	125	4 CdSe
CL704L/2	.36 X .18	1.5K	1:400	100	125	4 CdSe
CL705/2	.36 X .18	166K	1:100	300	125	5 CdS
CL705L/2	.36 X .18	7.5K	1:100	100	125	5 CdS

Plastic Encapsulated Photoconductive Cells

CL5P4	.430 X .130	2.7K	1:400	250	250	Type 4 CdSe
CL5P4L	.430 X .130	0.45K		170	250	
CL7P4	.283 X .075	54K		300	125	
CL7P4L	.283 X .075	1K		170	125	
CL9P4L	.180 X .065	2K		100	50	
CL5P5	.430 X .130	9K	1:100	250	250	Type 5 CdS
CL5P5M	.430 X .130	6K		250	250	
CL5P5L	.430 X .130	1.5K		170	250	
CL7P5	.283 X .075	166K		300	125	
CL7P5L	.283 X .075	3.3K		170	125	
CL9P5	.180 X .065	166K		250	50	
CL9P5L	.180 X .065	10K		100	50	
CL7P5HL	.283 X .075	28K	1:1000	170	125	Type 5H CdS
CL9P5HL	.180 X .065	100K		100	50	
CL7P7HL	.283 X .075	10K	1:1000	170	125	Type 7H CdS
CL7P7HM	.283 X .075	30K		400	125	
CL9P7HL	.180 X .065	24K		100	50	
CL9P7HLL	.180 X .065	4.5K		70	50	
CL5P9M	.430 X .130	9K	1:1000	250	250	Type 9 CdS
CL7P9L	.283 X .075	28K		170	125	
CL9P9L	.180 X .065	100K		100	50	
CL9P9LL	.180 X .065	15K		70	50	

CLAIREX ELECTRONICS

A DIVISION OF CLAIREX® CORPORATION

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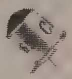
Clairex



Phototransistors • Darlingtons • Diodes • Infrared Emitters

TO 18 FLAT WINDOW

Part No.	I_L (ma) V_{CE} = 5V		H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE} = 10V	P_T (mw) 25°C
	Min	Max				
CLT 2065	7.0	—	5.0	40	50	250
CLT 2064	3.0	7.0	5.0	50	50	250
CLT 2030	1.0	3.0	5.0	30	25	250
CLT 2020	0.4	1.2	5.0	30	25	250
CLT 2010	0.2	0.6	5.0	50	25	250
CLR 2060	1.4 14.0	6.0 —	0.2 2.0	40	100	250
CLR 2050	0.6 6.0	1.8 —	0.2 2.0	40	100	250
CLR 2049	0.2	1.0	0.2	40	100	250

TO 18 LENS

Part No.	I_L (ma) V_{CE} = 5V		H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE} = 10V	P_T (mw) 25°C
	Min.	Max				
CLT 2165	15.0	—	5.0	40	50	250
CLT 2164	7.0	—	5.0	40	50	250
CLT 2160	4.0	12.0	5.0	30	25	250
CLT 2150	2.4	7.2	5.0	40	25	250
CLT 2140	1.2	3.6	5.0	40	25	250
CLT 2130	0.6	1.8	5.0	50	25	250
CLR 2180	0.6 4.0	— —	0.02 0.20	40	100	250
CLR 2170	0.2 2.0	0.8 —	0.02 0.20	40	100	250

WINDOW LENS .115 LENGTH X .077 DIAMETER

Part No.	Lens	I_L (ma) V_{CE}=5V		H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO}(na) V_{CE}=10V	P_T (mw) 25°C
		Min	Max				
CLT 5170	L	1.4 6.0	— —	5 20	40	25	50
CLT 5160	L	0.5 2.0	— 7 0	5 20	40	25	50
CLR 5101	L	2.0 20.0	— —	0.2 2.0	40	100	50

-2 Designation is with second lead welded to the header

PLASTIC ENCAPSULATED SIDE VIEW

Part No.	I_L (ma) V_{CE}=5V		H (Note 1) mw/cm²	BV_{CEO} Volts	I_{CEO} (na) V_{CE}=10V	P_T(mw) 25°C
	Min	Max				
CLT 4000	.3	—	5	30	50	75
CLT 4140	.5	—	5	40	50	75
CLT 4150	1.0	3.0	5	40	50	75
CLT 4160	2.0	—	5	40	50	75
CLR 4180	.1	—	.1	40	200	75
CLR 4185	.6	—	.1	40	200	75

PHOTO DIODES

Part No.	Active Area Inches	Package	I_{SC} (ua) Min.	H mw/cm²	I_D(na) V=-.1V
CLD 31	.222 x .122	Plastic	120	5	100
CLD 41	.051 x .051	To 18	6	5	50
CLD 42	.051 x .051	To 18	35	5	50
CLD 56	.222 x .122	To 5	100	5	100
CLD 71	.125 x .125	Plastic	70	5	100
CLD 72	.051 x .051	Plastic	17	5	10

Note 1: The light source is a frosted tungsten incandescent lamp at 2854°K.

INFRARED EMITTERS

Part No.	Package	Material	Power Out (mw)	Vf (Volts)	Pt 25°C	Peak Wave Length nm
CLED-1	T046 lens	GaAs	1.0 @ 50 ma	1.8 @ 60 ma	200 mw	930
CLED-1F	T046 Window	GaAs	1.0 @ 50 ma	1.8 @ 60 ma	200 mw	930
CLED-3	Pill-lens	GaAs	0.75 @ 50 ma	1.6 @ 50 ma	75 mw	930
CLED-5	Post lens	GaAs	0.80 @ 50 ma	1.6 @ 50 ma	75 mw	930
CLED-400	Plastic	GaAs	0.50 @ 50 ma	1.6 @ 50 ma	100 mw	930
CLED-155	T046 lens	GaAlAs	3.0 @ 50 ma	1.8 @ 50 ma	200 mw	880
CLED-155F	T046 Window	GaAlAs	3.0 @ 50 ma	1.8 @ 50 ma	200 mw	880
CLED-305	Pill-lens	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	75 mw	880
CLED-405	Plastic	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	100 mw	880
CLED-505	Post-lens	GaAlAs	2.0 @ 50 ma	1.7 @ 40 ma	75 mw	880

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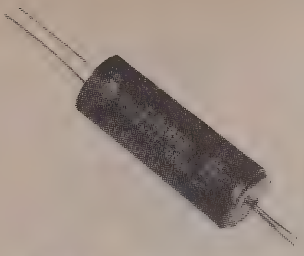

Clairex
Opto-Isolators

LED PHOTOCONDUCTIVE CELL ISOLATORS

Part No.	Package	R "ON" Ohms Max	10 SEC R "OFF" Ohms Min	Cell Volts PAC	Isol. Volts
CLM6000	Axial	500@20ma	500K	60	2000
CLM6200	Axial	10K@10ma	10Meg	60	2000
CLM6500	Axial	400@20ma	10Meg	100	2000
CLM8000	Axial	400@40ma	500K	220	2500
CLM8200 ЯU	Axial	2 8K@16ma	10Meg	220	2500
CLM8200 2	Axial	5.0K@16ma	10Meg	100	2500
CLM8500	Axial	2.0K@16ma	10Meg	220	2000
CLM8500/2	Axial	1.0K@16ma	1Meg	100	2000
CLM8500HV	Axial	5K@16ma	10Meg	400	2000
CLM8600 ЯU	Axial	2K@16ma	10Meg	500	3000
CLM9000	Axial	1.2Meg@16ma	1000Meg	3500	7000
CLM50 ЯU	DIP	2.5K@16ma	1Meg	250	2500
CLM51 ЯU	DIP	4.5K@1ma	1Meg	250	2500
CLM60 ЯU	DIP	4K@±16ma	1Meg	250	2500
CLM61 ЯU	DIP	7K@±1ma	1Meg	250	2500

ЯU IRED – PHOTOTRANSISTOR AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=1ma Volts	I_{CEO} @V_{CE}=10V na
CLA7	20	10	7000	40	50
CLA7AA	10	10	7000	40	100

ЯU IRED – PHOTODARLINGTON AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=.1ma Volts	I_{CEO} @V_{CE}=10V na
CLA7D	400	10	7000	40	100
CLA7DA	200	10	7000	40	100

ЯU THE SURVIVOR® – HERMETICALLY SEALED COMPONENTS – AXIAL ISOLATOR

Part No.	C.T.R. V_{CE}=10V % Min	I_F ma	Isolation Volts PAC	BV_{CEO} I_C=1ma Volts	I_{CEO} @V_{CE}=10V na	Type of Units
CLA60	40	10	10,000	55	50	IRED — PHOTOTRANSISTOR
CLA60AA	20	10	10,000	55	50	IRED — PHOTOTRANSISTOR
CLA60AB	10	10	10,000	40	100	IRED — PHOTOTRANSISTOR
CLA65	400	10	10,000	55	100	IRED — PHOTO DARLINGTON
CLA65AA	200@V_{CE}=5V	10	10,000	40	100	IRED — PHOTO DARLINGTON
CLA90	3.5 volts	1	10,000	—	.4 volts	IRED — PHOTO INTEGRATED CIRCUIT
CLA90AA	3.5 volts	5	10,000	—	.4 volts	IRED — PHOTO INTEGRATED CIRCUIT

PHOTOMOD® PHOTOCONDUCTIVE CELL – LAMP ISOLATORS

Part No.	Dia. Inch	Length Inch	R "ON" Ohms Max	@ Lamp Rated Voltage Volts	10 SEC R "OFF" Ohms Min	Cell Volts PAC	Isolation Voltage PAC
CLM3006A	.415	1.125	160	6	10 Meg	200	2500
CLM4006A	.415	1.125	55	6	1 Meg	200	2500
CLM3012A	.415	1.125	160	12	100 Meg	200	2500
CLM4012A	.415	1.125	30	12	1 Meg	200	2500
CLM5H10A	.415	1.125	3000	10	10 Meg	200	2500
CLM7H16A	.415	1.125	550	16	10 Meg	200	2500
CLM3120A	.415	1.125	1150	120 *	100 Meg	200	2500
CLM4120A	.415	1.125	160	120 *	1 Meg	200	2500
CLM3000	.420 X .445 X .620		500	14	1 Meg	200	1600
CLM3500	.420 X .445 X .620		160	120 *	1 Meg	250	1600
CLM3500/2	.420 X .445 X..620		500	120 *	1 Meg	120	1600
CLM3700	.420 X .445 X .620		1000	120 *	1 Meg	250	1600

ЯU U.L. RECOGNIZED COMPONENT

*Series resistor required.

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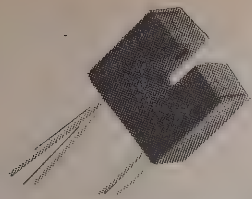
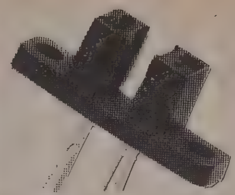


Clairex



OPTICAL SWITCHES

HERMETICALLY SEALED EMITTERS AND SENSORS

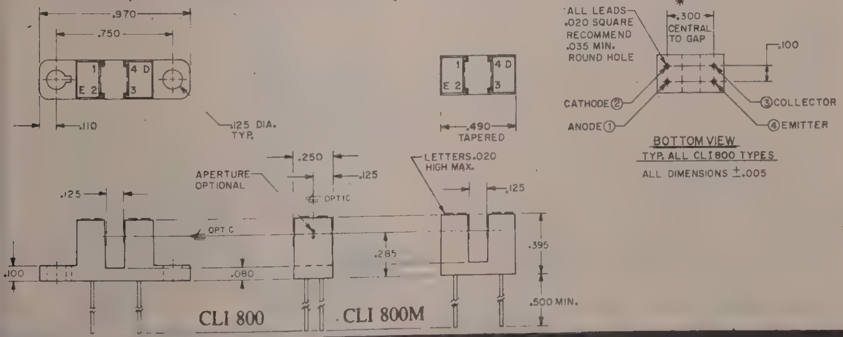
Part No.	Dimensions Height, Width, Thickness Inches	Gap Width Inches	Slit on Sensor	I_{CE} min (ma) V_{CE} = 5V	@ I_F ma	BV_{CEO} Volts	I_D max (na) V_{CE} = 10V	Internal R_L	Sensor Darlington	Sensor Transistor
CLI 200	.425 x .500 x .250	.100	–	1.0	20	40	50	No		✓
CLI 210	.425 x .500 x .250	.100	.005	0.1	20	40	50	No		✓
CLI 220	.425 x .500 x .250	.100	–	10.0	20	40	100	No	✓	
CLI 230	.425 x .500 x .250	.100	.005	2.0	20	40	100	No	✓	
CLI 305	1.3 x .950 x .500	.250	.005	.5V Max.	20	30	4.7V Min.	No	Emitter Follower	
CLI 325	1.3 x .950 x .500	.250	–	3.0	10	30	100	No	✓	
CLI 355	1.3 x .950 x .500	.250	–	12.0	10	30	100	Yes	✓	
CLI 375	1.3 x .950 x .500	.250	–	1.0	20	30	100	No		✓
CLI 385	1.3 x .950 x .500	.250	–	4.0 Volts	20	15	.4V @ .5V	No	Integrated Circuit	
CLI 395	1.3 x .950 x .500	.250	—	.5	10	30	100	No		✓

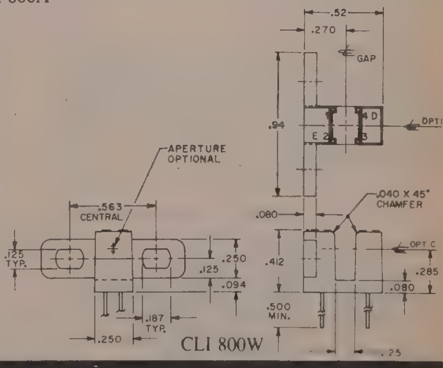
PLASTIC ENCAPSULATED EMITTERS AND SENSORS

Part Numbers			Gap Width Inches	Slit** on Sensor	I_{CE} min ma	V_{CE} Volts	@I_F ma	BV_{CEO} Volts	I_D max (na) VCE=10V	Sensor Darlington	Sensor Transistor
CLI 800	CLI 800M	CLI 800W	.125	—	0.4	5	20	30	100		✓
CLI 810	CLI 810M	CLI 810W	.125	—	1.0	5	20	30	100		✓
CLI 820	CLI 820M	CLI 820W	.125	—	2.0	5	20	30	100		✓
CLI 830	CLI 830M	CLI 830W	.125	—	4.0	5	20	30	100		✓
CLI 835	CLI 835M	CLI 835W	.125	.010	0.4	5	20	30	100		✓
CLI 811	CLI 811M	CLI 811W	.125	—	1.0	5	20	50	50		✓
CLI 821	CLI 821M	CLI 821W	.125	—	2.0	5	20	50	50		✓
CLI 831	CLI 831M	CLI 831W	.125	—	4.0	5	20	50	50		✓
CLI 836	CLI 836M	CLI 836W	.125	.010	0.4	5	20	50	50		✓
CLI 840	CLI 840M	CLI 840W	.125	—	2.5	1.5	5	30	250	✓	
CLI 850	CLI 850M	CLI 850W	.125	—	5.0	1.5	5	30	250	✓	
CLI 860	CLI 860M	CLI 860W	.125	—	10.0	1.5	5	30	250	✓	
CLI 870	CLI 870M	CLI 870W	.125	.010	1.0	1.5	10	30	250	✓	
CLI 841	CLI 841M	CLI 841W	.125	—	2.5	1.5	5	55	100	✓	
CLI 851	CLI 851M	CLI 851W	.125	—	5.0	1.5	5	55	100	✓	
CLI 861	CLI 861M	CLI 861W	.125	—	10.0	1.5	5	55	100	✓	
CLI 871	CLI 871M	CLI 871W	.125	.010	1.0	1.5	10	55	100	✓	

* The respective CLI 800 types are available with lead spacing of .220 inches. Add the suffix A, ie. CLI 800A

** .005 inch aperture available — consult factory.


.970
.750
1
4 D
E 2
3
.110
.125 DIA. TYP.
.490 TAPERED
ALL LEADS .020 SQUARE RECOMMEND .035 MIN. ROUND HOLE
*
.300 CENTRAL TO GAP
.100
CATHODE ②
ANODE ①
③ COLLECTOR
④ EMITTER
BOTTOM VIEW
TYP. ALL CLI 800 TYPES
ALL DIMENSIONS ±.005
.250
.125
APERTURE OPTIONAL
OPTIC
.125
OPT C
LETTERS .020 HIGH MAX.
.125
.395
.285
.100
.080
.500 MIN.
CLI 800
CLI 800M


.52
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.125 TYP.
.250
.125
.094
.187 TYP.
.250
.040 X 45° CHAMFER
.080
.412
OPT C
.285
.080
.500 MIN.
.25
CLI 800W

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MINIGLOSSARY

OPTO SEMICONDUCTORS

Avalanche Photodiode: A photodiode that takes advantage of avalanche multiplication of photocurrent. It is particularly suited to low noise and/or high speed applications.

Contrast: A noticeable difference in color, brightness, or other characteristics in a side-by-side comparison.

Chrominance Contrast: The color contrast between two adjacent surfaces of identical area, shape, texture, and luminance. The human eye is more sensitive to differences in color than it is to differences in brightness.

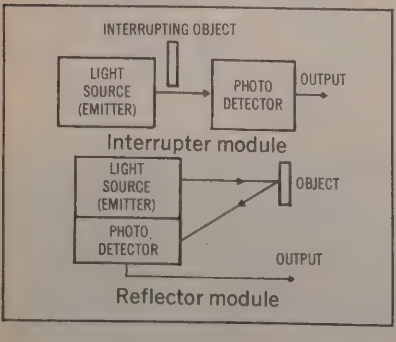
Current Transfer Ratio: The ratio of an optocoupler's output current to input current at a specified bias.

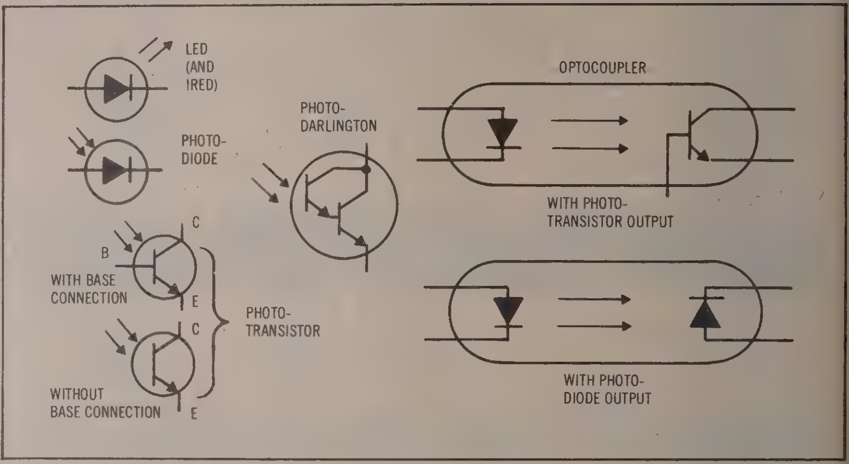
Dark Current: The leakage current of a photodetector with no incident light.

Dominant Wavelength: The wavelength that is a quantitative measure of apparent color of light as perceived by the human eye.

Infrared Radiation: The electromagnetic wavelength region between approximately 0.75 and 100 micrometers longer than the wavelength of visible light.

Interrupter (module): A device that produces an electrical output signal when an object breaks the light (visible or invisible) between a light source and a photodetector.





IRED: An infrared-emitting diode. See light-emitting diode.

Light Current: The current that flows through a photodetector when it is exposed to radiant energy.

Light-Emitting Diode (LED): A semiconductor diode that emits incoherent light at its PN junction when forward biased. The light can be in the visible or invisible (infrared) wavelength region.

Luminance Contrast: The observed brightness of a light-emitting element compared to the brightness of the "surround," an integral part of the device and inseparable from it.

Optocoupler: A device that transmits electrical signals, without electrical connection, between a light source (input) and the receiver (output). The input is generally an LED; the output might be a photodiode, phototransistor, a photo–Darlington, etc. Sometimes referred to as optoisolator.

Peak Wavelength: The wavelength at the peak of the radiated spectrum of an emitter.

Photo–Darlington: A light-sensitive Darlington-connected transistor pair. The photo–Darlington has a very high sensitivity to illumination or radiation.

Photodetector: A device that provides an electrical output signal when subjected to radiation in the visible, infrared, or ultraviolet regions of the electromagnetic spectrum. Photodiodes, phototransistors, and photo–Darlingtons are the most common type of photodetectors.

Photodiode: A junction diode that is responsive to radiant energy. Photodiodes have a high degree of linearity between the input radiation and the output current, and faster switching speeds than phototransistors.

Photothyristor: A thyristor whose switching action is controlled by light applied to the thyristor gate.

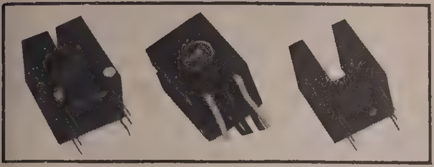
Phototransistor: A light-sensitive transister that delivers an electrical output proportional to the light intensity at its input. The low-level photocurrent that is generated is amplified by the current gain of the transistor. The base region (or gate in a FET) may or may not be brought out as an external terminal.

Point Source: A source with a maximum dimension less than one-tenth the distance between sources and detector.

Reflector (module): A device containing a light source and a photodetector that detects any object that reflects light produced by the source back to the detector.

HEI OPTOELECTRONIC PRODUCTS

OPTICAL SWITCHES



HEI optical switches consist of an LED/photo-transistor pair operating across an air gap. Light beam interruption causes a change in output. Switches are contactless, highly reliable, and extremely long-lived. The LEDs operate in the infrared range.

Choose from 32 models, including some with integral hybrid amplifiers and Schmitt triggers. Both analog and digital models.

Two small packages available with either DIP pins or 12-in. leads. Most styles compatible with TTL/DTL/MOS circuits. OS-591S series have TTL/DTL square wave output. Switches are normally closed when uninterrupted. Precise alignment gives maximum output, and lens system reduces ambient light. HEI offers custom packaging, and can meet special performance requirements. Contact factory representative for specific information.

- **OS-521S-XXX** Contains LED and high-gain photo transistor. Medium speed, analog output.
- **OS-581-XXX** Contains LED and photo Darlington transistor. High gain, medium speed. Ideal for limit switching, presence detection. Analog output.
- **OS-561A-XXX** LED/photo transistor with integral hybrid amplifier for high speed, high output current. Used with TTL/DTL gates, analog output.
- **OS-591S-XXXL** Ultimate optical switch with hybrid amplifier and Schmitt trigger. Square wave output at TTL levels. Positive switching at all speeds.

PART NUMBER EXAMPLE:

OS - 5 6 2 A - 200 L W

Optical Switch
LED Series
Sensor Series
No. of LED/Sensor Pairs
Optional Circuitry: Amplifier (A)
Schmitt Trigger (S)
Gap Dimension in mils: 060
200
Package Size: Small Housing (Blank)
Large Housing (L)
Wire Added Optional (W)

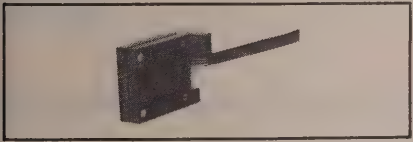
Absolute Maximum Ratings (25°C free air)

Single Channel — Part Number **Dual Channel — Part Number**	**OS-521-XXX** **OS-522-XXXL**	**OS-581-XXX** **OS-582-XXXL**	**OS-561A-XXX** **OS-562A-XXXL**	**OS-591S-XXXL** **OS-592S-XXXL**
LED Side:				
Forward Current (mA) $I_{F/LED}$	50	50	50	50
Reverse Voltage (V) V_R	3	3	3	3
Power Dissipation (mW) $P/_{LED}$	75	75	75	75
Sensor Side:				
Voltage Collector to Emitter (V) V_{CEO}	20	20	25	5
Voltage Emitter to Collector (V) V_{ECO}	5	5	5	5
Light Current (mA) I_L	5	5	10	50
Power Dissipation (mW) $P/_{Sensor}$	100	100	100	200

Electrical Characteristics (Typ.)

Light Current (I_F=35mA, V_{CC}=5V, R_L=1K) (mA) I_L	1.0	2.0	4.7	4.9
Dark Current (I_F=0, V_{CE}=5V, H=0) (μA) I_D	0.1	0.1	10	0.1
LED Forward Voltage (I_F=40mA) (V) V_F	1.3	1.3	1.3	1.3
Sensor Saturation Voltage (I_F=35mA, R_L=10K, V_{CC}=5V) (V) $V_{CE(SAT)}$	.35	.8	0.2	0.1
Switching Speeds (For .060 Gap)				
Rise Time (μsec) t_r	25	150	15	.05
Fall Time (μsec) t_f	30	170	20	.1
Frequency (KHz) f	10	2.5	10	15

MULTI-CHANNEL READER



The 125-1 assembly contains infra-red LEDs which are spectrally matched with silicon photo transistors. Hybrid circuitry is included for TTL compatibility. Primarily designed as an 8 or 12 channel vertical format unit for line printers.

Number of channels and centerline spacing may be varied to suit assorted applications. Air gap may be specified, along with analog or digital output.

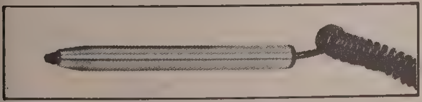
Using a data hole width of .030″, an obstruction of ≤15% transmissivity will result in a low output. Obstruction of ≥40% transmissivity causes a high output. A glass wear plate provides self cleaning and dust elimination.

- Each channel has a fanout capacity of 10 TTL gates, with CMOS compatibility optionally available.
- Source and sensor sides electrically isolated to avoid ground loop.
- Non-standard data holes (less than .030″ or greater than .073″) available on request.
- Standard sensor spacing is .1094″ for 12 channel unit, .100″ for 8 channel unit (except for channels 6 and 7 which are .250″).
- Supply voltage 4.5 to 5.5V. Output current 800 μA high, 16 mA low.
- Slot depth 1.725″ standard, width 1.5″, gap .020″.

CHARACTERISTICS		MIN.	TYP.	MAX.
High Level Output Voltage (V_{CC}=4.75V, I_{OH}=-800 μA)	V_{OH}	4.5V	4.75V	
Low level Output Voltage (V_{CC}=4.75V, I_{OL}=16 mA)	V_{OL}		0.2V	0.4V
*Short Circuit Output Current (V_{CC}=5.25V)	I_{OS}	-1.8 mA		-2.5 mA
Supply Current (Per Channel)				
Source Side (V_{CC}=5.25V)	I_{CC}		21 mA	25 mA
Detector Side (V_{CC}=5.25V)	I_{CC}		3.6 mA	5.0 mA

*Not more than one output should be shorted at one time.

LIGHT PENS (New Color-Sensitive Light Pen Available in 1983)



HEI light pens for CRT terminals are solid state assemblies which utilize opto-electronics and hybrid circuitry to provide two TTL-compatible outputs: "Light Pen Hit" and "Light Pen Switch". The latter is generated when tip of pen is pressed against CRT face. A "Hit" is generated when an unblanked spot on the CRT face is under the pen tip. Signals are transmitted to control logic of the terminal for fast data manipulation.

Two models available: 120-3 has black plastic barrel, 120-2 has slimmer stainless steel barrel. Both available with optional coiled cord, and adjustable sensitivity. Resolution is excellent, along with high ambient light rejection. Both models light weight, meet Mil Stds. for radiation susceptibility and vibration.

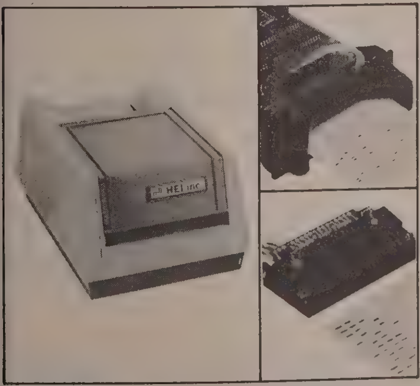
ELECTRICAL

Input Power	5V @ 125 mA
Sensitivity	7 FL Spot Brightness (Minimum Pickup)
Ambient Rejection	100 FL
Response Time	<.5us @ 20 FL
Field of View	<.075 inches
Light Pen Switch	TTL compatible (Normally high, low while nose cone is actuated)
Light Pen Hit	TTL compatible (Normally high, low during pulse period)

MECHANICAL

	120-3	120-2
Length	<6.2 inches	5.96 inches
Diameter	<.625 inches	.495 inches
Weight	<2 ounces	<2 ounces
Nose Cone Travel	<.100 inches	.090 inches
Cable Length	4 feet	4 feet
Cable Diameter	<.150 inches	.150 inches
Color	Black	Silver

CARD READERS



HEI offers several card reader models as well as OEM read heads. Call or write for details.

HEI's hand-fed card reader offers capability to interpret either marked or punched cards. High reliability hybrid circuitry provides TTL-compatible output. Designed to read standard 80-column cards with clock marks. Can handle other cards of reasonable length.

This reader has superior mark detection capability, and will read a wide variety of pencil and ink colors. Toleration of worn or mutilated cards is good.

The reader head is self cleaning, and no lubrication is required. Cards are fed by hand, internal mechanism transports cards through at 6″/second.

Either parallel or RS-232 interface format available. The unit may be ordered with or without internal power supply. For mark/sense applications, cards must have printed strobe marks on either margin.

Specifications

Input Power	115VAC, 60 Hz, .35A +5VDC, .2A −12VDC, .1A
Output	TTL Compatible 12 rows paralleled up to 80 rows serial
Physical Size	4.75″ (120.6mm) W 9.75″ (247.6mm) D 4.25″ (108mm) H
Weight	4.5 lbs. (2 kg)

The Optoelectronic Specialists

HEI inc.

DEPT. EM • VICTORIA, MN 55386 • (612) 443-2500

Introduction

Honeywell

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Honeywell offers industry's broadest range of optoelectronic products. They include:

- LEDs
- Silicon photodetectors (Transistor, and IC)
- Transmissive switches
- Reflective switches
- Encoders
- Emitter/Detector arrays
- Discrete chips
- Custom components and assemblies
- Pin diodes
- Fiber optic components
- Fiber optic links

Honeywell strives for continuing leadership in high-technology optoelectronic products — today and tomorrow. That's why we're committing substantial resources to research and development efforts for the next generation of optoelectronics.

In addition to its standard products, Honeywell can develop custom components, assemblies and systems to meet exact customer requirements.

For more information
or the name of your local
distributor or representative,
contact Honeywell
today at (214) 234-4271.

Optical switches

- LED and photodetector in the same package.
- Reflective and transmissive (interrupter) types.
- Plastic and hermetic components.
- Transistor, Darlington and Schmitt trigger outputs.
- Variety of package designs.

Optoschmitt switches

Characteristics	Components	Output voltage		Forward voltage	Propagation delay				Rise time	Fall time	Required LED current		Slot width
		Low	High		Low-high		High-low						
Test condition				$I_F = 20$ mA									
Symbol		V_{OL}	V_{OH}	V_F	T_{DLH}		T_{DHL}		t_r	t_f	I_{FT}		d
Units		V	V	V	µs		µs		ns	ns	mA		mm
		max.	typ.	max.	typ.	max.	typ.	max.	typ.	typ.	typ.	max.	
HOA 2001	plastic	0.4	V_{CC}	1.5	1	5	2.5	5	60	6	4	10	.120
HOA 2002 (a)	plastic	0.4	V_{CC}	1.5	1	5	2.5	5	60	6	4	10	.125

(a) Features .010 x .040 aperture

(b) V_{CC} operating range = 4.5 to 16 Volts

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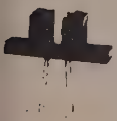
ransmissive switches

Characteristics	Components	Sensor aperture	On-state collector current			Off-state collector current	Saturation voltage			LED forward voltage		Response time		Slot width	Output
Test condition			$V_{CE} = 5$ V I_F as shown			$V_{CE} = 10$ V $I_F = 0$	I_C and I_F as shown			I_F as shown		$R_L = 1000\ \Omega$, $V_{CC} = 5$ V, $I_C = 1$ mA			
Symbol			I_L			I_D	$V_{CE\ (SAT)}$			V_F		t_r, t_f		d	
Units		inches	mA			nA	V			V		μs		inches	
			min.	max.	I_F(mA)	max.	max.	I_C(mA)	I_F(mA)	max.	I_F(mA)	rise (typ.)	fall (typ.)	nom	
HOA 1870-21	plastic	.012x.040	0.4	2.8	20	100	0.4	.05	20	1.5	20	10	12	.070	transistor
HOA 1870-23	plastic	.012x.040	2.5	18.0	20	250	1.1	.31	20	1.5	20	500	750	.070	darlington
HOA 1870-31	plastic	.006x.040	.30	2.1	20	100	0.4	.04	20	1.5	20	10	12	.070	transistor
HOA 1870-33	plastic	.006x.040	2.0	14.0	20	250	1.1	.25	20	1.5	20	500	750	.070	darlington
HOA 1872-1	hermetic		.30	2.0	20	100	0.4	.04	20	1.6	50	10	12	.100	transistor
HOA 1872-2	hermetic		1.8	10.0	20	100	0.4	.23	20	1.6	50	10	12	.100	transistor
HOA 1872-3	hermetic		4.0	25.0	20	250	1.1	.50	20	1.6	50	500	750	.100	darlington
HOA 1872-11	plastic		.30	2.0	20	100	0.4	.04	20	1.5	20	10	12	.100	transistor
HOA 1872-12	plastic		1.8	10.0	20	100	0.4	.23	20	1.5	20	10	12	.100	transistor
HOA 1872-13	plastic		4.0	25.0	20	250	1.1	.50	20	1.5	20	500	750	.100	darlington
HOA 1873-1	hermetic		.30	2.0	20	100	0.4	.04	20	1.6	50	10	12	.100	transistor
HOA 1873-2	hermetic		1.8	10.0	20	100	0.4	.23	20	1.6	50	10	12	.100	transistor
HOA 1873-3	hermetic		4.0	25.0	20	250	1.1	.50	20	1.6	50	500	750	.100	darlington
HOA 1873-11	plastic		.30	2.0	20	100	0.4	.04	20	1.5	20	10	12	.100	transistor
HOA 1873-12	plastic		1.8	10.0	20	100	0.4	.23	20	1.5	20	10	12	.100	transistor
HOA 1873-13	plastic		4.0	25.0	20	250	1.1	.50	20	1.5	20	500	750	.100	darlington
 HOA 1874-1	hermetic		.30	2.0	20	100	0.4	.04	20	1.6	50	10	12	.120	transistor
HOA 1874-2	hermetic		1.8	10.0	20	100	0.4	.23	20	1.6	50	10	12	.120	transistor
HOA 1874-3	hermetic		4.0	25.0	20	250	1.1	.50	20	1.6	50	500	750	.120	darlington
HOA 1874-11	plastic		.30	2.0	20	100	0.4	.04	20	1.5	20	10	12	.120	transistor
HOA 1874-12	plastic		1.8	10.0	20	100	0.4	.23	20	1.5	20	10	12	.120	transistor
HOA 1874-13	plastic		4.0	25.0	20	250	1.1	.50	20	1.5	20	500	750	.120	darlington
HOA 1875-1	hermetic		.15	.75	30	100	0.4	.02	20	1.6	50	10	12	.200	transistor
HOA 1875-2	hermetic		.60	3.0	30	100	0.4	.08	20	1.6	50	10	12	.200	transistor
HOA 1875-3	hermetic		1.8	12.0	30	250	1.1	.23	20	1.6	50	500	750	.200	darlington
HOA 1876-1	hermetic		.15	.75	30	100	0.4	.02	20	1.6	50	10	12	.200	transistor
HOA 1876-2	hermetic		.60	3.0	30	100	0.4	.08	20	1.6	50	10	12	.200	transistor
HOA 1876-3	hermetic		1.8	12.0	30	250	1.1	.23	20	1.6	50	500	750	.200	darlington
HOA 1877-1	hermetic		.10	.60	30	100	0.4	.01	20	1.6	50	10	12	.375	transistor
HOA 1877-2	hermetic		.50	2.5	30	100	0.4	.06	20	1.6	50	10	12	.375	transistor
HOA 1877-3	hermetic		1.5	10.0	30	250	1.1	.19	20	1.6	50	500	750	.375	darlington
HOA 1878-11	plastic		.20	2.0	20	100	0.4	.03	20	1.5	20	10	12	.125	transistor
HOA 1878-12	plastic		1.8	10.0	20	100	0.4	.23	20	1.5	20	10	12	.125	transistor
HOA 1878-13	plastic		4.0	25.0	20	250	1.1	.50	20	1.5	20	500	750	.125	darlington

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Transmissive switches

Characteristics	Components	Sensor aperture	On-state collector current			Off-state collector current	Saturation voltage			LED forward voltage		Response time		Slot width	Output
Test condition			$V_{CE} = 5$ V I_F as shown			$V_{CE} = 10$ V $I_F = 0$	I_C and I_F as shown			I_F as shown		$R_L = 1000\,\Omega$, $V_{CC} = 5$ V, $I_C = 1$ mA			
Symbol			I_L			I_D	$V_{CE(SAT)}$			V_F		t_r, t_f		d	
Units		inches	mA			nA	V			V		μs		inches	
			min	max	I_F(mA)	max.	max.	I_C(mA)	I_F(mA)	max.	I_F(mA)	rise (typ.)	fall (typ.)	nom	
HOA 1879-11	plastic		.40	2.0	20	100	0.4	.05	20	1.5	20	10	12	.125	transistor
HOA 1879-12	plastic		1.8	10.0	20	100	0.4	.22	10	1.5	20	10	12	.125	transistor
HOA 1879-15	plastic	.010x.040	.50	4.0	20	100	0.4	.06	20	1.5	20	10	12	.125	transistor
HOA 1881-11	plastic		.30	2.0	20	100	0.4	0.025	20	1.5	20	10	12	.125	transistor
HOA 1881-12	plastic		1.8	10.0	20	100	0.4	0.075	20	1.5	20	10	12	.125	transistor
HOA 1881-13	plastic		4.0	25.0	20	250	1.1	0.250	20	1.5	20	500	750	.125	darlington
HOA 2762-1	hermetic	.007x.040	0.1	1.1	20	100	0.4	0.010	20	1.6	50	10	12	.060	transistor
HOA 2762-2	hermetic	.007x.040	1.0	5.0	20	100	0.4	0.025	20	1.6	50	10	12	.060	transistor
HOA 2762-3	hermetic	.007x.040	2.0	15.0	20	250	1.1	0.250	20	1.6	50	500	750	.060	darlington
HOA 2862-1	hermetic	.025x.040	0.2	2.0	20	100	0.4	0.025	20	1.6	50	10	12	.100	transistor
HOA 2862-2	hermetic	.025x.040	1.8	10.0	20	100	0.4	0.075	20	1.6	50	10	12	.100	transistor
HOA 2862-3	hermetic	.025x.040	4.0	25.0	20	250	1.1	0.500	20	1.6	50	500	750	.100	darlington

Notes:

(1) Storage temperature −65°C to +100°C (hermetic)
−40°C to +85°C (plastic)
(2) Operating temperature −65°C to +100°C (hermetic)
−40°C to +80°C (plastic)
(3) BV_{CEO} @ $I_C = 100\mu A$, 30V min (transistor), 15V min (darlington)
(4) BV_{ECO} @ $I_C = 100\mu A$, 5V min
(5) $I_R = 10\mu A$ max @ $V_R = 3V$

Reflective switches

Characteristics	Components	Light current				Dark current		LED forward voltage		Light current rise time	Collector-emitter breakdown	Output
Test condition		$V_{CE} = 5$ V I_F as shown				$I_F = 0$, $H = 0$ V_{CE} as shown		I_F as shown		$V_{CC} = 5$ V, $I_C = 1$ mA $R_L = 1000\,\Omega$		
Symbol		I_L				I_D		V_F		t_r	BV_{CEO}	
Units		mA				nA		V		μs	V	
		min	max	I_F(mA)	d Inch (a)	max	V_{CE}(V)	max	I_F(mA)	typ.	min.	
HOA 1160-1	hermetic	0.5	2.5	30	.075	100	10	1.6	50	8	30	transistor
HOA 1160-2	hermetic	2.0	10.0	30	.075	100	10	1.6	50	10	30	transistor
HOA 1160-3	hermetic	5.0	35.0	30	.075	250	10	1.6	50	50(c)	15	darlington
HOA 1180-1	hermetic	.04	.20	30	.50	100	10	1.6	50	6	30	transistor
HOA 1180-2	hermetic	.16	.80	30	.50	100	10	1.6	50	6	30	transistor
HOA 1180-3	hermetic	2.0	14.0	30	.50	250	10	1.6	50	50(c)	15	darlington

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HOA 1397-1	plastic	.20	.80	20	.050(b)	100	10	1.5	20	6	30	transistor
HOA 1397-2	plastic	.70	2.8	20	.050(b)	100	10	1.5	20	6	30	transistor
HOA 1397-31	plastic	2.0	8.0	20	.050(b)	250	10	1.5	20	50(c)	15	darlington
HOA 1397-32	plastic	7.0	28.0	20	.050(b)	250	10	1.5	20	50(c)	15	darlington
HOA 1404-1	hermetic	.20	1.0	30	.20	100	10	1.6	50	6	30	transistor
HOA 1404-2	hermetic	.80	4.0	30	.20	100	10	1.6	50	8	30	transistor
HOA 1404-3	hermetic	2.0	14.0	30	.20	250	10	1.6	50	50(c)	15	darlington
HOA 1405-1	plastic	.20	1.0	30	.20(b)	100	10	1.5	20	6	30	transistor
HOA 1405-2	plastic	.80	4.0	30	.20(b)	100	10	1.5	20	6	30	transistor
HOA 2498-1	hermetic	.04	.20	30	.50	100	10	1.6	50	6	30	transistor
HOA 2498-2	hermetic	.16	.80	30	.50	100	10	1.6	50	8	30	transistor
HOA 2498-3	hermetic	2.0	14.0	30	.50	250	10	1.6	50	50(c)	15	darlington

(a) d is the distance to the reflective object (a mirror), see test circuit below.

(b) Reflective surface is an Eastman Kodak® neutral white test card having 90% diffuse reflectance.

(c) $R_L = 100\Omega$

Light emitting diodes

- hermetic and plastic packages
- long operating life
- high conversion efficiency

Characteristics	Package	Output power			Beam angle	Forward voltage		Reverse breakdown	Radiation rise time	Forward continuous current	Peak wave-length
Test condition		I_F as shown			3	I_F as shown		$I_R = 10\,\mu A$		25 C	
Symbol		P_O			Ø	V_F		V_R	t_r	I_F	λ
Units		mW			degrees	V		V	μs	mA	nm
		min.	max.	I_F(mA)	typ.	max.	I_F(mA)	min.	typ.	max.	typ.
SE 1450-1	hermetic	0.20		50	12	1.6	50	2	0.7	100	930
SE 1450-2	hermetic	0.36		50	12	1.6	50	2	0.7	100	930
SE 1450-3	hermetic	0.7		50	12	1.6	50	2	0.7	100	930
SE 1450-4	hermetic	1.00		50	12	1.6	50	2	0.7	100	930
SE 1450-1L	hermetic	0.20		50	12	1.6	50	2	0.7	100	930
SE 1450-2L	hermetic	0.35		50	12	1.6	50	2	0.7	100	930
SE 1450-3L	hermetic	0.70		50	12	1.6	50	2	0.7	100	930
SE 1450-4L	hermetic	1.00		50	12	1.6	50	2	0.7	100	930
SE 2460-1	hermetic	0.27		50	18	1.6	50	2	0.7	100	930
SE 2460-2	hermetic	0.40		50	18	1.6	50	2	0.7	100	930
SE 2460-3	hermetic	1.00		50	18	1.6	50	2	0.7	100	930
SE 3455-1	hermetic	2.0		100	90	1.7	100	2	0.7	100	930
SE 3455-2	hermetic	3.5		100	90	1.7	100	2	0.7	100	930
SE 3455-3	hermetic	4.8		100	90	1.7	100	2	0.7	100	930
SE 3455-4	hermetic	5.4		100	90	1.7	100	2	0.7	100	930
SE 3470-1	hermetic	7.0		100	75	1.9	100	6	0.7	100	880
SE 3470-2	hermetic	9.0		100	75	1.9	100	6	0.7	100	880
SE 3470-3	hermetic	10.5		100	75	1.9	100	6	0.7	100	880
SE 3470-4	hermetic	12.0		100	75	1.9	100	6	0.7	100	880

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Characteristics	Package	Output power			Beam angle	Forward voltage		Reverse breakdown	Radiation rise time	Forward continuous current	Peak wave-length
Test condition		I_F as shown			3	I_F as shown		$I_R = 10\,\mu A$		25 C	
Symbol		P_O			Ø	V_F		V_R	t_r	I_F	λ
Units		mW			degrees	V		V	µs	mA	nm
		min.	max.	I_F(mA)	typ.	max.	I_F(mA)	min.	typ.	max	typ
SE 5455-1	hermetic	2.0		100	20	1.7	100	2	0.7	100	930
SE 5455-2	hermetic	3.5		100	20	1.7	100	2	0.7	100	930
SE 5455-3	hermetic	4.8		100	20	1.7	100	2	0.7	100	930
SE 5455-4	hermetic	5.4		100	20	1.7	100	2	0.7	100	930
SE 5470-1	hermetic	7.0		100	20	1.9	100	6	0.7	100	880
SE 5470-2	hermetic	9.0		100	20	1.9	100	6	0.7	100	880
SE 5470-3	hermetic	10.5		100	20	1.9	100	6	0.7	100	880
SE 5470-4	hermetic	12.0		100	20	1.9	100	6	0.7	100	880
SEP 8505-1	plastic	0.5(a)		20	15	1.5	20	3	0.6	40	930
SEP 8505-2	plastic	1.5(a)	3.0(a)	20	15	1.5	20	3	0.6	40	930
SEP 8505-3	plastic	2.5(a)	4.5(a)	20	15	1.5	20	3	0.6	40	930
SEP 8505-4	plastic	3.5(a)		20	15	1.5	20	3	0.6	40	930
SEP 8506-1	plastic	.05(b)	.36(b)	20	25	1.6	20	3	0.6	40	930
SEP 8506-2	plastic	.33(b)	.52(b)	20	25	1.6	20	3	0.6	40	930
SEP 8506-3	plastic	.45(b)	.90(b)	20	25	1.6	20	3	0.6	40	930
SEP 8506-4	plastic	.80(b)	2.2(b)	20	25	1.6	20	3	0.6	40	930

Notes:

(1) Storage temperature −65°C to +150°C (hermetic)
−40°C to +85°C (plastic)

(2) Operating temperature −65°C to +125°C (hermetic)
−40°C to +80°C (plastic)

Specifications indicated are for 25°C ambient temperature.
See individual data sheets for temperature derating information.

(3) Beam angle is defined to be the total included angle between half intensity points.

(a) Output power is in mW/cm^2. The on-axis power is measured using a .081 (2.06mm) diameter apertured sensor placed .400 (10.16mm) from lens tip.

(b) Output power is in mW/cm^2. The on-axis power is measured using a .104 (2.65mm) diameter apertured sensor placed .535 (13.6mm) from lens tip.

Photodetectors

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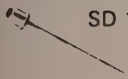
- Choice of diode, transistor, darlington and Schmitt outputs.
- Photodiodes for fast speed of response.
- Phototransistors offer medium response and high stability.
- Photodarlingtons for applications requiring extremely high sensitivity.
- Optoschmitt devices have voltage regulator, differential amplifier and Schmitt trigger on the same chip, eliminating additional signal processing circuitry.
- Plastic and hermetic packages available.

Photodiodes

Characteristics	Package	Light current		Dark current	Reverse breakdown voltage	Light current rise time	Angular response
Test condition		$V_R = 20$ V H as shown		$V_R = 20$ V H = 0	$I_R = 10\ \mu A$		3
Symbol		I_L		I_D	BV_R	t_r	Ø
Units		μA		nA	V	ns	degrees
		min.	H*	max.	min.	typ.	typ.
 SD 1420-2	hermetic	5	5	5	50	50	24
SD 1420-2L	hermetic	5	5	5	50	50	24
SD 2420-2	hermetic	7	20	5	50	50	48
SD 3421-2	hermetic	10	5	20	75	5(max.)	90
SD 5421-2	hermetic	40	5	20	75	5(max.)	18

Notes:
(1) Storage temperature −65°C to +150°C
(2) Operating temperature −65°C to +125°C
Specifications indicated are for 25°C ambient temperature.
See individual data sheets for temperature derating information.
(3) Angular response is defined to be the total included angle between half sensitivity points.
*The value of H is measured in mW/cm² from a tungsten source @ a color temperature of 2870°K.

phototransistors

Characteristics	Package	Light current			Dark current		Collector breakdown	Emitter breakdown	Saturation voltage	Light current rise time	Angular response
Test condition		$V_{CE} = 5$ V H as shown			H=0 V_{CE} as shown		$I_C = 100\ \mu A$	$I_C = 100\ \mu A$	$I_C = 0.4$ mA	$R_L = 1000\ \Omega$ $V_{CC} = 5$ V, $I_L = 1$ mA	3
Symbol		I_L			I_D		BV_{CEO}	BV_{ECO}	V_{CE} (sat)	t_r	Ø
Units		mA			nA		V	V	V	μs	degrees
		min.	max.	H*	max.	V_{CE}	min.	min.	typ.	typ.	typ.
SD 1440-1	hermetic	0.7		5	100	10	30	7	0.3	4	24
SD 1440-2	hermetic	1.5		5	100	10	30	7	0.3	4	24
SD 1440-3	hermetic	3.0		5	100	10	30	7	0.3	8	24
SD 1440-4	hermetic	6.0		5	100	10	30	7	0.3	16	24

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SD 1440-1L	hermetic	0.7	5	100	10	30	7	0.3	4	24
SD 1440-2L	hermetic	1.5	5	100	10	30	7	0.3	4	24
SD 1440-3L	hermetic	3.0	5	100	10	30	7	0.3	8	24
SD 1440-4L	hermetic	6.0	5	100	10	30	7	0.3	16	24
SD 2440-1	hermetic	0.5	20	100	10	30	7	0.3	4	48
SD 2440-2	hermetic	2.0	20	100	10	30	7	0.3	4	48
SD 2440-3	hermetic	4.0	20	100	10	30	7	0.3	8	48
SD 2440-4	hermetic	7.0	20	100	10	30	7	0.3	14	48
SD 3443-1	hermetic	0.5	5	100	10	30	7	0.2	6(b)	90
SD 3443-2	hermetic	1.0	5	100	10	30	7	0.2	6(b)	90
SD 3443-3	hermetic	2.0	5	100	10	30	7	0.2	8(b)	90
SD 5443-1	hermetic	1.0	5	100	10	30	7	0.2	4(b)	18
SD 5443-2	hermetic	4.0	5	100	10	30	7	0.2	4(b)	18
SD 5443-3	hermetic	8.0	5	100	10	30	7	0.2	6(b)	18
SD 5443-4	hermetic	16.0	5	100	10	30	7	0.2	8(b)	18

Notes:

(1) Storage temperature –65°C to +150°C (hermetic)
–40°C to +85°C (plastic)

(2) Operating temperature –65°C to +125°C (hermetic)
–40°C to +80°C (plastic)

Specifications indicated are for 25°C ambient temperature.
See individual data sheets for temperature derating information.

(3) Angular response is defined to be the total included angle between half sensitivity points.

(a) Light source is 940nm LED.
(b) R_L = 100Ω

•The value of H is measured in mW/cm^2 from a tungsten source @ a color temperature of 2870°K.

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Phototransistors

Characteristics	Package	Light current			Dark current		Collector breakdown	Emitter breakdown	Saturation voltage	Light current rise time	Angular response
Test condition		$V_{CE} = 5$ V H as shown			H = 0 V_{CE} as shown		$I_C = 100\ \mu A$	$I_C = 100\ \mu A$	$I_C = 0.4$ mA	$R_L = 1000\ \Omega$ $V_{CC} = 5$ V, $I_L = 1$ mA	3
Symbol		I_L			I_D		BV_{CEO}	BV_{ECO}	V_{CE} (sat)	t_r	Ø
Units		mA			nA		V	V	V	μs	degrees
		min.	max.	H*	max.	V_{CE}	min.	min.	typ.	typ	typ
SDP 8405-1	plastic	1.0		5	100	10	30	7	0.3	8	40
SDP 8405-2	plastic	7.0	14.0	5	100	10	30	7	0.3	10	40
SDP 8405-3	plastic	12.0	24.0	5	100	10	30	7	0.3	12	40
SDP 8405-4	plastic	20.0		5	100	10	30	7	0.3	16	40
SDP 8406-1	plastic	.15	1.9	1(a)	100	10	30	7	0.4(c)	8	50
SDP 8406-2	plastic	1.8	3.6	1(a)	100	10	30	7	0.4(c)	8	50
SDP 8406-3	plastic	3.4	6.5	1(a)	100	10	30	7	0.4(c)	8	50
SDP 8406-4	plastic	6.4	12.0	1(a)	100	10	30	7	0.4(c)	8	50

Optoschmitts

- TTL, LSTTL, CMOS compatible.
- Fan out of 10.
- Operate over 4.5 to 16 V_{CC} supply.

Characteristics	Package	Output voltage (low)	Output voltage (high)	Operate point	Release point	Rise time		Fall time		Propagation delay (low)		Propagation delay (high)		Clock freq.
Symbol		V_{OL}	V_{OH}	O_P	R_P	t_r		t_f		T_{DLH}		T_{DHL}		
Units		V	V	mW/cm²	mW/cm²	ns		ns		μs		μs		kHz
		max.	typ (d)	max.(a)	max.(a)	typ	max.	typ.	max.	typ.	max.	typ.	max.	max
SD 5600	hermetic	0.4	V_{CC}	0.5	0.47	60	150	6	15	1	5	2.5	5	100
SDP 8600*	plastic	0.4	V_{CC}	2.5	2.35	60	150	6	15	1	5	2.5	5	100
SDP 8601*	plastic	0.4	V_{CC}	2.5	2.35	60	150	6	15	1	5	2.5	5	100
SDP 8602*	plastic	0.4	V_{CC}	2.5	2.35	60	150	6	15	1	5	2.5	5	100
*DIFFERENT MOUNTING CONFIGURATION														

Notes:

1) Storage temperature	−65°C to +150°C (hermetic) −40°C to +85°C (plastic)
2) Operating temperature	−65°C to +125°C (hermetic) −40°C to +80°C (plastic)

3) Angular response is defined to be the total included angle between half sensitivity points.

(a) Light source is 940nm LED.
(b) R_L = 100Ω
(c) I_C = 25μA
(d) An internal load resistor of 10kΩ is tied between V_{CC} and V_O.

Specifications indicated are for 25°C ambient temperature.

See individual data sheets for temperature derating information.

*The value of H is measured in mW/cm² from a tungsten source @ a color temperature of 2870°K.

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Photodarlingtons

Characteristics	Package	Light current		Dark current	Collector breakdown	Emitter breakdown	Saturation voltage	Light current rise time	Angular response
Test condition		$V_{CE} = 5$ V H as shown		$V_{CE} = 10$ V H = 0	$I_C = 100\,\mu A$	$I_C = 100\,\mu A$	$I_C = 1$ mA	$R_L = 1000\,\Omega$ $V_{CC} = 5$ V, $I_L = 1$ mA	
Symbol		I_L		I_D	BV_{CEO}	BV_{ECO}	V_{CE} (sat)	t_r	Ø
Units		mA		nA	V	V	V	µs	degrees
		min	H*	max.	min	min.	max	typ	typ.
SD 1410-1	hermetic	0.6	0.2	250	15	7	1.1	15	24
SD 1410-2	hermetic	2.0	0.2	250	15	7	1.1	25	24
SD 1410-3	hermetic	4.0	0.2	250	15	7	1.1	75	24
SD 1410-4	hermetic	8.0	0.2	250	15	7	1.1	125	24
SD 1410-1L	hermetic	0.6	0.2	250	15	7	1.1	15	24
SD 1410-2L	hermetic	2.0	0.2	250	15	7	1.1	25	24
SD 1410-3L	hermetic	4.0	0.2	250	15	7	1.1	75	24
SD 1410-4L	hermetic	8.0	0.2	250	15	7	1.1	125	24
SD 2410-1	hermetic	1.0	1.0	250	15	7	1.1	15	48
SD 2410-2	hermetic	3.0	1.0	250	15	7	1.1	25	48
SD 2410-3	hermetic	6.0	1.0	250	15	7	1.1	75	48
SD 3410-1	hermetic	0.6	2.0	250	15	7	1.1	15	90
SD 3410-2	hermetic	2.0	2.0	250	15	7	1.1	25	90
SD 3410-3	hermetic	4.0	2.0	250	15	7	1.1	75	90
SD 3410-4	hermetic	8.0	2.0	250	15	7	1.1	125	90
SD 5410-1	hermetic	2.0	0.2	250	15	7	1.1	15	6
SD 5410-2	hermetic	4.0	0.2	250	15	7	1.1	25	6
SD 5410-3	hermetic	8.0	0.2	250	15	7	1.1	75	6
SDP 8106-1	plastic	1.0	1.0(a)	250	15	7	1.1(b)	75	50

Notes:

(1) Storage temperature −65°C to +150°C (hermetic)
−40°C to +85°C (plastic)
(2) Operating temperature −65°C to +125°C (hermetic)
−40°C to +80°C (plastic)
(3) Angular response is defined to be the total included angle between half sensitivity points.

(a) Light source is a 940nm LED.
(b) $I_C = 250\mu A$

*The value of H is measured in mW/cm^2 from a tungsten source @ a color temperature of 2870°K.

Specifications indicated are for 25°C ambient temperature.
See individual data sheets for temperature derating information.

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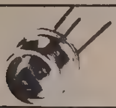
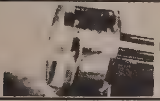
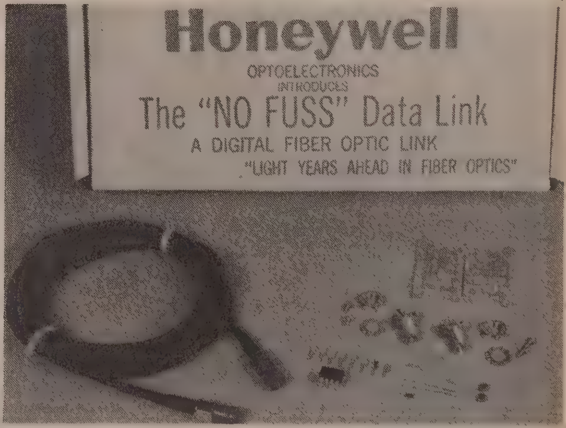
i Detectors

Pin photodiodes	Responsivity (A/W) min.	Rise time t_r (ns) typ.	@ V_R (V)	Operating temperature range
SD 3322-002	0.2	1.0	15	–40 to +100 °C
SD 3478-002 SD 3498-002	0.45 0.45	1.1 15	90 30	–65 to +150 °C
SD 4478-002 SD 4498-002	0.38 0.38	1.1 15	90 30	–40 to +100 °C

ptoschmitt Detectors

Type	Switch point sensitivity (µW) typ.	max.	Propagation delay (typ.) (µs) t_{DHL}	t_{DLH}	Risetime (typ.) (ns) t_r	t_f	Operating temperature range
 D 3324-002	2	5	3	1	60	6	0 to 70 °C
 D 4324-002	2	5	3	1	60	6	0 to 70 °C

C to 5 MB/s Fiber Optic ink Kit HF 4102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OPTOELECTRONICS
INTRODUCES
The "NO FUSS" Data Link
A DIGITAL FIBER OPTIC LINK
"LIGHT YEARS AHEAD IN FIBER OPTICS"

his link has been designed to be used in computer nd process control applications. It requires no knowledge f optics or communications protocols or adjustment of ny components.

eatures:

- Code transparent digital data transmission
- Data rates up to 5 MB/s, bandwidth DC to 2,5 MHz
- TTL compatible inputs and outputs
- Operation to 2 km
- Supply voltage - 0,5 V to + 7 V
- No additional components needed

ow Cost Digital Fiber Optic Link Kit

PX 4101

his is ideal for first contact with fiber ptics technology. No special tool is equired. The kit contains all necessary omponents to construct a 5 meter ligital data link.

Features

- TTL/CMOS compatible input and output
- Single power supply (5V to 15V)
- DC to 200 Kbit data rate
- Operation to 15 meters
- GaAlAs LED
- Monolithic Schmitt Trigger detector
- Low profile AMP field-applicable connectors
- DuPont OE1040 plastic fiber (5 m)
- No special tools, no polishing, no adhesive for fiber termination
- Press-fit components (AMP Optimate Simpex connector)

SPX4101
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INTRODUCES
THE SWEET SPOT™ CONNECTION
A LOW COST DIGITAL FIBER OPTIC LINK
"LIGHT YEARS AHEAD IN FIBER OPTICS"

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FIBER OPTICS sweet spot components

GaAlAs Emitters

(λ_p = 820 nm)

Features: on chip microlens to collimate led output for optimum power coupling to a variety of fibers.

Emitter	P_o min. (μW)	t_r max. (a) (ns)	Test conditions	Operating temperature range	Fiber core diameter min.
SE 3352-002 SE 3352-003 SE 3352-004 SE 3352-012 SE 3352-013	150 400 1000 150 400	20 20 20 10 10	IF = 100 mA NA = 0.25 Aperture = 300 μm dia.	−55 to +125 °C	100 μm
SE 3362-002 SE 3362-003 SE 3362-004	10 15 20	20 20 20	IF = 100 mA NA = 0.21 50 μm graded index fiber	−55 to +125 °C	50 μm
SE 4352-002 SE 4352-003	200 400	20 20	IF = 100 mA NA = 0.53 Aperture = 368 μm	−40 to +100 °C	100 μm

GaAsP Emitters

(λ_p = 660 nm)

Emitter	P_o min. (μW)	t_r max. (a) (ns)	Test conditions	Operating temperature range	Fiber core diameter min.
SE 4355-002	25	150	I_F = 50 mA CROFON OE 10 40 (10 meters)	−40 to +100 °C	1000 μm

Note 1:
Fiber optics emitters nomenclature is as follows:
ex.: SE 3352- X X X
0, . . ., 4 = power output range
0 = standard
1 = high speed
0 = standard
1 = hermetic

Note 2:
9 inches min. pigtail is supplied with this LED.

IXYS
SOLUTIONS FOR POWER CONTROL

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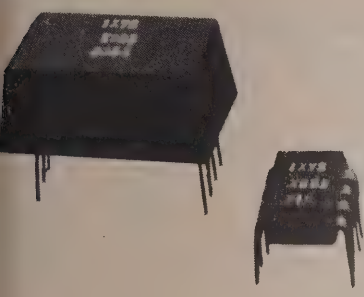
SANTA CLARA, CA 95051
TELEPHONE: (408) 733-4045

XVS OPTO-COUPLED VOLTAGE SENSOR



FEATURES:

- Built in precision reference
- ±50 ppm/deg C average Threshold TC
- Fast turn on response
- Low output noise
- 3500-7500V isolation voltage
- Low coupling capacitance
- TTL compatible
- High noise immunity
- 8 lead DIP or VDE package

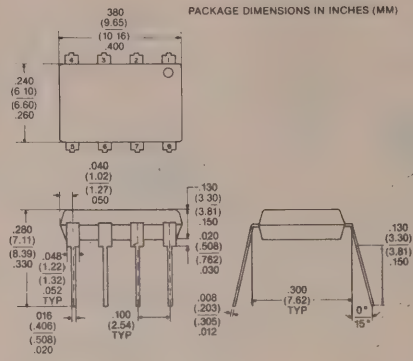
DESCRIPTION:

The XVS includes an amplifier/comparator/driver having a built in precision bandgap reference of 2.5V, the output of which drives directly a GaAs infrared transmitting diode optically coupled to a Si NPN transistor. The amplifier has a high current sinking capability of 100 ma with a transconductance of 2 siemens minimum. The amplifier output is brought out to pin 3 such that feedback can be applied. The built in optocoupler has a high CTR of 50% typical. Built in precision reference. Fast turn on response. Low output noise. A 3500V isolation voltage. Low coupling capacitance. TTL compatible. High noise immunity. XVS-2 in 8-pin DIPpackage. XVS-3 in 8-pin VDE package.

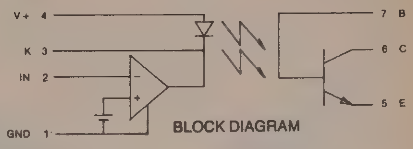
APPLICATIONS:

- Fault-tolerant line voltage sensing
- Feedback element switching power supply
- Signal ground isolation
- Replace pulse transformers
- Opto-isolated microprocessor data bus
- Isolated line receiver/transmitter
- AC/DC voltage monitoring element

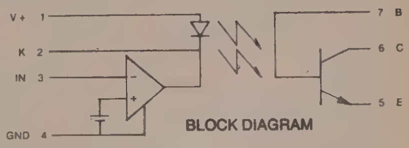
XVS-2


PACKAGE DIMENSIONS IN INCHES (MM)
380 (9.65) (10.16) .400
.240 (6.10) (6.60) .260
.040 (1.02) (1.27) .050
.130 (3.30) (3.81) .150
.280 (7.11) (8.39) .330
.048 (1.22) (1.32) .052 TYP
.020 (.508) (.762) .030
.016 (.406) (.508) .020
.100 (2.54) TYP
.008 (.203) (.305) .012
.130 (3.30) (3.81) .150
.300 (7.62) TYP
0°
15°

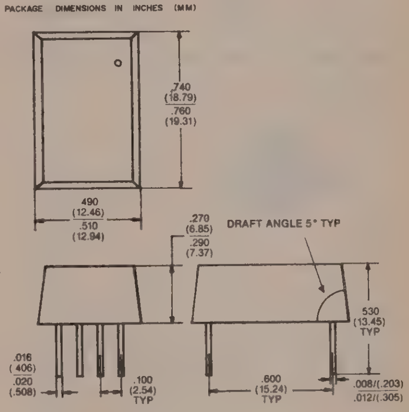
XVS-2


V+ 4
K 3
IN 2
GND 1
7 B
6 C
5 E
BLOCK DIAGRAM

XVS-3 XVS-3V


V+ 1
K 2
IN 3
GND 4
7 B
6 C
5 E
BLOCK DIAGRAM

XVS-3 XVS-3V


PACKAGE DIMENSIONS IN INCHES (MM)
.740 (18.79) .760 (19.31)
.490 (12.46) .510 (12.94)
.270 (6.85) .290 (7.37)
DRAFT ANGLE 5° TYP
.530 (13.45) TYP
.016 (.406) .020 (.508)
.100 (2.54) TYP
.600 (15.24) TYP
.008/(.203) .012/(.305)

ABSOLUTE MAXIMUM RATINGS

Input to output isolation XVS-2/XVS-3 . . 3500VDC
. . . XVS-3V . . . 7500VDC
Storage Temperature . . . . −55 to +150 deg C
Operating Temperature . . . . 0 to 70 deg C
Lead Solder Temperature . . . . . 260 deg C for 10s
(1.6mm below seating plane)
Total power dissipation Pd 320mW
Derate linearly from 25 deg C. . . . −4.0mW/deg C

INPUT SECTION
V+terminal voltage (V+) . . . −5 to +37V(Note 1)
V+terminal current (I+) 60mA
In voltage (Vin). . . . . −0.5 to +35V
In current (Iin) . . . . −50uA to +10mA

OUTPUT TRANSISTOR
BV_{CBO} 70V
BV_{CEO} 30V
BV_{ECO} 5V
Collector current (I_c). 100mA

ELECTRICAL CHARACTERISTICS(*)

At 25 deg C unless otherwise noted—(Note 2)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
INPUT AMPLIFIER SECTION:						
Input threshold voltage	V_{TH}	V+=4V,I+=10mA	2.40	2.50	2.60	V
Change of threshold voltage w/temperature	$V_{TH}(T)$	V+=4V,I+=10mA T_A=0 to 70 deg C		±5.0	±10	mV
Common Mode Rejection Ratio	CMRR	I+=10mA, V+=4 to 11V V+=11 to 37V		−1.4 −1.0	−2.7 −2.0	mV/V mV/V
Input bias current	Iin Iin (T)	I+=10mA I+=10mA, T_AA=0 to 70 deg C		2.0 2.5	4.0 5.2	uA uA
I+ Off current	I+(OFF)	Vin=0,V+=37V		0.1	1.0	uA
Transconductance (Note 3)	gm	Vin=V_{TH},I+=1 to 60mA	2.0	5.0		Siemens
OPTO COUPLER SECTION (I_F=0 unless otherwise specified):						
LED Forward voltage	V_F	I_F=10mA	0.8	1.3	1.5	V
Collector to Emitter leakage current	I_{CEO}	V_{CE}=10V,I_F=0 V_{CE}=30V,I_F=0, T_A=70 deg C		5.0	50 50	nA
Collector to Base breakdown voltage	BV_{CBO}	I_c=100uA	70			V
Collector to Emitter breakdown voltage	BV_{CEO}	I_c=100uA	30			V
Forward current gain	H_{FE}	V_{CE}=5V,I_c=100uA,I_F=0	100	150		
Collector to Emitter saturation voltage	$V_{CE}(SAT)$	I_c=0.5mA,I_F=10mA			0.3	V
Current Transfer Ratio	CTR=I_C/I_F	V_{CE}=10V, I_F=10mA		50		%
Turn on time	t on	I_c=10mA,V_{CE}=10V		2.5		uS
Turn off time	t off	RL=100 ohm		2.5		uS
Input Output Isolation	I_{IO}	V_{IO}=3500V peak, T=8mS			100	uA

NOTES: (1) All voltages are with respect to GND terminal (pin1)
(2) All typical parameters @ 25 deg C ambient temperature
(3) Transconductance change is defined as gm=△I+/△Vin
(*) Specifications subject to change without notice

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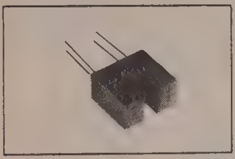
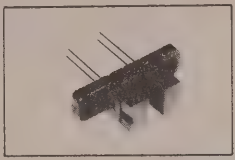
A DIVISION OF CROWN SEMICONDUCTOR


K-8105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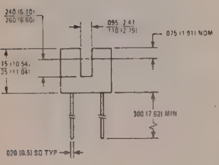
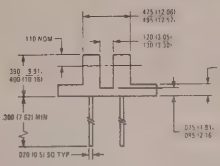
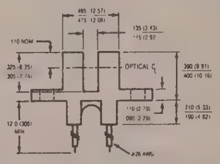
K-8170



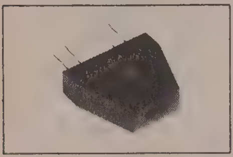


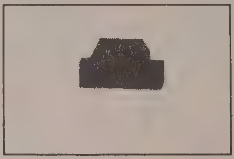


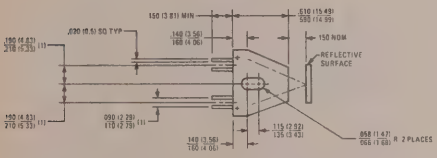
Coupled Electrical Characteristics

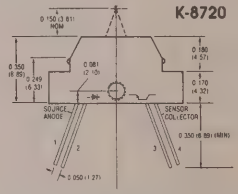
Device	On State Output Current $I_F = 20mA, V_{CE} = 10.0V$		
	MIN	TYPICAL	UNIT
K-8105	500	1300	μA
K-8102	500	1400	μA
K-8170	200	1500	μA

Available with wires attached and various apertures on sensor.


K-8710


K-8720

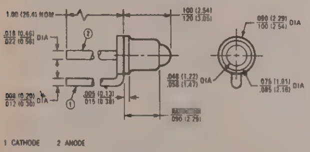




Coupled Electrical Characteristics

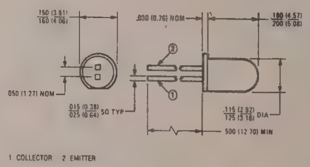
Device	On State Output Current $I_F = 40mA$ $V_{CE} = 5.0V$, d = 0.15″		
	MIN	TYPICAL	UNIT
K-8710	200	500	μA
K-8720	100	350	μA

Available with wires attached.



1. EMITTER 2. COLLECTOR

K-6100 K-5100

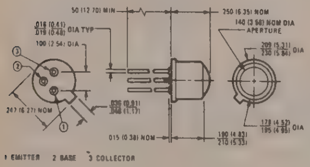


1. EMITTER 2. COLLECTOR

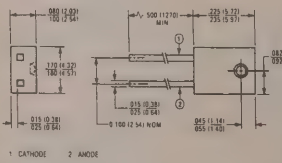
K-6500 K-5500

Phototransistors

Device	Light Current	@$V_{CE} = 5.0V$
	MIN	H = mW/cm^2
K-5100	1.5mA	5
K-5250	4.0 mA	5
K-5500	0.5 mA	20
K-5550	1.0 mA	20



K-5250

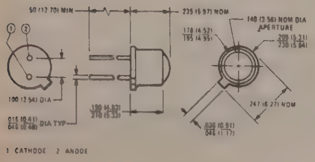


1 EMITTER 2. COLLECTOR

K-6550 K-5550

Infrared Light Emitting Diodes

Device	Output Power	Forward Current
	MIN	I_F
K-6100	0.35mW	50mA
K-6250	3.00 mW	100 mA
K-6500	0.5 mW	20 mA
K-6550	0.5 mW	40 mA



K-6250

Other electrical and mechanical devices available as standard products from Optek. Write for the Optek catalog for other standard products.

SILONEX inc

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PHOTOCELLS • PHOTODIODES • PHOTOVOLTAIC CELLS, PANELS AND POWER SYSTEMS • OPTICALLY COUPLED ISOLATORS • OPTOELECTRONIC ARRAYS • UV SENSITIVE LDRs

CdS & CdSe PHOTOCELLS

Cell Type No.	Typical 1.0 Ftc Res. KΩ	Min. Dark Res. MΩ	Max. Peak Volt.	Max. Power MW.	Description
NSL-3120	75	100	70	50	CdSe Photoconductive Cell in Hermetic Glass and Metal TO-18.
NSL-3130	30	100	70	50	
NSL-3140	14	100	70	50	
NSL-3150	550	1000	250	50	
NSL-3160	260	1000	250	50	
NSL-3170	110	1000	250	50	
NSL-3180	50	500	120	50	
NSL-3812	43	10	80	100	CdSe Photoconductive cell in TO-5 plastic coated "open pill" package.
NSL-3822	18.6	10	80	100	
NSL-3832	8	10	80	100	
NSL-3842	3.5	10	80	100	
NSL-3852	330	100	320	100	
NSL-3862	155	100	320	100	
NSL-3872	66	100	320	100	
NSL-4440	120	50	1000	1000	1″ CdS Photoconductive Cell in Hermetic Glass and Metal case 1.25″ diameter.
NSL-4450	26.0	15	1000	1000	
NSL-4460	11.4	5	1000	1000	
NSL-4470	5.5	0.5	1000	1000	
NSL-4442	120	10	1000	500	1″ CdS Photoconductive Cell in plastic coated "open pill" package.
NSL-4452	26	1.5	1000	500	
NSL-4462	11.4	0.5	1000	500	
NSL-4472	5.5	0.2	1000	500	
NSL-4610	65	80	80	100	CdS Photoconductive Cell in Hermetic Glass and Metal ¼″ dia. case. Hermetic CdSe versions also available.
NSL-4620	28	20	80	100	
NSL-4630	12	2.7	80	100	
NSL-4640	5.2	0.7	80	100	
NSL-4650	550	160	250	100	
NSL-4660	230	20	250	100	
NSL-4670	100	4	250	100	
NSL-4810	43.0	65	120	200	CdS Photoconductive Cell in Hermetic Glass and Metal TO-5. Plastic coated "open pill" versions also available.
NSL-4820	18.6	15	120	200	
NSL-4830	8	1.8	120	200	
NSL-4840	3.5	0.25	120	200	
NSL-4850	330	200	320	200	
NSL-4860	155	130	320	200	
NSL-4870	66	20	320	200	
NSL-2930	1.7	0.5	80	500	TO-8 Hermetic CdS/Se Photoconductive Cell.
NSL-2940	.75	0.1	80	500	
NSL-2970	7.5	5.0	250	500	
NSL-3921	4.0	2	80	200	TO-8 CdSe Photoconductive Cell in Plastic Case, Glass Lens and Plastic Coated "open pill" and CdS versions also available.
NSL-3931	1.7	2	80	200	
NSL-3941	0.75	2	80	200	
NSL-3951	40.0	5	320	200	
NSL-3961	17.0	5	320	200	
NSL-3971	7.5	5	320	200	
NSL-4920	4.0	2.0	80	500	CdS Photoconductive Cell in Hermetic Glass and Metal TO-8. Hermetic CdSe version also available.
NSL-4930	1.7	0.4	80	500	
NSL-4940	0.75	0.05	80	500	
NSL-4950	40	30	320	500	
NSL-4960	17	4.0	320	500	
NSL-4970	7.5	0.5	320	500	
NORP-11	20	2.5	320	250	CdS Photocell in 0.5″ lensed Plastic case.
NORP-12	9	1	320	250	
NORP-13	4	0.5	320	250	

UV SENSITIVE LDRs

Cell Type No.	Typical 1.0 Ftc Res. KΩ	Min. Dark Res. MΩ	Max. Peak Volt	Max. Power MW	Description
NSL-2129/3	1.7	0.2	80	200	0.5″ Plastic Case with Phosphor-Coated Quartz Window
NSL-2129/6	17.0	1	320	200	

PIN PHOTODIODES

NSL Type No.	Light Current* MA	Dark Current nA	Rise Time nS	Fall Time nS	Description
NSL-530	0.3	10	3	6	TO-18 Package
NSL-580	1.5	30	5	8	TO-5

* At 500 Ftc (25 MW/cm²) 2870°K Source

PHOTOVOLTAIC MODULES

NSL Type No.	Typical Short Ct. Current	Typical Open Ct. Voltage	Peak Power	Mechanical Description
NSL-5925	2.2A	20.5V	32W	40.2″ x 15.8″ x 1.74″
NSL-5950	1.25A	19.5V	18W	21.2″ x 17.6″ x 1.74″
NSL-5978	680mA	19.5V	9W	17.56″ x 12.32″ x 1.74″

PHOTODETECTOR LAMP/LED ASSEMBLIES

CdSe Photodetector

	Emitter			Detector			
Module Type No.	Volts	Current MA	Max. ON Res. Ω	Min. OFF Res. MΩ	Max. Volts	Max. Power mW	Description
PL-1033-1	10	15	100	10	80	250	Phenolic .75″ x .75″ x 625″ Pin Leads for P.C. Board Mounting, (Matched, Multi-Detector Configurations available.)
PL-1036-1	10	15	400	50	320	250	
PL-2H33-1	200	2	100	10	80	250	
PL-2H36-1	200	2	400	50	320	250	
PL-5S33-1		25	250	10	80	250	
PL-5S36-1		25	2000	50	320	250	
PLT-10384	10	15	250	10	80	100	Standard tube: Axial leads.
PLT-10387	10	15	3000	50	320	100	
PLT-2H384	200	2	500	10	80	100	
PLT-2H387	200	2	10000	50	320	100	
PLS-5S380		25	250	10	80	100	Small tube; Axial leads.
PLS-5S387		25	4000	100	320	100	
PLM-5S310		25	500	10	80	50	Miniature Tube; Axial leads.
PLM-5S317		25	5000	100	320	50	

SILICON PHOTODIODES

Cell Type No.	Min. Short Ct.* Curr. MA	Min. Open Ct.* Volt.	Dark Curr. μA @ IV @ 25°C	Reverse Voltage Recom. Max.	Description
NSL-701-1	0.30	0.35	3	5	.1″ x .2″ Chip. Wire Leads
NSL-801-1	0.325	0.275	1.5	10	
NSL-701-9	0.30	0.35	3	5	9 Element Cell, 0.1″ Spacing
NSL-702	0.6	0.35	5	5	.2″ x .2″ Chip. Wire Leads
NSL-802	0.65	0.275	2.5	10	
NSL-703	1.4	0.35	15	5	.2″ x .4″ Chip. Wire Leads
NSL-803	1.5	0.275	7.5	10	
NSL-705	4.5	0.35	25	5	.76″ x .354″ Chip. Wire Leads
NSL-805	4.77	0.275	12.5	10	
NSL-706	2.9	0.35	20	5	.4″ x .4″ Chip. Wire Leads
NSL-806	3.0	0.275	10	10	
NSL-707	3.3	0.35	25	5	.2″ x 1″ Chip. Wire Leads
NSL-807	3.5	0.275	12.5	10	
NSL-708	1.3	0.35	15	5	.1″ x 1″ Chip. Wire Leads
NSL-808	1.4	0.275	7.5	10	
NSL-710	0.125	0.4	1	5	TO-18 Package
NSL-810	0.150	0.275	0.5	10	
NSL-751	1.4	0.35	2.0	5	0.5″ dia. Epoxy Package
NSL-851	1.5	0.275	10	10	
NSL-781	0.28	0.35	5	5	Hermetic TO-5 Case
NSL-881	0.3	0.275	2.5	10	
NSL-782	0.42	0.35	5	5	
NSL-791	0.60	0.35	5	5	Hermetic TO-8 Case
NSL-792	1.1	0.35	15	5	
NSL-8932	0.65	0.275	0.5	10	0.5″ dia. Ceramic

* At 500 Ftc (25 MW/cm²) 2870°K Source

SILICON PLANAR PHOTODETECTORS

Cell Type No.	Min. Short Ct.* Curr. μA	Min. Open Ct.* Volt.	Dark Curr. NA @ 5V @ 25°C	Breakdown Voltage (V)	Description
NSL-811	100	0.4	5	40	TO-18, Flat Window
NSL-812	310	0.4	5	40	TO-18, Low Lens
NSL-813	220	0.4	5	40	TO-18, High Lens
NSL-814	90	0.4	5	40	TO-52, Flat Window
NSL-815	240	0.4	5	40	TO-52, Low Lens
NSL-883	360	0.4	10	20	TO-5, Flat Window
NSL-893	800	0.4	20	10	TO-8, Flat Window

* At 500 Ftc, 2870°K Source

SILICON BLUE SENSITIVE PHOTODIODES

Cell Type No.	Sensitivity @ 500 nM (A/W)	Min. Short Ct.* Curr. μA	Dark Curr. μA @ 1V @ 25°C	Breakdown Voltage	Description
NSL-710BG	0.17	18	1.0	5	TO-18, BG Filter
NSL-810BG	0.17	18	0.5	10	TO-18, BG Filter
NSL-811BG	0.20	18	0.005	40	TO-18, BG Filter
NSL-780BG	0.17	35	5.0	5	TO-5, BG Filter
NSL-880BG	0.17	35	2.5	10	TO-5, BG Filter
NSL-883BG	0.20	40	0.01	20	TO-5, BG Filter

* At 500 Ftc, 2870°K Source

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Infrared Emitters, Sensors and Photologic™ Devices

Emitters

Infrared emitters from the Optoelectronics Division of TRW are currently made of two basic materials, gallium arsenide (GaAs) and gallium aluminum arsenide (GaAlAs). These materials are cut into a variety of chip sizes and mounted into a much greater variety of package styles and lens configurations to suit almost any application requirement.

The latest state-of-the-art solution grown epitaxial techniques are used to ensure high efficiency, long operating life, and minimum degradation.

Aside from slight differences in spectral emission, (GaAs is centered at 930 nanometers, GaAlAs is centered at 875 nanometers), there are some other things to consider when deciding which material to choose for a specific application:

GaAs	GaAlAs
1. Less degradation	1. 2.5 times the effective P_O at the same I_F.
2. Lower cost	2. Large area chips available for high current pulsing applications.
3. Lower V_F	3. Improved spectral match with silicon phototransistors and ICs.

Sensors

For every infrared emitter made by TRW, except the T-1¾ package, there is a spectrally and mechanically matched sensor. Though most are phototransistors, there are several package styles which allow a photodarlington, photodiode or photologic™ option.

Photodarlingtons are used when infrared signal levels are low and more current gain is needed than is possible with phototransistors. Photodiodes are used where high speed, low noise and linear output are needed. Photologics are used where direct interface to logic circuitry is needed.

All sensors are fabricated using advanced silicon planar diffused technology and are silicon nitride passivated for long term stability. An antireflective coating over the active area ensures maximum absorption of irradiated energy.

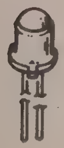
Photologic™ Devices

"Photologic™" is a trademark TRW uses to identify its family of direct interface logic compatible sensors. Each device is a bipolar monolithic integrated circuit containing a high speed photodiode, a linear amplifier and a Schmitt trigger on a single silicon chip. Four output options are available: buffer totem-pole, buffer open-collector, inverter totem-pole and inverter open-collector. Sink current of 12.8 mA is available for driving up to 8 TTL loads without additional circuitry and medium speed data rates to 250 KBaud are possible with typical rise and fall times of 25 nsec.

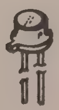
ase Styles

Hermetic
Pill
Lensed

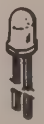
Hermetic
TO-46
Lensed



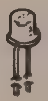
Hermetic
TO-46



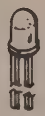
Plastic
T-1
Lensed
0.05" (1.27 mm)
Lead Spacing



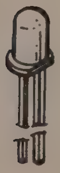
Plastic
T-1



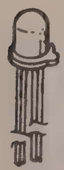
Plastic
T-1
Lensed
0.10" (2.54 mm)
Lead Spacing *



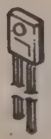
Plastic
T-1¾
Lensed



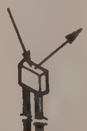
Plastic
TO-46
Lensed



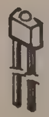
Style A
Plastic
Lensed



Style B
Plastic
Custom



Style C
Plastic
Lensed



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Infrared Emitters, Sensors and Photologic™ Devices

Electrical Characteristics ($T_A = 25°C$)

Emitters

Devices containing GaAs chips can be distinguished from devices containing GaAlAs chips by the first *number* of the part number sequence.

Example: An OP160 contains GaAs. An OP260 is a mechanical equivalent containing GaAlAs.

Part No.	Case Style	Beam Angle (1)	Symbol	Min.	Max.	Output	at Rated I_F	Max. V_F at Rated I_F	Max. I_R at Rated V_R
OP123	Hermetic Pill Lensed	35°	P_O	0.4	—	mW	50 mA	1.5 V @ 50 mA	100 µA @ 2 V
OP124	Hermetic Pill Lensed	35°	P_O	1.0	—	mW	50 mA	1.5 V @ 50 mA	100 µA @ 2 V
OP131	Hermetic TO-46 Lensed	18°	P_O	3.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP132	Hermetic TO-46 Lensed	18°	P_O	4.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP133	Hermetic TO-46 Lensed	18°	P_O	5.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP130W	Hermetic TO-46	50°	P_O	1.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP131W	Hermetic TO-46	50°	P_O	3.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP132W	Hermetic TO-46	50°	P_O	4.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP133W	Hermetic TO-46	50°	P_O	5.0	—	mW	100 mA	1.75 V @ 100 mA	100 µA @ 2 V
OP140	A	40°	P_O	0.50	—	mW	40 mA	1.6 V @ 20 mA	100 µA @ 2 V
OP140SL	A	40°	E_e(APT)	0.02	—	mW/cm^2	20 mA (2)	1.6 V @ 20 mA	100 µA @ 2 V
OP140SLD	A	40°	E_e(APT)	0.10	0.30	mW/cm^2	20 mA (2)	1.6 V @ 20 mA	100 µA @ 2 V
OP140SLC	A	40°	E_e(APT)	0.20	0.40	mW/cm^2	20 mA (2)	1.6 V @ 20 mA	100 µA @ 2 V
OP140SLB	A	40°	E_e(APT)	0.30	0.55	mW/cm^2	20 mA (2)	1.6 V @ 20 mA	100 µA @ 2 V
OP140SLA	A	40°	E_e(APT)	0.40	—	mW/cm^2	20 mA (2)	1.6 V @ 20 mA	100 µA @ 2 V
OP160	Plastic T-1 Lensed	16°	P_O	0.50	—	mW	20 mA	1.6 V @ 20 mA	100 µA @ 2 V
OP160SL	Plastic T-1 Lensed	16°	E_e(APT)	0.05	—	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP160SLD	Plastic T-1 Lensed	16°	E_e(APT)	0.28	0.95	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP160SLC	Plastic T-1 Lensed	16°	E_e(APT)	0.85	1.60	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP160SLB	Plastic T-1 Lensed	16°	E_e(APT)	1.40	2.20	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP160SLA	Plastic T-1 Lensed	16°	E_e(APT)	1.95	—	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP160W	Plastic T-1	85°	P_O	0.50	—	mW	20 mA	1.6 V @ 20 mA	100 µA @ 2 V
OP161	Plastic T-1 Lensed *	16°	P_O	0.50	—	mW	20 mA	1.6 V @ 20 mA	100 µA @ 2 V
OP161SL	Plastic T-1 Lensed *	16°	E_e(APT)	0.05	—	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP161SLD	Plastic T-1 Lensed *	16°	E_e(APT)	0.28	0.95	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP161SLC	Plastic T-1 Lensed *	16°	E_e(APT)	0.85	1.60	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP161SLB	Plastic T-1 Lensed *	16°	E_e(APT)	1.40	2.20	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP161SLA	Plastic T-1 Lensed *	16°	E_e(APT)	1.95	—	mW/cm^2	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP168F	B	104°	P_O	0.25	—	mW	20 mA (3)	1.6 V @ 20 mA	100 µA @ 2 V
OP169	C	46°	P_O	0.20	—	mW	20 mA	1.7 V @ 20 mA	100 µA @ 2 V
OP169SL	C	46°	E_e(APT)	0.020	—	mW/cm^2	20 mA (3)	1.7 V @ 20 mA	100 µA @ 2 V
OP169SLD	C	46°	E_e(APT)	0.116	0.244	mW/cm^2	20 mA (3)	1.7 V @ 20 mA	100 µA @ 2 V
OP169SLC	C	46°	E_e(APT)	0.195	—	mW/cm^2	20 mA (3)	1.7 V @ 20 mA	100 µA @ 2 V
OP223	Hermetic Pill Lensed	36°	E_e(APT)	1.00	—	mW/cm^2	50 mA (3)	1.8 V @ 50 mA	100 µA @ 2 V
OP224	Hermetic Pill Lensed	36°	E_e(APT)	3.50	—	mW/cm^2	50 mA (3)	1.8 V @ 50 mA	100 µA @ 2 V
OP231	Hermetic TO-46 Lensed	18°	E_e(APT)	1.50	—	mW/cm^2	100 mA (3)	2.0 V @ 100 mA	100 µA @ 2 V
OP232	Hermetic TO-46 Lensed	18°	E_e(APT)	2.0	4.5	mW/cm^2	100 mA (3)	2.0 V @ 100 mA	100 µA @ 2 V
OP233	Hermetic TO-46 Lensed	18°	E_e(APT)	3.0	—	mW/cm^2	100 mA (3)	2.0 V @ 100 mA	100 µA @ 2 V
OP230W	Hermetic TO-46	50°	P_O	6.0	—	mW	100 mA	2.0 V @ 100 mA	100 µA @ 2 V
OP231W	Hermetic TO-46	50°	P_O	8.0	—	mW	100 mA	2.0 V @ 100 mA	100 µA @ 2 V
OP232W	Hermetic TO-46	50°	P_O	10.0	—	mW	100 mA	2.0 V @ 100 mA	100 µA @ 2 V
OP233W	Hermetic TO-46	50°	P_O	12.0	—	mW	100 mA	2.0 V @ 100 mA	100 µA @ 2 V
OP240	A	40°	E_e(APT)	0.05	—	mW	20 mA (2)	1.8 V @ 20 mA	100 µA @ 2 V
OP240SLC	A	40°	E_e(APT)	0.20	0.86	mW/cm^2	20 mA (2)	1.8 V @ 20 mA	100 µA @ 2 V
OP240SLB	A	40°	E_e(APT)	0.40	1.20	mW/cm^2	20 mA (2)	1.8 V @ 20 mA	100 µA @ 2 V
OP240SLA	A	40°	E_e(APT)	0.60	—	mW/cm^2	20 mA (2)	1.8 V @ 20 mA	100 µA @ 2 V
OP260	Plastic T-1 Lensed	16°	E_e(APT)	0.10	—	mW/cm^2	20 mA (3)	1.8 V @ 20 mA	100 µA @ 2 V
OP260SLC	Plastic T-1 Lensed	16°	E_e(APT)	0.50	3.50	mW/cm^2	20 mA (3)	1.8 V @ 20 mA	100 µA @ 2 V
OP260SLB	Plastic T-1 Lensed	16°	E_e(APT)	2.50	6.00	mW/cm^2	20 mA (3)	1.8 V @ 20 mA	100 µA @ 2 V
OP260SLA	Plastic T-1 Lensed	16°	E_e(APT)	4.00	—	mW/cm^2	20 mA (3)	1.8 V @ 20 mA	100 µA @ 2 V
OP290C	Plastic T-1¾ Lensed	50°	E_e(APT)	160.0	—	mW/cm^2	1.5 A (4)	4.0 V @ 1.5 A	10 µA @ 5 V
OP290B	Plastic T-1¾ Lensed	50°	E_e(APT)	200.0	300	mW/cm^2	1.5 A (4)	4.0 V @ 1.5 A	10 µA @ 5 V
OP290A	Plastic T-1¾ Lensed	50°	E_e(APT)	240.0	—	mW/cm^2	1.5 A (4)	4.0 V @ 1.5 A	10 µA @ 5 V
OP291C	Plastic T-1¾ Lensed	50°	E_e(APT)	10.0	—	mW/cm^2	100 mA (4)	2.0 V @ 100 mA	100 µA @ 2 V
OP291B	Plastic T-1¾ Lensed	50°	E_e(APT)	13.0	20.0	mW/cm^2	100 mA (4)	2.0 V @ 100 mA	100 µA @ 2 V
OP291A	Plastic T-1¾ Lensed	50°	E_e(APT)	16.0	—	mW/cm^2	100 mA (4)	2.0 V @ 100 mA	100 µA @ 2 V
OP292C	Plastic T-1¾ Lensed	50°	E_e(APT)	1.8	—	mW/cm^2	20 mA (4)	1.75 V @ 20 mA	10 µA @ 5 V
OP292B	Plastic T-1¾ Lensed	50°	E_e(APT)	2.5	04.0	mW/cm^2	20 mA (4)	1.75 V @ 20 mA	10 µA @ 5 V
OP292A	Plastic T-1¾ Lensed	50°	E_e(APT)	3.2	—	mW/cm^2	20 mA (4)	1.75 V @ 20 mA	10 µA @ 5 V
OP293C	Plastic TO-46 Lensed	60°	E_e(APT)	10.0	—	mW/cm^2	100 mA (5)	2.0 V @ 100 mA	100 µA @ 2 V
OP293B	Plastic TO-46 Lensed	60°	E_e(APT)	13.0	20.0	mW/cm^2	100 mA (5)	2.0 V @ 100 mA	100 µA @ 2 V
OP293A	Plastic TO-46 Lensed	60°	E_e(APT)	16.0	—	mW/cm^2	100 mA (5)	2.0 V @ 100 mA	100 µA @ 2 V
OP295C	Plastic T-1¾ Lensed	15°	E_e(APT)	24.0	—	mW/cm^2	1.5 A (6)	4.0 V @ 1.5 A	10 µA @ 5 V
OP295B	Plastic T-1¾ Lensed	15°	E_e(APT)	36.0	72.0	mW/cm^2	1.5 A (6)	4.0 V @ 1.5 A	10 µA @ 5 V
OP295A	Plastic T-1¾ Lensed	15°	E_e(APT)	48.0	—	mW/cm^2	1.5 A (6)	4.0 V @ 1.5 A	10 µA @ 5 V
OP296C	Plastic T-1¾ Lensed	15°	E_e(APT)	2.0	—	mW/cm^2	100 mA (6)	2.0 V @ 100 mA	100 µA @ 2 V
OP296B	Plastic T-1¾ Lensed	15°	E_e(APT)	3.0	06.0	mW/cm^2	100 mA (6)	2.0 V @ 100 mA	100 µA @ 2 V
OP296A	Plastic T-1¾ Lensed	15°	E_e(APT)	4.0	—	mW/cm^2	100 mA (6)	2.0 V @ 100 mA	100 µA @ 2 V
OP297C	Plastic T-1¾ Lensed	15°	E_e(APT)	0.3	—	mW/cm^2	20 mA (6)	1.75 V @ 20 mA	10.0 µA @ 5 V
OP297B	Plastic T-1¾ Lensed	15°	E_e(APT)	0.6	01.2	mW/cm^2	20 mA (6)	1.75 V @ 20 mA	10.0 µA @ 5 V
OP297A	Plastic T-1¾ Lensed	15°	E_e(APT)	0.9	—	mW/cm^2	20 mA (6)	1.75 V @ 20 mA	10.0 µA @ 5 V
OP298C	Plastic TO-46 Lensed	25°	E_e(APT)	2.0	—	mW/cm^2	100 mA (7)	2.0 V @ 100 mA	100 µA @ 2 V
OP298B	Plastic TO-46 Lensed	25°	E_e(APT)	2.8	04.4	mW/cm^2	100 mA (7)	2.0 V @ 100 mA	100 µA @ 2 V
OP298A	Plastic TO-46 Lensed	25°	E_e(APT)	3.6	—	mW/cm^2	100 mA (7)	2.0 V @ 100 mA	100 µA @ 2 V

Notes: (1) "Beam Angle" refers to the solid beam angle measured at half power points.
(2) Measured with a 0.081" (2.06 mm) diameter aperture at 0.400" (10.16 mm) from lens tip.
(3) Measured with a 0.180" (4.57 mm) diameter aperture at 0.653" (16.59 mm) from lens tip.
(4) Measured with a 0.250" (6.35 mm) diameter aperture at 0.200" (5.08 mm) from lens tip.
(5) Measured with a 0.250" (6.35 mm) diameter aperture at 0.280" (7.11 mm) from lens ti
(6) Measured with a 0.250" (6.35 mm) diameter aperture at 1.129" (28.68 mm) from lens
(7) Measured with a 0.250" (6.35 mm) diameter aperture at 1.209" (30.71 mm) from lens

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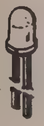
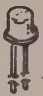
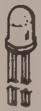

Plastic
T-1
Lensed
0.05″ (1.27 mm)
Lead Spacing


Plastic
T-1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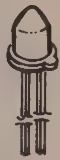
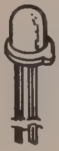
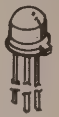
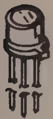
T-1
Lensed
0.10″ (2.54 mm)
Lead Spacing*

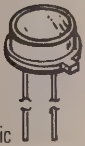

Plastic
TO-18
Lensed*

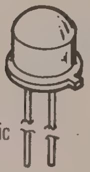

Plastic
TO-18
Lensed

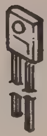

Hermetic
TO-18
Lensed

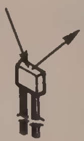
*(Narrow Reception)


lermetic
O-18


Hermetic
TO-5


Hermetic
TO-5
Lensed


Style A
Plastic
Lensed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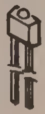
Plastic
Custom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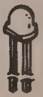
Plastic
Lensed


Style D
Plastic
Lensed

ensors ($T_A=25°C$)

art No.	Case Style	Output Type	Min.	Max.	$I_{C(ON)}$	at Rated V_{CE} and E_e (8)	Min. $V_{(BR)CEO}$ at rated I_C	Max. I_{CEO} at Rated V_{CE}
P300	Hermetic Pill Lensed	Photodarlington	0.8	–	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	1.0 μA @ 10 V
P301	Hermetic Pill Lensed	Photodarlington	0.8	2.4	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	0.25 μA@ 10 V
P302	Hermetic Pill Lensed	Photodarlington	1.8	5.4	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	0.25 μA@ 10 V
P303	Hermetic Pill Lensed	Photodarlington	3.6	12.0	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	1.0 μA @ 10 V
P304	Hermetic Pill Lensed	Photodarlington	7.0	21.0	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	1.0 μA @ 10 V
P305	Hermetic Pill Lensed	Photodarlington	14.0	43.0	mA	5 V and 1 mW/cm^2	15 V @ 100 μA	1.0 μA @ 10 V
P500	Plastic T-1 Lensed	Phototransistor	4.0	–	mA	5 V and 20 mW/cm^2	30 V @ 100 μA	100 nA @ 15 V
P500SLD	Plastic T-1 Lensed	Phototransistor	10.0	24.0	mA	5 V and 20 mW/cm^2	30 V @ 100 μA	100 nA @ 15 V
P500SLC	Plastic T-1 Lensed	Phototransistor	17.0	35.0	mA	5 V and 20 mW/cm^2	30 V @ 100 μA	100 nA @ 15 V
P500SLB	Plastic T-1 Lensed	Phototransistor	25.0	50.0	mA	5 V and 20 mW/cm^2	30 V @ 100 μA	100 nA @ 15 V
P500SLA	Plastic T-1 Lensed	Phototransistor	40.0	–	mA	5 V and 20 mW/cm^2	30 V @ 100 μA	100 nA @ 15 V
P500W	Plastic T-1	Phototransistor	0.5	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P501	Plastic T-1 Lensed *	Phototransistor	4.0	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P501SLD	Plastic T-1 Lensed *	Phototransistor	10.0	24.0	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P501SLC	Plastic T-1 Lensed *	Phototransistor	17.0	35.0	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P501SLB	Plastic T-1 Lensed *	Phototransistor	25.0	50.0	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P501SLA	Plastic T-1 Lensed *	Phototransistor	40.0	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P502	D	Phototransistor	0.8	–	mA	5 V and 5 mW/cm^2	20 V @ 1 mA	100 nA @ 10 V
P502B	D	Phototransistor	1.0	4.0	mA	5 V and 5 mW/cm^2	20 V @ 1 mA	100 nA @ 10 V
P502A	D	Phototransistor	2.5	10.0	mA	5 V and 5 mW/cm^2	20 V @ 1 mA	100 nA @ 10 V
P508F	B	Phototransistor	0.5	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P509	C	Phototransistor	0.50	–	mA	5 V and 1 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P509SLD	C	Phototransistor	0.17	–	mA	5 V and 1 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P509SLC	C	Phototransistor	0.30	.50	mA	5 V and 1 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P509SLB	C	Phototransistor	0.70	.90	mA	5 V and 1 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P509SLA	C	Phototransistor	1.20	1.50	mA	5 V and 1 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P530	Plastic T-1 Lensed	Photodarlington	5.0	–	mA	5 V and 0.5 mW/cm^2	15 V @ 1 mA	100 nA @ 10 V
P538F	B	Photodarlington	1.0	–	mA	5 V and 1 mW/cm^2	15 V @ 1 mA	225 nA @ 10 V
P550	A	Phototransistor	0.5	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P550SLD	A	Phototransistor	4.5	14.5	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P550SLC	A	Phototransistor	12.0	19.0	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P550SLB	A	Phototransistor	15.0	27.5	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P550SLA	A	Phototransistor	22.0	–	mA	5 V and 20 mW/cm^2	30 V @ 1 mA	100 nA @ 10 V
P560	A	Photodarlington	0.5	–	mA	2 V and 1 mW/cm^2, $R_L=50$	30 V @ 1 mA	100 nA @ 10 V
P593C	Plastic TO-18 Lensed	Phototransistor	1.0	–	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P593B	Plastic TO-18 Lensed	Phototransistor	2.0	4.0	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P593A	Plastic TO-18 Lensed	Phototransistor	3.0	–	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P598C	Plastic TO-18 Lensed *	Phototransistor	2.5	–	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P598B	Plastic TO-18 Lensed *	Phototransistor	5.0	10.0	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P598A	Plastic TO-18 Lensed *	Phototransistor	7.5	–	mA	5 V and 5 mW/cm^2	30 V @ 100 μA	100 nA @ 10 V
P600	Hermetic Pill Lensed	Phototransistor	0.8	–	mA	5 V and 20 mW/cm^2	50 V @ 100 μA	25 nA @ 30 V
P601	Hermetic Pill Lensed	Phototransistor	0.5	3.0	mA	5 V and 20 mW/cm^2	50 V @ 100 μA	25 nA @ 10 V
P602	Hermetic Pill Lensed	Phototransistor	2.0	5.0	mA	5 V and 20 mW/cm^2	50 V @ 100 μA	25 nA @ 10 V
P603	Hermetic Pill Lensed	Phototransistor	4.0	8.0	mA	5 V and 20 mW/cm^2	50 V @ 100 μA	25 nA @ 10 V
P604	Hermetic Pill Lensed	Phototransistor	7.0	22.0	mA	5 V and 20 mW/cm^2	50 V @ 100 μA	25 nA @ 10 V
P640	Hermetic Pill Lensed	Phototransistor	0.8	–	mA	5 V and 20 mW/cm^2	25 V @ 100 μA	100 nA @ 10 V
P641	Hermetic Pill Lensed	Phototransistor	0.5	3.0	mA	5 V and 20 mW/cm^2	25 V @ 100 μA	100 nA @ 10 V
P642	Hermetic Pill Lensed	Phototransistor	2.0	5.0	mA	5 V and 20 mW/cm^2	25 V @ 100 μA	100 nA @ 10 V
P643	Hermetic Pill Lensed	Phototransistor	4.0	8.0	mA	5 V and 20 mW/cm^2	25 V @ 100 μA	100 nA @ 10 V
P644	Hermetic Pill Lensed	Phototransistor	7.0	22.0	mA	5 V and 20 mW/cm^2	25 V @ 100 μA	100 nA @ 10 V

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Infrared Emitters, Sensors and Photologic™ Devices

Sensors (continued)

Part No.	Case Style	Output Type	Min.	Max.	$I_{C(ON)}$	at Rated V_{CE} and E_e (8)	Min. $V_{(BR)CEO}$ at rated I_C	Max. I_{CEO} at Rated V_{CE}
OP800	Hermetic TO-18 Lensed	Phototransistor	0.8	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP801	Hermetic TO-18 Lensed	Phototransistor	0.5	3.0	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP802	Hermetic TO-18 Lensed	Phototransistor	2.0	5.0	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP803	Hermetic TO-18 Lensed	Phototransistor	4.0	8.0	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP804	Hermetic TO-18 Lensed	Phototransistor	7.0	22.0	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP805	Hermetic TO-18 Lensed	Phototransistor	15.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP800W	Hermetic TO-18	Phototransistor	0.3	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP801W	Hermetic TO-18	Phototransistor	0.5	3.0	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP802W	Hermetic TO-18	Phototransistor	2.5	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP830	Hermetic TO-18 Lensed	Photodarlington	15.0	—	mA	5 V and 0.5 mW/cm^2	15 V @ 100 µA	1 µA @ 10 V
OP830W	Hermetic TO-18	Photodarlington	4.0	—	mA	5 V and 0.5 mW/cm^2	15 V @ 100 µA	1 µA @ 10 V
OP841	Hermetic TO-18 Lensed	Phototransistor	0.5	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP842	Hermetic TO-18 Lensed	Phototransistor	2.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP843	Hermetic TO-18 Lensed	Phototransistor	5.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP844	Hermetic TO-18 Lensed	Phototransistor	7.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP845	Hermetic TO-18 Lensed	Phototransistor	15.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP841W	Hermetic TO-18	Phototransistor	0.3	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP842W	Hermetic TO-18	Phototransistor	1.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP843W	Hermetic TO-18	Phototransistor	1.5	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP844W	Hermetic TO-18	Phototransistor	2.0	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
OP845W	Hermetic TO-18	Phototransistor	2.5	—	mA	5 V and 5 mW/cm^2	30 V @ 100 µA	100 nA @ 10 V
Part No.	**Case Style**	**Output Type**	**Min.**	**Max.**	**I_L**	**at Rated V_R and E_e (8)**	**Min. $V_{(BR)R}$ at Rated I_R**	**Max. I_D at Rated V_R**
OP900	Hermetic Pill Lensed	Photodiode	8	—	µA	10 V and 20 mW/cm^2	100 V @ 100 µA	10 nA @ 50 V
OP903	Hermetic TO-5 Lensed	Photodiode	100	—	µA	5 V and 5 mW/cm^2	32 V @ 100 µA	25 nA @ 10 V
OP903W	Hermetic TO-5	Photodiode	35	—	µA	5 V and 5 mW/cm^2	32 V @ 100 µA	25 nA @ 10 V

Note: (8) Light source is an unfiltered tungston bulb operating at CT=2870°K.

Case Styles

Hermetic TO-18 Lensed

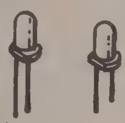
Style E Plastic Lensed

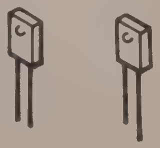
Photologic ™ Devices (−40°C to +85°C)

Part No.	Case Style	Output Circuit	V_{CC}	Max. I_{CC} at V_{CC}=5.25 V	Min./Max. E_eT (+) (9)	Max. Propogation Delay (t_{PLH}, t_{PHL}) (10)
OPL550	E	Buffer, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL550-OC	E	Buffer, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL551	E	Inverter, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL551-OC	E	Inverter, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL552SLA	E	Buffer, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 1.4 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL552SLB	E	Buffer, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	1.05 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL552SLA-OC	E	Buffer, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 1.4 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL552SLB-OC	E	Buffer, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	1.05 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL553SLA	E	Inverter, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 1.4 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL553SLB	E	Inverter, Totem-Pole	5.0 V	15 mA @ 0 or 3 mW/cm^2	1.05 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL553SLA-OC	E	Inverter, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	0.25 1.4 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL553SLB-OC	E	Inverter, Open-Collector	5.0 V	15 mA @ 0 or 3 mW/cm^2	1.05 2.3 mW/cm^2	5 µs, E_e=0 or 3 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL800	Hermetic TO-18 Lensed	Buffer, Totem-Pole	5.0 V	15 mA @ 0 or 1 mW/cm^2	— 3.0 mW/cm^2	5 µs, E_e=0 or 1 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL800-OC	Hermetic TO-18 Lensed	Buffer, Open-Collector	5.0 V	15 mA @ 0 or 1 mW/cm^2	— 3.0 mW/cm^2	5 µs, E_e=0 or 1 mW/cm^2, f=10 kHz, R_L=360 Ω
OPL801	Hermetic TO-18 Lensed	Inverter, Totem-Pole	5.0 V	15 mA @ 0 or 1 mW/cm^2	— 3.0 mW/cm^2	5 µs, E_e=0 or 1 mW/cm^2, f=10 kHz, R_L=8 TTL Loads
OPL801-OC	Hermetic TO-18 Lensed	Inverter, Open-Collector	5.0 V	15 mA @ 0 or 1 mW/cm^2	— 3.0 mW/cm^2	5 µs, E_e=0 or 1 mW/cm^2, f=10 kHz, R_L=360 Ω

Notes: (9) Positive going threshold irradiance. (10) Measured at V_{CC}=5 V, T_A=25°C, Duty Cycle=50%.

Case Styles


Style V


Style W

Matched Pairs (T_A=25°C)

Part No.	Case Style	V_F at Rated I_F	I_R at Rated V_R	Min. $I_{C(ON)}$ at Rated V_{CE} and I_F	$V_{(BR)CEO}$ at Rated I_C	I_{CEO} at Rated V_{CE}, E_e=0
OPS660	V	1.6 V @ 20 mA	100 µA @ 2 V	0.5 mA @ 5 V and 20 mA (11)	30 V @ 1.0 mA	100 nA @ 10 V
OPS661	V	1.6 V @ 20 mA	100 µA @ 2 V	1.0 mA @ 5 V and 20 mA (11)	30 V @ 1.0 mA	100 nA @ 10 V
OPS662	V	1.6 V @ 20 mA	100 µA @ 2 V	5.0 mA @ 5 V and 20 mA (11)	30 V @ 1.0 mA	100 nA @ 10 V
OPS690	W	1.6 V @ 20 mA	100 µA @ 2 V	100 µA @ 10 V and 20 mA (12)	30 V @ 1.0 mA	100 nA @ 10 V
OPS691	W	1.6 V @ 20 mA	100 µA @ 2 V	0.5 mA @ 10 V and 20 mA (12)	30 V @ 1.0 mA	100 nA @ 10 V
OPS692	W	1.6 V @ 20 mA	100 µA @ 2 V	1.0 mA @ 10 V and 20 mA (12)	30 V @ 1.0 mA	100 nA @ 10 V
OPS693	W	1.6 V @ 20 mA	100 µA @ 2 V	2.0 mA @ 10 V and 20 mA (12)	30 V @ 1.0 mA	100 nA @ 10 V

Notes: (11) Distance from lens tip to lens tip is 0.25 inches (6.35 mm). (12) Distance from lens tip to lens tip is 0.125 inches (3.18 mm).

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TRW

Optically Coupled Isolators

Optically coupled isolators allow direct circuit control with complete electrical isolation of input from output and are currently the best, lowest cost way to eliminate ground loops and EMI/RFI problems associated with such control.

With one of the largest and most varied product lines in the industry, the Optoelectronics Division of TRW is able to offer the designer everything from standard 6 pin plastic P-DIP couplers, to 8 pin P-DIP high speed, high gain, "High Tech" couplers, specialty couplers, triac driver couplers, and photologic couplers. Most of TRW's optocouplers are UL recognized and several are VDE approved.

Case Style

Plastic
6 Pin P Dip

Standard Couplers (T_A=25°C)

Part No.	Case Style	Output Type	Min. CTR @ Rated V_{CE} and I_F	Min. Isolation Voltage	Min. $V_{(BR)CEO}$ at Rated I_C	Max. I_{CEO} at Rated V_{CE}
CNY17I	6 Pin P-DIP	Phototransistor	40% @ 5 V and 10 mA	4000 VDC (1)	70 V @ 1 mA	50 nA @ 10 V
CNY17II	6 Pin P-DIP	Phototransistor	63% @ 5 V and 10 mA	4000 VDC (1)	70 V @ 1 mA	50 nA @ 10 V
CNY17III	6 Pin P-DIP	Phototransistor	100% @ 5 V and 10 mA	4000 VDC (1)	70 V @ 1 mA	100 nA @ 10 V
CNY17IV	6 Pin P-DIP	Phototransistor	160% @ 5 V and 10 mA	4000 VDC (1)	70 V @ 1 mA	100 nA @ 10 V
OPI2100	6 Pin P-DIP	Phototransistor	150% @ 5 V and 10 mA	4000 VDC (1)	30 V @ 1 mA	50 nA @ 5 V
OPI2150	6 Pin P-DIP	Phototransistor	2.0% @ 5 V and 10 mA	1500 VDC (1)	20 V @ 1 mA	100 nA @ 10 V
OPI2250	6 Pin P-DIP	Phototransistor	2.0% @ 5 V and 10 mA	2500 VDC (1)	20 V @ 1 mA	100 nA @ 10 V
OPI2151	6 Pin P-DIP	Phototransistor	10% @ 5 V and 10 mA	1500 VDC (1)	30 V @ 1 mA	100 nA @ 10 V
OPI2251	6 Pin P-DIP	Phototransistor	10% @ 5 V and 10 mA	2500 VDC (1)	30 V @ 1 mA	100 nA @ 10 V
OPI2152	6 Pin P-DIP	Phototransistor	20% @ 5 V and 10 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2252	6 Pin P-DIP	Phototransistor	20% @ 5 V and 10 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2153	6 Pin P-DIP	Phototransistor	50% @ 5 V and 10 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2253	6 Pin P-DIP	Phototransistor	50% @ 5 V and 10 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2154	6 Pin P-DIP	Phototransistor	10% @ 0.5 V and 0.5 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2155	6 Pin P-DIP	Phototransistor	20% @ 0.5 V and 1 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2254	6 Pin P-DIP	Phototransistor	10% @ 0.5 V and 0.5 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2255	6 Pin P-DIP	Phototransistor	20% @ 0.5 V and 1 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
OPI2500	6 Pin P-DIP	Phototransistor AC	12.5% @ 0.4 V and ±16 mA	1500 VDC	30 V @ 1 mA	50 nA @ 10 V
OPI2501	6 Pin P-DIP	Phototransistor AC	20% @ 10 V and ±10 mA	1500 VDC	30 V @ 1 mA	50 nA @ 10 V
OPI3150	6 Pin P-DIP	Photodarlington	300% @ 2 V and 10 mA	1500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
OPI3250	6 Pin P-DIP	Photodarlington	300% @ 2 V and 10 mA	2500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
OPI3151	6 Pin P-DIP	Photodarlington	300% @ 1 V and 10 mA	1500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
OPI3251	6 Pin P-DIP	Photodarlington	300% @ 1 V and 10 mA	2500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
OPI3152	6 Pin P-DIP	Photodarlington	300% @ 5 V and 10 mA	1500 VDC (1)	55 V @ 100 µA	100 nA @ 10 V
OPI3252	6 Pin P-DIP	Photodarlington	300% @ 5 V and 10 mA	2500 VDC (1)	55 V @ 100 µA	100 nA @ 10 V
OPI3153	6 Pin P-DIP	Photodarlington	500% @ 5 V and 1 mA	1500 VDC (1)	25 V @ 1 mA	100 nA @ 10 V
OPI3253	6 Pin P-DIP	Photodarlington	500% @ 5 V and 1 mA	2500 VDC (1)	25 V @ 1 mA	100 nA @ 10 V
OPI6000	6 Pin P-DIP	Phototransistor	20% @ 5 V and 10 mA	1500 VDC (1)	300 V @ 1 mA	100 nA @ 200 V
OPI6100	6 Pin P-DIP	Phototransistor	10% @ 5 V and 10 mA	1500 VDC (1)	200 V @ 1 mA	100 nA @ 100 V
4N25	6 Pin P-DIP	Phototransistor	20% @ 10 V and 10 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N26	6 Pin P-DIP	Phototransistor	20% @ 10 V and 10 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N27	6 Pin P-DIP	Phototransistor	10% @ 10 V and 10 mA	1500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N28	6 Pin P-DIP	Phototransistor	10% @ 10 V and 10 mA	500 VDC (1)	30 V @ 1 mA	100 nA @ 10 V
4N29	6 Pin P-DIP	Photodarlington	100% @ 10 V and 10 mA	2500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
4N30	6 Pin P-DIP	Photodarlington	100% @ 10 V and 10 mA	1500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
4N31	6 Pin P-DIP	Photodarlington	50% @ 10 V and 10 mA	1500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
4N32	6 Pin P-DIP	Photodarlington	500% @ 10 V and 10 mA	2500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
4N33	6 Pin P-DIP	Photodarlington	500% @ 10 V and 10 mA	1500 VDC (1)	30 V @ 100 µA	100 nA @ 10 V
4N35	6 Pin P-DIP	Phototransistor	100% @ 10 V and 10 mA	2500 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N36	6 Pin P-DIP	Phototransistor	100% @ 10 V and 10 mA	1750 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N37	6 Pin P-DIP	Phototransistor	100% @ 10 V and 10 mA	1050 VDC (1)	30 V @ 1 mA	50 nA @ 10 V
4N38	6 Pin P-DIP	Phototransistor	20% @ 1 V and 20 mA	1500 VDC (1)	80 V @ 1 mA	50 nA @ 60 V
4N38A	6 Pin P-DIP	Phototransistor	20% @ 1 V and 20 mA	2500 VDC (1)	80 V @ 1 mA	50 nA @ 60 V

riac Driver Couplers (T_A=25°C)

Part No.	Case Style	Type	Max. LED Trigger Current	Peak Blocking Current Max. @ Rated V_{DRM}	Peak On-State Voltage @ Rated I_{TM}	Isolation Voltage	Holding Current, Either Direction
OPI3009	6 Pin P-DIP	Zero Current	30 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3010	6 Pin P-DIP	Zero Current	15 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3011	6 Pin P-DIP	Zero Current	10 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3012	6 Pin P-DIP	Zero Current	5 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3020	6 Pin P-DIP	Zero Current	30 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3021	6 Pin P-DIP	Zero Current	15 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3022	6 Pin P-DIP	Zero Current	10 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3023	6 Pin P-DIP	Zero Current	5 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	100 µA
OPI3030	6 Pin P-DIP	Zero Voltage	30 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3031	6 Pin P-DIP	Zero Voltage	15 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3032	6 Pin P-DIP	Zero Voltage	10 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3033	6 Pin P-DIP	Zero Voltage	5 mA @ 3 V	100 nA @ 250 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3040	6 Pin P-DIP	Zero Voltage	30 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3041	6 Pin P-DIP	Zero Voltage	15 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3042	6 Pin P-DIP	Zero Voltage	10 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	200 µA
OPI3043	6 Pin P-DIP	Zero Voltage	5 mA @ 3 V	100 nA @ 400 V (1)	3 V @ 100 mA	2500 V	200 µA

ote: (1) UL Recognized, File No. E58730

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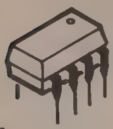
Optically Coupled Isolators

Case Styles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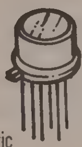
8 Pin P Dip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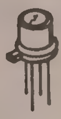
TO-5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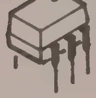
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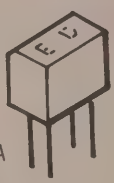
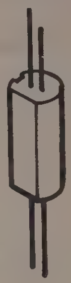


Style A
Plastic
Custom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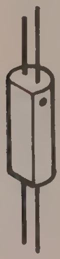
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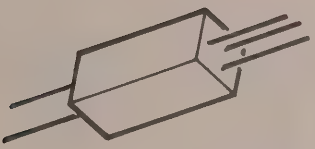
Custom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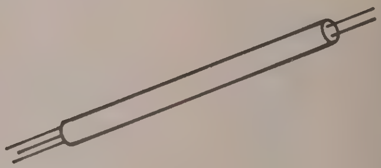
Hermetic
Custom


Style E
Hermetic
Custom
(shown ½ size)

Specialty Couplers (T_A=25° C)

Part No.	Case Style	Output Type	Min. CTR @ Rated V_{CE} and I_F	Isolation Voltage	Min. $V_{(BR)CEO}$ at Rated I_C	Max. I_{CEO} at Rated V_{CE}
OPI102	Herm. TO-5	Phototransistor	25% @ 5 V and 10 mA	1000 VDC	35 V @ 1 mA	100 nA @ 20 V
OPI103	Herm. TO-5	Phototransistor	100% @ 5 V and 10 mA	1000 VDC	35 V @ 1 mA	100 nA @ 20 V
OPI110	C	Phototransistor	12.5% @ 5 V and 16 mA	10,000 VDC (1) (3)	30 V @ 1 mA	100 nA @ 10 V
OPI113	C	Photodarlington	50% @ 2 V and 16 mA	10,000 VDC (1) (3)	25 V @ 1 mA	100 nA @ 10 V
OPI120	D	Phototransistor	20% @ 5 V and 10 mA	15,000 VDC	25 V @ 1 mA	100 nA @ 10 V
OPI123	D	Photodarlington	50% @ 2 V and 10 mA	15,000 VDC	20 V @ 1 mA	100 nA @ 10 V
OPI1264A	B	Phototransistor	25% @ 5 V and 10 mA	10,000 VDC (1) (3)	32 V @ 1 mA	100 μA @ 10 V
OPI1264B	B	Phototransistor	50% @ 5 V and 10 mA	10,000 VDC (1) (3)	32 V @ 1 mA	200 nA @ 20 V
OPI1264C	B	Phototransistor	100% @ 5 V and 10 mA	10,000 VDC (1) (3)	32 V @ 1 mA	200 nA @ 20 V
OPI130	Herm. TO-5	Photodarlington	100% @ 2 V and 5 mA	1000 VDC	25 V @ 1 mA	100 nA @ 10 V
OPI140	Herm. TO-72	Phototransistor	15% @ 10 V and 10 mA	1000 VDC	30 V @ 1 mA	50 nA @ 10 V
OPI150	E	Phototransistor	10% @ 5 V and 10 mA	50,000 VDC	30 V @ 1 mA	100 nA @ 10 V
OPI153	E	Photodarlington	25% @ 5 V and 20 mA	50,000 VDC	15 V @ 1 mA	500 nA @ 10 V
3N243	Herm. TO-72	Phototransistor	15% @ 10 V and 10 mA	1000 VDC	30 V @ 1 mA	100 nA @ 10 V
3N244	Herm. TO-72	Phototransistor	30% @ 10 V and 10 mA	1000 VDC	30 V @ 1 mA	100 nA @ 10 V
3N245	Herm. TO-72	Phototransistor	60% @ 10 V and 10 mA	1000 VDC	30 V @ 1 mA	100 nA @ 10 V
4N22A	Herm. TO-5	Phototransistor	25% @ 5 V and 10 mA	1000 VDC	35 V @ 1 mA	100 nA @ 20 V
4N23A	Herm. TO-5	Phototransistor	60% @ 5 V and 10 mA	1000 VDC	35 V @ 1 mA	100 nA @ 20 V
4N24A	Herm. TO-5	Phototransistor	100% @ 5 V and 10 mA	1000 VDC	35 V @ 1 mA	100 nA @ 20 V
OPI7002	A	Phototransistor	20% @ 10 V and 5 mA	6000 VDC (1) (3)	30 V @ 1 mA	100 μA @ 10 V
OPI7010	A	Phototransistor	100% @ 10 V and 5 mA	6000 VDC (1) (3)	30 V @ 1 mA	100 μA @ 10 V
OPI7320	A	Photodarlington	200% @ 5 V and 5 mA	6000 VDC (1) (3)	30 V @ 1 mA	100 μA @ 10 V
OPI7340	A	Photodarlington	400% @ 5 V and 5 mA	6000 VDC (1) (3)	30 V @ 1 mA	100 μA @ 10 V

High Technology Couplers (0° C to +70° C)

Part No.	Case Style	Output Type	Max. V_F at Rated I_F (2)	Min. CTR at Rated V_{CE} and I_F	Isolation Voltage	Max. V_{OL} at Rated I_{OL}	Bandwidth
OPI125	D	Photologic	1.5 V @ 10 mA	Buffer, Totem-Pole Output	15,000 VDC	0.4 V @ 12.8 mA	250 K-baud
OPI126	D	Photologic	1.5 V @ 10 mA	Buffer, Open-Collector Output	15,000 VDC	0.4 V @ 12.8 mA	250 K-baud
OPI127	D	Photologic	1.5 V @ 10 mA	Inverter, Totem-Pole Output	15,000 VDC	0.4 V @ 12.8 mA	250 K-baud
OPI128	D	Photologic	1.5 V @ 10 mA	Inverter, Open-Collector Output	15,000 VDC	0.4 V @ 12.8 mA	250 K-baud
OPI2502	8 Pin P-DIP	Phototransistor	1.7 V@ 16 mA	15% @ 4.5 V and 16 mA	3000 VDC (1)	0.4 V @ 2.4 mA	2 MHz, R_L = 100 Ω
OPI8012	6 Pin P-DIP	Photologic	1.5 V @ 10 mA	Buffer, Totem-Pole Output	1500 VDC (1)	0.4 V @ 12.8 mA	250 K-baud
OPI8013	6 Pin P-DIP	Photologic	1.5 V @ 10 mA	Buffer, Open-Collector Output	1500 VDC (1)	0.4 V @ 12.8 mA	250 K-baud
OPI8014	6 Pin P-DIP	Photologic	1.5 V @ 10 mA	Inverter, Totem-Pole Output	1500 VDC (1)	0.4 V @ 12.8 mA	250 K-baud
OPI8015	6 Pin P-DIP	Photologic	1.5 V @ 10 mA	Inverter, Open-Collector Output	1500 VDC (1)	0.4 V @ 12.8 mA	250 K-baud
4N45	6 Pin P-DIP	Photodarlington	1.7 V @ 1 mA	250%, V_O = 1 V and 1 mA	3000 VDC (1)	1.0 V @ 2.5 mA	—
4N46	6 Pin P-DIP	Photodarlington	1.7 V @ 1 mA	500%, V_O = 1.2 V and 1 mA	3000 VDC (1)	1.0 V @ 5.0 mA	—
6N135	8 Pin P-DIP	Phototransistor	1.7 V @ 16 mA	7% @ 4.5 V and 16 mA	3000 VDC (1)	0.4 V @ 1.1 mA	2 MHz, R_L = 100 Ω
6N136	8 Pin P-DIP	Phototransistor	1.7 V @ 16 mA	19% @ 4.5 V and 16 mA	3000 VDC (1)	0.4 V @ 2.4 mA	2 MHz, R_L = 100 Ω
6N137	8 Pin P-DIP	Logic Gate	1.75 V @ 10 mA	700%, R_L = 100Ω and 5 mA	3000 VDC (1)	0.6 V @ 13 mA	5 MHz, R_L = 100 Ω
6N138	8 Pin P-DIP	Phototransistor	1.7 V @ 1.6 mA	300% @ 4.5 V and 1.6 mA	3000 VDC (1)	0.4 V @ 4.8 mA	—
6N139	8 Pin P-DIP	Phototransistor	1.7 V @ 1.6 mA	500% @ 4.5 V and 1.6 mA	3000 VDC (1)	0.4 V @ 24 mA	—

Notes. (1) UL Recognized, File No. E 58730 (2) T_A = 25 °C (3) VDE Approved to STD 0883/6.80

OPTOELECTRONICS DIVISION, TRW ELECTRONIC COMPONENTS GROUP, 1207 TAPPAN CIRCLE, CARROLLTON, TX 75006 • (214) 323-2200 TWX: 910-860-5958

Slotted Optical Switches, Reflective Assemblies, and Matched Pairs

TRW

lotted Optical Switches

Slotted optical switches, also known as interrupter assemblies, are designed to provide non-contact sensing of linear or rotary motion as in optical encoders. Devices from the Optoelectronics Division of TRW consist of an infrared emitting diode and a silicon photosensor mounted on opposite sides of a slot in a molded plastic housing. Switching takes place whenever an opaque object passes through the slot. Slotted optical switches are available with the following options:

1. Phototransistor, photodarlington or Photologic™ output.
2. Gallium arsenide or gallium aluminum arsenide LEDs.
3. Dual channel devices in side-by-side or over-under configuration for speed, direction of movement and relative position sensing.
4. Different slot widths.
5. Different lead spacing.
6. Sensor apertures, emitter apertures, or both for high resolution sensing.
7. Different mounting configurations.
8. Lead wires and connectors.

ustomer Selected lotted Optical Switches

TRW offers a line of products which allows the engineer complete flexibility to select a standard part to meet exact design requirements. These are called Customer Selected Slotted Optical Switches. Customers build their selected part through the use of a simple option selection guide, which controls mechanical and electrical variations through the use of a unique part number. The available options are as follows:

1. Phototransistor output—three different $I_{C(ON)}$ ranges.
2. Photologic™ output—four different output variations.
3. Different sensor and emitter lead spacings.
4. Different aperture widths in front of sensor and emitter.
5. Standard leads or 18″ (minimum length) lead wires.
6. Different mounting configurations—four housing styles
7. Housing material—polycarbonate or polysulfone.

It should be noted when making a decision on whether to specify polycarbonate or polysulfone housings, that polycarbonate is opaque to infrared and visible light. Therefore openings in the housings are required for infrared energy to pass from emitter to sensor. As a result, polycarbonate is not recommended for use in high dust and dirt environments. Polysulfone, however, is transparent to infrared, and, housings are completely sealed making them ideal for high dust and dirt environments. In unique applications where standard or customer selected parts will not work, TRW can help custom design a part to match your exact specifications. Call TRW for more information.

eflective Assemblies

Reflective assemblies are designed to provide non-contact sensing of the presence of a reflective surface, or a change in surface reflectivity. Unfocused types, where the emitter and sensor are mounted on parallel optical axes, are best suited for sensing diffuse or rough surfaces. Focused types, where the emitter and sensor are mounted on converging optical axes are best suited for sensing specular or polished surfaces. Reflective assemblies come in a wide variety of sizes and shapes and contain an infrared emitting diode and an NPN silicon phototransistor or photodarlington. They have the advantage of having both the emitter and sensor mounted on the same side of the surface being sensed.

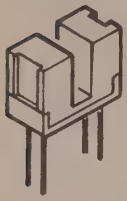
An important design consideration when using reflective assemblies is that the photosensor will not necessarily see infrared radiation the same way the human eye sees visible light. In other words, a black surface and a white surface could have similar reflective properties when illuminated with infrared radiation.

latched Pairs

TRW currently makes two different series of matched emitter and sensor pairs; the OPS660 mini-axial or "end looker" series and the OPS690 lateral or "side looker" series. The end lookers provide high $I_{C(ON)}$ ratings due to higher lens magnification. The side lookers offer reduced mounting space requirements. Matched pairs are characterized and specified in the coupled configuration. This allows the user the flexibility to design unique mounting configurations and to control specified performance in various applications.

Slotted Optical Switches, Reflective Assemblies, and Matched Pairs

Case Styles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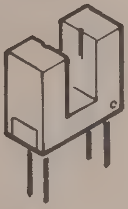
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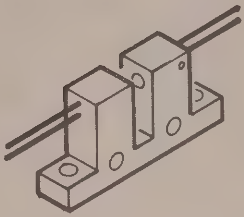
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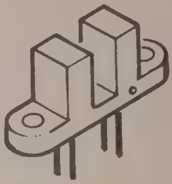
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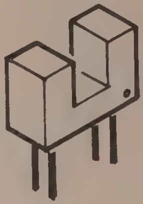
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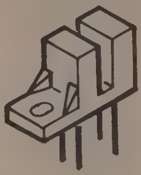
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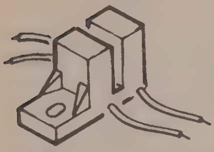
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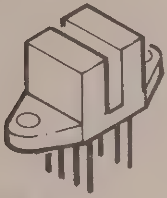
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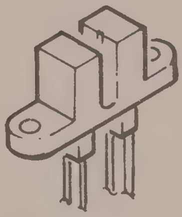
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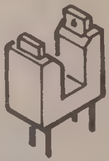
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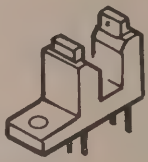
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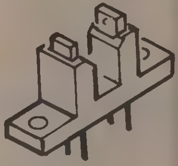
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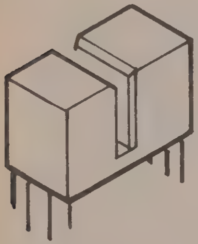
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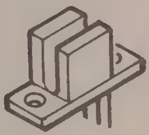
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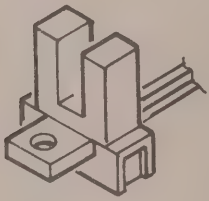
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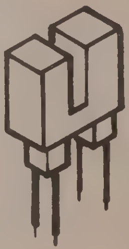
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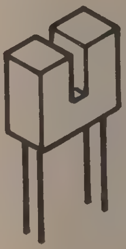
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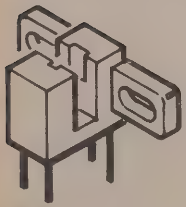
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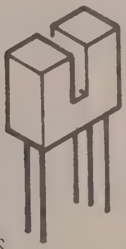

Style S

Electrical Characteristics ($T_A = 25°C$)

Slotted Optical Switches

Part No.	Case Style	Slot Width Inches (mm)	Sensor Aperture Inches (mm)[1]	V_F at Rated I_F	I_{CEO} at Rated V_{CE}, $I_F=0$, $E_e=0$	Min. On-State Collector Current at Rated V_{CE} and I_F
CNY36	A	0.120 (3.05)		1.7 V @ 20 mA	100 nA @ 10 V	200 μA @ 10 V and 20 mA
OPB804	B	0.155 (3.94)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 10 V and 20 mA
OPB806	C	0.125 (3.18)		1.7 V @ 20 mA	100 nA @ 10 V	400 μA @ 0.5 V and 15 mA
OPB813S7	D	0.125 (3.18)	0.007 (0.178) × 0.04 (1.02)	1.5 V @ 20 mA	100 nA @ 10 V	350 μA @ 10 V and 20 mA
OPB813S5	D	0.125 (3.18)	0.005 (0.127) × 0.04 (1.02)	1.5 V @ 20 mA	100 nA @ 10 V	250 μA @ 10 V and 20 mA
OPB813S3	D	0.125 (3.18)	0.003 (0.076) × 0.04 (1.02)	1.5 V @ 20 mA	100 nA @ 10 V	75 μA @ 10 V and 20 mA
OPB816	D	0.125 (3.18)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 10 V and 20 mA
OPB817	D	0.125 (3.18)		1.7 V @ 20 mA	100 nA @ 10 V	1.0 mA @ 5 V and 10 mA
OPB818	E	0.20 (5.08)		1.7 V @ 20 mA	100 nA @ 10 V	100 μA @ 5 V and 20 mA
OPB819S10	D	0.125 (3.18)	0.01 (0.254) × 0.06 (1.52)	1.7 V @ 20 mA	100 nA @ 10 V	200 μA @ 10 V and 20 mA

Notes: 1. First dimension shown is aperture width. Second dimension is aperture height.

Slotted Optical Switches, Reflective Assemblies, and Matched Pairs

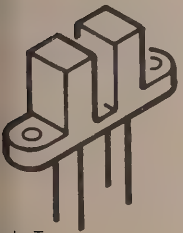
TRW

Slotted Optical Switches (continued)

Part No.	Case Style	Slot Width Inches (mm)	Sensor Aperture Inches (mm)[(1)(2)]	V_F at Rated I_F	I_{CEO} at Rated V_{CE}, $I_F=0$, $E_e=0$	Min. On-State Collector Current at Rated V_{CE} and I_F
OPB820	F	0.08 (2.03)		1.6 V @ 20 mA	100 nA @ 10 V	500 μA @ 5 V and 20 mA
OPB820S12	F	0.08 (2.03)	0.012 (0.305)×0.06 (1.53)	1.6 V @ 20 mA	100 nA @ 10 V	400 μA @ 5 V and 20 mA
OPB820S7	F	0.08 (2.03)	0.007 (0.178)×0.04 (1.02)	1.6 V @ 20 mA	100 nA @ 10 V	300 μA @ 5 V and 20 mA
OPB820S5	F	0.08 (2.03)	0.005 (0.127)×0.04 (1.02)	1.6 V @ 20 mA	100 nA @ 10 V	170 μA @ 5 V and 20 mA
OPB821	G	0.08 (2.03)		1.6 V @ 20 mA	100 nA @ 10 V	500 μA @ 5 V and 20 mA
OPB821S12	G	0.08 (2.03)	0.012 (0.305)×0.04 (1.02)	1.6 V @ 20 mA	100 nA @ 10 V	400 μA @ 5 V and 20 mA
OPB821S7	G	0.08 (2.03)	0.007 (0.178)×0.04 (1.02)	1.6 V @ 20 mA	100 nA @ 10 V	300 μA @ 5 V and 20 mA
OPB821S5	G	0.08 (2.03)	0.005 (0.127)×0.04 (1.02)	1.6 V @ 20 mA	100 nA @ 10 V	170 μA @ 5 V and 20 mA
OPB822S	H	0.10 (2.54)	2) 0.01 (0.254)×0.08 (2.03)	1.7 V @ 20 mA	100 nA @ 10 V	250 μA @ 10 V and 20 mA
OPB822SD	H	0.10 (2.54)	2E–2S) 0.01 (0.254)×0.08 (2.03)	1.7 V @ 20 mA	100 nA @ 10 V	100 μA @ 10 V and 20 mA
OPB823A	I	0.125 (3.18)		1.7 V @ 20 mA	100 nA @ 10 V	200 μA @ 10 V and 20 mA
OPB824A	I	0.125 (3.18)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 10 V and 20 mA
OPB825	J	0.160 (4.06)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 0.5 V and 20 mA
OPB825A	K	0.160 (4.06)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 0.5 V and 20 mA
OPB825B	L	0.160 (4.06)		1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 0.5 V and 20 mA
OPB826S	M	0.10 (2.54)	2) 0.01 (0.254)×0.04 (1.02)	1.7 V @ 20 mA	100 nA @ 10 V	250 μA @ 10 V and 20 mA
OPB826SD	M	0.10 (2.54)	2E–2S) 0.01 (0.254)×0.04 (1.02)	1.7 V @ 20 mA	100 nA @ 10 V	100 μA @ 10 V and 20 mA
OPB831S20	N	0.20 (5.08)	2) 0.02 (0.508)×0.06 (1 52)	3.4 V @ 40 mA	100 nA @ 10 V	400 μA @ 2 V and 25 mA
OPB835	O	0.15 (3.81)		1.7 V @ 20 mA	100 nA @ 10 V	1.5 mA @ 0.4 V and 26 mA
OPB836	P	0.20 (5.08)	0.02 (0.508) Wide	1.7 V @ 20 mA	100 nA @ 10 V	1 0 mA @ 5 V and 20 mA
OPB837	R	0.125 (3.18)	0.01 (0.254)×0.06 (1.52)	1.7 V @ 20 mA	100 nA @ 10 V	500 μA @ 10 V and 20 mA
OPB847	Q	0.10 (2.54)	0.025 (0.635)×0.06 (1.52)	1.7 V @ 20 mA	100 nA @ 10 V	4.0 mA @ 5 V and 20 mA
OPB848	Q	0.10 (2.54)	0.025 (0.635)×0.06 (1.52)	1.7 V @ 20 mA	100 nA @ 10 V	1.0 mA @ 5 V and 20 mA
OPB947	S	0.10 (2.52)		1.7 V @ 20 mA	$I_{CC}=15$ mA @ 5 V	Buffer, Totem-Pole
OPB948	S	0.10 (2.52)		1.7 V @ 20 mA	$I_{CC}=15$ mA @ 5 V	Buffer, Open-Collector

tes: 1. First dimension shown is aperture width. Second dimension is aperture height.
2. 2) indicates dual channel device with apertures in front of both sensors.
2E–2S) indicates dual channel device with apertures in front of both emitters and sensors.
E–S) indicates single channel device with apertures in front of emitter and sensor.

ase Styles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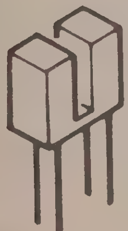
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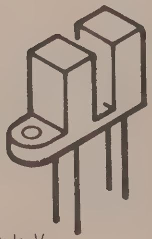
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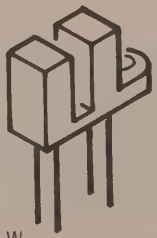
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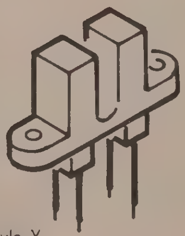
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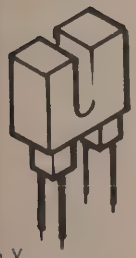
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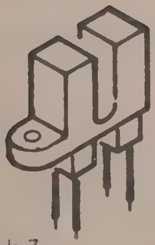
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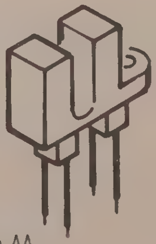
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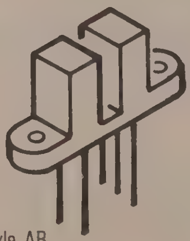
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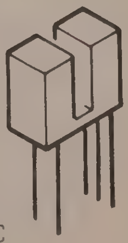
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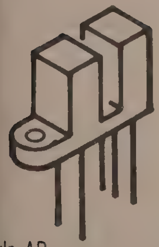
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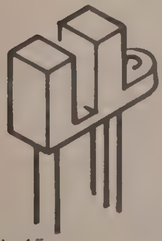
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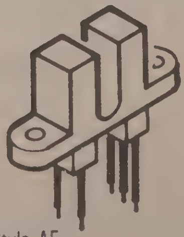
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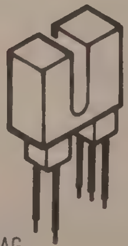
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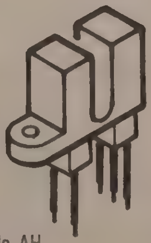
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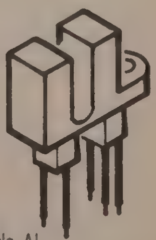

Style AI

Slotted Optical Switches, Reflective Assemblies, and Matched Pairs

TRW

Customer Selected Slotted Optical Switches

By using the Part Number Selection Guide shown, it is possible to select a Customer Selected Slotted Optical Switch to meet almost any mechanical or electrical requirement. An example is provided to illustrate use of the selection guides.

Following each selection guide, a listing of the most popular types is provided. These are recommended for new designs and may be used as direct replacements for earlier discontinued part numbers. In addition, these are normally stocked by authorized TRW distributors.

Phototransistor Output Part Number Selection Guide

OPB 8XX X XX

TRW Assembly Prefix

8 = Phototransistor Output

Housing Material Designation
- 6 = Polysulfone with standard leads
- 7 = Polycarbonate with standard leads
- 8 = Polysulfone with 18″ (457 mm) minimum #26 PVC wires
- 9 = Polycarbonate with 18″ (457 mm) minimum #26 PVC wires

Note: Wire leads for 8 and 9 (above) are stripped and tinned 0.125″ (3.18 mm) minimum and color coded as follows: Red—Anode, Orange—Cathode, Black—Emitter, Brown—Collector

Mechanical and Electrical Variations
(See chart below for additional detail)

Lead spacing 0.320″ (8.13 mm)	Lead spacing 0.220″ (5.59 mm)
0 = Electrical parameter A	5 = Electrical parameter A
1 = Electrical parameter B	6 = Electrical parameter B
2 = Electrical parameter C	7 = Electrical parameter C

Wire lead devices are available only with options 0, 1, and 2.

Aperture Width in Front of Sensor
- 1 = 0.010″ (0.25 mm) × 0.060″ (1.52 mm)
- 5 = 0.050″ (1.27 mm) × 0.060″ (1.52 mm)

Note: Devices specified with a 0.010″ (0.25 mm) wide sensor aperture (1 above) are available with electrical parameter A only. For custom aperture sizes, call TRW.

Aperture Width in Front of Emitter
- 2 = 0.020″ (0.51 mm) × 0.060″ (1.52 mm)
- 5 = 0.050″ (1.27 mm) × 0.060″ (1.52 mm)

Note: Devices specified with a 0.020″ (0.51 mm) wide emitter aperture (2 above) are available only with electrical parameter A and polycarbonate housings.

Mounting Configurations
- T = Mounting tabs both sides
- N = No mounting tabs
- L = Single mounting tab, emitter side
- P = Single mounting tab, sensor side

Example

OPB 882 L 55

TRW Assembly Prefix

8 = Phototransistor Output

Polysulfone Housing with 18″ (457 mm) minimum #26 PVC wires

Electrical Paramater C

0.05″ (1.27 mm) aperture in front of sensor

0.05″ (1.27 mm) aperture in front of emitter

Single mounting tab, emitter side

Mechanical and Electrical Variations

Number	Case Styles	Lead Spacing	Electrical Paramater	Min. On-State Collector Current at Rated V_{CE} and I_F	V_F at Rated I_F	I_{CEO} at Rated V_{CE}, I_F=0, E_e=0
0	T, U, V, W, X, Y, Z, AA	0.320″	A	500 μA @ 10 V and 20 mA	1.7 @ 20 mA	100 nA @ 10 V
1	T, U, V, W, X, Y, Z, AA	0.320″	B	1000 μA @ 5 V and 10 mA	1.7 @ 20 mA	100 nA @ 10 V
2	T, U, V, W, X, Y, Z, AA	0.320″	C	1800 μA @ 0.6 V and 20 mA	1.7 @ 20 mA	100 nA @ 10 V
5	T, U, V, W,	0.220″	A	500 μA @ 10 V and 20 mA	1.7 @ 20 mA	100 nA @ 10 V
6	T, U, V, W,	0.220″	B	1000 μA @ 5 V and 10 mA	1.7 @ 20 mA	100 nA @ 10 V
7	T, U, V, W,	0.220″	C	1800 μA @ 0.6 V and 20 mA	1.7 @ 20 mA	100 nA @ 10 V

The following parts are the most popular types and are stocked by authorized TRW distributors. Where indicated, they may be used as replacements for discontinued parts.

Recommended New Part Number	Discontinued Part Number
OPB865T51	OPB813S10
OPB865T55	OPB813
OPB866T55	OPB814
OPB870T51	—
OPB871N55	—

For other design requirements refer to Phototransistor Output Part Number Selection Guide (above), or call TRW and ask about custom designs.

lotted Optical Switches, eflective Assemblies, and Matched Pairs

TRW

hotologic™ Output Part Number Selection Guide

OPB 9XX X XX

TRW Assembly Prefix

9 = Photologic™ Output

Housing Material Designation
- 6 = Polysulfone with standard leads
- 7 = Polycarbonate with standard leads
- 8 = Polysulfone with 18" (457 mm) minimum #26 PVC wires
- 9 = Polycarbonate with 18" (457 mm) minimum #26 PVC wires

Note: Wire leads for 8 and 9 (above) are stripped and tinned 0.125" (3.18 mm) minimum and color coded as follows:

Red—Anode	Brown—V_{CC}
Orange—Cathode	Green—Output
Black—Emitter	

Photologic™ Sensor Output Variations
(See Photologic™ Output Schematics below for additional detail.)
- 0 = Buffer with totem pole output
- 1 = Buffer with open collector output
- 2 = Inverter with totem pole output
- 3 = Inverter with open collector output

Aperture Width in Front of Sensor
- 1 = 0.010" (0.25 mm) × 0.060" (1.52 mm)
- 5 = 0.050" (1.27 mm) × 0.060" (1.52 mm)

Aperture Width in Front of Emitter
- 2 = 0.020" (0.51 mm) × 0.060" (1.52 mm)
- 5 = 0.050" (1.27 mm) × 0.060" (1.52 mm)

Note: Devices specified with a 0.020" (0.51 mm) wide emitter aperture (2 above) are available only with polycarbonate housings.

Mounting Configurations
- T = Mounting tabs both sides
- N = No mounting tabs
- L = Single mounting tab, emitter side
- P = Single mounting tab, sensor side

xample

OPB 973 T 51

TRW Assembly Prefix

Photologic™ Output

Polycarbonate Housing

Inverter, Open-Collector Output

0.01" (0.25 mm) aperture in front of sensor

0.05" (1.27 mm) aperture in front of emitter

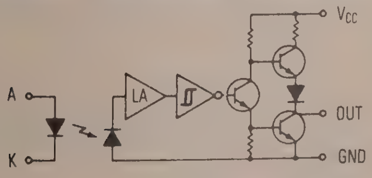
Mounting tabs, both sides

hotologic™ Sensor Output Variations

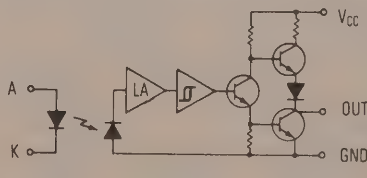
Number	Case Styles	Lead Spacing	Output Type	V_F at Rated I_F	Bandwidth	I_{CC} At Rated V_{CC}
0	AB, AC, AD, AE AF, AG, AH, AI	0.320"	Buffer, Totem-Pole	1.7 @ 20 mA	250 K Baud	I_{CC} = 15 mA @ 5 V
1	AB, AC, AD, AE AF, AG, AH, AI	0.320"	Buffer, Open-Collector	1.7 @ 20 mA	250 K Baud	I_{CC} = 15 mA @ 5 V
2	AB, AC, AD, AE AF, AG, AH, AI	0.320"	Inverter, Totem-Pole	1.7 @ 20 mA	250 K Baud	I_{CC} = 15 mA @ 5 V
3	AB, AC, AD, AE AF, AG, AH, AI	0.320"	Inverter, Open-Collector	1.7 @ 20 mA	250 K Baud	I_{CC} = 15 mA @ 5 V

hotologic™ Output Schematics

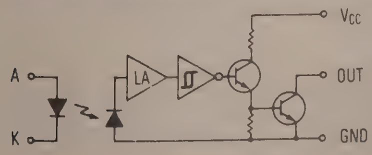
OPB960, 970, 980, 990 Buffer Totem-Pole Output



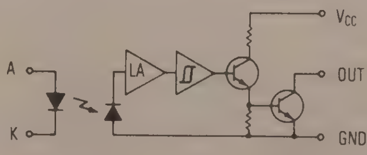
OPB962, 972, 982, 992 Inverter Totem-Pole Output



OPB961, 971, 981, 991 Buffer Open-Collector Output



OPB963, 973, 983, 993 Inverter Open-Collector Output



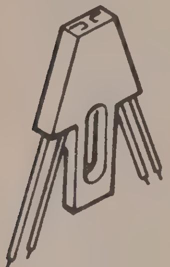
Slotted Optical Switches, Reflective Assemblies, and Matched Pairs

The following parts are the most popular types and are stocked by authorized TRW distributors. Where indicated, they may be used as replacements for discontinued parts.

Recommended New Part Number	Discontinued Part Number
OPB960T51	OPB913S10
OPB961T51	OPB914S10
OPB962T51	OPB915S10
OPB963T51	OPB916S10
OPB971N51	—
OPB973T51	—

For other design requirements refer to Photologic™ Output Part Number Selection Guide (page 6) or call TRW and ask about custom designs.

Case Styles (shown actual size)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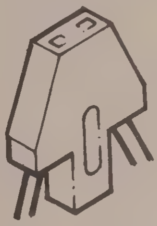
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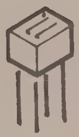
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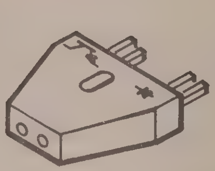
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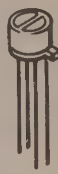
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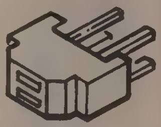
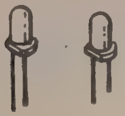

Style AO

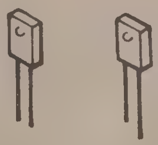
Reflective Assemblies

Part No.	Case Style	Output Type	Max. V_F at Rated I_F	Min. $V_{(BR)CEO}$ at Rated I_C	Max. I_{CEO} at Rated V_{CE}, $I_F=0$	Min. On-State Collector Current at Rated V_{CE} and I_F (3)
OPB125A	AJ	Photodarlington	1.7 V @ 50 mA	25 V @ 100 μA	1 μA @ 10 V	2.0 mA @ 5 V and 40 mA, d=0.20 in. (5.08 mm)
OPB253A	AJ	Phototransistor	1.7 V @ 50 mA	25 V @ 100 μA	100 nA @ 10 V	25 μA @ 5 V and 40 mA, d=0.20 in. (5.08 mm)
OPB703A	AK	Phototransistor	1.7 V @ 40 mA	30 V @ 100 μA	100 nA @ 10 V	200 μA @ 5 V and 40 mA, d=0.20 in. (5.08 mm)
OPB706A	AL	Phototransistor	1.7 V @ 20 mA	30 V @ 100 μA	100 nA @ 5 V	500 μA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB706B	AL	Phototransistor	1.7 V @ 20 mA	30 V @ 100 μA	100 nA @ 5 V	350 μA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB706C	AL	Phototransistor	1.7 V @ 20 mA	30 V @ 100 μA	100 nA @ 5 V	200 μA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB707A	AL	Photodarlington	1.7 V @ 20 mA	15 V @ 100 μA	250 nA @ 5 V	25 mA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB707B	AL	Photodarlington	1.7 V @ 20 mA	15 V @ 100 μA	250 nA @ 5 V	17 mA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB707C	AL	Photodarlington	1.7 V @ 20 mA	15 V @ 100 μA	250 nA @ 5 V	10 mA @ 5 V and 20 mA, d=0.05 in. (1.27 mm)
OPB708	AM	Phototransistor	1.7 V @ 40 mA	30 V @ 100 μA	100 nA @ 15 V	10 μA @ 5 V and 40 mA, d=0.15 in. (3.81 mm)
OPB709	AM	Photodarlington	1.7 V @ 40 mA	15 V @ 100 μA	250 nA @ 10 V	1.0 mA @ 5 V and 40 mA, d=0.15 in. (3.81 mm)
OPB710	AN	Phototransistor	1.5 V @ 50 mA	20 V @ 1.0 mA	100 nA @ 5 V	150 μA @ 5 V and 50 mA, d=0.25 in. (6.35 mm)
OPB730	AN	Photodarlington	1.5 V @ 50 mA	20 V @ 1.0 mA	250 nA @ 5 V	1.0 mA @ 5 V and 50 mA, d=0.25 in. (6.35 mm)
OPB711	AO	Phototransistor	1.7 V @ 20 mA	30 V @ 100 μA	100 nA @ 10 V	350 μA @ 5 V and 20 mA, d=0.8 in. (2.03 mm)
OPB712	AO	Photodarlington	1.7 V @ 20 mA	15 V @ 100 μA	250 nA @ 10 V	20 mA @ 5 V and 20 mA, d=0.08 in. (2.03 mm)

Note (3) Measured using an Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface.

Case Styles


Style AP


Style AQ

Matched Pairs

Part No.	Case Style	V_F at Rated I_F	I_R at Rated V_R	$V_{(BR)CEO}$ at Rated I_C	I_{CEO} at Rated V_{CE}, $E_e=0$	On-State Collector Current at Rated V_{CE} and I_F
OPS660	AP	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	0.5 mA @ 5 V and 20 mA (4)
OPS661	AP	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	1.0 mA @ 5 V and 20 mA (4)
OPS662	AP	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	5.0 mA @ 5 V and 20 mA (4)
OPS690	AQ	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	100 μA @ 10 V and 20 mA (5)
OPS691	AQ	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	0.5 mA @ 10 V and 20 mA (5)
OPS692	AQ	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	1.0 mA @ 10 V and 20 mA (5)
OPS693	AQ	1.6 V @ 20 mA	100 μA @ 2 V	30 V @ 1.0 mA	100 nA @ 10 V	2.0 mA @ 10 V and 20 mA (5)

NOTES: (4) Distance from lens tip to lens tip is 0.25 inches (6.35 mm). (5) Distance from lens tip to lens tip is 0.125 inches (3.18 mm).

Power Semiconductors

Power Switching Transistors and Darlingtons

High speed NPN switching transistors from the Optoelectronics Division of TRW, feature MIL-quality construction, including gold-silicon eutectic die attach and gold plated package headers. Discrete transistor and monolithic high gain Darlington configurations are offered with continuous collector currents from 5 to 30 Amps.

MIL screening to "S" levels are available upon special request.

Fast Recovery Rectifiers

Fast recovery rectifiers from TRW incorporate a platinum doped process which yields maximum reverse recovery times of as low as 25 nanoseconds.

Featured are the "double-slug" A and B packages, DO-4, DO-4 isolated, DO-5, and DO-5 isolated packages which find wide usage in both military and industrial service.

Typical uses are as commutating and clamp diodes in switching power supplies and modulators.

Schottky Rectifiers

The inherent low forward voltage drop (≤0.86 V) caused by the Schottky barrier principle makes Schottky diodes ideally suited for use in low voltage/high frequency power supplies.

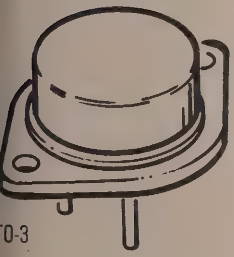
Schottky diodes from TRW feature switching times of less than 50 nanoseconds and are available in the TO-3, DO-4, DO-5 and DO-203AB (DO-5 with flexible lead) package styles.

LVA® Zener Diodes

The LVA® series of devices from TRW exhibit sharper breakdown characteristics than conventional zeners in the 4–10 volt range.

Below 10 volts the field emission phenomenon starts and its effect on the breakdown mechanism increases as the voltage decreases. These effects are altered at TRW by optimum selection of doping levels. LVA® zener diodes from TRW are available in the 400 milliwatt DO-7 package.

Case Styles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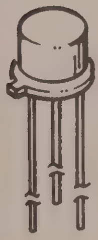
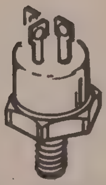
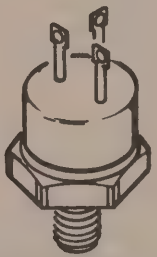
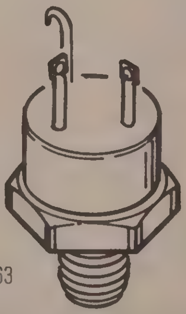

TO-5/39


TO-59
Isolated


TO-61
Isolated


TO-63

Discrete Power Switching Transistors

Part No.	Case Style	I_C (Oper) (Amps)	I_C (Max.) (Cont) (Amps)	V_{CEO} (Min., Sus) (Volts)	V_{CBO} (Min.) (Volts)	V_{EBO} (Min.) (Volts)	H_{FE} @ Rated I_C (Amps)	$V_{CE(SAT)}$ (Max.) (Volts)	T_{off} (Max.) (µsec)
SVT100-5	TO-5/39	5.0	5.0	100	100	6.0	40 @ 1 A	1.0	0.4
SVT200-5C	TO-3	5.0	10	200	225	7.0	15 @ 5 A	1.0	3.0
SVT250-3C	TO-3	3.0	5.0	250	275	6.0	15 @ 3 A	1.0	2.0
SVT250-5C	TO-3	5.0	10.0	250	275	6.0	15 @ 5 A	1.0	2.0
SVT300-3C	TO-3	3.0	5.0	300	325	6.0	15 @ 3 A	1.0	2.0
SVT300-5C	TO-3	5.0	10	300	325	6.0	15 @ 5 A	1.0	2.0
SVT350-3C	TO-3	3.0	5.0	350	350	7.0	15 @ 3 A	1.2	3.0
SVT350-5C	TO-3	5.0	10	350	350	7.0	15 @ 5 A	1.2	3.0
SVT400-3C	TO-3	3.0	5.0	400	400	7.0	15 @ 3 A	1.2	3.0
SVT400-5C	TO-3	5.0	10	400	400	7.0	15 @ 5 A	1.2	3.0
SVT450-3C	TO-3	3.0	5.0	450	450	7.0	15 @ 3 A	1.2	3.0
SVT450-5C	TO-3	5.0	10	450	450	7.0	15 @ 5 A	1.2	3.0

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TRW

Power Semiconductors

Discrete Power Switching Transistors (continued)

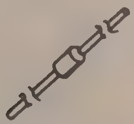
Part No.	Case Style	I_C (Oper) (Amps)	I_C (Max.) (Cont) (Amps)	V_{CEO} (Min., Sus) (Volts)	V_{CBO} (Min.) (Volts)	V_{EBO} (Min.) (Volts)	H_{FE} @ Rated I_C (Amps)	$V_{CE(SAT)}$ (Max.) (Volts)	T_{off} (Max.) (μsec)
SVT60-5	TO-5/39	5.0	5.0	60	60	6.0	40 @ 1 A	1.0	0.4
SVT80-5	TO-5/39	5.0	5.0	80	80	6.0	40 @ 1 A	1.0	0.4
2N4305	TO-5/39	5.0	5.0	80	120	6.0	50–150 @ 1 A	1.0	0.4
2N4307	TO-5/39	5.0	5.0	60	100	6.0	50–150 @ 1 A	1.0	0.4
2N4309	TO-5/39	5.0	5.0	80	120	6.0	40–120 @ 1 A	1.0	0.4
2N4311	TO-5/39	5.0	5.0	60	100	6.0	40–120 @ 1 A	1.0	0.4
2N5154	TO-5/39	5.0	10	80	100	6.0	70–200 @ 2.5 A	0.75	1.0
2N5326	TO-59	5.0	5.0	80	120	6.0	50–150 @ 1 A	1.0	0.4
2N5328	TO-59	10	10	70	100	5.0	100–300 @ 1 A	0.6	0.9
2N5329	TO-61	20	30	90	150	8.0	40–120 @ 10 A	1.8	1.1
2N5330	TO-61	30	30	90	150	8.0	10 @ 30 A	0.6	1.25
2N5331	TO-63	30	30	90	150	8.0	10 @ 30 A	0.6	1.25
2N6579	TO-3	5.0	10	350	450	9.0	7–35 @ 5 A	1.5	2.5
2N6580	TO-3	5.0	10	400	500	9.0	7–35 @ 5 A	1.5	2.5
2N6581	TO-3	5.0	10	450	550	9.0	7–35 @ 5 A	1.5	2.5
2N6582	TO-3	7.0	10	350	450	9.0	7–35 @ 7 A	1.5	2.5
2N6583	TO-3	7.0	10	400	500	9.0	7–35 @ 7 A	1.5	2.5
2N6584	TO-3	7.0	10	450	550	9.0	7–35 @ 7 A	1.5	2.5
2N6585	TO-61	5.0	10	350	450	9.0	7–35 @ 5 A	1.5	2.5
2N6586	TO-61	5.0	10	400	500	9.0	7–35 @ 5 A	1.5	2.5
2N6587	TO-61	5.0	10	450	550	9.0	7–35 @ 5 A	1.5	2.5
2N6588	TO-61	7.0	10	350	450	9.0	7–35 @ 7 A	1.5	2.5
2N6589	TO-61	7.0	10	400	500	9.0	7–35 @ 7 A	1.5	2.5
2N6590	TO-61	7.0	10	450	550	9.0	7–35 @ 7 A	1.5	2.5

Monolithic Darlington Power Switching Transistors

Part No.	Case Style	I_C (Cont) (Amps)	I_C (PK) (Amps)	V_{CEO} (Min., Sus) (Volts)	V_{CBO} (Min.) (Volts)	H_{FE} (Min.) @ I_C=10 A	$V_{CE(SAT)}$ (Max.) (Volts)	$V_{BE(SAT)}$ (Max.) (Volts)	T_{off} (Max.) (μsec)
SVT6000H	TO-3	15	20	300	400	60	1.6	2.5	1.2
SVT6001H	TO-3	15	20	350	450	60	1.6	2.5	1.2
SVT6002H	TO-3	15	20	400	500	60	1.6	2.5	1.2
SVT6060H	TO-3	20	25	300	400	100	1.5	2.5	1.2
SVT6061H	TO-3	20	25	350	450	100	1.5	2.5	1.2
SVT6062H	TO-3	20	25	400	500	100	1.5	2.5	1.2
SVT6251H	TO-3	10	15	350	400	40	2.5	2.5	1.5
SVT6252H	TO-3	10	15	400	450	40	2.5	2.5	1.5
SVT6253H	TO-3	10	15	450	500	40	2.5	2.5	1.5

Case Style

Double-Slug A Package



Fast Recovery Rectifiers (T_{case}=25° C unless otherwise noted)

Part No.	Case Style	I_F Average Forward Current (Amps dc)	PIV Peak Inverse Voltage (Min.) (Volts dc)	V_F Maximum Forward Voltage @ I_F (Volts dc)	I_R Maximum Reverse Current @ PIV T_A=25°C (μA)	I_R Maximum Reverse Current @ PIV T_A=100°C (mA)	t_{rr} Maximum Reverse Recovery Time (nsec)	I_{Surge} (5) Maximum Surge Current (Amps)	Θ_{JC} (6) Thermal Resistanc Junction-t Case (°C/W)
DSR3050	Double-Slug A Pkg.	1.0	50	1.0	5.0	–	25 (2)	20	38
DSR3051	Double-Slug A Pkg.	1.0	50	1.1	5.0	–	50 (2)	20	38
DSR3100	Double-Slug A Pkg.	1.0	100	1.0	5.0	–	25 (2)	20	38
DSR3101	Double-Slug A Pkg.	1.0	100	1.1	5.0	–	50 (2)	20	38
DSR3150	Double-Slug A Pkg.	1.0	150	1.0	5.0	–	25 (2)	20	38
DSR3151	Double-Slug A Pkg	1.0	150	1.1	5.0	–	50 (2)	20	38
DSR3200	Double-Slug A Pkg.	1.0	200	1.1	5.0	–	25 (2)	20	38
DSR3201	Double-Slug A Pkg.	1.0	200	1.2	5.0	–	50 (2)	20	38
DSR3400X	Double-Slug A Pkg.	1.0	400	1.5	10	0.16	30 (3)	–	38
DSR3500X	Double-Slug A Pkg.	1.0	500	1.8	10	0.16	30 (3)	–	38
DSR3600X	Double-Slug A Pkg.	1.0	600	1.8	10	0.16	50 (3)	–	38

Notes: (2) 1.0 A to 1.0 A to 0.5 A (3) 0.5 A to 1.0 A to 0.25 A (5) 1.0 msec operating surge, $T_{case} = 100°C$, duty cycle < 1%
(6) For double slug A and B packages, this is a nominal rating with ⅜″ (9.53 mm) lead length.

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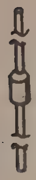
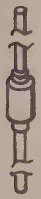
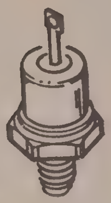
Power Semiconductors

Case Styles


Double-Slug A Package


Double-Slug B Package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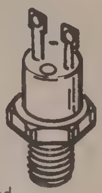
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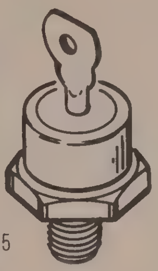
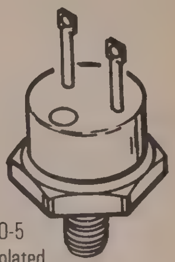

DO-5


DO-5 Isolated

ast Recovery Rectifiers (T_{case}=25° C unless otherwise noted) (continued)

art No.	Case Style	I_F Average Forward Current (Amps dc)	PIV Peak Inverse Voltage (Min.) (Volts dc)	V_F Maximum Forward Voltage @ I_F (Volts dc)	I_R Maximum Reverse Current @ PIV T_A=25°C (μA)	I_R Maximum Reverse Current @ PIV T_A=100°C (mA)	t_{rr} Maximum Reverse Recovery Time (nsec)	I_{Surge} (5) Maximum Surge Current (Amps)	Θ_{JC} (6) Thermal Resistance Junction-to-Case (°C/W)
SR5050	Double-Slug B Pkg.	4.0	50	1.0	10	–	25 (2)	80	19
SR5051	Double-Slug B Pkg.	4.0	50	1.1	10	–	50 (2)	80	19
SR5100	Double-Slug B Pkg.	4.0	100	1.0	10	–	25 (2)	80	19
SR5101	Double-Slug B Pkg.	4.0	100	1.1	10	–	50 (2)	80	19
SR5150	Double-Slug B Pkg.	4.0	150	1.0	10	–	25 (2)	80	19
SR5151	Double-Slug B Pkg.	4.0	150	1.1	10	–	50 (2)	80	19
SR5200	Double-Slug B Pkg.	4.0	200	1.1	10	–	25 (2)	80	19
SR5201	Double-Slug B Pkg.	4.0	200	1.2	10	–	50 (2)	80	19
SR5400X	Double-Slug B Pkg.	4.0	400	1.5	20	0.7	30 (3)	–	19
SR5500X	Double-Slug B Pkg.	4.0	500	1.8	20	0.7	30 (3)	–	19
SR5600X	Double-Slug B Pkg.	4.0	600	1.8	20	0.7	50 (3)	–	19
VD50-2	Double-Slug A Pkg.	2.0	50	1.1	5.0	–	25 (2)	20	38
VD50-3	Double-Slug B Pkg.	3.0	50	1.0	10	–	25 (2)	80	19
VD50-6	DO-4	6.0	50	1.2	10	–	50 (2)	60	2.5
VD50-6I	DO-4 Isolated	6.0	50	1.2	10	–	50 (2)	60	2.5
VD50-12	DO-4	12	50	1.2	10	–	50 (2)	120	2.5
VD50-12I	DO-4 Isolated	12	50	1.2	10	–	50 (2)	120	2.5
VD50-30	DO-5	30	50	1.2	10	–	70 (2)	200	1.5
VD50-30I	DO-5 Isolated	30	50	1.2	10	–	70 (2)	200	1.5
VD100-2	Double-Slug A Pkg.	2.0	100	1.1	5.0	–	25 (2)	20	38
VD100-3	Double-Slug B Pkg.	3.0	100	1.0	10	–	25 (2)	80	19
VD100-6	DO-4	6.0	100	1.2	10	–	50 (2)	60	2.5
VD100-6I	DO-4 Isolated	6.0	100	1.2	10	–	50 (2)	60	2.5
VD100-12	DO-4	12	100	1.2	10	–	50 (2)	120	2.5
VD100-12I	DO-4 Isolated	12	100	1.2	10	–	50 (2)	120	2.5
VD100-30	DO-5	30	100	1.2	10	–	70 (2)	200	1.5
VD100-30I	DO-5 Isolated	30	100	1.2	10	–	70 (2)	200	1.5
VD150-2	Double-Slug A Pkg.	2.0	150	1.1	5.0	–	25 (2)	20	38
VD150-3	Double-Slug B Pkg.	3.0	150	1.0	10	–	25 (2)	80	19
VD200-2	Double-Slug A Pkg.	2.0	200	1.2	5.0	–	25 (2)	20	38
VD200-3	Double-Slug B Pkg.	3.0	200	1.1	10	–	25 (2)	80	19
VD200-12	DO-4	12	200	1.2	10	–	50 (2)	120	2.5
VD200-12I	DO-4 Isolated	12	200	1.2	10	–	50 (2)	120	2.5
VD200-30	DO-5	30	200	1.2	10	–	70 (2)	200	1.5
VD200-30I	DO-5 Isolated	30	200	1.2	10	–	70 (2)	200	1.5
VD300-12	DO-4	12	300	1.5	10	–	70 (2)	120	2.5
VD300-12I	DO-4 Isolated	12	300	1.5	10	–	70 (2)	120	2.5
VD350-12	DO-4	12	350	1.5	10	–	70 (2)	120	2.5
VD350-12I	DO-4 Isolated	12	350	1.5	10	–	70 (2)	120	2.5
VD400-12	DO-4	12	400	1.5	10	–	70 (2)	120	2.5
VD400-12I	DO-4 Isolated	12	400	1.5	10	–	70 (2)	120	2.5
VD450-12	DO-4	12	450	1.5	10	–	70 (2)	120	2.5
VD450-12I	DO-4 Isolated	12	450	1.5	10	–	70 (2)	120	2.5
N5409	DO-5	30	150	1.2	10	–	70 (2)	200	1.5
N5410	DO-4	12	150	1.0	10	–	70 (2)	200	2.0

lotes: (2) 1.0 A to 1.0 A to 0.5 A (3) 0.5 A to 1.0 A to 0.25 A (5) 1.0 msec operating surge, T_{case} = 100°C, duty cycle < 1%
(6) For double slug A and B packages, this is a nominal rating with ³/₈" (9.53 mm) lead length.

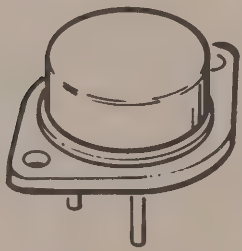
Power Semiconductors

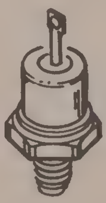
Fast Recovery Rectifiers (continued)

Part No.	Case Style	I_F Average Forward Current (Amps dc)	PIV Peak Inverse Voltage (Min.) (Volts dc)	V_F Maximum Forward Voltage @ I_F (Volts dc)	I_R Maximum Reverse Current @ PIV $T_A=25°C$ (μA)	I_R Maximum Reverse Current @ PIV $T_A=100°C$ (mA)	t_{rr} Maximum Reverse Recovery Time (nsec)	I_{Surge} (5) Maximum Surge Current (Amps)	Θ_{JC} (6) Thermal Resistance Junction-to-Case (°C/W)
IN5415	Double-Slug B Pkg.	3.0	50	1.1	1.0	1.0 (7)	150 (3)	–	19
IN5416	Double-Slug B Pkg.	3.0	100	1.1	1.0	2.0 (7)	150 (3)	–	19
IN5417	Double-Slug B Pkg.	3.0	200	1.1	1.0	2.0 (7)	150 (3)	–	19
IN5418	Double-Slug B Pkg.	3.0	400	1.1	1.0	2.0 (7)	150 (3)	–	19
IN5419	Double-Slug B Pkg.	3.0	500	1.1	1.0	2.0 (7)	250 (3)	–	19
IN5420	Double-Slug B Pkg.	3.0	600	1.1	1.0	2.0 (7)	400 (3)	–	19
IN5615	Double-Slug A Pkg.	1.0	200	1.2	0.5	1.5	150 (3)	–	38
IN5617	Double-Slug A Pkg.	1.0	400	1.2	0.5	1.5	150 (3)	–	38
IN5619	Double-Slug A Pkg.	1.0	600	1.2	0.5	1.5	250 (3)	–	38
IN5802	Double-Slug A Pkg.	1.0	50	0.875	1.0	5.0	25 (1)	–	38
IN5803	Double-Slug A Pkg.	1.0	75	0.875	1.0	5.0	25 (1)	–	38
IN5804	Double-Slug A Pkg.	1.0	100	0.875	1.0	5.0	25 (1)	–	38
IN5805	Double-Slug A Pkg.	1.0	125	0.875	1.0	5.0	25 (1)	–	38
IN5806	Double-Slug A Pkg.	1.0	150	0.875	1.0	5.0	25 (1)	–	38
IN5807	Double-Slug B Pkg.	4.0	50	0.875	5.0	15	30 (4)	–	19
IN5808	Double-Slug B Pkg.	4.0	75	0.875	5.0	15	30 (4)	–	19
IN5809	Double-Slug B Pkg.	4.0	100	0.875	5.0	15	30 (4)	–	19
IN5810	Double-Slug B Pkg.	4.0	125	0.875	5.0	15	30 (4)	–	19
IN5811	Double-Slug B Pkg.	4.0	150	0.875	5.0	15	30 (4)	–	19

Notes: (1) 0.5 A to 0.5 A to 0.05 A (3) 0.5 A to 1.0 A to 0.25 A (4) 1.0 A to 1.0 A to 0.1 A (5) 1.0 msec operating surge, $T_{case}=100°C$, duty cycle < 1%
(6) For double slug A and B packages, this is a nominal rating with 3/8" (9.53 mm) lead length. (7) $T_A=175°C$

Case Styles


TO-3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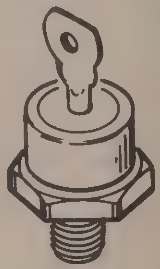
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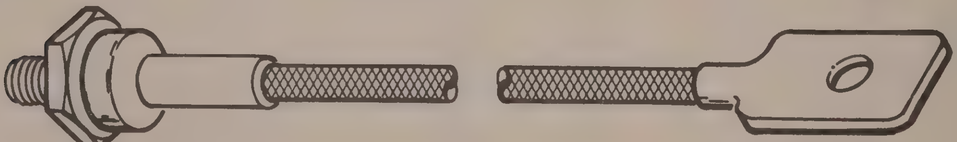

DO-203AB
DO-5 with
Flexible Lead

Schottky Rectifiers ($T_{case}=25°C$ unless otherwise noted)

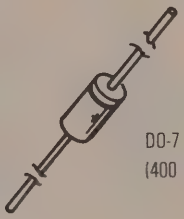
Part No.	Case Style	V_{RRM} (1) Peak Reverse Voltage (Volts)	V_{RWM} (1) Peak Working Reverse Voltage (Volts)	V_{FM} (2) Maximum Forward Voltage @ I_F (Volts dc)	I_F Average Forward Current @ T_C (°C) (Amps dc)	I_R (1) Maximum Reverse Current @ V_{RWM} $T_C=125°C$ (mA dc)	I_{Surge} (3) Peak Forward Surge Current (Amps)	Θ_{JC} Thermal Resistance Junction-to-Case (°C/W)
SD241 (6) (4)	TO-3	45	35	0.6	20 @ 125°C	100	400	1.4
SD41 (6)	DO-4	45	35	0.55	30 @ 125°C	125	600	2.0
SD51 (6)	DO-5	45	35	0.6	60 @ 125°C	200	800	1.0
SD5171 (6)	DO-203AB DO-5 with Flexible Lead	45	35	0.65	60 @ 125°C	200	800	1.0
SD75 (6)	DO-5	45	35	0.66	75 @ 150°C	150	800	0.8
IN6095	DO-4	36 (5)	30	0.86	25 @ 70°C	250	400	2.0
IN6096	DO-4	48 (5)	40	0.86	25 @ 70°C	250	400	2.0
IN6097	DO-5	36 (5)	30	0.86	50 @ 70°C	250	800	1.0
IN6098	DO-5	48 (5)	40	0.86	50 @ 70°C	250	800	1.0

Notes (1) Voltage pulse width, 400 μsec, duty cycle 1%, $T_{case}=25°C$ (2) Current pulse width, 300 μsec, duty cycle 1%, $T_A=25°C$ (3) Non-repetitive 8.35 msec half sine wav
(4) Dual unit. Specifications for each diode. (5) Non-repetitive (6) Trademark of TRW Inc. as shown or in hyphenated form (example: SD-51)

Power Semiconductors

TRW

ase Style



DO-7
(400 mW)

ener Diodes (T_{case}=25° C unless otherwise noted)

able I

art No.(1)	Case Style	Vz Nominal Zener Voltage @ Rated Iz (Volts dc)	Zz (2) Maximum Dynamic Impedence @ Iz (Ohms)	Maximum (3) Noise Density @ 250 μA (μV/√Hz)	IR Maximum Reverse Leakage @ Rated VR (μA dc)	VF Maximum Forward Voltage @ 200 mA (Volts dc)	Maximum Regulation Iz to Iz Low Δ Vz (Volts)	 Iz Low (mA)
VA43A	DO-7	4.3 @ 20 mA	18	4.0	4.0 @ 1.5 V	1.5	—	—
VA47A	DO-7	4.7 @ 10 mA	15	4.0	4.0 @ 2.0 V	1.5	—	—
VA51A	DO-7	5.1 @ 5 mA	15	4.0	0.1 @ 2.0 V	1.5	—	—
VA56A	DO-7	5.6 @ 1 mA	40	4.0	0.05 @ 3.0 V	1.5	—	—
VA62A	DO-7	6.2 @ 1 mA	50	4.0	0.05 @ 4.0 V	1.5	—	—
VA68A	DO-7	6.8 @ 1 mA	50	4.0	0.05 @ 5.0 V	1.5	—	—
VA75A	DO-7	7.5 @ 1 mA	100	4.0	0.01 @ 6.0 V	1.5	—	—
VA82A	DO-7	8.2 @ 1 mA	100	4.0	0.01 @ 6.5 V	1.5	—	—
VA91A	DO-7	9.1 @ 1 mA	100	4.0	0.01 @ 8.0 V	1.5	—	—
VA100A	DO-7	10 @ 1 mA	100	4.0	0.01 @ 9 V	1.5	—	—

ener Diodes (continued)

able II

art No.(1)	Equiv. (4) JEDEC Part No.	Case Style	Vz Nominal Zener Voltage @ Rated Iz (Volts dc)	Zz (2) Maximum Dynamic Impedence @ Iz (Ohms)	Maximum (3) Noise Density @ 250 μA (μV/√Hz)	IR Maximum Reverse Leakage @ Rated VR (μA dc)	VF Maximum Forward Voltage @ 200 mA (Volts dc)	Maximum Regulation Iz to Iz Low Δ Vz (Volts)	 Iz Low (mA)
VA343A	IN6082	DO-7	4.3 @ 20 mA	18	1.0	2.0 @ 1.5 V	1.2	0.75	2.0
VA347A	IN6083	DO-7	4.7 @ 10 mA	10	1.0	2.0 @ 2.0 V	1.2	0.50	1.0
VA351A	IN6084	DO-7	5.1 @ 5 mA	10	1.0	2.0 @ 3.0 V	1.2	0.30	0.25
VA356A	IN6085	DO-7	5.6 @ 1 mA	40	1.0	2.0 @ 4.5 V	1.2	0.10	0.05
VA362A	IN6086	DO-7	6.2 @ 1 mA	45	1.0	0.5 @ 5.6 V	1.2	0.10	0.01
VA368A	IN6087	DO-7	6.8 @ 1 mA	50	1.0	0.05 @ 6.2 V	1.2	0.10	0.01
VA375A	IN6088	DO-7	7.5 @ 1 mA	50	1.0	0.01 @ 6.8 V	1.2	0.10	0.01
VA382A	IN6089	DO-7	8.2 @ 1 mA	60	1.0	0.01 @ 7.5 V	1.2	0.10	0.01
VA391A	IN6090	DO-7	9.1 @ 1 mA	60	2.0	0.01 @ 8.2 V	1.2	0.10	0.01
VA3100A	IN6091	DO-7	10 @ 1 mA	60	2.0	0.01 @ 9.1 V	1.2	0.10	0.01

otes: (1) Suffix denotes zener voltage tolerance. A = ±5%, B = ±2%.
Other tolerances available on special order. Consult factory.
(2) Measured @ DC test current with 10% AC superimposed (60 Hz rms)
(3) Measured from 1 KHz to 3 KHz
(4) Suffix denotes zener voltage tolerance: None = ±20%; A = ±10%; B = ±5%; C = ±2%.
Other tolerances available on special order. Consult factory.

Power Semiconductors

TRW

Zener Diodes (continued)

Table III

						Maximum Regulation Iz Hi to Iz Low			Typical Parameters			
Part No. (7)	Case Style	V_z Nominal Zener Voltage @ 250 µA (Volts dc)	Z_z (3) Maximum Dynamic Impedence @ 250 µA (Ohms)	Maximum (4) Noise Density @ 250 µA (µV/√Hz)	I_R Maximum Reverse Leakage @ 80% Vz (µA dc)	ΔV_z (Volts)	Iz Hi (mA)	Iz Low (µA)	T_C (6) @ 250 µA (mV/°C)	Zener Voltage @ 10 µA (Volts dc)	Reverse Current @ 50% Zener Voltage (nA dc)	Reverse Current @ 90% Zener Voltage
LVA450A	DO-7	5.0	700	1.0	10	0.4	1.0	100	0.75	4.15	70	15 µA
LVA453A	DO-7	5.3	250	1.0	5.0	0.2	1.0	100	1.33	4.9	35	7.0 µA
LVA456A	DO-7	5.6	100	1.0	1.0	0.1	1.0	50	1.96	5.45	15	3.0 µA
LVA459A	DO-7	5.9	100	1.0	0.5	0.1	1.0	10	2.30	5.85	2.5	1.0 µA
LVA462A	DO-7	6.2	100	1.0	0.1	0.1	1.0	10	2.67	6.2	0.8	0.13 µA
LVA465A	DO-7	6.5	100	1.0	0.05	0.1	1.0	10	3.06	6.5	0.15	2.5 nA
LVA468A	DO-7	6.8	100	1.0	0.01	0.1	1.0	10	3.40	6.8	0.1	9.0 nA
LVA471A	DO-7	7.1	175	1.0	0.01	0.1	1.0	10	3.76	7.1	<0.1	5.5 nA
LVA474A	DO-7	7.4	175	1.0	0.01	0.1	1.0	10	4.07	7.4	<0.1	3.0 nA
LVA477A	DO-7	7.7	175	1.0	0.01	0.1	1.0	10	4.47	7.7	<0.1	2.5 nA
LVA480A	DO-7	8.0	175	1.0	0.01	0.1	1.0	10	4.80	8.0	<0.1	1.8 nA
LVA483A	DO-7	8.3	175	1.0	0.01	0.1	1.0	10	5.15	8.3	<0.1	1.2 nA
LVA486A	DO-7	8.6	175	1.0	0.01	0.1	1.0	10	5.50	8.6	<0.1	0.9 nA
LVA489A	DO-7	8.9	175	2.0	0.01	0.1	1.0	10	5.87	8.9	<0.1	0.6 nA
LVA492A	DO-7	9.2	175	2.0	0.01	0.1	1.0	10	6.16	9.2	<0.1	0.5 nA
LVA495A	DO-7	9.5	175	2.0	0.01	0.1	1.0	10	6.46	9.5	<0.1	0.5 nA
LVA498A	DO-7	9.8	175	2.0	0.01	0.1	1.0	10	6.86	9.8	<0.1	0.4 nA

Zener Diodes (continued)

Table IV

						Reverse Leakage Current				Maximum Regulation	
						I_R	V_R				
JEDEC Part No. (1)(8)	Case Style	V_z Nominal Zener Voltage @ Iz (Volts dc)	Iz Test Current (mA)	Z_z (2)(3) Maximum Dynamic Impedance @ Iz (Ohms)	Maximum (2)(4) Noise Density @ 250 µA (µV/√Hz)	(µA)	Suffix None, A (Volts)	Suffix B,C,D (Volts)	I_{ZM} (2) Maximum Zener Current (mA dc)	ΔV_z (2)(5) (Volts)	I_{ZL} Low Vz Curren (mA dc)
IN5521	DO-7	4.3	20	18	0.5	3.0	1.0	1.5	88	0.75	2.0
IN5522	DO-7	4.7	10	22	0.5	2.0	1.5	2.0	81	0.60	1.0
IN5523	DO-7	5.1	5.0	26	0.5	2.0	2.0	2.5	75	0.65	0.25
IN5524	DO-7	5.6	3.0	30	1.0	2.0	3.0	3.5	68	0.30	0.25
IN5525	DO-7	6.2	1.0	30	1.0	1.0	4.5	5.0	61	0.20	0.01
IN5526	DO-7	6.8	1.0	30	1.0	1.0	5.5	6.2	56	0.10	0.01
IN5527	DO-7	7.5	1.0	35	2.0	0.5	6.0	6.8	51	0.05	0.01
IN5528	DO-7	8.2	1.0	40	4.0	0.5	6.5	7.5	46	0.05	0.01
IN5529	DO-7	9.1	1.0	45	4.0	0.1	7.0	8.2	42	0.05	0.01
IN5530	DO-7	10.0	1.0	60	4.0	0.05	8.0	9.1	38	0.10	0.01

Notes:
(1) Numbers shown are ±20%, A suffix is ±10%, B is 5%, C is ±2%, D is ±1%.
(2) Guaranteed for B, C, and D suffix only.
(3) Measured at DC test current with 10% VAC RMS superimposed (60 Hz).
(4) 1 KHz to 3 KHz.
(5) ΔV_z is max. difference between V_z at I_z and V_{zL} at I_{zL}.
(6) ±.5 mV/°C, 0–100 °C, ±Vz nominal only.
(7) Suffix denotes zener voltage tolerance.
A = ±.200 Vdc, B = ±.15 Vdc, other tolerances available on special order. Consult factory.
(8) V_F = 1.1 volts max. @ I_F = 200 mA for all types.

- Photoconductive Cells
- Interrupter Switches
- Phototransistors and Photodarlingtons
- Retroreflective Switches
- Light Activated Switches

VACTEC

- Selenium Photovoltaic Cells
- Vactrols (Opto-Isolators)
- Infrared Emitters

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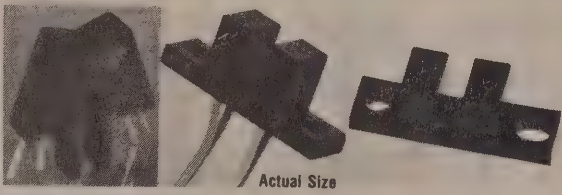
- Standard Silicon and Blue-Enhanced Photovoltaic Cells, Blue-Enhanced Photodiodes, and PIN Photodiodes

RETROREFLECTIVE & INTERRUPTER SWITCHES (Slotted)

Standard and custom optical switches—infrared GaAs LED and silicon phototransistor in an I-R transmitting housing. No openings or seams to collect dirt—available completely sealed for submersion during board cleaning—interchangeable with industry standard sizes. Request bulletins RPS-1 and SPS-1. New slotted switch with Schmitt Trigger output, bulletin SPS-2.



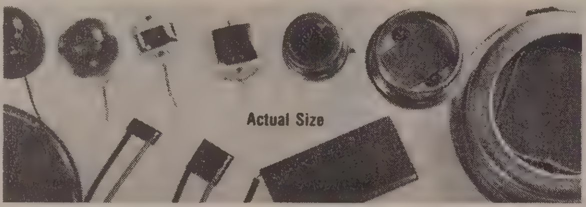
PHOTOCONDUCTIVE CELLS

Vactec light dependent resistors (LDR's) are available in three hermetic enclosures (TO-18, TO-5, TO-8) and 4 ceramic types. Ceramic types have automatically inserted wires which insure perfect contact integrity. Six materials of CdS, CdSe and CdSeS-CdS mixtures with spectral response peaks from 565-735 nm. Each material has a variety of sensitivities to satisfy all requirements. Request bulletin PCD-6.

Actual Size

SILICON PHOTOVOLTAIC CELLS

Three processes: BLUE ENHANCED, LOW CAPACITANCE, STANDARD SOLAR. All available in a variety of hermetic, ceramic, as chips, or with flying leads. The BLUE ENHANCED cells are unique large area detectors with high U-V sensitivity to as low as 200 nm. Almost non-existent U-V enhancement effect with stability equivalent to high quality photodiodes. Request bulletin VTS3A. LOW CAPACITANCE cells have fast response less than 15μS with 10KΩ load. The high shunt impedance is desirable for driving amplifiers. Request bulletin VTS-2. SOLAR cells have high V_{OC} at low illumination (typ 200mV at .05mW/cm²). Linear over wide illumination range—request bulletin VTD-1.



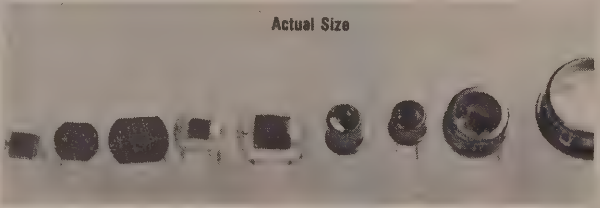
PHOTOTRANSISTORS — LED'S — PHOTODARLINGTONS — LIGHT ACTIVATED SWITCHES (LAS)

Phototransistors and photodarlingtons are NPN passivated—4 chip sizes of 25, 40, 50, and 60, mil square in TO-18, ceramic, coaxial, and lateral (side looking) packages. High light current at very low drive current ideal for instrumentation applications. Request bulletin VTTA-3A. GaAs I-R LED's with excellent stability in TO-18, T-1, T-1¾, lateral packages. Bulletin VTE-1. LAS (light activated switches) have high sensitivity with Schmitt Trigger output. Bulletin LAS-1, LAS-2.

Actual Size

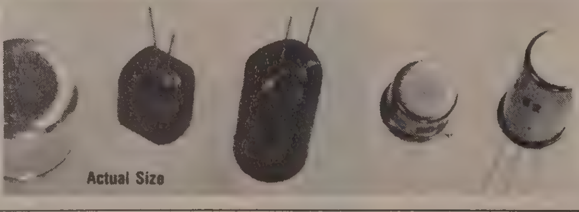
PHOTODIODES

BLUE ENHANCED photodiodes are extremely low dark current devices with excellent response in the U-V. Less than 10pA (I_D) for small chips. Large area diodes (VTB5051) 14.8mm² active area with 1.2A/(W/cm²) at 365nm and I_D of 250pA max. Request bulletin VTB-1B. FAST photodiodes have low capacitance. Use with reverse bias for fast response time and excellent linearity. Ideal for remote I-R sensor digital controls. Request bulletin VTD-1.



VACTROLS

Optical couplers using LED's, neons, or incandescent lamps as the emitter and Vactec photoconductive cells (LDR's) as the detector. For noiseless switching and signal monitors for audio. Neon types to sense telephone ring. LED types for triac gate control. Incandescent types for low cost true RMS sensor as voltage regulator or control of constant wattage heater. Five package types include 2 hermetic. Request bulletins VTL1, VTL2C, VTL3, VTL5CA, VTL5C8 and VTL9.



SELENIUM PHOTOVOLTAIC CELLS

Large area detectors for direct meter drive or in conjunction with amplifier. Spectral response peaks at 575 nm and is close to visible response. Available with integral #102 filter to match standard observer curve (CIE) Available in many flat or round cells with or without leads—also in 9 package styles including 2 hermetic. Request bulletin SPV-5A.

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When Replacing These Series	Replace With Littelfuse Series
A2D-R	LLNRK
A4BT	KLP-C
A4J	JLS
A6D-R	LLSRK
A6Y TYPE 2	KLK
A13X	KLA
A13Z	KLA
A25X	KLB
A25Z	KLB
A50P	KLH
A60C	KLC
BAF	BLF
BAN	BLN
BBS	BLS
EBS	BLS
ECNR	FLNR
ECSR	FLSR
EON	NLN
EOS	NLS
ERN	RLN
ERS	RLS
FNA	FLA
FNM	FLM
FNQ	FLQ
FRNR	FLNR
FRSR	FLSR
JCL	JLS
JKS	JLS
KAA	KLA
KAB	KLB
KAC	KLC
KAW	KLW
KBH	KLH
KLU	KLLU
KRP-C	KLP-C
KTK	KLK
KTK-R	KLK-R
LCL	KLP-C
LENR	LLNRK
LESR	LLSRK
LOWR	LLNRK
LPNR	LLNRK
LPSR	LLSRK
MCL	KLK
MEN	FLM
MEQ	FLQ
MID	FLA
MOF	BLN
MOL	BLF
MRL	KLW
NON	NLN
NOS	NLS
OTM	BLF
OTN	NLN
OTS	NLS
RES	RLS
RF	RLN
RFA	KLA
RFC	KLC
RFN	KLB
RFV	KLH
TR-R	FLNR
TR-SR	FLSR
TRM	FLM

	Fuse Symbol	Ampere Rating	AC Volts	U.L. Class	Interrupting Rating	General Fuse Applications
MIDGET FUSES	BLF	1/2-30	250	"Micro miniature miscellaneous fuses"	10,000	• Electronic devices • Control circuit transformers • Motor controls • Switchboards • Panels
	BLN	1-30	250			
	BLS	2/10-10	600			
	FLA	1/10-30	250/125			
	FLM	1/10-30	250			
	FLQ	1/10-30	500			
MIDGET FUSES	KLK	1/10-30	600	Miscellaneous	200,000	• Pilot circuit wiring or switchboards • Electronic devices • Control circuitry • CT applications
	KLK-R	1/10-30	600		200,000	
SEMICONDUCTOR RECTIFIER FUSES	KLA	1/2-1000	130	"Special purpose fuses"	30,000	• Variable speed drives • Motor controllers for conveyers & rotative machines • U.P.S. systems • D.C. drives • AC or DC semiconductor rectifiers • S.C.R. drives • Inverters • Mine power supplies
	KLB	1/2-1000	250		200,000	
	KLC	1-1000	600		200,000	
	KLW	1-30	130		10,000	
	KLH	10-1000	500		200,000	
GENERAL PURPOSE FUSES	LLNRK	1/10-60 70-600	250 250	RK5 RK1	200,000 200,000	• Motor branch circuits • C/B back-up protection • Branch feeders • Transformers • Protection distribution
	LLSRK	1/10-60 70-600	600 600	RK5 RK1	200,000 200,000	
GENERAL PURPOSE FUSES	FLNR	1/10-600	250	K5 & RK5	200,000	• Motor controllers & overcurrent protection • Motor protection • Coordinated systems & thermal sensitivity • Protect mains & feeders • Heating & air conditioning coils & transformers • Thermal protection in panels & switches
	FLSR	1/10-600	600	K5 & RK5		
HI-INTERRUPTING FUSES	JLS	1-600	600	J	200,000	• Switchgear • Air circuit breakers • Safety switches • Bolted pressure switches • Service entrance equipment
	KLL-U	601-2000	600	L	200,000	
	KLP-C	601-6000	600	L	200,000	
ONE-TIME & RENEWABLE FUSE	NLN	1-600	250	H	10,000	• Service entrance equipment • Low cost circuit protection • Fusible equipment • Lighting & heating loads
	NLS	1-600	600	H	10,000	
	RLN	1-600	250	H	10,000	
	RLS	1-600	600	H	10,000	

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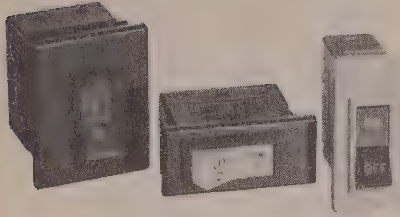
Atlee	1B•1259							●				●
Bel Fuse	1B•1260- 1B•1262	●	●	●	●		●	●	●	●	●	
FIC Corporation	1B•1265							●	●	●		●
Littelfuse	1B•1254 1B•1268- 1B•1274	●	●	●	●	●	●	●	●	●	●	●
Panel Components	1B•1282 1B•1283	●	●	●			●				●	
Power Dynamics	1B•1286 1B•1287			●			●	●	●	●		●

CIRCUIT BREAKERS, LIMITERS, SUPPRESSORS

Manufacturer	EEM Page No.	Circuit Breakers	Limiters/ Protectors, Surge	Suppressors, Transient Voltage	Data Line Protectors	UL	CSA	SEMKO	MIL
Airpax	1B•1256	●				●	●	●	●
Atlantic Scientific	1B•1257		●		●	●			
Control Concepts	1B•1263		●	●	●				
Heinemann Electric	1B•1266 1B•1267	●	●			●	●		
MCG Electronics	1B•1277- 1B•1280		●	●	●				
Perma Power	1B•1284		●		●	●			
PolyPhaser	1B•1285			●	●				

Circuit Breakers

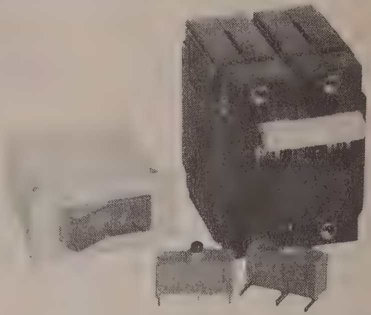


Model 203

Front panel mount device combines overcurrent protection, ON-OFF switching, pilot light. Series, shunt or relay trip.

Specifications: 1 to 3 poles. Ratings: 0.05-10A, 250Vac, 50Vdc, 10.1-20A, 120Vac, 32 Vdc. Interrupting capacity: 1000A.

Approval: SP S ЯU



Models SNAPAK®, CARDGARD™, IPG

All conform to VDE and IEC spacing requirements. CARDGARD is pc board mountable.

Specifications: SNAPAK®: 1 or 2 pole ratings: 0.10 to 15A at 32Vdc/125Vac, 0.10 to 7.5A at 50Vdc/250Vac. 2 pole only (2 pole breaking) and ratings; 7.6 to 15A at 125/250Vac, 32/50Vdc. Interrupting capacity: 1000A at 125Vac, 32Vdc and 50Vdc.

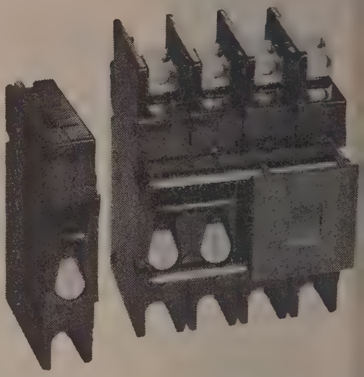
Approval: IEC SP S ЯU

CARDGARD™: 1 pole. Ratings: 1.0 to 6.0A, 32Vdc, 250Vac. Interrupting capacity: 10 times rated current.

Approval: ЯU

IPG: 1 to 4 poles. Ratings: 0.02-30A, 250Vac, 65Vdc, 31-50A, 50Vdc. Interrupting capacity: 1000A, 250Vac, 65Vdc, and at 5000A, max. ratings of 30A at 120Vac, 20A at 250Vac, 10A at 250Vac.

Approval: SP S ЯU
Q P L : MIL-C-55629

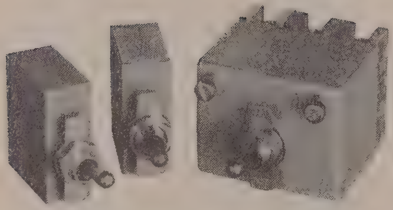


Model 209

Ideal for branch circuits. Mount in switch boards, panel enclosures, panel boards, junction boxes. Series includes 219 manu motor controller, 229 appliance controller 249 marine power selector.

Specifications: 1 to 6 poles. Ratings: 0.10-100A, 125Vdc; 0.10-77A, 600Vac; 0.10-100A, 120, 240, 277 and 480 Vac. Interrupting capacity: 5000A.

Approval: SP S UL ЯU

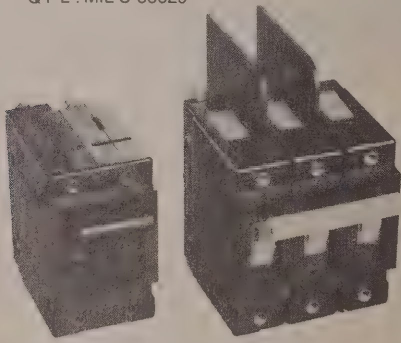


Models AP and UP

Hermetically sealed. DC, 50/60Hz or 400Hz versions. Various delays to meet your needs. UP version has wide glass terminals.

Specifications: 1 to 3 poles. Ratings: 0.05-20A, 240Vac, 50Vdc. Interrupting capacity: 1000A.

Approval: SP S ЯU
(UP single pole series only)
Q P L : MIL-C-39019

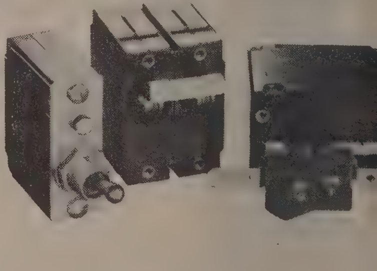


Models APL/UPL & 205

These breakers offer precision operation for critical service. Series, shunt and relay configuration options. Choice of delays, ratings. 205 dust-sealed for harsh environments.

Specifications: 1 to 9 poles. Ratings: 0.05-20A, 277Vac (Mod. 205, 277/480Vac); 0.05-50A, 250Vac, 65Vdc; 51-100A, 32Vdc. Interrupting capacity: 1000A, 65Vdc (Mod. 205 also 250Vac), 2000A, 32Vdc, 5000A, 120Vac (50A max. rating); 5000A, 277Vac (Mod. 205, 277/480Vac) (20A max. rating).

Approval: SP S ЯU
Q P L : MIL-C-55629



Models APG/UPG

Low-cost, precision operation. Multipole assemblies, single or multi-handle. For da processing, broadcast equipment, vendin machines, controllers, etc.

Specifications: 1 to 4 poles. Ratings: 0.02-30A, 277Vac, 65Vdc, 31-50A, 50Vdc Interrupting capacity: 1000A, 277Vac, 65Vdc, and at 5000A, max. ratings of 30 at 120Vac, 20A at 250Vac, 10A at 277Va

Approval: SP S ЯU
Q P L : MIL-C-55629

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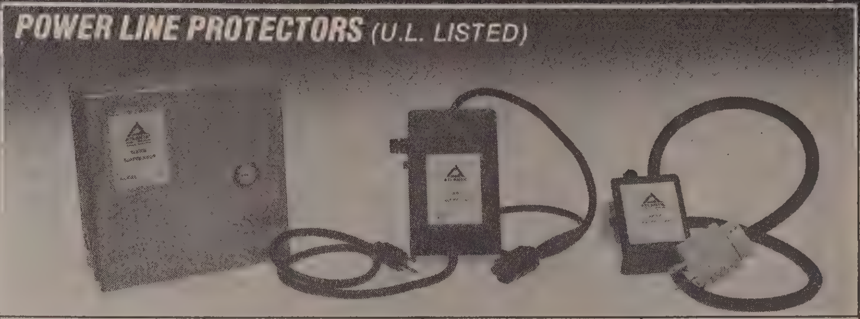
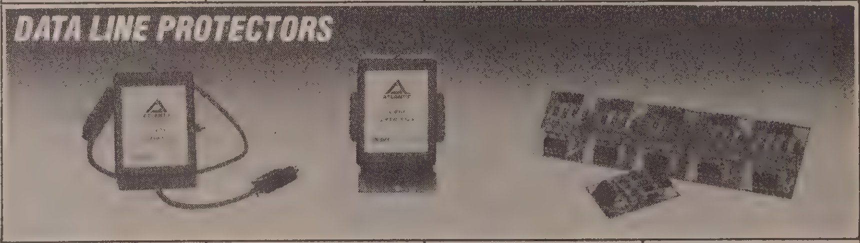


FEATURES:	M B SERIES	R B SERIES	H P B SERIES
Protection from surges	Up to 65,000A	Up to 25,000A	Up to 250A
Response time	50 nanoseconds	<10 nanoseconds	<10 nanoseconds
Holdover current	None	None	None
Failure indicator light	Yes	Yes	Yes
Solid state	100%	100%	100%
For protection of:	-power lines at service entrance and circuit breaker panels, against high current line surges and lightning induced effects	-solid state equipment control systems, and computers, where high energy powerline surge protection is required	-secondary power insertion applications to semiconductor equipment, such as computer, CATV, and control systems
Models available (VAC)	120, 240, 277, 350, 480, 600 split-phase or 3-phase	120, 240, 277 1-phase or split-phase	120, 240 1-phase, split-phase or 3-phase
Recovery time	Instant	Instant	Instant
Life of unit	500A>5000 times	500A>5000 times	250A>1500 times
Fail safe	Short	Short	Short
Other features	Wall or knockout mounting, metal enclosures	Completely self contained in phenolic enclosure with line cord and connectors as specified	

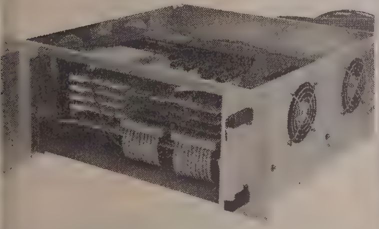
DATA LINE PROTECTORS



FEATURES:	RS 232 SERIES	D L SERIES	D L(E) SERIES
Protection from surges	Up to 6500A surges	Up to 6500A surges	Up to 6500A surges
Response time	5 nanoseconds	5 nanoseconds	5 nanoseconds
Holdover current	None	None	None
Recovery time	Instant	Instant	Instant
For protection of:	-the EIA (RS-232-C) digital interface of computers, terminals, and modems from surge and transient voltages caused by lightning, inductive load switching and static electricity	-low energy, low voltage DC data, telephone, or signal lines from surge and transient voltages caused by lightning, inductive load switching and static electricity	
Solid state	100%	100%	100%
Number of wires protected	1, 2, 3 and 7 standard additional wires available	2 to 8	4 to 20 each card
Other features	Plug-in protection for RS-232	Protection for RS-232, RS-422, 20 ma loop, etc.	

AS USED BY THE WORLD'S LARGEST COMPUTER MANUFACTURERS

FIBER OPTIC TECHNOLOGY



FIBER OPTIC MULTIPLEXER

APPLICATION:

Computer to computer links

Secure communication links

Error free operation in high electrical noise environment

MULTIPLEXER FEATURES

- Synchronous or Asynchronous operation
- 32 channel modular construction expandable to 128 channels/chassis
- Selectable channel/data rate configuration from 128 channels at 9.6 KBPS to 8 channels at 153.6 KBPS
- RS232-C electrical interface standard
- High density modular packaging and local/remote loop back provides easy maintenance and fault isolation
- Synchronous clocks provided at all standard rates at or below 9.6 KBPS

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Call (305) 725-8000 or write:

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2711 South Harbor City Blvd. Melbourne, Florida 32901 Telex 755959

LIGHTNING WARNING • LOCATION • PROTECTION

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1**•**B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

ATLEE COMPONENT HOLDERS

Atlee component clips are made of spring steel and beryllium copper because they afford the most generally desirable combination of properties. Specific selection of material will depend on conditions of the application. In addition clips can be manufactured to your specification for a variety of uses. Please contact the factory with your questions and special requirements.

FEATURES

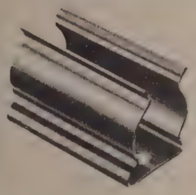
- The design of our component holders, from raw material through the finished product, ensures maximum performance and reliability under extreme usage, insertion, withdrawal force, and shock and vibration.
- Holding power increases as shock and vibration increase, measured by force required to remove component.
- Special contour design acquires closer set to component during shock and vibration, increasing security without localized pressure.

Atlee offers a complete line of MS and NAS component clips.

M24066 M17160

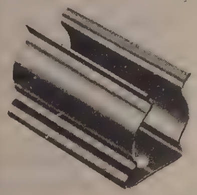
MS28136 MS28137 NAS1464

- Slotted design assures firm retention for fragile components without risk of injury.
- As an indication of the spring characteristics of Atlee's component holders, all of which are heat treated after forming, the following data is supplied; beryllium copper will withstand over 500 and spring steel 100 insertion-withdrawals of a slug 1/32" larger than nominal diameter, without metal fatigue.



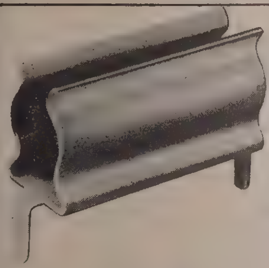
Beryllium Copper, QQ-C-533a

PLATING: cadmium CQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-T-425; nickel, QQ-U-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors and small cylindrical devices. Fastened by means of rivets, eyelets, screws or similar fasteners.



Spring Steel, QQ-S-777a

PLATING: cadmium CQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-T-425; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors and small cylindrical devices. Fastened by means of rivets, eyelets, screws or similar fasteners.



Tab Mounted Clips

MATERIAL: beryllium copper, QQ-C-533a.
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold resistors, capacitors, relays and similar cylindrical components. Fastened to a circuit board by tabs.

Industrial Component Holders

MATERIAL: spring steel S.A.E. 1065, .020 thick.

PLATING: commercial nickel, commercial nickel and vinyl coating
Designed for use in industrial and commercial applications.

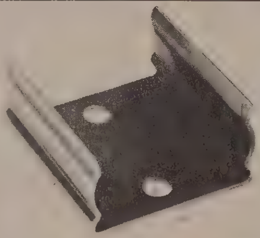
No-Twist Clips

MATERIAL: spring steel, QQ-S-777a.
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc, QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed for holding capacitors and similar cylindrical components, without twisting.

Fuse and Resistor Holders

MATERIAL: phosphor bronze, QQ-B-750; beryllium copper, QQ-C-533a.

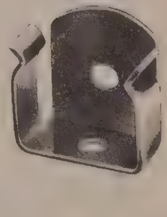
PLATING: silver, QQ-S-365a.
Finishes available silver plate.
Designed to hold fuses and ferrule-type resistors plus reduce heating by providing high contact pressure.



Crystal Clips

MATERIAL: spring steel, QQ-S-777a, spring steel S.A.E. 1065.

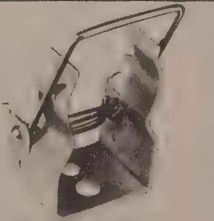
PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; zinc QQ-Z-325; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to provide secure mounting for flattened elliptical components.



Transistor Clips

MATERIAL: beryllium copper, QQ-C-533a.

PLATING: cadmium, QQ-P-416a; silver, QQ-S-365a; tin, QQ-M-151; nickel, QQ-N-290; black matte, MIL-F-495A.
Various finishes available.
Designed to hold transistors without depending on soldered leads and at the same time act as a heat sink.



Locking Clips

MATERIAL: spring temper phosphor bronze, QQ-B-750.
PLATING: silver, QQ-S-365a; cadmium, QQ-P-416a; nickel, QQ-N-290; Class II, Type VI.
Various finishes available.
Designed to hold a fuse, ferrule-type resistor or similar component against the most severe shock and vibration.

Heat Dissipating Liners

MATERIAL: beryllium copper, .002 thick per QQ-C-533a, heat treated.

FINISH: black matte
Designed to cool many types of components combined with different types of cooling methods.

ATLEE

1 GILL STREET, WOBURN, MA 01801 • (617) 933-3510 • TELEX 949407

Atlee manufactures a full line of Bus Bars Card Guides and Component Holders. For additional information, please contact the factory.

FUSES/UL, CSA 1-1/4" x 1/4" & 1" x 1/4"

TYPE 3AG NORMAL BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.250 (6.35)
Length	1.250 (31.75)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3AG010	1/100	250	3AG1	1	250
3AG031	1/32	250	3AG1.25	1-1/4	250
3AG062	1/16	250	3AG1.5	1-1/2	250
3AG100	1/10	250	3AG1.6	1-6/10	250
3AG125	1/8	250	3AG1.75	1-3/4	250
3AG150	15/100	250	3AG2	2	250
3AG175	.175	250	3AG2.3	2-3/10	250
3AG187	3/16	250	3AG2.5	2-1/2	250
3AG200	2/10	250	3AG3	3	250
3AG250	1/4	250	3AG3.5	3-1/2	250
3AG300	3/10	250	3AG4	4	250
3AG375	3/8	250	3AG4.5	4-1/2	250
3AG400	4/10	250	3AG5	5	250
3AG500	1/2	250	3AG6	6	125
3AG600	6/10	250	3AG7	7	125
3AG750	3/4	250	3AG8	8	125
3AG800	8/10	250	3AG10	10	125

Listed by Underwriters' Laboratories through 8 amperes. Certified by Canadian Standards Association through 8 amperes.

Type 3AG fuses, described as normal blow, are medium to quick acting protectors for use in general circuit applications. Suitable for most circuits where high surges or transients are not anticipated.

TYPE 3AP NORMAL BLOW PIGTAIL GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.270 (6.86)
Length	1.290 (32.77)

Pigtail Leads	Inches (mm)
Diameter	.032 (.813)
Length	1.5 (38.1)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3AP010	1/100	250	3AP1	1	250
3AP031	1/32	250	3AP1.25	1-1/4	250
3AP062	1/16	250	3AP1.5	1-1/2	250
3AP100	1/10	250	3AP1.6	1-6/10	250
3AP125	1/8	250	3AP1.75	1-3/4	250
3AP150	15/100	250	3AP2	2	250
3AP175	.175	250	3AP2.3	2-3/10	250
3AP187	3/16	250	3AP2.5	2-1/2	250
3AP200	2/10	250	3AP3	3	250
3AP250	1/4	250	3AP3.5	3-1/2	250
3AP300	3/10	250	3AP4	4	250
3AP375	3/8	250	3AP4.5	4-1/2	250
3AP400	4/10	250	3AP5	5	250
3AP500	1/2	250	3AP6	6	125
3AP600	6/10	250	3AP7	7	125
3AP750	3/4	250	3AP8	8	125
3AP800	8/10	250	3AP10	10	125

Listed by Underwriters' Laboratories through 8 amperes. Certified by Canadian Standards Association through 7 amperes.

Type 3AP fuses are medium to quick blowing fuses with the same electrical characteristics as Type 3AG. They are supplied with pigtail leads so that the fuse can be wired directly to the circuit.

TYPE 3SB SLOW BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.250 (6.35)
Length	1.250 (31.75)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
3SB010	1/100	250	3SB1	1	250
3SB031	1/32	250	3SB1.2	1-2/10	250
3SB040	4/100	250	3SB1.25	1-1/4	250
3SB062	1/16	250	3SB1.5	1-1/2	250
3SB100	1/10	250	3SB1.6	1-6/10	250
3SB125	1/8	250	3SB1.8	1-8/10	250
3SB150	15/100	250	3SB2	2	250
3SB175	.175	250	3SB2.25	2-1/4	250
3SB187	3/16	250	3SB2.5	2-1/2	250
3SB200	2/10	250	3SB2.8	2-8/10	250
3SB250	1/4	250	3SB3	3	250
3SB300	3/10	250	3SB3.2	3-2/10	250
3SB375	3/8	250	3SB3.5	3-1/2	250
3SB400	4/10	250	3SB4	4	250
3SB500	1/2	250	3SB4.5	4-1/2	250
3SB600	6/10	250	3SB5	5	250
3SB700	7/10	250	3SB6	6	250
3SB750	3/4	250			
3SB800	8/10	250			

Listed by Underwriters' Laboratories through 6 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 3SB fuses, described as slow blow, are designed to prevent unnecessary blowing in circuits where transient surges are anticipated. Protection against short circuit or continued overload is still maintained.

TYPE 3SBP SLOW BLOW PIGTAIL GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Inches (mm)
Diameter	.270 (6.86)
Length	1.290 (32.77)

Pigtail Leads	Inches (mm)
Diameter	.032 (.813)
Length	1.5 (38.1)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Rating Voltage
3SBP010	1.100	250	3SBP1	1	250
3SBP031	1/32	250	3SBP1.2	1-2/10	250
3SBP040	4/100	250	3SBP1.25	1-1/4	250
3SBP062	1/16	250	3SBP1.5	1-1/2	250
3SBP100	1/10	250	3SBP1.6	1-6/10	250
3SBP125	1/8	250	3SBP1.8	1-8/10	250
3SBP150	15/100	250	3SBP2	2	250
3SBP175	.175	250	3SBP2.25	2-1/4	250
3SBP187	3/16	250	3SBP2.5	2-1/2	250
3SBP200	2/10	250	3SBP2.8	2-8/10	250
3SBP250	1/4	250	3SBP3	3	250
3SBP300	3/10	250	3SBP3.2	3-2/10	250
3SBP375	3/8	250	3SBP3.5	3-1/2	250
3SBP400	4/10	250	3SBP4	4	250
3SBP500	1/2	250	3SBP4.5	4-1/2	250
3SBP600	6/10	250	3SBP5	5	250
3SBP700	7/10	250	3SBP6	6	250
3SBP750	3/4	250			
3SBP800	8/10	250			

Listed by Underwriters' Laboratories through 6 amperes Certified by Canadian Standards Association through amperes.

Type 3SBP fuses, designated as slow blow, preven unnecessary blowing from sudden current surges Normal protection is still maintained against cor tinued overload and short circuits. Similar electr cally to the 3SB series, but supplied with pigta leads.

TYPE 8AG/8AP NORMAL BLOW GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	8AG Inches (mm)	8AP Inches (mm)	Pigtail Leads Inches (mm)
Diameter	.250 (6.35)	.275 (6.99)	.032 (.813)
Length	1.00 (25.4)	1.025 (26.04)	1.5 (38.1)

Catalog Number		Ampere Rating	Voltage Rating
8AG100	8AP100*	1/10	250
8AG125	8AP125	1/8	250
8AG250	8AP250	1/4	250
8AG375	8AP375	3/8	250
8AG500	8AP500	1/2	250
8AG750	8AP750	3/4	250
8AG1	8AP1	1	250
8AG1.5	8AP1.5	1-1/2	250
8AG2	8AP2	2	250
8AG2.5	8AP2.5	2-1/2	125
8AG3	8AP3	3	125
8AG4	8AP4	4	125
8AG5	8AP5	5	125
8AG6	A8P6	6	125
8AG7	8AP7	7	125

*Pigtail (AP)

Listed by Underwriters' Laboratories through 7 ampere Certified by Canadian Standards Association through amperes.

Type 8AG is designated as a normal blow fuse for u in general circuit protection. Their smaller size pe mits use where space limitations prevent use Type 3AG. Pigtail leads (Type 8AP) are available wh direct soldering into circuits is desired.

bel BEL FUSE INC. 198 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

FUSES/UL, CSA & SEMKO 5mm x 20mm

TYPE 5MF FAST ACTING GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
200%	5 seconds, maximum

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5MF100	1/10	250	5MF1	1	250
5MF125	1/8	250	5MF1.25	1-1/4	250
5MF200	2/10	250	5MF1.6	1-6/10	250
5MF250	1/4	250	5MF2	2	250
5MF300	3/10	250	5MF2.5	2-1/2	250
5MF400	4/10	250	5MF3	3	250
5MF500	1/2	250	5MF4	4	125
5MF600	6/10	250	5MF5	5	125
5MF700	7/10	250	5MF6	6	125
5MF800	8/10	250	5MF7	7	125

Listed by Underwriters' Laboratories from 700 mA to 5 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 5MF fuses, described as fast acting are manufactured to meet the requirements of UL 198.6 and CSA 22.2. They permit European manufacturers of original equipment to substitute a fuse listed or certified by UL/CSA when exporting their equipment to the United States or Canada without making costly changes in mountings and printed circuit board layouts. Since fusing characteristics are different than those specified by IEC 127 for specific ratings, a careful analysis of the blowing curves should be made before determining the proper substitution. The small size of these fuses also offer the American/Canadian designer a protective device where space limitations are an important consideration. Pigtail leads (5MFP) are available when direct soldering into circuits is desired.

TYPE 5MT TIME LAG GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
110%	4 hours, minimum
135%	1 hour, maximum
1000%	10 milliseconds, minimum

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.797)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5MT100	1/10	250	5MT1	1	125
5MT125	1/8	250	5MT1.25	1-1/4	125
5MT200	2/10	250	5MT1.6	1-6/10	125
5MT250	1/4	250	5MT2	2	125
5MT300	3/10	250	5MT2.5	2-1/2	125
5MT400	4/10	250	5MT3	3	125
5MT500	1/2	250	5MT4	4	125
5MT600	6/10	250	5MT5	5	125
5MT700	7/10	250	5MT6	6	125
5MT800	8/10	250	5MT7	7	125

Listed by Underwriters' Laboratories from 250mA to 5 amperes. Certified by Canadian Standards Association through 5 amperes.

Type 5MT fuses, described as time lag offer additional surge protection for circuits where momentary transients are anticipated. They are built to meet the specifications of UL 198.6 and CSA 22.2. They permit the European manufacturers of original equipment to substitute a fuse listed or certified by UL/CSA when exporting their equipment to the United States or Canada without making costly changes in mountings and printed circuit board layouts. Since fusing characteristics are different than those specified by IEC 127 for specific ratings, a careful analysis of the blowing curves should be made before determining the proper substitution. The small size of these fuses also offer the American/Canadian designer a protective device where space limitations are an important consideration. Pigtail leads (5MTP) are available when direct soldering into circuits is desired.

TYPE 5SF QUICK ACTING GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rated Current	2.1 I_n	2.75 I_n		4 I_n		10 I_n
	Max.	Min.	Max.	Min.	Max.	Max.
32 to 100 mA inclusive	30 min	10 ms	500 ms	3 ms	100 ms	20 ms
Above 100 mA to 6.3A	30 min	50 ms	2 s	10 ms	300 ms	20 ms

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5SF032	.032	250	5SF500	1/2	250
5SF040	.040	250	5SF630	.630	250
5SF050	1/20	250	5SF800	8/10	250
5SF063	1/16	250	5SF1	1	250
5SF080	.080	250	5SF1.25	1-1/4	250
5SF100	1/10	250	5SF1.6	1-6/10	250
5SF125	1/8	250	5SF2	2	250
5SF160	.160	250	5SF2.5	2-1/2	250
5SF200	2/10	250	5SF3.15	3.15	250
5SF250	1/4	250	5SF4	4	250
5SF315	.315	250	5SF5	5	250
5SF400	4/10	250	5SF6.3	6-3/10	250

Approved by SEMKO for 80 mA, 125 mA, and from 250 mA through 6.3A.

Type 5SF fuses, described as quick acting, low breaking capacity, are manufactured to the specifications of IEC 127, CEE 4, Standard Sheet II (Type F). Used throughout Europe, they carry the SEMKO mark in the ratings indicated. They are used for general circuit protection in electrical and electronic equipment where momentary transients are not anticipated. Pigtail leads (5SFP) are available when direct soldering into circuits is desired.

TYPE 5ST TIME LAG GLASS TUBE FUSE SERIES

ELECTRICAL CHARACTERISTICS

Rated Current	2.1 I_n	2.75 I_n		4 I_n		10 I_n	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.
32 to 100 mA inclusive	2 min	200 ms	10 s	40 ms	3 s	10 ms	300 ms
Above 100 mA to 6.3A	2 min	600 ms	10 s	150 ms	3 s	20 ms	300 ms

MECHANICAL DIMENSIONS

Dimensions	Millimeters (Inches)
Diameter	5 (0.197)
Length	20 (0.787)

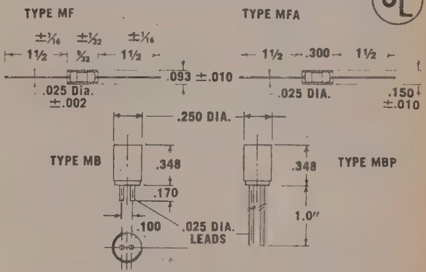
Catalog Number	Ampere Rating	Voltage Rating	Catalog Number	Ampere Rating	Voltage Rating
5ST032	.032	250	5ST500	1/2	250
5ST040	.040	250	5ST630	.630	250
5ST050	1/20	250	5ST800	8/10	250
5ST063	1/16	250	5ST1	1	250
5ST080	.080	250	5ST1.25	1-1/4	250
5ST100	1/10	250	5ST1.6	1-6/10	250
5ST125	1/8	250	5ST2	2	250
5ST160	.160	250	5ST2.5	2-1/2	250
5ST200	2/10	250	5ST3.15	3.15	250
5ST250	1/4	250	5ST4	4	250
5ST315	.315	250	5ST5	5	250
5ST400	4/10	250	5ST6.3	6-3/10	250

Approved by SEMKO from 160 mA through 6.3A.

Type 5ST fuses, described as time lag, low breaking capacity, are manufactured to the specifications of IEC 127, CEE 4, Standard Sheet III (Type T). They carry the SEMKO mark in the ratings indicated. They are used for general circuit protection in electrical and electronic equipment where momentary transients are anticipated. Pigtail leads (5STP) are available when direct soldering into circuits is desired.

MICRO FUSES

TYPE MF/MFE/MB/MBP/MFA MICROBEL MICRO FUSE SERIES



ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
150%	10 minutes, maximum
200%	1 minute, maximum

Catalog Number				Ampere Rating	Voltage Rating
MF125	MB125	MBP125	MFA125	1/8	125
MF250	MB250	MBP250	MFA250	1/4	125
MF375	MB375	MBP375	MFA375	3/8	125
MF500	MB500	MBP500	MFA500	1/2	125
MF750	MB750	MBP750	MFA750	3/4	125
MF1	MB1	MBP1	MFA1	1	125
MF1.5	MB1.5	MBP1.5	MFA1.5	1-1/2	125
MF2	MB2	MBP2	MFA2	2	125
MF2.5	MB2.5	MBP2.5	MFA2.5	2-1/2	125
MF3	MB3	MBP3	MFA3	3	125
MF3.5	MB3.5	MBP3.5	MFA3.5	3-1/2	125
MF4	MB4	MBP4	MFA4	4	125
MF5	MB5	MBP5	MFA5	5	125
MF7	MB7	MBP7	MFA7	7	125

Microbel Type Micro Fuses are subminiature fuses for use in circuits where space requirements are an important factor. Built to meet the requirements of UL 198.6 for micro-fuses, they are supplied in the four different mechanical configurations illustrated below.

Type MF is supplied with Kynar sleeve. Type MFE* is supplied with epoxy coating. Marked with or without color coding, MF fuses are available with radial or axial leads with the axial construction packaged either bulk or taped and reeled.

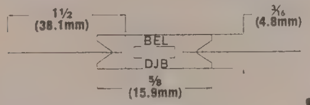
*** UL Pending.**

Listed by Underwriters' Laboratories through 7 amperes.

bel BEL FUSE INC. 198 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

SPECIAL FUSES

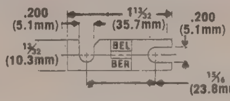
TYPE DJB FLAT PACK FUSE


1½ (38.1mm)
³⁄₁₆ (4.8mm)
BEL
DJB
⅝ (15.9mm)

ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
160%	20 seconds, maximum

TYPE BER FLAT PACK FUSE


.200 (5.1mm)
1¹³⁄₃₂ (35.7mm)
.200 (5.1mm)
¹³⁄₃₂ (10.3mm)
BEL
BER
¹⁵⁄₁₆ (23.8mm)

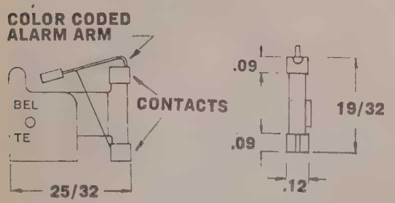
ELECTRICAL CHARACTERISTICS

Rating	Blow Time
100%	4 hours, minimum
135%	1 hour, maximum
200%	1 minute, maximum

Catalog Number		Ampere Rating	Catalog Number		Ampere Rating
DJB250	BER250	1/4	DJB2	BER2	2
DJB300	BER300	3/10	DJB2.25	BER2.25	2-1/4
DJB400	BER400	4/10	DJB2.5	BER2.5	2-1/2
DJB500	BER500	1/2	DJB2.75	BER2.75	2-3/4
DJB600	BER600	6/10	DJB3	BER3	3
DJB750	BER750	3/4	DJB3.5	BER3.5	3-1/2
DJB875	BER875	7/8	DJB4	BER4	4
DJB1	BER1	1	DJB5	BER5	5
DJB1.25	BER1.25	1-1/4	DJB8	BER8	8
DJB1.5	BER1.5	1-1/2	DJB10	BER10	10

Flat pack fuses, TYPE DJB with pigtails for direct soldering and TYPE BER for mounting with #10 screws, find broad application in telecommunication circuits and in low energy circuits where cost and space are important considerations. They are recognized under the component program of Underwriters' Laboratories and may be used in those circuits where the suitability of application has been investigated.

TYPE TE INDICATING FUSE


COLOR CODED ALARM ARM
BEL
TE
CONTACTS
.09
.09
19/32
25/32
.12

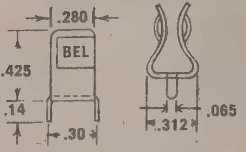
ELECTRICAL CHARACTERISTICS

Rating	Blow Time
80%	4 hours, minimum
100%	10 minutes, minimum
150%	5 minutes, maximum

Catalog Number	Ampere Rating	Color Code	Catalog Number	Ampere Rating	Color Code
TE180	18/100	Y	TE2	2	OR
TE250	1/4	V	TE3	3	BLU
TE500	1/2	R	TE3.5	3-1/2	W/BLU
TE650	65/100	BK	TE4	4	W/BRN
TE750	3/4	BRN	TE5	5	GRN
TE1	1	6RY	TE7.5	7½	BK/W
TE1.3	1-1/3	W	TE10	10	R/W
TE1.5	1-1/2	W/Y			

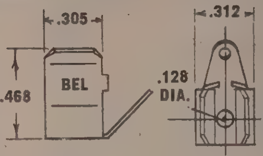
Type TE fuses find extensive use in telecommunication circuits and other applications where both electrical and visual fuse failure indication is required. The alarm spring is color coded to give quick current rating identification.

FUSE CLIPS AND FUSE MOUNTINGS


.280
BEL
.425
.14
.30
.312
.065

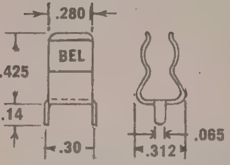
TYPE FC-101

3AG Clip
PC Board Mount
(Ear Stops)


.305
BEL
.468
.312
.128 DIA.

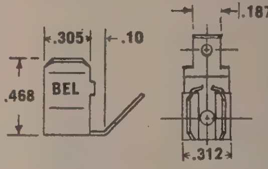
TYPE FC-105

3AG Clip
Hole Mount
(Solder Lug)


.280
BEL
.425
.14
.30
.312
.065

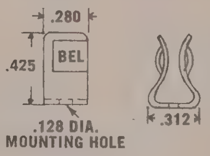
TYPE FC-102

3AG Clips
PC Board Mount
(Earless)


.305
.10
BEL
.468
.187
.312

TYPE FC-106

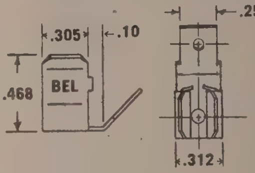
3AG Clip
Hole Mount
(.187 Quick Connect)


.280
BEL
.425
.312

.128 DIA.
MOUNTING HOLE

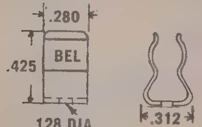
TYPE FC-103

3AG Clip
Hole Mount
(Ear Stops)


.305
.10
BEL
.468
.250
.312

TYPE FC-107

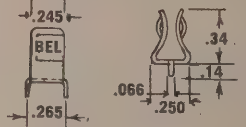
3AG Clip
Hole Mount
(.250 Quick Connect)


.280
BEL
.425
.312

.128 DIA.
MOUNTING HOLE

TYPE FC-104

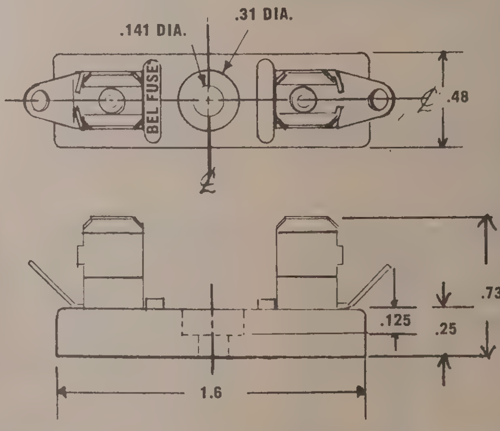
3AG Clip
Hole Mount
(Earless)


.245
BEL
.265
.34
.14
.066
.250

TYPE FC-201

5mm Clip
PC Board Mount
(Ear Stops)

Mountings


.141 DIA.
.31 DIA.
BEL FUSE
.48
.734
.125
.25
1.6

All Bel Fuse clips are manufactured from .020 phosphor bronze stock and specially hardened to assure long life and minimum contact resistance. They are bright tin plated to facilitate soldering and prevent oxidation. In addition to the stock designs illustrated, clips can be quickly tooled to meet customer specifications.

The bases on mountings illustrated above are molded from a polyamid modified nylon rated by Underwriters' Laboratories at 94V-0. Clips are riveted to the base for maximum strength and are butted against a barrier to prevent rotation and assure alginment. The fuse mounts illustrated use Type FC-105 clips. Fuse mounts can be supplied with any combination of hole mount tyoe clips.

bel BEL FUSE INC. 158 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

A New Generation in State of the Art Power Conditioning by Control Concepts

Islatrol®

"Active Tracking Spike & Transient Suppressors That Work"

Islatrol's unique active suppression is the secret of its success. The patented circuitry senses spikes and transients on incoming AC power and triggers itself into action. Islatrol effectively clamps the spike and absorbs the energy in the series and shunt elements, while simultaneously supplying energy to fill any undershoot. The result is clean incoming AC power. Islatrol means active protection for sensitive solid state equipment.

Secondary induced voltages from lightning, line faults or power switching often found in commercial and manufacturing environments can generate transients far exceeding the peak value of applied voltage. If not attenuated, these microsecond pulses can destroy semiconductors, and damage normal low level logic types. Islatrol protection reduces logic errors, erroneous control or memory loss and the possibility of equipment degradation or total failure.

Islatrol Specifications

General Description: A solid state, active tracking voltage suppressor which protects against transients, spikes, short-term outages and noise on incoming AC power lines.

Standard Voltage Inputs: 120V, 240V, 480V

Power Line Frequency: 50 to 60 Hz. (400 Hz available)

Response Time: Less than 10 nanoseconds

Transient Reduction: Minimum of 40 db, from the midband audio range through 50 MHz. The active filter improves the quality of the input line. Attenuation is greater than 50 db to IEEE surge withstand capability test No. 587 Category A and B.

Preset Switch Level: +/-2V

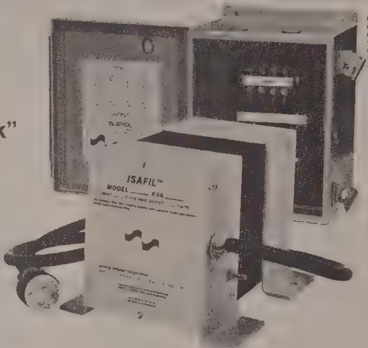
Regulation: Better than 1% no load through full load.

Leakage: Less than 50 microamperes. Voltage isolation to case 5000V RMS.

Operating Temperature: -40°C to 85°C

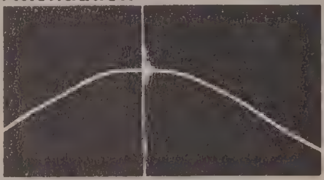
Reliability/Test Criteria: Each Islatrol unit is 300% fully tested at an input energy level of two joules for approximately 1000 spikes, superimposed at the peak of the input sinusoid at main power line distribution impedance.

Standard Available Models:
.5A to 100A, 120V Single Phase
.5A to 100A, 240V Single Phase
7.5A to 400A, 480V Single Phase
15.0 to 1500A, 240V Three Phase
15.0 to 1500A, 480V Three Phase

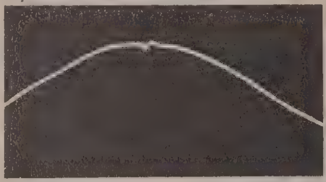


Patent #4095163, #4156838 and #4434396

Normal Mode Transient Attenuation



700V P-P 30 Microseconds Wide Input to Islatrol or Isafil



Output After Islatrol or Isafil

Isafil Common & Normal Mode Noise Attenuation:

Isafil easily attenuates IEEE 587-80 category A and B oscillatory and impulse surges. The unit incorporates a shielded isolation transformer, which is superior in common mode noise attenuation and the active tracking Islatrol filter for maximum normal mode transient attenuation. This significant attenuation occurs to both sinusoid type noise and oscillatory transient disturbances.

Islatrol Suppression Performance:

Destructive or spurious transients, present at any point on the input sine wave of the AC power line, are clamped to within several volts, both above and below the instantaneous value of a filtered input sinusoid. For example, a two joule, 1000V spike (peak-to-peak) is suppressed to 10V (peak-to-peak). The above is accompanied with minimal power line loss.

control concepts
CORPORATION

Dept. EEM, P.O. Box 1380
Binghamton, New York 13902-1380
Phone (607) 724-2484

Isafil™

"The Best in Isolation and Greatest Attenuation of Common and Normal Mode Noise"

Isafil is a combination of the newest in magnetic technology plus active tracking filters designed to provide the best in isolation and greatest attenuation of common and normal mode noise. Isafil works effectively well for sinusoidal or random transient noise.

Isafil provides far superior rejection capability than other products available today. So good, in fact, that it easily attenuates IEEE 587-80 category A and B transients.

In today's electrical environment we encounter many types of power pollution that prevent power operation of sensitive electronic equipment. Transients usually show themselves by causing random errors, soft data, loss of memory or even catastrophic failures. Spikes and transients are probably the greatest cause of degradation of IC's, capacitors, diodes and other electronic components.

Isafil Specifications

General Description: A super magnetic isloator incorporating a shielded isolation transformer offering superior isolation combined with an active tracking filter to effectively eliminate both normal and common modes of power line disturbances.

Terminals: Two-terminal input and two-terminal output, all floating. Fifth terminal, super shield, attaches to earth ground.

Attenuation: Noise voltages between power line and ground to less than one part in 20 million (146 db).* Noise voltages across the power line to less than I part in 500 (54 db).** **Greater than 50 db for IEEE 472-74 and IEEE 587-80.**

Through-Capacitance: Input to output with shield grounded, less than .0005 picofarads (5×10^{-16} Farads).

Leakage: Leakage resistance greater than 1000 Megohms D.C.

Active Filtering: Squelches either spike or oscillatory noise voltages across input terminals within 10 nanoseconds (10×10^{-9} Second).

Super Isolation: High conductivity copper barrier shield between input and output circuits gives greater protection against high energy discharges of power line, such as induced lightning surges.

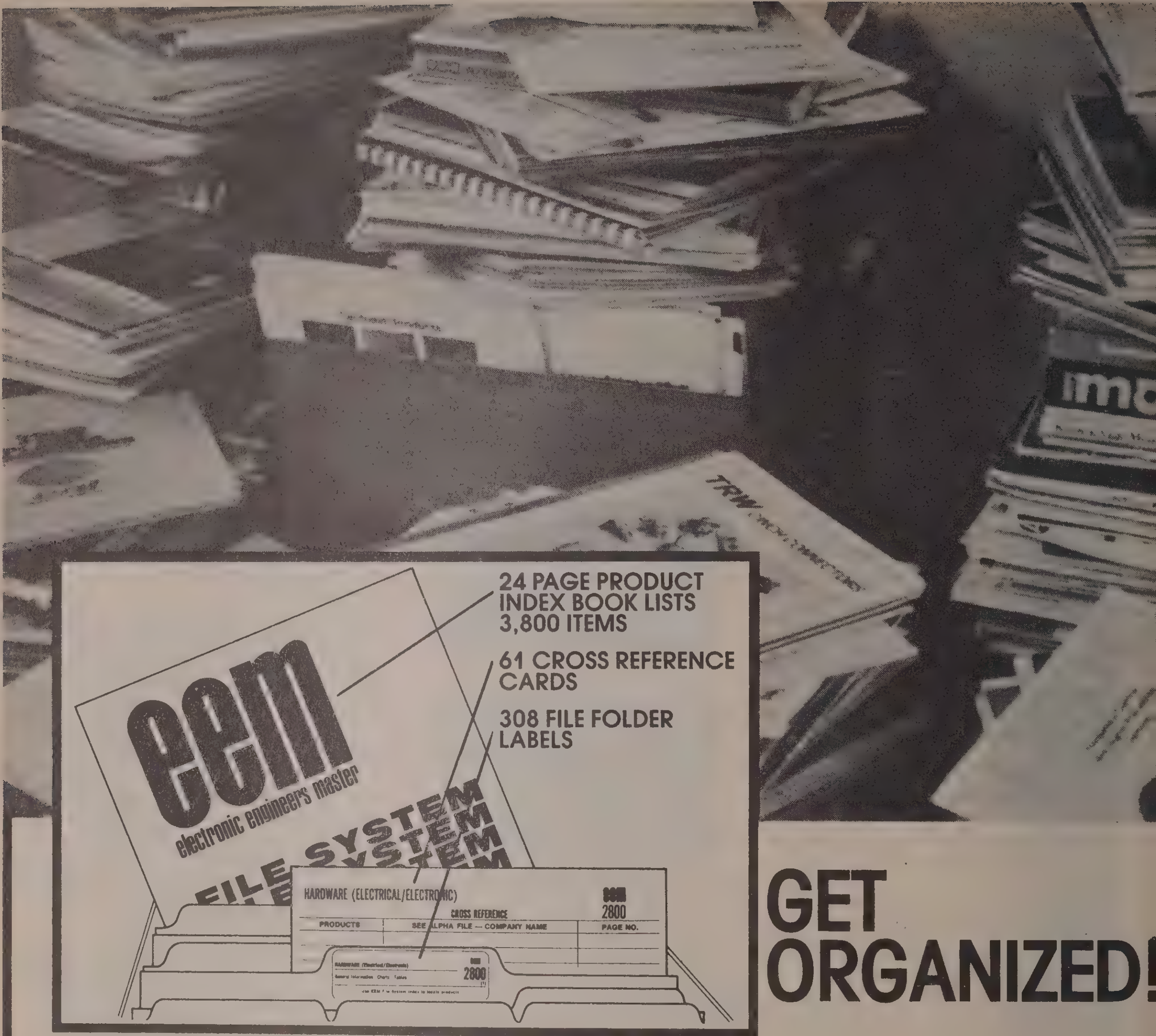
Power Sizes:
125 to 600VA, Single Phase
1 to 15KVA, Single Phase
3 to 45KVA, Three Phase

---

*Common mode transient reduction exceeding 80 db.
**Normal mode (Transverse mode) transient reduction exceeding 80 db

For additional help, information, and specifications, call Control Concepts, Dept. EEM.

Islatrol/Isafil features a five year limited warranty


24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
PRODUCTS
SEE ALPHA FILE — COMPANY NAME
PAGE NO.
2800
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The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

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·Fuseholders·Fuse Clips ·Blown Fuse Indicators

Commercial & Military Approved Panel Mount Fuseholders

- Superior Clip Design for Solid Fuse Contact
- UL Recognized & C.S.A. Certified
- Most Commercial Models are recognized under the Marine Electrical and Fuel System (PEQZ2) as "Ignition Protected Devices"
- Blown Fuse Indicating & Non-Indicating
- High Impact Plastic for Superior Strength
- Dead-Front, Watertight
- Military Versions Meet MIL-F-19207

Commercial Fuseholders

All Recognized by Underwriters Laboratories

Model	Fuse Size	Qty	Indicating (I) or Non-Indicating (N)	Voltage AC/DC	UL Recognized Amps	UL Recognized Voltage
5000⁺	¼x1¼"	1	N	250	0-30	250 max
5100⁺	¼x1¼"	3	N	250	0-30	250 max
5200⁺	¼x1¼"	1	N or I	250	0-30	250 max
*5300⁺	¼x1¼"	2	N or I	250	0-30	250 max
*5400⁺	13/32x1½"	1	N	600	0-30	600 max
*5500⁺	13/32x1½"	3	N	600	0-30	600 max
*5600⁺	13/32x1½"	1	N or I	600	0-30	600 max
*5700⁺	13/32x1½"	2	N or I	600	0-30	600 max
*5800	9/16x2"	1	N or I	600	0-30	250 max
*5900	13/16x3"	1	N or I	600	31-60	250 max

*CSA Certified
⁺Ignition Protected Devices

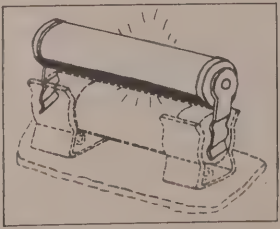
Indicating models can be modified for use in low voltage applications.

Military Fuseholders

MIL-SPEC	Type	Fuse Size	Qty	Indicating (I) or Non-Indicating (N)	Amps	Volts	Moisture Protection
19207/1	FHL10U	¼x1¼"	2	I	0-30	90-250	Unsealed
19207/2	FHL11U	¼x1¼"	1	I	0-30	90-250	Unsealed
19207/3	FHL12U	13/32x1½"	1	I	0-30	90-500	Unsealed
19207/4	FHL13G	9/16x2"	1	I	0-30	90-500	Dripproof
19207/5	FHL14G	13/16x3"	1	I	31-60	90-500	Dripproof
19207/6	FHL15G	11/16x5⅞"	1	I	61-100	90-500	Dripproof
19207/7	FHL16G	1⅝x7⅛"	1	I	101-200	90-500	Dripproof
19207/17	FHN28WB	¼x1¼"	1	N	0-30	250 Max	Watertight Body Sealed
19207/18	FHL29G	¼x1¼"	2	I	0-30	12-90	Dripproof
19207/19	FHL30G	¼x1¼"	1	I	0-30	12-90	Dripproof
19207/21	FHL32W	¼x1¼"	1	I	0-30	90-250	Watertight
19207/22	FHL33W	¼x1¼"	2	I	0-30	90-250	Watertight
19207/23	FHL34W	13/32x1½"	2	I	0-30	90-500	Watertight
19207/24	FHL35W	13/32x1½"	1	I	0-30	90-500	Watertight
19207/25	FHN41WB	13/32x1½"	1	N	0-30	500 Max	Watertight Body Sealed
19207/30	FHN46WB	¼x1¼"	3	N	0-30	250 Max	Watertight Body Sealed
19207/31	FHN47WB	13/32x1½"	3	N	0-30	500 Max	Watertight Body Sealed

Blown Fuse Indicators

When A Fuse Blows, A Light Glows!®

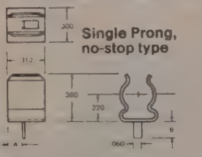


Several Models To Choose From

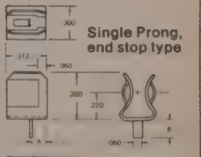
- Bolt Down for Rectifier Fuses
- Snap On for Ferrule Fuses
- Top Mounting for Knife Blade Fuses

PC BOARD FUSE CLIPS

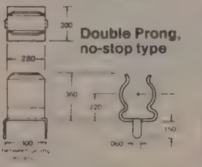
Low profile clips (.360" high) are soldered to printed circuit boards eliminating eyeletting or riveting. Available in Spring brass, beryllium copper or spring bronze with various platings.



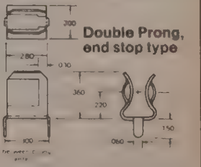
Single Prong, no-stop type



Single Prong, end stop type



Double Prong, no-stop type



Double Prong, end stop type

FIC CORPORATION
P.O. Box 2046
12216 Parklawn Drive
Rockville, MD 20852

TOLL FREE: 800/638-6594
IN MD: 301/881-8124
TWX: 710-828-9809

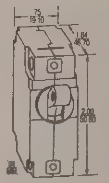
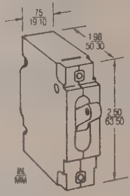
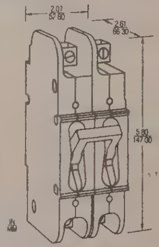
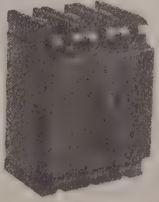
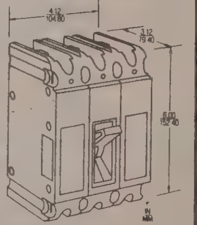
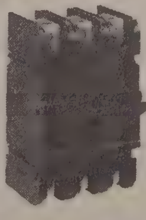
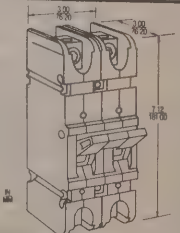
HEINEMANN

CIRCUIT PROTECTORS

Heinemann Electric Company
P.O. Box 6800, Lawrenceville, NJ 08648-0800 USA
(609) 882-4800 • Telex 843431

Heinemann offers the widest range of styles and current ratings in high-quality, reliable circuit protectors–from miniature, environmentally-sealed models with ratings as low as 0.020A to high-capacity industrial breakers rated 700A,160Vd

Heinemann hydraulic-magnetic circuit protectors hold their rated capacity regardless of ambient temperature—no derating, no nuisance tripping. A variety of time-delay characteris-

		APPLICATIONS	NO. OF POLES	CURRENT RATINGS	MAX. VOLTAGE
TYPE J	The Series J is an exceptionally compact, lightweight, and moderately-priced breaker for single or multipole OEM applications. Snap-in mounting, rocker handles, sealed-mount, and push-button models are available. Color-coded caps serve as panel accents and for circuit identification. Bulletin 81JA. 	OEM (power supplies, medical-electronic equipment, control systems, office and EDP equipment), control panels, marine equipment, field instrumentation.	1 to 4	0.020 — 30A	277V, 50/60 Hz 240V, 400 Hz 415V, 50/60 Hz, 3-phase "Y" 65Vdc
Series J/S	Designed to meet VDE 0730 requirements; SEV approved. Series JB/S is J/S with snap-in mounting. Bulletin 81JS.				
SERIES AM	A low-cost, lightweight breaker available in single or multipole configurations, the Series AM features rear-connection studs, a high level of moisture resistance, and a current range up to 100A dc or 60A ac. Qualified under Mil-C-55629 to 50A dc and ac. Bulletins 81AM and 82AM-MIL. 	OEM (data-processing equipment, mobile applications, humid environments)	1 to 4	0.020-60A (ac) 0.020-100A (dc)	250V, 50/60 or 400 Hz 277V, 50/60 Hz, 1-phase 480V, 50/60 Hz, 3-phase "Y" 65Vdc
Series AM/S	Designed to meet VDE 0730 requirements; SEV approved. Bulletin 82AM/S.				
SERIES CF E-FRAME	Priced considerably lower than competitive E-frame breakers, the Series CF is the most compact and versatile circuit breaker available for equipment and branch-circuit protection. Single and multipole models are stocked in a wide range of standard ratings for fast, off-the-shelf delivery. Bulletin 81CD. 	Panelboards, switchboards, branch circuits, EDP equipment, machine tools, environmental systems, single- and three-phase applications.	1 to 6	0.01 — 100A (ac) 0.04 — 100A (dc)	240V, 50/60 or 400 Hz 480V, 1- and 3-phase 125Vdc
SERIES GH EH-FRAME	 This rugged new EH-frame breaker offers all the advantages of a completely magnetic three-pole breaker with 14,000A interrupting capacity for less than most thermal units. Compact, environmentally stable to 100A at 480Vac and 250Vdc Bulletin 81GJ. 	Motor controls, air conditioning, electric heating, computer main frames, transportation, indoor or outdoor installations.	3	10 — 100A (ac) 10 — 100A (dc)	480V, 50/60 Hz 250Vdc
SERIES GJ	 Where space is at a premium and current capacity up to 250A is called for, the Series GJ is the answer. Available in one-, two-, or three-pole models, it is especially suitable for panelboards, service-entrances, and electric vehicles Bulletin 81GJ. 	Commercial, industrial, and residential service-entrance or panelboard applications; lighting, appliance, transformer, electric vehicles, EDP power supplies, heating, air conditioning, and electronic circuit protection.	1 to 3	100 — 250A	240V, 50/60 Hz 125/250Vdc
Series GJ1P	Special 1-pole dc breaker with up to 700A capacity. Optional 25 mV shunt output permits current metering. Bulletin 83GJ1P.		1	100-700A	160Vdc

ics lets you closely match
oad and circuit-protection
equirements.

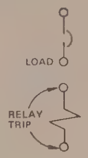
Invented by Heinemann,
hydraulic-magnetic opera-
ion is now the specified
standard for critical-hold/
critical-trip applications.

INTERRUPTING CAPACITY	UL/CSA RECOGNIZED OR LISTED
1000A 5000A with proper backup protection	Recognized, Component Recognition Program
1000A 5000A with proper backup protection	Recognized, Component Recognition Program
Up to 7500A (ac) 5000A (dc)	240V, 50/60 Hz and 125Vdc. Listed Others: Recognized
14,000A (ac) 10,000A (dc)	Listed (ac)
18,000A @ 240V, 50/60 Hz 10,000A @ 125/250Vdc 14,000A @ 160Vdc 25,000A @ 65Vdc	240V, 50/60 Hz and 125/250Vdc. Listed
14,000A @ 160Vdc 25,000A @ 65Vdc	160Vdc Listed

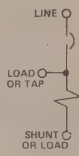
Special-Function Circuits

Heinemann protectors (except KD and TX) can be furnished with a number of special-function internal circuits. They permit a single protector to perform the protection and control functions of several components.

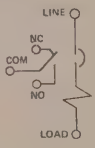
RELAY-TRIP
Provides for remote actuation using separate control circuit. Electrical isolation permits use of a different current or voltage from contact circuit. Both time-delay and non-time-delay constructions are available.



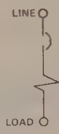
SHUNT/TAP
Use of third terminal permits remote tripping by utilizing line voltage with or without a time-delay response. On breakers rated up to 1A, the trip point may be raised by shunting with an external resistor on the shunt/tap terminal.



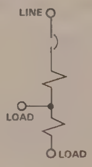
AUXILIARY SWITCH
Used for logic functions, alarms, lights, and other circuits. Miniature snap-action SPDT or DPDT switch is mounted on back of breaker, mechanically connected to switching mechanism. Contact capacity: 10A at 125/250V, 50/60 Hz; 4A resistive at 30Vdc; 2.5A inductive at 30Vdc. Minimum operating voltage: 6Vdc or ac, at 3VA dc or ac.



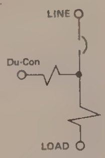
SERIES-TRIP (Standard internal circuit)
Ideal for use as both power switch and overload protector. Usually installed in series with line and load terminals to provide circuit interruption in the protected circuit.



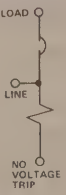
DUAL RATING
Two concentrically-wound sensing coils provide two discrete current ratings in the same breaker. Protects equipment designed to operate at two different current levels or supply voltages within certain limitations.



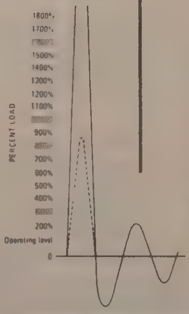
DU-CON™ (DUAL-CONTROL)
Provides sensing of both overcurrent and separate voltage signals in a single-pole breaker through a small, non-continuous-duty voltage sensing coil. DU-CON overload and voltage coils must be specified separately.



NO-VOLTAGE TRIP
Prevents uncontrolled re-start of equipment after power outage. Used in ground-fault interrupters and other safety applications. Not intended for overload protection without one pole connected in series-trip configuration.

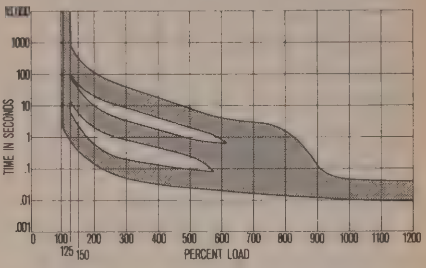


HIGH-INRUSH
Economical protection of high-reactance loads, which draw starting surges often as high as 30 times normal load current in a 50/60 Hz ½ cycle pulse, such as ferro-resonant power supplies and distribution transformers. Eliminates nuisance tripping without derating or special circuitry.



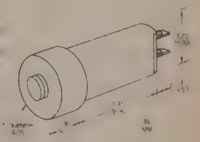
Typical Time-Delay Curves

Below are three time-delay curves for the Series CF at 50/60 Hz. Other special application curves, including high-inrush, dc, and non-time-delay, are also available.



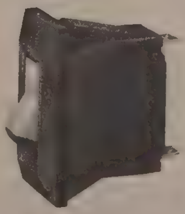
Re-Cirk-IT® Series KD

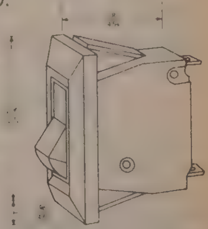
The UL- and CSA-recognized Re-Cirk-It® is a low-cost (non-magnetic) pushbutton circuit protector designed as a direct replacement for conventional ⅝-diameter fuse assemblies in consumer products and appliances. Resettable up to 1000% of its current rating of 2.5A through 15A, 500% at 0.25A to 2A. Both 250V, 50/60 Hz and 32Vdc models. SEV approvals. Bulletin 84KD.



Series TX

The Series TX is an attractive circuit protector designed to snap into a front panel to double as an off/on switch. A selection of colored rocker handles; backlighting available. Smudge-resistant matte black escutcheon. Cannot be held ON during an overload condition. Current rating from 2A to 20A at 125V, 50/60 Hz, or a 32Vdc; 2A to 10A at 250V, 50/60 Hz. UL- and CSA-recognized. Unlighted models designed to meet VDE requirements. Bulletin TX-4020.





8010

LITTELFUSE® CIRCUIT PROTECTION DEVICES

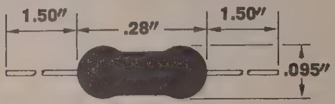
PICO II™ SUBMINIATURE FUSES

- World's smallest fuse for use in micro electronic circuits including computer and aerospace applications.
- Short circuit current of up to 300A.
- Low resistance values.
- Hi-speed action.
- Epoxy coated body for protection against environmental conditions.
- Withstand axial pull of 7 lbs.
- Available with or without color-coding per I.E.C. standards.

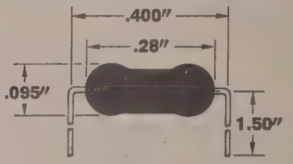
ENVIRONMENTAL CHARACTERISTICS

- Operating ambient temperature range: −55°C to 125°C
- Current carrying capacity:
  - −55°C = 110% of rating
  - 25°C = 100% of rating
  - 125°C = 80% of rating
- Withstand vibrations of 10 to 2000 cps at 20 G's per method 204 test condition D of MIL-STD-202.
- Withstand shock of 100 G's for 6 milliseconds per method 213 test condition I of MIL-STD-202.

255 Series - Axial Leads



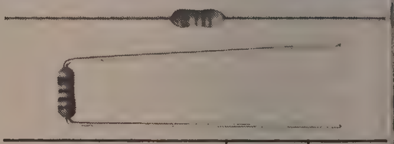
256 Series - Radial Leads



Note: Leads are solder-coated copper, .025″ diameter for ¹⁄₁₆-10A, .032″ diameter for 12-15A.

Blow Time: 100%, 4 hrs. min.; 200%, 5 sec. max. (1/16-10A) 10 sec. max. (12-15A)

U.L. Recognized through 10 amps.



L.F. Number		Amp Rating	Voltage Rating
Axial Leads	Radial Leads		
255.062	256-062	1/16	125
255.100	256.100	1/10	125
255.125	256.125	1/8	125
255.250	256.250	1/4	125
255.375	256.375	3/8	125
255.500	256.500	1/2	125
255.750	256.750	3/4	125
255001	256001	1	125
25501.5	25601.5	1-1/2	125
255002	256002	2	125
25502.5	25602.5	2-1/2	125
255003	256003	3	125
25503.5	25603.5	3-1/2	125
255004	256004	4	125
255005	256005	5	125
255007	256007	7	125
255010	256010	10	125
255012	256012	12	32
255015	256015	15	32

Note: To order axial lead PICO II fuses without colo coding, change **255** to **251**. To order radial lead typ without color-coding, change **256** to **252**.

MICROFUSE SUBMINIATURE FUSES (125V)

Designed for applications where space is a critical factor. Ideal for installation on printed circuit boards. Short-circuit interrupting capacity — 125 volts at 10,000 amperes A.C.

Blow Time: 100%, 4 hour min.; 200%, 5 sec. max.

Size: 1/4″ dia. x 11/32″ (fuse body).

U.L. Recognized.

Plug-in, transparent cap type listed. Use prefix **272** for plug-in, metal cap; prefix **279** for pigtail, transparent cap; prefix **278** for pigtail, metal cap.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
273.002	1/500	273.125	1/8	273.750	3/4
273.005	1/200	273.200	2/10	273.800	8/10
273.010	1/100	273.250	1/4	273001	1
273.015	1/64	273.300	3/10	27301.5	1-1/2
273.031	1/32	273.400	4/10	273002	2
273.050	1/20	273.500	1/2	273003	3
273.062	1/16	273.600	6/10	273004	4
273.100	1/10	273.700	7/10	273005	5

SUBMINIATURE FUSES (250V) 5 x 20mm

For original installations and replacements in foreign-made equipment, such as home and car radios, amplifiers, tape recorders, etc. and in other applications where space is a factor. Ava able in fast-acting, high interrupting; fast-ac ing; and slo-blo types.

FAST-ACTING HIGH-INTERRUPTING (250V) TYPE F

Blow Time: .050-3.15 amp — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-2 seconds; 400%, .003-0.3 seconds; 1000%, .02 seconds max. **4-10 amp** — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-3 seconds; 400%, .003-0.3 seconds; 1000%, .02 seconds max.

Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.
216.050	.050	216.315	.315	216002	2
216.063	.063	216.400	.400	21602.5	2.5
216.080	.080	216.500	.500	2163.15	3.15
216.100	.100	216.630	.630	216004	4
216.125	.125	216.800	.800	216005	5
216.160	.160	216001	1	21606.3	6.3
216.200	.200	2161.25	1.25	216008	8
216.250	.250	21601.6	1.6	216010	10

SEMKO approved through 6.3 amps.

FAST-ACTING (250V) TYPE F

Blow Time: .032-.100 amp — 150%, 60 minutes min.; 210%, 30 minutes max.; 275%, .01-5 seconds; 400%, .003-1 second; 1000%, .02 seconds max. **.125-10 amp** — 150%, 60 minutes min.; 210% 30 minutes max.; 275%, .05-2 seconds; 400%, .01-3 seconds; 1000%, .02 seconds max.

Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.	Cat. No.	Amp. Rtg.
217.032	.032	217.250	.250	217002	2
217.040	.040	217.315	.315	21702.5	2.5
217.050	.050	217.400	.400	2173.15	3.15
217.063	.063	217.500	.500	217004	4
217.080	.080	217.630	.630	217005	5
217.100	.100	217.800	.800	21706.3	6.3
217.125	.125	217001	1	217008	8
217.160	.160	21701.25	1.25	217010	10
217.200	.200	21701.6	1.6		

SEMKO approved through 6.3 amperes. BEAB approved from .050-6.3 amperes.

SLO-BLO® (250V) TYPE T

Blow Time. .032-.100 amp — 150%, 60 minut min.: 210%, 2 minutes max.; 275%, 0.2-10 se onds; 400%, .04-3 seconds; 1000%, .01-3 se onds. **.125-10 amp** — 150%, 60 minutes mi 210%, 2 minutes max.; 275%, 0.6-10 se onds; 400%, .15-3 seconds; 1000%, .02-3 se onds.

Catalog Number	Ampere Rating	Catalog Number	Ampere Rating
218.032	.032	218.630	.630
218.040	.040	218.800	.800
218.050	.050	218001	1
218.063	.063	2181.25	1.25
218.080	.080	21801.6	1.6
218.100	.100	218002	2
218.125	.125	21802.5	2.5
218.160	.160	2183.15	3.15
218.200	.200	218004	4
218.250	.250	218005	5
218.315	.315	21806.3	6.3
218.400	.400	218008	8
218.500	.500	218010	10

SEMKO and BEAB approved through 6.3 amperes.

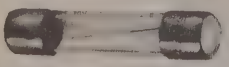
7AG FUSES (32V) ¼″ x ⅞″

Quick to medium acting fuses for low voltage applications: home and car radios, amplifiers, heaters, lighting circuits, cigar lighters.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 10 sec. max.

L.F. No.	Amp Rtg.	No. L.F.	Amp Rtg.	L.F. No.	Amp Rtg.
303001	1	303004	4	303020	20
30301.5	1-1/2	303005	5	303030	30
30302.5	2-1/2	303006	6		
303003	3	303015	15		

SFE AUTO FUSES (32V)



Medium-acting, made to sizes specified by SAE — graduated in length according to current rating.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 10 sec. max.

Size: 1/4″ dia.

Length: See chart

U.L. Listed Under U.L. STD 275.

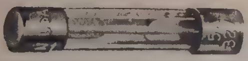
L.F. No.	Amp Rating	Length In.
307004	4	5/8
307006	6	3/4
30707.5	7-1/2	7/8
307009	9	7/8
307014	14	1-1/16
307020	20	1-1/4
307030	30	1-7/16

LITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

For manufacturers' sales offices, see yellow pages

LITTELFUSE® CIRCUIT PROTECTION DEVICES

G FUSES (32V) ¼" x 1¼"



dium-acting fuses for use in cars, radios, plifiers, etc.

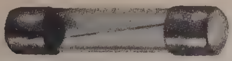
Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 10 sec. max.

U.L. Listed under U.L. STD 275 through 30 amps.

CSA Certified through 30 amps.

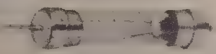
L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
311004	4	**31107.5**	7-1/2	**311015**	15
311005	5	**311008**	8	**311025**	25
311006	6	**311010**	10	**311030**	30
311007	7	**311012**	12	**311035**	35

G FUSES (250V or less) ¼" x 1¼"



ck-acting, normal-blo fuses for general cir- t protection.

G PIGTAIL FUSES



ne as above but with pigtails for direct wiring chassis. Leads are 1-1/2" long, copper wire.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 5 sec. max.

U.L. Listed and Certified by CSA

Note: Internal construction may vary depending on ampere rating.

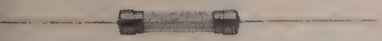
L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
312.010	1/100	**312.300**	3/10	**31202.5**	2-1/2
312.031	1/32	**312.375**	3/8	**312003**	3
312.062	1/16	**312.500**	1/2	**312004**	4
312.100	1/10	**312.600**	6/10	**312005**	5
312.125	1/8	**312.750**	3/4	**312006**	6
312.150	15/100	**312001**	1	**312007**	7*
312.175	.175	**3121.25**	1-1/4	**312008**	8*
312.187	3/16	**31201.5**	1-1/2	**312010**	10*
312.200	2/10	**31201.6**	1-6/10		
312.250	1/4	**312002**	2		

* 125 volt. **Note: To order fuses with pigtail leads,** change **312** series number to **318.**

G SLO BLO® FUSES (250V or less) ¼" x 1¼"

igned to withstand momentary high-current ges but still blow quickly on shorts. Provide tection for equipment with high reactive rent surges or heavy starting currents such solenoids, motors and lamp circuits.

G SLO BLO® PIGTAIL FUSES



ne as above but with pigtails for direct wiring chassis. Leads are 1-1/2" long, copper wire.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max., 200%, 5 sec. min.

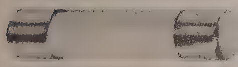
U.L. Listed and certified by CSA through 7 amps. U.L. Recognized from 8-30 amps.

Note: Internal construction may vary depending on ampere rating.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
313.010	1/100	**313.700**	7/10	**313005**	5
313.031	1/32	**313.750**	3/4	**3136.25**	6-1/4
313.040	4/100	**313.800**	8/10	**313007**	7
313.062	1/16	**313001**	1	**313008**	8*
313.100	1/10	**31301.2**	1-2/10	**313010**	10*
313.125	1/8	**3131.25**	1-1/4	**313012**	12*
313.150	15/100	**31301.5**	1-1/2	**313015**	15*
313.175	.175	**31301.6**	1-6/10	**313020**	20*
313.187	3/16	**31301.8**	1-8/10	**313025**	25*
313.200	2/10	**313002**	2	**313030**	30*
313.250	1/4	**3132.25**	2-1/4		
313.300	3/10	**31302.5**	2-1/2		
313.375	3/8	**31302.8**	2-8/10		
313.400	4/10	**313003**	3		
313.500	1/2	**31303.2**	3-2/10		
313.600	6/10	**313004**	4		

* 32 volt. Note: For pigtail leads, change **313** to **315.**

3 CERAMIC SLO BLO® FUSES (250V or less) ¼" x 1¼"



Similar to 313(000) series above, but have higher interrupting capacity.

Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 5 sec. min.

U.L. Listed 1/100 - 10 amps.

***U.L. Recognized** 12-30 amps.

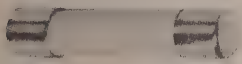
CSA Certified 1/4-10 amps.

*Note: 15 and 20 amp ratings are U.L. Recognized at 250V but meet all requirements for listing at 125V.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
326.010	1/100	**326.600**	6/10	**326004**	4
326.031	1/32	**326.700**	7/10	**326005**	5
326.062	1/16	**326.750**	3/4	**3266.25**	6-1/4
326.100	1/10	**326.800**	8/10	**326007**	7
326.125	1/8	**326001**	1	**326008**	8
326.150	15/100	**32601.2**	1-2/10	**326010**	10
326.175	.175	**3261.25**	1-1/4	**326015**	15
326.187	3/16	**32601.5**	1-1/2	**326020**	20
326.200	2/10	**32601.6**	1-6/10	**326025**	25*
326.250	1/4	**326002**	2	**326030**	30*
326.300	3/10	**32602.5**	2-1/2		
326.375	3/8	**32602.8**	2-8/10		
326.400	4/10	**326003**	3		
326.500	1/2	**32603.2**	3-2/10		

* 125 volt.

3 CERAMIC BODY FUSES (250V or less) ¼" x 1¼"



amic body and arc-quenching filler in higher perages provide high interrupting capacity.

Blow Time: 1/8-30 amps: 110%, 4 hrs. min.; 135%, 1 hr. max.; **1/8-12 amps:** 200%, 15 sec. max.; **15-30 amps:** 200%, 60 sec. max.

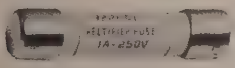
U.L. Listed through 15 amps.

Certified by CSA through 15 amps. U.L. Recognized 20-30 A.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
314.125	1/8	**314003**	3	**314012**	12
314.250	1/4	**314004**	4	**314015**	15
314.375	3/8	**314005**	5	**314020**	20
314.500	1/2	**314006**	6	**314025**	25*
314.750	3/4	**314007**	7	**314030**	30*
314001	1	**314008**	8		
314002	2	**314010**	10		

* 125 volt.

3 CERAMIC BODY RECTIFIER FUSES (250V or less) ¼" x 1¼"



emely fast-acting fuses for protection of con controlled rectifiers and similar solid e devices.

Blow Time: 1-30 **amps:** 100%, 4 hour min.; **1-10 amps:** 250%, .2 sec. max. (pre-arcing); **12-30 amps:** 250%, 1 sec. max. (pre-arcing).

U.L. Recognized

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
322001	1	**322006**	6	**322012**	12*
3221.25	1-1/4	**322007**	7	**322015**	15*
322002	2	**322008**	8	**322020**	20*
322003	3	**322009**	9	**322025**	25*
322004	4	**322010**	10	**322030**	30*
322005	5				

* 65V. All others 250V.

LITTELFUSE® CIRCUIT PROTECTION DEVICES

8AG INSTRUMENT FUSES (250V or less) ¼" x 1"

Very fast-acting fuses for protection of delicate equipment such as microammeters, galvanometers, voltmeters and other instruments.

Blow Time: 100%, 4 hour min.; 200%, 5 sec. max.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
361.002	1/500	361.125	1/8	361.750	3/4
361.005	1/200	361.187	3/16	361001	1
361.010	1/100	361.200	2/10	36101.5	1-1/2
361.015	1/64	361.250	1/4	361002	2
361.031	1/32	361.375	3/8	361003	3*
361.062	1/16	361.400	4/10	361004	4*
361.100	1/10	361.500	1/2	361005	5*

* 125 volt.

8AG NORMAL BLO FUSES ¼" x 1"

Normal blo fuses designed to standard N.E.C. specs. Used when space limitations prevent use of 3AG fuses. **For pigtail leads, change series number to 368.**

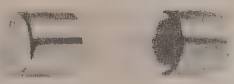
Blow Time: 110%, 4 hour min.; 135%, 1 hour max.; 200%, 10 sec. max.

U.L. Listed through 5 amps. Certified by CSA 1/4-5 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
362.125	1/8	362002	2*	362010	10†
362.250	1/4	36202.5	2-1/2*	362012	12†
362.375	3/8	362003	3*	362015	15†
362.500	1/2	362004	4*	362020	20†
362.750	3/4	362005	5*	362025	25†
362001	1	362006	6*	362030	30†
36201.5	1-1/2*	362008	8†		

* 125V. † 32V.

5AG NORMAL-BLO FUSES (250/125/32V) 13/32" x 1½"



Normal blo fuses for general circuit protection requiring larger fuse with more rugged construction.

Blow Time: 35-60 amps: 100%, 4 hrs. min.; **1-30 amps:** 100%, 4 hrs. min.; 135%, 1 hr. max.; **1-8 amps:** 200%, 5 sec. max.; **10-30 amps:** 200%, 10 sec. max.; **35-60 amps:** 300%, 4 sec. max.

U.L. Recognized 10-60 amps.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
512001*	512005*	511020	511040
512002*	512008†	511025	511050
512003*	511010	511030	511060
512004*	511015	511035	

Note: Numerals indicate amperage ratings.
* 250V. All others 32V except (†) is 125V.

BLF FUSES (250V/125V or less) 13/32" x 1½"

For low-cost, non-time delay use in control circuits.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 15 sec. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed.
Certified by CSA.

* 125V. All others 250V.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLF 1/2	BLF 3	BLF 7	BLF 15
BLF 1	BLF 4	BLF 8	BLF 20*
BLF 1-1/2	BLF 5	BLF 9	BLF 25*
BLF 2	BLF 6	BLF 10	BLF 30*
BLF 2-1/2	BLF 6-1/4	BLF 12	

Note: Numerals indicate amperage ratings.

BLN FUSES (250V or less) 13/32" x 1½"

For low-cost, non-time delay use in control circuits and military applications.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 15 sec. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed. Certified by CSA.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLN 1	BLN 5	BLN 10	BLN 20
BLN 2	BLN 6	BLN 12	BLN 25
BLN 3	BLN 8	BLN 15	BLN 30
BLN 4			

Note: Numerals indicate amperage ratings.

FLA FUSES (250V/125V/32V) 13/32" x 1½"

Time delay fuses. Indicating pin protrudes when fuse blows.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed 1/10 - 15 amperes.
C.S.A. Certified 1/10 - 10 amperes.

* 250V. All others 125V except (†) are 32V.
Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLA 1/10*	FLA 1	FLA 3	FLA 7
FLA 15/100*	FLA 1-1/8	FLA 3-2/10	FLA 8
FLA 2/10*	FLA 1-1/4	FLA 3-1/2	FLA 10
FLA 1/4*	FLA 1-1/2	FLA 4	FLA 12
FLA 3/10*	FLA 1-6/10	FLA 4-1/2	FLA 15
FLA 4/10*	FLA 1-8/10	FLA 5	FLA 20†
FLA 1/2*	FLA 2	FLA 5-6/10	FLA 25†
FLA 6/10*	FLA 2-1/4	FLA 6	FLA 30†
FLA 8/10*	FLA 2-8/10	FLA 6-1/4	

FLM FUSES (250V or less) 13/32" x 1½"

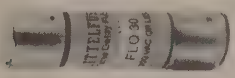
Dual element, time delay fuses for use in circuits with high in-rush currents.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 12 sec. min.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed.
CSA Certified

Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLM 1/10	FLM 1-1/8	FLM 3	FLM 8
FLM 15/100	FLM 1-1/4	FLM 3-2/10	FLM 9
FLM 2/10	FLM 1-4/10	FLM 3-1/2	FLM 10
FLM 1/4	FLM 1-1/2	FLM 4	FLM 12
FLM 3/10	FLM 1-6/10	FLM 4-1/2	FLM 15
FLM 4/10	FLM 1-8/10	FLM 5	FLM 20
FLM 1/2	FLM 2	FLM 5-6/10	FLM 25
FLM 6/10	FLM 2-1/4	FLM 6	FLM 30
FLM 8/10	FLM 2-1/2	FLM 6-1/4	
FLM 1	FLM 2-8/10	FLM 7	

FLQ FUSES (500V or less for U.L.) 13/32" x 1½"
(600V or less for CSA)



Dual element, time delay fuses for circuits with high in-rush currents.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max., 200%, 12 sec. min.
Short Circuit Rating: 10,000 Amperes AC.
U.L. Listed. CSA Certified

Note: Numerals indicate amperage ratings.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
FLQ 1/10	FLQ 8/10	FLQ 3-2/10	FLQ 9
FLQ 1/8	FLQ 1	FLQ 3-1/2	FLQ 10
FLQ 15/100	FLQ 1-1/8	FLQ 4	FLQ 12
FLQ 3/16	FLQ 1-1/4	FLQ 4-1/2	FLQ 14
FLQ 2/10	FLQ 1-1/2	FLQ 5	FLQ 15
FLQ 1/4	FLQ 1-6/10	FLQ 5-6/10	FLQ 20
FLQ 3/10	FLQ 2	FLQ 6	FLQ 25
FLQ 4/10	FLQ 2-1/4	FLQ 6-1/4	FLQ 30
FLQ 1/2	FLQ 2-1/2	FLQ 7	
FLQ 6/10	FLQ 3	FLQ 8	

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1B-1270

LITTELFUSE® CIRCUIT PROTECTION DEVICES

BLS FUSES (600V or less) 13/32" x 1 3/8"

Fast clearing, space-saving fuses for street lighting, control and electronic circuits.

Blow Time: 110%, 4 hrs. min., 135%, 1 hr. max.
Short Circuit Rating: 10,000 amperes AC.
U.L. Listed 1/2-5 amperes.
C.S.A. Certified 1/2 - 5 amperes.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
BLS 2/10	BLS 1	BLS 2	BLS 6
BLS 4/10	BLS 1-1/2	BLS 3	BLS 7
BLS 1/2	BLS 1-6/10	BLS 4	BLS 8
BLS 3/4	BLS 1-8/10	BLS 5	BLS 10
BLS 8/10			

Note: Numerals indicate amperage ratings.

KLK FUSES (600 VAC or less) 13/32" x 1 1/2"

Fast-acting, current limiting fuses for use in control, electronic and other circuits with high fault current capacity.

Blow Time: 110%, 4 hrs. min.; 135%, 1 hr. max.
Short Circuit Rating: 100,000 amperes AC.
U.L. Listed 3/10 - 30 amperes.
C.S.A. Certified 3/10 - 30 amperes.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
KLK 1/10	KLK 1/3	KLK 3	KLK 10
KLK 1/8	KLK 3/4	KLK 4	KLK 15
KLK 2/10	KLK 1	KLK 5	KLK 20
KLK 1/4	KLK 1-1/2	KLK 6	KLK 25
KLK 3/10	KLK 2	KLK 8	KLK 30

Note: Numerals indicate amperage ratings.

KLW RECTIFIER FUSES (130V or less) 13/32" x 1 1/2"

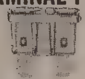
Fast-acting fuses for protection of rectifiers, S.C.R.'s, thyristors, solid state devices.

Blow Time: 100%, 4 hrs. min.; 120% - 180%, 1000 sec. max.; 250%, 1 sec. max.
Interrupting Rating: 200,000 amperes AC.

L.F. No.	L.F. No.	L.F. No.	L.F. No.
KLW 1	KLW 5	KLW 9	KLW 20
KLW 2	KLW 6	KLW 10	KLW 25
KLW 3	KLW 7	KLW 12	KLW 30
KLW 4	KLW 8	KLW 15	

Note: Numerals indicate amperage ratings.

BLADE TYPE TERMINAL FUSES (32V)



Low voltage plug-in fuses. Color-coded for amperage identification.

Blow Time: 110%, 100 hours min.; 135%, 1500 sec. max.; 200%, 5 sec. max. 350%, .080 sec. min. **Size:** .76" wide x .75" high x .207" deep.
U.L. Listed 3 - 30 amps.

L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.	L.F. No.	Amp Rtg.
257003	3	25707.5	7.5	257020	20
257004	4	257010	10	257025	25
257005	5	257015	15	257030	30

ALARM INDICATING FUSES (125 VAC, 60 VDC)

Plug-in fuses for telecommunications and similar applications. Blown fuse indicating flag can also activate alarm circuit. Flag is color-coded by ampere rating.

Blow Time: 100%, 10 minutes min.; 150%, 5 minutes max.
U.L. Recognized at 60 VDC.

L.F. No.	Amp Rtg.	Color Code	L.F. No.	Amp Rtg.	Color Code
401.180	18/100	Yellow	401002	2	Orange
401.250	1/4	Violet	401003	3	Blue
401.500	1/2	Red	401005	5	Green
401.600	65/100	Black	40107.5	7-1/2	Black/ White
401.750	3/4	Brown			
401001	1	Gray	401010	10	Red/ White
4011.33	1-1/3	White			

TYPE T FUSE BLOCKS WITH SCREW TERMINAL CLIPS

Open type blocks available for 3AG and 5AG fuse sizes from one to twelve poles. Bases are of grade X black laminate with 1/32" insulator sheet cemented to underside. Screw terminal clips.

Mounting Hole: 3AG—.142"/.147" dia. with .295"/.302" by 82°CS. **5AG**—.171"/.176" dia. with .342"/.349" x 82°CS.
Clip Material: 356 Series—Nickel Plated Spring Brass. **359** and **556** Series—Silver Plated Beryllium Copper.
Size: Width: 2-3/8" (3AG), 2-3/4" (5AG). See chart for length dimensions. **356 Series is Recognized under the Components Program of Underwriters Laboratories.**

No. of Poles	For 3AG Fuses		For 5AG Fuses	
	Length (In.)	Part No.	Length (In.)	Part No.
1	25/32	356001	27/32	556001
2	1-11/16	356002	1-13/16	556002
3	2-19/32	356003	2-25/32	556003
4	3-1/2	356004	3-3/4	556004
5	4-13/32	356005	4-23/32	556005
6	5-5/16	356006	5-11/16	556006
7	6-7/32	356007	6-21/32	556007
8	7-1/8	356008	7-5/8	556008
9	8-1/32	356009	8-19/32	556009
10	8-15/16	356010	9-9/16	556010
11	9-27/32	356011	10-17/32	556011
12	10-3/4	356012	11-1/2	556012

For 3AG block with silver plated beryllium copper, change series number to **359**.

TYPE S BLOCKS WITH SOLDER LUG CLIPS

Similar to Type T blocks above but with solder terminals which are an integral part of the clip. For 3AG and 8AG fuses.
Mounting Hole: .142"/.147" dia.
Clip Material: 357 and **387** Series — Tin Plated Spring Brass. **357(200)** Series — Silver Plated Beryllium Copper.
Size: Width: 1-5/8" (3AG), 1-3/8" (8AG). See chart for length dimensions.

No. of Poles	Length (inches)	For 3AG Fuses Catalog No.	For 8AG Fuses Catalog No.
1	1/2		387001
2	1-1/8		387002
3	1-3/4	357003	
4	2-3/8	357004	
5	3	357005	
6	3-5/8	357006	
7	4-1/4	357007	
8	4-7/8	357008	
9	5-1/2	357009	
10	6-1/8	357010	
11	6-3/4	357011	
12	7-3/8	357012	

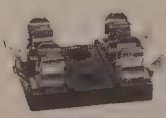
Note: #357001 and #357002 are provided with a molded black phenolic base as shown below.

No. of Poles	Catalog No.	Width
1	357001	1/2"
2	357002	1-1/8" 2 mtg. holes on 5/8" centers

Recognized under the Components Program of Underwriters Laboratories.

TYPE Q BLOCKS WITH Q.C. TERMINALS

Type Q Blocks with Q.C. Terminals. For 3AG fuses. Mounting Hole: .142"/.147" dia.
Clips: Nickel Plated Spring Brass.
Terminals: Plated Brass.
Width: 1-5/8".
Recognized under the Components Program of Underwriters Laboratories.



Note: The quick-connect fuse blocks shown below are supplied with a molded black phenolic base.

No. of Poles	Width	Catalog Number	
		1/4" Terminals	3/16" Terminals
1	1/2"	350329	350327
2	1-1/8" - 2 mtg. holes on 5/8" centers	350330	350328

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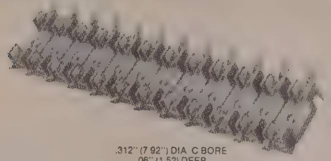
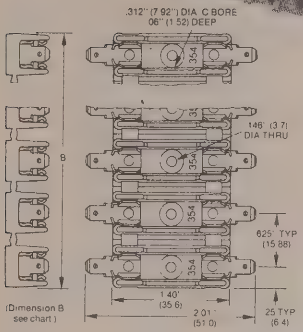
LITTELFUSE® CIRCUIT PROTECTION DEVICES

OMNI-BLOK® FUSE BLOCKS





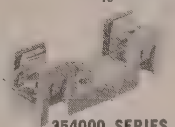
For 3AG fuses. New, low profile fuse blocks with "break-away" pole feature . . . 12 pole units may be broken apart as needed to obtain desired number of poles. One piece-high amperage clip/terminal eliminates resistance build-up and allows operation at higher current levels than previous designs.

Specifications: 354 (000) Series (Solder type terminals); 30 amps, 300V. 354 (600) Series (3/16" Q.C. terminals); 20 amps, 300V. 354 (800) Series (¼" Q.C. terminals); 30 amps, 300V. 354101-GY (PC Board): 15A, 300V.

Materials: Clip/terminal; High tensile spring brass, electro-tin plated. Base; Grey Polyester, glass reinforced. UL-94VO flammability rating.

Special Options: Standard color is gray. Contact factory for special colors. Single pole units can be supplied with anti-rotation boss. Contact factory.

U.L. Recognized up to 30 amperes, 300V



354000 SERIES
SOLDER TERMINALS

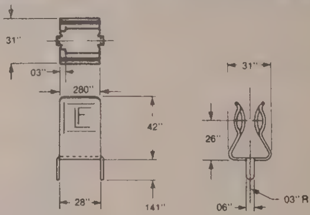
354800 SERIES
¼" Q.C. TERMINALS

354600 SERIES
3/16" Q.C. TEMINALS

354101-GY
P.C. BOARD TERMINALS

Standard Part Numbers			Number of Poles	Dimension "B"	
Solder Type Terminals	3/16" Q.C. Terminals	1/4" Q.C. Terminals		Inches	mm
354001-GY	354601-GY	354801-GY	1	.50"	12.7
354002-GY	354602-GY	354802-GY	2	1.12"	28.4
354003-GY	354603-GY	354803-GY	3	1.75"	44.5
354004-GY	354804-GY	354804-GY	4	2.38"	60.5
354005-GY	354605-GY	354805-GY	5	3.00"	76.2
354006-GY	354606-GY	354806-GY	6	3.63"	92.2
354007-GY	354607-GY	354807-GY	7	4.25"	108
354008-GY	354608-GY	354808-GY	8	4.88"	124
354009-GY	354609-GY	354809-GY	9	5.50"	139.7
354010-GY	354610-GY	354810-GY	10	6.13"	155.7
354011-GY	354611-GY	354811-GY	11	6.75"	171.5
354012-GY	354612-GY	354812-GY	12	7.38"	187.5

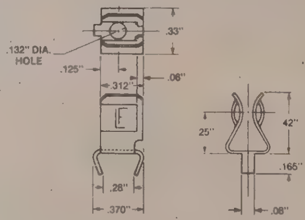
P.C. BOARD FUSE CLIPS
FOR 1/4" DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
102071	Spring Brass	Tin Plated	Ear
102074	Spring Brass	Tin Plated	Earless
122083	Beryllium Copper	Silver Plated	Ear
122088	Beryllium Copper	Tin Plated	Ear
122087	Beryllium Copper	Silver Plated	Earless

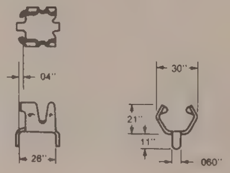
Note: Spring brass clips are suitable for current levels up to 15 amperes; beryllium copper clips up to 30 amps.

P.C. BOARD FUSE CLIPS
BOWED TAB TYPE FOR 1/4" DIAMETER FUSES



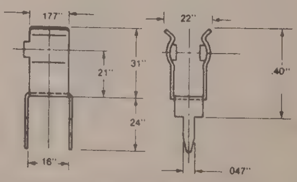
Cat. No.	Clip Material	Finish	Style
102078	Spring Brass	Tin Plated	Earless
102079	Spring Brass	Tin Plated	Ear

P.C. BOARD FUSE CLIPS
LOW PROFILE TYPE FOR 1/4" DIAMETER FUSES



Cat. No.	Clip Material	Finish	Style
122090	Beryllium Copper	Silver Plated	Low Profile
102080	Spring Brass	Tin Plated	Low Profile

P.C. BOARD FUSE CLIPS
FOR 5mm DIAMETER FUSES

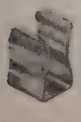


Cat. No.	Clip Material	Finish	Style
100054	Spring Brass	Silver Plated	Ear
100056	Spring Brass	Tin Plated	Ear

RIVET MOUNT FUSE CLIPS

Be Cu*	Spring Brass†	Style	Fuse Div.
121001	101001	Ear	1/4"
125001	105001		13/32"
127001	107001		9/16"
129001	109001		13/16"
121002	101002	Earless	1/4"
125002	105002		13/32"
127002	107002		9/16"
129002	109002		13/16"
121004	101003‡	Lug-45°	1/4"
122081	102064‡	Lug-Straight	1/4"

* Silver Plated. † Nickel Plated. ‡ Tin Plated.



EAR TYPE

EARLESS TYPE

LUG TYPE

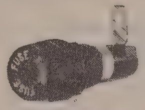
LITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

LITTELFUSE CIRCUIT PROTECTION DEVICES

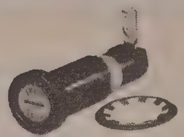
HOCK-SAFE FUSEHOLDERS FOR 3AG OR 5 x 20mm FUSES

RONT PANEL, LOW PROFILE

FRONT PANEL, HIGH PROFILE


FRONT PANEL

REAR PANEL


LOW PROFILE, FAST MOUNT

Designed to meet IEC (International Electrotechnical Commission) specifications 65 and 257.

Eliminate possibility of electrical shock.

Bodies accept ¼″ x 1¼″ or 5 x 20mm fuses with use of appropriate knob.

U.L. Recognized. Certified by CSA (20A, 300V). SEMKO approved (6.3A, 250 V). VDE approved (10A, 250V).

PECIFICATIONS

OLDED PARTS

ody material: black glass-filled thermoplastic
nob material: grey or black glass-filled thermoplastic
ex nut material: glass filled thermoplastic

OW PROFILE BODY
ith screwdriver slot knob)

L.F. No.		Bottom Terminal	
1/4″ x 1-1/4″ Fuses	5mm x 20mm Fuses	Right Angle	Straight
345601	345621	X	
345611	345631		X

ody only: #345601-010 (Rt. Angle)
#345611-010 (Straight)
nob only: #345601-020 (¼″ x 1¼″)
#345621-020 (5 x 20mm)

IGH PROFILE BODY
ith screwdriver slot knob)

L.F. No.		Bottom Terminal	
/4″ x 1-1/4″ Fuses	5mm x 20mm Fuses	Right Angle	Straight
345602	345622	X	
345612	345632		X

ody only: #345602-010 (Rt. Angle)
#345612-010 (Straight)
ob only: #345601-020 (¼″ x 1¼″)
#345621-020 (5 x 20mm)

KNOB
Finger grip or screwdriver slot types
Spring loaded, bayonet style
Fuse extractor
Nickel plated copper alloy insert

TERMINALS
Electro tin plated brass
Accept solder or 3/16″ female connector

MOUNTING
Withstands 15 pound/inch mounting torque
Maximum panel thickness: 5/16″

ELECTRICAL CHARACTERISTICS
300 volt rating 20 amperes max.
Insulation resistance: 10,000 megohm minimum at 500 VDC

FINGER GRIP BODY
(with finger grip knob)

L.F. No.		Bottom Terminal	
1/4″ x 1-1/4″ Fuses	5mm x 20mm Fuses	Right Angle	Straight
345603	345623	X	
345613	345633		X

Body only: #345603-010 (Rt. Angle)
#345613-010 (Straight)
Knob only: #345603-020 (¼″ x 1¼″)
#345623-020 (5 x 20mm)

REAR PANEL-FINGER GRIP

L.F. No.		Bottom Terminal	
1/4″ x 1-1/4″ Fuses	5mm x 20mm Fuses	Right Angle	Straight
345903	345923	X	
345913	345933		X

Body and Nuts (2) only: #345903-010 (Rt. Angle)
#345913-010 (Straight)
Knob only: #345603-020 (¼″ x 1¼″)
#345623-020 (5 x 20mm)

Contact Resistance: Less than .005 ohms average at currents up to 1 ampere.
Dielectric strength: 4000 volts minimum

ENVIRONMENTAL
Ambient temperature: −40°C to +85°C
Vibration: 10-500 Hz, .03″ constant amplitude or 10 G's constant acceleration

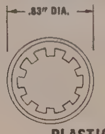
Patents: Pending

LOW PROFILE-FAST MOUNT

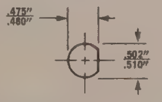
L.F. No.		Bottom Terminal	
1/4″ x 1-1/4″ Fuses	5mm x 20mm Fuses	Right Angle	Straight
345701	345721	X	
345711	345731		X

Body and Retaining Ring only: #345701-010 (Rt. Angle)
#345711-010 (Straight)
Knob only: #345601-020 (¼″ x 1¼″)
#345621-020 (5 x 20mm)

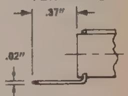
"PUSH-ON" TYPE RETAINING RING



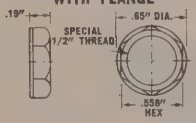
SUGGESTED MOUNTING HOLE



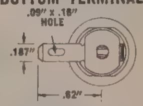
STRAIGHT BOTTOM TERMINAL



PLASTIC HEX NUT WITH FLANGE

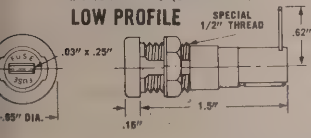


RIGHT ANGLE BOTTOM TERMINAL

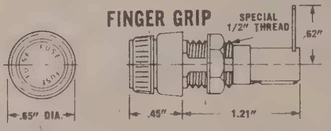


NOTE: Knobs are color-coded. On screwdriver slot type, knobs are grey for 1/4″ x 1-1/4″ fuses, black for 5 x 20mm fuses. On finger grip type, the lettering on knobs for 1/4″ x 1-1/4″ fuses are filled with grey paint.

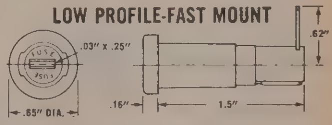
LOW PROFILE



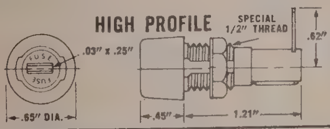
FINGER GRIP



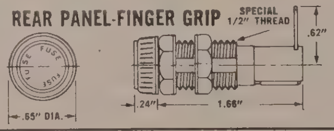
LOW PROFILE-FAST MOUNT



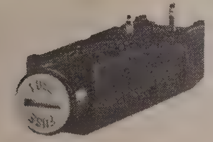
HIGH PROFILE



REAR PANEL-FINGER GRIP



.C. BOARD FUSEHOLDERS FOR 3AG OR 5x20MM FUSES



milar to shock-safe fuseholders shown above ut designed for p.c. board mounting. Shockfe design per IEC Standards 257 and 65. Two fferent knob styles available for use with ″ x 1¼″ or 5 x 20mm fuses.

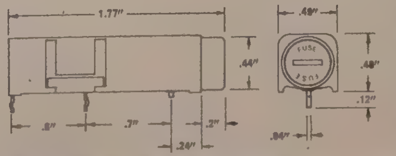
PECIFICATIONS:
lectrical: Rating See APPROVALS.
nsulation Resistance: 10,000 megohm minimum at 500 VDC.
ontact Resistance: Less than .005 ohms average at a current of one ampere.
ielectric Strength: 4000 volts minimum.

Mounting: Intended for soldering to printed circuit boards.
Molded Parts: Body Material: Black glass-filled thermoplastic.
Knob Material: Grey or black glass-filled thermoplastic.
Knob: Screwdriver slot, fuse extractor type with nickel-plated copper alloy insert. Spring-loaded, bayonet style.
Terminals: Brass. Tin-plated.
Ambient Temperature: −40°C to +85°C.

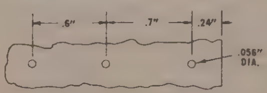
APPROVALS: Recognized under the Components Program of Underwriters Laboratories (16A, 250V)
Certified by CSA (15A, 250V).
SEMKO and VDE approvals pending.

L.F. No.	
1/4″ x 1-1/4 FUSES 345101	5mm x 20mm FUSES 345121

Body only: #345101-010
Knob only: #345101-020 (¼″ x 1¼″)
#345121-020 (5mm x 20mm)



RECOMMENDED HOLE PATTERN



NOTE: Knobs are color-coded; grey for 1/4″ x 1-1/4″ fuses, black for 5 x 20mm fuses.

ITTELFUSE, Inc. • Dept. EM, 800 E. Northwest Highway • Des Plaines, IL 60016 • (312) 824-1188

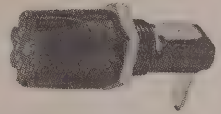
LITTELFUSE® CIRCUIT PROTECTION DEVICES

3AG FUSEHOLDERS WITH SOLDER TYPE, 3/16" OR 1/4" QUICK-CONNECT TERMINALS

Extend only 1" behind panel. **UL Recognized and Certified by CSA.**

KNURLED KNOB

FLUTED KNOB



SPECIFICATIONS

Electrical: Rated at 20 amperes for any voltage up to 250V. Dielectric withstanding voltage exceeds 2400 volts.

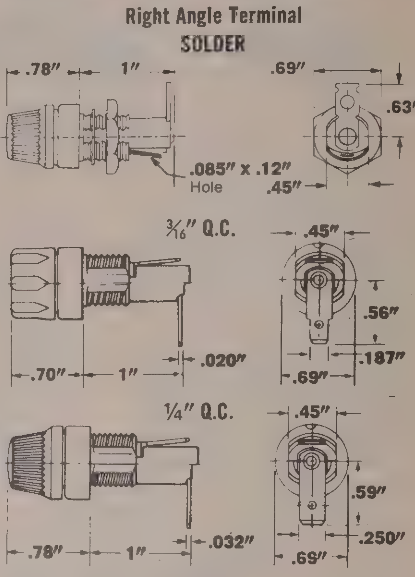
Mounting: Withstands 15 pound/inch (1.69Nm) mounting torque. Maximum panel thickness .18" (4.8)

Molded Parts: Black thermoset

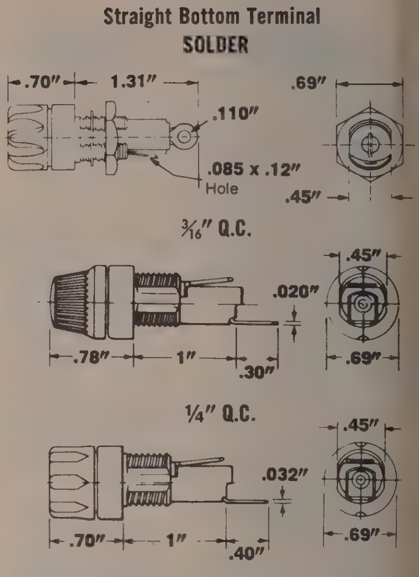
Knob: Bayonet style with white lettering

Brass Terminals: Tin plated except 1/4" quick connect terminals are nickel plated.

Hardware: Standard fuseholders supplied with a neoprene washer and a hex nut unassembled. Lockwasher (L) and drip-proof seal (P) variations available by adding appropriate suffix letters (L, P or PL) to catalog number.



Right Angle Terminal
SOLDER
.78"
1"
.69"
.63"
.085" x .12"
Hole
.45"
3/16" Q.C.
.45"
.56"
.187"
.70"
1"
.020"
.69"
1/4" Q.C.
.45"
.59"
.250"
.78"
1"
.032"
.69"



Straight Bottom Terminal
SOLDER
.70"
1.31"
.69"
.110"
.085 x .12"
Hole
.45"
3/16" Q.C.
.45"
.020"
.78"
1"
.30"
.69"
1/4" Q.C.
.45"
.032"
.70"
1"
.40"
.69"

RIGHT ANGLE TERMINAL

Fluted Knob	Knurled Knob	Type of Terminal
342004	342022	Solder
342028	342048	3/16" Q.C.
342828	342848	1/4" Q.C.

STRAIGHT BOTTOM TERMINAL

Fluted Knob	Knurled Knob	Type of Terminal
342014	342012	Solder
342038	342058	3/16" Q.C.
342838	342858	1/4" Q.C.

LOW PROFILE FUSEHOLDERS
348 (000) SERIES

Snap into panel. Eliminate need for mounting hardware. Square cap design and choice of cap and bezel colors. 3/16" or 1/4" Q.C. terminals. **U.L. Recognized and Certified by CSA.**

SPECIFICATIONS

Molded Parts: Body-Phenolic Resin. Cap-High temperature thermoplastic.

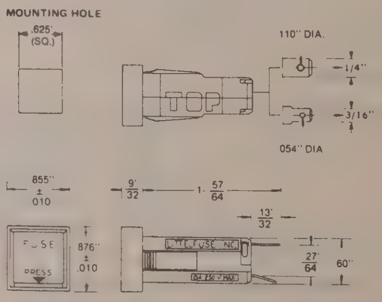
Terminals: One piece-brass-Electro-tin plated.

Electrical Characteristics: Rated at 15 amps for any voltage to 250. Dielectric withstanding voltage between terminals and terminals to ground at room temperature and 90% R.H. exceeds 1,500 volts.

Vibration: Withstands 10-55 Hz at .06" double amplitude.

Mechanical Shock: Withstands 50G for 11 milliseconds duration.

Mounting: .625" sq. hole in 1/32" through 1/8" thick chassis panel.



MOUNTING HOLE
.625"
(SQ.)
110" DIA.
TOP
1/4"
3/16"
054" DIA
855"
±
010
9/32
1 57/64
13/32
FUSE
PRESS
876"
±
.010
LITTELFUSE INC
27/64
60"

HOW TO ORDER
LOW PROFILE FUSEHOLDERS

The six digit catalog number is a coded desc tion of the finished unit. To specify type quired, select appropriate code numbers fr chart below. To order a cap assembly only 3AG fuses, use **348** series numbers and inser "0" in the terminal style and bezel color lo tions. To order a body assembly only, use 3 series number and insert a "0" in the cap co location.

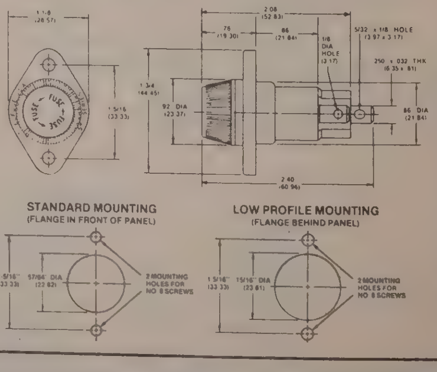
SIX DIGIT CATALOG NUMBERS CONSIST

Series No.	Terminal Style	Bezel Color	Cap C
348 For 3AG Fuses		1 Red	1
		2 Green	2
		3 Yellow	3
		4 Blue	4
	6 3/16" Wide Terminals	5 White	5
	8 1/4" Wide Terminals	7 Black	7
		9 Grey	9

For example: 348615 is a holder with 3/16" termina red bezel and white cap.

PANEL FUSEHOLDER FOR
13/32" DIAMETER FUSES #571007

Versatile fuseholder for 13/32" diameter fuses with lengths from 1-3/8" to 1-1/2". Minimum rear panel projection, 3/4" spacing between mounting flange and terminals to accommodate even the thickest panels. Recessed side terminal for additional shock-safe characteristics. For watertight version, order #571007P. **U.L. Recognized and Certified by CSA.**



1 1/8
(28 57)
FUSE
1 5/16
(33 33)
2 08
(52 83)
76
(19 30)
86
(21 84)
1/8
DIA
HOLE
(3 17)
5/32 x 1/8 HOLE
(3 97 x 3 17)
250 x 032 THK
(6 35 x 81)
1 3/4
(44 45)
92 DIA
(23 37)
86 DIA
(21 84)
2 40
(60 96)
STANDARD MOUNTING
(FLANGE IN FRONT OF PANEL)
1-5/16"
(33 33)
57/64" DIA
(22 62)
2 MOUNTING
HOLES FOR
NO 8 SCREWS
LOW PROFILE MOUNTING
(FLANGE BEHIND PANEL)
1 5/16"
(33 33)
15/16" DIA
(23 81)
2 MOUNTING
HOLES FOR
NO 8 SCREWS

SPECIFICATIONS

Molded Parts: Black Phenolic.

Knob: Spring-loaded, extractor type, knurled for finger grip. Threaded nickel-plated, brass insert. Watertight O-ring seal provided with model 571007P. White markings.

Terminals: Side terminal, electro tin-plated brass. End terminal electro tin-plated brass with elongated 1/8" hole (5/32" long). Terminals will accept solder or 1/4" female connector.

Electrical Characteristics: Rated at 30 amps for any voltage up to 600. Dielectric withstanding voltage greater than 2400V. Contact resistance less than 0.004 ohms when checked in accordance with MIL-STD-202, method 307.

NEED MORE INFORMATION?

USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

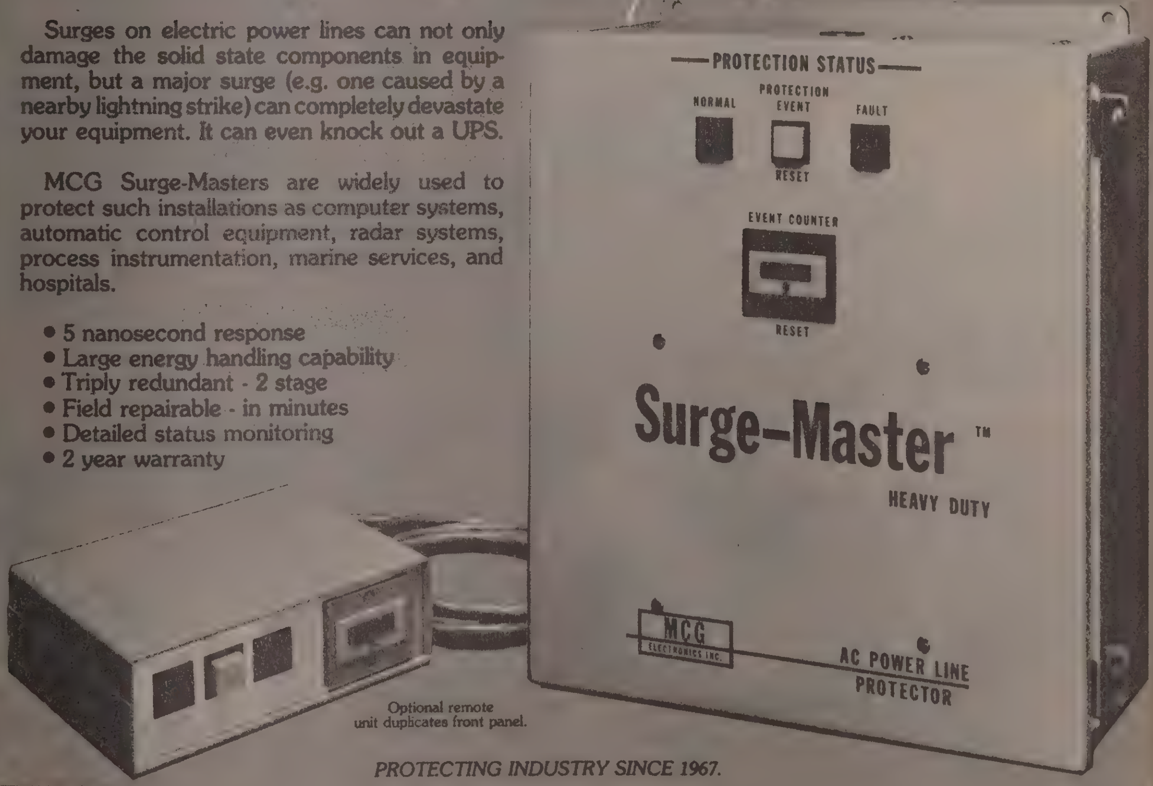
EEM-1984

PROTECT MAJOR INSTALLATIONS FROM LIGHTNING, TRANSIENTS AND SURGES WITH "SURGE-MASTER" POWER LINE PROTECTORS BY... MCG

Surges on electric power lines can not only damage the solid state components in equipment, but a major surge (e.g. one caused by a nearby lightning strike) can completely devastate your equipment. It can even knock out a UPS.

MCG Surge-Masters are widely used to protect such installations as computer systems, automatic control equipment, radar systems, process instrumentation, marine services, and hospitals.

- 5 nanosecond response
- Large energy handling capability
- Triply redundant - 2 stage
- Field repairable - in minutes
- Detailed status monitoring
- 2 year warranty

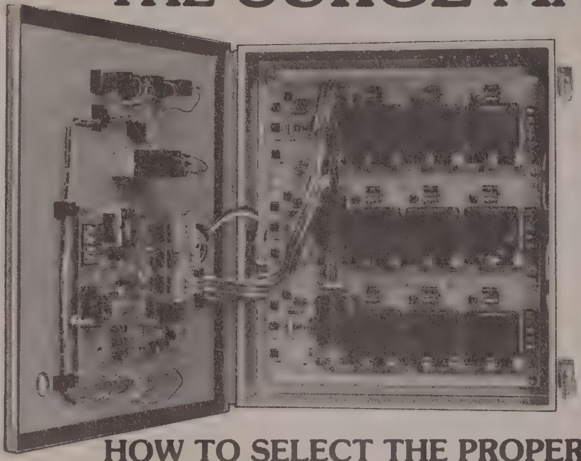

PROTECTION STATUS
NORMAL
PROTECTION EVENT
FAULT
RESET
EVENT COUNTER
RESET
Surge–Master™
HEAVY DUTY
MCG ELECTRONICS INC.
AC POWER LINE PROTECTOR

Optional remote unit duplicates front panel.

PROTECTING INDUSTRY SINCE 1967.

MCG ELECTRONICS, INC.
12 BURT DRIVE, DEER PARK, NEW YORK 11729 (516) 586-5125 • TELEX 645518

THE SURGE-MASTER



Internal view (Models 1800-3100) shows redundant protection per phase.

Black modules simply unplug for replacement.

HOW TO SELECT THE PROPER MODEL

Example:
A computer facility manager in Baton Rouge, LA., needed to protect his equipment from damage. Utility provides 120/208 VAC, 3 phase, wye (4-wire and ground) to a 200 Amp service panel.

Approach:

1. On Chart 1, the service panel current load of 200 Amp would be protected by a 300 Amp unit. However, since lightning activity is common in LA., MCG would recommend using 1 model higher. Therefore, choose Model 3100, rather than Model 2800.
2. On Chart 2, in Column 1, find the 120/208 VAC listing. Column 2 description permits a double check, while Column 3 indicates the suffix of -120Y for specifying purposes. Columns 4 and 5 give information on the clamping capacity provided.
3. To order, combine the above to read Model 3100-120Y

CHART 1 Specifications

Model	1800	2800	3100	4100	12,000
Service Panel Current	to 100A	to 300A	to 1000A	to 2000A	to 5000A
Power diss. /per leg ‡	6-1mw	1.2-2mw	1.8-3mw	3.6-6mw	7.2-12mw
Energy handling/per leg ‡	600-1000j	1200-2000j	1800-3000j	2600-6000j	7200-12,000j
Standby power diss. (max.)	5w	7w	9w	20w	35w
Response time (nanosec.)	5	5	5	5	5
Voltage	see chart 2				
Frequency/Phase	50/60/400Hz/1 phase, 3 phase, wye, delta				
Temperature Operating	− 40 degrees C to + 85 degrees C				

‡ Depends on the nominal AC voltage level

CHART 2 Voltage

Line AC (rms) Volts	Description	Model Suffix	(Line-Ground) Protection Levels Min.	Max.
120	120V, 1 phase, 2 wire + gnd	− 120S	200V	350V
120/240	120/240V, 1 phase, 3 wire + gnd	− 120T	200	350
120/208	120/208V, 3 phase, 4 wire + gnd	− 120Y	200	350
240	240V, 3 phase, 3 wire + gnd	− 240D	400	600*
240	240V, 3 phase, 4 wire (note 2)	− 240DCT	400	600*
277/480	277/480V, 3 phase, 4 wire + gnd	− 277Y	450	650
480	480V, 3 phase, 3 wire + gnd	− 480D	800	1000*

*Measured Line-Line

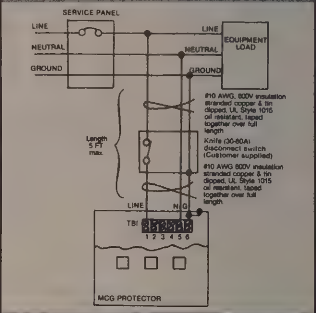
(1) Ground wire is connected to case only.
(2) Center tapped phase to ground.

CHART 3 Unit Dimensions

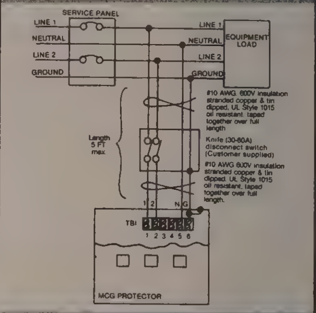
Enclosures are NEMA 12		
	Models 1800-3100	14″ × 16″ × 6″
	4100	30″ × 24″ × 8″
	12000	60″ × 36″ × 8″

WIRING DIAGRAMS

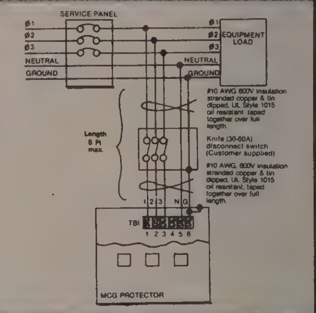
1 PHASE - 2 WIRE & GND


SERVICE PANEL
LINE
NEUTRAL
GROUND
LINE
NEUTRAL
GROUND
EQUIPMENT LOAD
#10 AWG, 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant, taped together over full length
Length 5 FT max.
Knife (30-60A) disconnect switch (Customer supplied)
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant, taped together over full length.
LINE
N G
TBI
1 2 3 4 5 6
MCG PROTECTOR

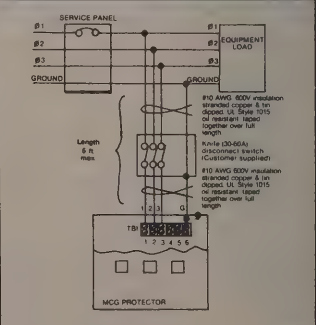
1 PHASE - 3 WIRE & GND


SERVICE PANEL
LINE 1
NEUTRAL
LINE 2
GROUND
LINE 1
NEUTRAL
LINE 2
GROUND
EQUIPMENT LOAD
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant, taped together over full length
Length 5 Ft max.
Knife (30-60A) disconnect switch (Customer supplied)
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant, taped together over full length.
1 2 N G
TBI
1 2 3 4 5 6
MCG PROTECTOR

3 PHASE - 4 WIRE & GND (WYE)


SERVICE PANEL
Ø1
Ø2
Ø3
NEUTRAL
GROUND
Ø1
Ø2
Ø3
NEUTRAL
GROUND
EQUIPMENT LOAD
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant taped together over full length
Length 5 Ft max.
Knife (30-60A) disconnect switch (Customer supplied)
#10 AWG, 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant, taped together over full length.
1 2 3 N G
TBI
1 2 3 4 5 6
MCG PROTECTOR

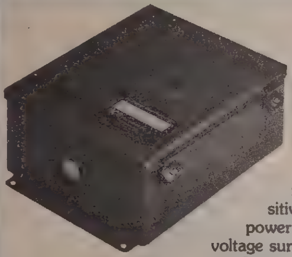
3 PHASE - DELTA


SERVICE PANEL
Ø1
Ø2
Ø3
GROUND
Ø1
Ø2
Ø3
GROUND
EQUIPMENT LOAD
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant taped together over full length
Length 6 ft max.
Knife (30-60A) disconnect switch (Customer supplied)
#10 AWG 600V insulation stranded copper & tin dipped, UL Style 1015 oil resistant taped together over full length
1 2 3 G
TBI
1 2 3 4 5 6
MCG PROTECTOR

MCG ELECTRONICS, INC. • 12 BURT DRIVE, DEER PARK, NEW YORK 11729 (516) 586-5125 • TELEX 645518

PROTECT SENSITIVE ELECTRONIC EQUIPMENT WITH POWER LINE PROTECTORS BY MCG

COMPUTER GRADE PROTECTION

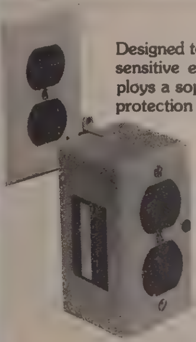


5000 SERIES

The 5000 Series offers moderate cost, high performance protection for computers, mini-computers, and other sensitive electronic equipment against power line noise and destructive high voltage surges, spikes and transients. The 5000 Series combines filtering (50db/500kz) and substantial suppression of high energy transients in a variety of protectors that respond in less than 5 nanoseconds, and have 320 joule energy handling capability. These units are suitable for operation on 120 VAC to 480 VAC, to 40 Amps for delta and wye configurations.

500 SERIES

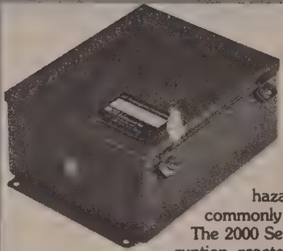
The 500 Series has been designed to protect a wide variety of modern mini-computers that operate on the 120 VAC or 240 VAC, single phase AC lines requiring up to 30 Amps. The compact and rugged constructed protector provides vigorous transient suppression and eliminates the need for dedicated lines. In use, it is simply plugged into the AC power outlet and the equipment into it. Status monitoring, replaceable fusing, and a range of connector options make the 500 Series a versatile protector.



P210

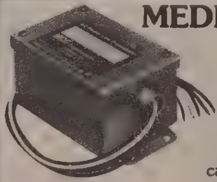
Designed to keep "transients and noise" from damaging sensitive electronic equipment. The Model P210 employs a sophisticated combination of brute force surge protection and impulse filtering. The P210 reacts in 5 nanoseconds, has an energy absorption capability of 160 joules, and resets automatically when the transient has passed. In use, it is simply plugged into any AC outlet, and the equipment plugged into it. Rated at 117 VAC and 10 Amps, the P210 converts your AC wall outlet into a "dedicated line". The P210 is used where the requirement is critical and only first rate protection will suffice.

INDUSTRIAL GRADE PROTECTION FOR O.E.M.'S



2000 SERIES

The 2000 Series are Heavy Duty Shunt Protectors that install at main service panels (to 3000 Amps) and provide superior protection from lightning and hazardous transient overvoltages that commonly occur in industrial environments. The 2000 Series protects without power interruption, reacts in 5 nanoseconds, has an energy absorption capability up to 6000 joules, and resets automatically when the transient has passed. Long life and maintenance free operation make these units the perfect protectors for remote, unattended sites, for facilities, mobile vans, or stations with no back-up circuits available. Protects 120 VAC, to 480 VAC, 1 ϕ, 3 ϕ, delta and wye service panels.



MEDIUM DUTY BRANCH PROTECTORS

These units are connected in shunt to the load side of the local branch panel and provide substantial protection for all equipment on the line. Load-carrying capacity for models intended for 120 VAC service is 240j, and for all models intended for use with higher voltages, 480j. All models can be used on lines having currents up to 50A. When any form of transient appears, raising the voltage on the line over the clamping threshold, the unit reacts within 50 nanoseconds to clamp it to a safe level. The clamping mode lasts only until the transient disappears, after which the unit recovers automatically. The units are of extraordinary rugged construction, with moisture-proof housings. They are thus ideal for remote and unattended locations where long life and maintenance-free operation are essential. Protects 120 VAC to 480 VAC, 1 ϕ, 3 ϕ, delta, wye service panels.

400 SERIES

The 400 Series install "within" a piece of equipment and is designed to keep "transients and noise" from damaging sensitive electronic equipment. The 400 Series employs a sophisticated combination of brute force surge protection and impluse filtering. Reacting in less than 5 nanoseconds, the 400 Series has an energy absorption capability exceding 200 joules and resets automatically when the transient has passed. The 400 Series will protect 120, 240 and 480 VAC, single phase lines handling currents to 15A. The 400 Series protects against lightning, EMP and switching transients.

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PROTECTION FOR SIGNAL/DATA/TELEPHONE LINES

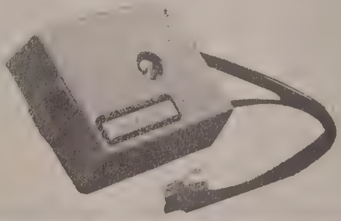
RS-232, RS-422, RS-423, 20 MA LOOPS, MODEMS

DLP-3: RS232 PROTECTION

Designed to provide complete protection for computers and terminals. RS232 connectors make installation easy, taking minutes for non-technical personnel. Pins 2, 3, 7, and 20 are protected. Other pins can be protected, consult factory.

DLP-4: MODEM PROTECTION

Dial-up protection unit puts an end to downtime and costly equipment failure for dial-up modems and CPU's. Compatible with RJ11 and RJ45 telephone jacks.



DLP-5: VIDEO CABLE PROTECTOR

Prevents coaxial cable from transmitting damaging transients to sensitive loads. Using isolated BNC connectors, the DLP-5 shunts damaging transients from the cable shield and center conductor to earth ground. Ideal for communications protection where wide baud width(to 20 mhz) is desired. The DLP-5 protects one circuit.

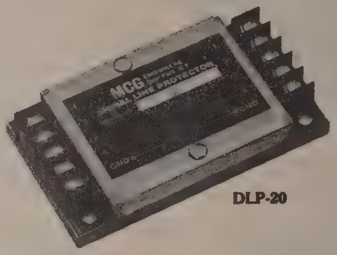
DLP-6:
Same as DLP-5 but protects 5 circuits.

DLP-5

Connector Options: BNC shown, twin ax, F connectors, N connectors, etc. Consult Factory.

DLP-10: MULTIPLE PROTECTION

Gives protection for 2 wires or 1 twisted pair circuit. Protection available for RS232, 20ma loops, etc.



DLP-20

DLP-20: Protects 4 wires or 2 pairs.

DLP-30: Protects 8 wires or 4 pairs.

DLP-33: Open PC board, protects 24 wires or 12 pairs. Not sold with case or cover.

DLP-40:RACK MOUNTED PROTECTION

Independent protection for up to 20 terminals or printers per system. Plug-in protection cards for all applications: RS-232, -422, -423, 20ma loops, etc. Protects up to 100 individual lines per system. Ideal for data logging & monitoring complex instrumentation. Protects computer main frames. Interface options include terminal strips, RS-232C connectors.

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EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

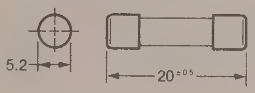
INTERNATIONAL

interpower™ International 5 × 20 mm Fuses

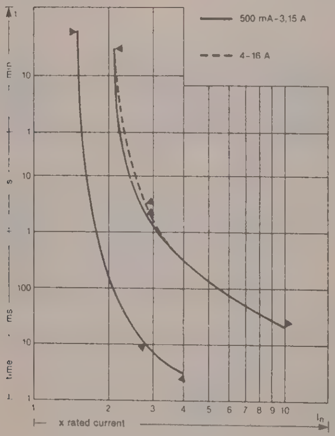
The 5 × 20 mm fuse is commonly used in international markets, particularly Europe. (The North American standard fuse is ¼ × 1¼″ or 6.3 × 32 mm.)

Interpower™ 5 × 20 mm fuses conform to IEC 127; most have been tested and approved by SEMKO and carry the SEMKO test mark. Approval documents available upon request.

All fuses are rated at 250 VAC.

5 × 20 mm	Quick-acting
	

Time current characteristics



high breaking capacity
to IEC publication 127, data sheet I; DIN 41660;
SEMKO 104-1976
Voltage rating: 250 VAC
Minimum order: 1 carton (10 fuses)

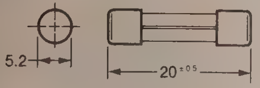
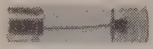
Model Number	Rated Current I_n	Breaking Capacity	Voltage drop max. MV
81413140**	50* mA	1500 A: at 250 V, 50 Hz, cosφ0.7 – 0.8	10,000
81413160**	63*		8,800
81413180**	71		8,000
81413200**	80		7,600
81413220**	100		7,000
81413240**	125		5,000
81413260**	160		4,300
81413280**	200		3,500
81413300**	250		2,800
81413320**	315		2,500
81413340**	400		2,000
81413360**	500		1,800
81413380**	630		1,500
81413400**	800		1,200
81413421	1 A		1,000
81413441	1.25		800
81413481	1.6		600
81413501	2		500
81413521	2.5		400
81413541	3.15		350
81413561	4		300
81413581	5		250
81413601	6.3		200

* Not included in the norms
** Special order

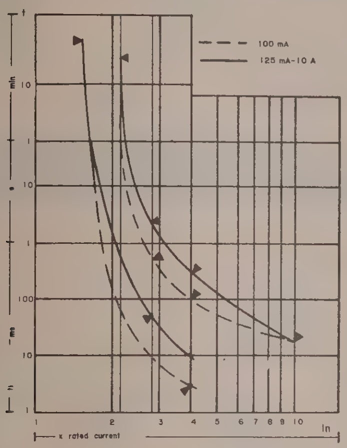
Time current characteristics

Rated Current I_n	$2.1 \times I_n$		$2.75 \times I_n$		$4 \times I_n$		$10 \times I_n$	
	min	max	min	max	min	max	min	max
50 mA – 3.15 A		30 min.	10 ms	2 s	3 ms	300 ms		20 ms
4 A – 6.3 A		30 min.	10 ms	3 s	3 ms	300 ms		20 ms

Fuses

5 × 20 mm	Quick-acting
	

Time current characteristics



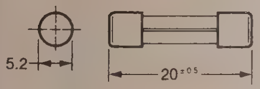
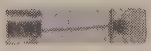
low breaking capacity
to IEC publication 127, data sheet II; DIN 41661;
SEMKO 104-1976
Voltage rating: 250 VAC
Minimum order: 1 carton (10 fuses)

Model Number	Rated Current I_n	Breaking Capacity at 250 V/cos $\varphi = 1$	Voltage drop max. mV
81411101	32* mA	35 A	10,000
81411120**	40		8,000
81411140**	50		7,000
81411160**	63*		5,000
81411181	71		4,500
81411200**	80		4,000
81411221	100		3,500
81411241	125		2,000
81411261	160		2,000
81411281	200		1,700
81411301	250		1,400
81411321	315		1,300
81411341	400		1,200
81411361	500		1,000
81411381	630		650
81411401	800		240
81411421	1 A		200
81411441	1.25		200
81411461	1.4		190
81411481	1.6		190
81411501	2		170
81411521	2.5		170
81411541	3.15		150
81411561	4	10 I_n	130
81411581	5		130
81411601	6.3		130

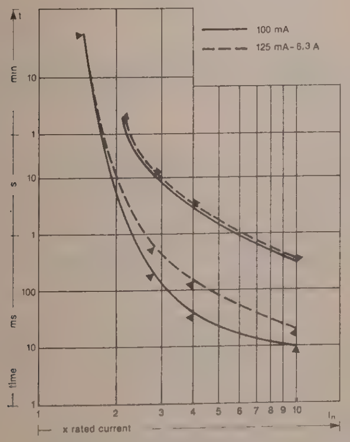
* Not included in the norms ** Special order

Time current characteristics

Rated Current I_n	2.1 × I_n		2.75 × I_n		4 × I_n		10 × I_n	
	min	max	min	max	min	max	min	max
32 mA – 100 mA		30 min.	10 ms	500 ms	3 ms	100 ms		20 ms
125 mA – 6.3 A		30 min.	50 ms	2 s	10 ms	300 ms		20 ms

5 × 20 mm	Time-lag
	

Time current characteristics



low breaking capacity
to IEC publication 127, data sheet III, DIN 41662;
SEMKO 104-1976
Voltage rating: 250 VAC
Minimum order: 1 carton (10 fuses)

Model Number	Rated Current I_n	Breaking Capacity at 250 V/cos $\varphi = 1$	Voltage drop max. mV
81412100**	32* mA	35 A	5,000
81412120**	40*		4,000
81412141	50		3,500
81412161	63		3,000
81412181	71		3,000
81412201	80		3,000
81412221	100		2,500
81412241	125		2,000
81412261	160		1,900
81412281	200		1,500
81412301	250		1,300
81412321	315		1,100
81412341	400		1,000
81412361	500		900
81412381	630		300
81412401	800		250
81412421	1 A		150
81412441	1.25		150
81412461	1.4		150
81412481	1.6		150
81412501	2		150
81412521	2.5		120
81412541	3.15		100
81412561	4	10 I_n	100
81412581	5		100
81412601	6.3		100

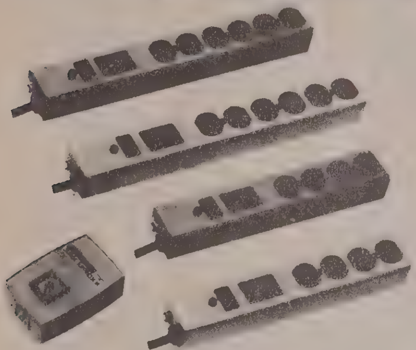
* Not included in the norms ** Special Order

Time current characteristics

Rated Current I_n	2.1 × I_n		2.75 × I_n		4 × I_n		10 × I_n	
	min	max	min	max	min	max	min	max
32 mA – 100 A		2 min.	200 ms	10 s	40 ms	3 s	10 ms	300 ms
125 ma – 6.3 A		2 min.	600 ms	10 s	150 ms	3 s	20 ms	300 ms

PERMA POWER®

sockets Plus™



SURGE SUPPRESSORS

PROTECT COMPUTERS AND SENSITIVE EQUIPMENT FROM DAMAGE CAUSED BY POWER LINE VOLTAGE SURGES

PROTECT PROGRAMS FROM DATA ERRORS

UL LISTED

SURGE SUPPRESSOR MODEL SELECTOR CHART

Perma Power Surge Suppressors

Model No.	Number of Outlets	Master Switch	Indicator Light	Case Length (inches)
PT 109	1	-	1	*
RT 410	4	1	1	12
KT 410	4	1	1	12
RT 610	6	1	1	15
KT 610	6	1	1	15

Perma Power Extended Life Surge Suppressors

Model No.	Number of Outlets	Master Switch	Indicator Light	Case Length (inches)
PS 109	1	-	1	*
RS 410	4	1	1	12
KS 410	4	1	1	12
RS 610	6	1	1	15
KS 610	6	1	1	15

*3$\frac{1}{8}$" 4$\frac{3}{4}$" × 2$\frac{1}{4}$"

Case Style and Color: (prefix) P-Tan plastic case
R-Beige with Oak plastic sides K-Silver with textured black sides

SURGE SUPPRESSOR MODEL FEATURES

- Both normal and common mode suppression
- Low let-through voltage
- High single-surge energy rating
- Automatic failure shutdown
- 1 year warranty

EXTENDED LIFE SURGE SUPPRESSOR MODEL FEATURES

- Both normal and common mode suppression
- Lower let-through voltage
- High pulse lifetime
- High steady-state (repetitive surges) power rating
- High single-surge energy rating
- Automatic failure shutdown
- 3 year warranty

specifications

	PERMA POWER SURGE SUPPRESSORS	EXTENDED LIFE SURGE SUPPRESSORS
Protection Modes	normal (lines/neutral) common (line/ground) common (neutral/ground)	normal (lines/neutral) common (line/ground) common (neutral/ground)
Clamping Threshold (Nominal)	250 Volts	225 Volts
Let-Through Voltage[1]	600 Volts	400 Volts
Pulse Life[1]	10^6 cycles	10^6 cycles
Pulse Life[2]	10^4 cycles	10^6 cycles
Steady State Power[3]	0.8 watts	5.0 watts
Single-Surge Energy[4]	70 joules	70 joules
Peak Current[4]	6000 ampres	6000 ampres
Maximum Transient Voltage[5]	6000 Volts	6000 Volts
Power Rating, Load	1875 watts	1875 watts
Noise Filtering	—	More than 20db, 2-100 mhz
Warranty	1 year	3 years

TEST WAVES

1 IEEE Std. 587 (0.5 us-100 KHz., 600 Volt, 200 Amp., Ringwave).

2 5KW peak, 1.0 millisecond, expotential switching transient.

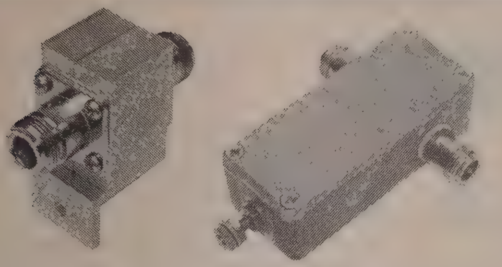
3 10 × 100 us-expotential (accepted industry test impulse for inductive load switching transients).

4 IEEE Std. 587 (8 x 20 us., 3.0 KA., Unipolar current wave).

5 Limited in 120VAC distribution systems by wiring devices *arcover* to 6000 Volts peak (IEEE Std. 587).

PERMA POWER®
Electronics Inc.
5615 West Howard Avenue
Chicago, Illinois 60648
Telephone (312) 647-9414

Nano-Fast Coax Protection from PolyPhaser Corporation



The patented PolyPhaser Impulse Suppressor Family is your best answer for protecting those vital communication links from lightning and static induced impulses.

With over 36 models of patented Impulse Suppression, PolyPhaser Corporation makes more reliable, longer lasting, faster, better VSWR, lower loss and having less throughput energy to your valuable equipment than air-gap type arrestors. Designed using the time proven controlled gas ionization discharge tube, these family members can handle tens-of-thousands of amperes time after time. They are made from quality, highly conductive aluminum with 18-8 stainless fasteners and weather-coated for marine applications.

BULKHEAD MOUNTABLE - TRANSMIT/RECEIVE

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-B50LU	Low power "UHF"	30-220 MHz 220-700 MHz	325 W 125 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50LN	Low power "N"	125-220 MHz 220-700 MHz 700-1 GHz	325 W 125 W 50 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50HU	Hi power "UHF"	30-220 MHz 220-700 MHz	500 W 250 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-B50HN	Hi power "N"	125-220 MHz 220-700 MHz 700-1 GHz	500 W 250 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-CT50HN	Cellular "N"	810-890 MHz	10 channels @ 70 W ea.	N**	10,000 A	≤ 10uJ	0.1	1.1 to 1
IS-UT50HN	"UHF" Combiner/out	450-512 MHz	3-375 W trans. 5-250 W trans.	N† **	10,000 A	≤ 20uJ	0.15	1.2 to 1
IS-IE50LN	Isolated Equipment	125-220 MHz 220-700 MHz	325 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.2 to 1

BULKHEAD MOUNTABLE RECEIVE ONLY

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-GF50LN	GaAs Fet	400 MHz-1 GHz	N/A	N† **	20,000 A	≤ 150 pJ	0.1	1.2 to 1
IS-GC50LN	DC Pick-off	400 MHz-1 GHz	N/A	N† **	20,000 A	≤ 150 pJ	0.2	1.2 to 1
IS-DC50LN	DC Injector	400 MHz-1 GHz	N/A	N† **	20,000 A	≤ 150 pJ	0.2	1.2 to 1

FLANGE MOUNTABLE - TRANSMIT/RECEIVE

Model	Description	Frequency	Power	Connector	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-50UX-C0	HF transceive	3.5-30 MHz	2 KW	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50UX-C1	Similar to IS-B50LU	30-220 MHz 220-700 MHz	325 W 125 W	UHF	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50NX-C1	Like IS-50UX-C1-"N"	30-220 MHz 220-700 MHz	325 W 125 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1
IS-50NX-C2	Similar to IS-B50LN	220-700 MHz 700-1GHz	125 W 50 W	N**	20,000 A	≤ 600uJ	0.1	1.1 to 1

DATA/VIDEO

Model	Description	Frequency	Impedance Ω	Connector	Max. Surge*	Clamp Voltage	Loss dB	VSWR
IS-50BB	HF-NEMP-R.O.	DC to 30 MHz	50	BNC	5,000 A	5.4	0.3	1.5 to 1
IS-75BB	CCTV	DC to 15 MHz	75	BNC***	5,000 A	5.4	0.3	1.2 to 1
IS-93BB	Data	DC to 10 MHz	93	BNC	5,000 A	5.4	0.3	1.5 to 1
IS-TWAX	IBM-34-36-38 Data	DC to 10 MHz	100	Twin Ax	5,000 A	2.8	0.3	1.5 to 1

POWER LINE/TV

Model	Description	Frequency	Impedance & Misc.	Max. Surge*	Thru put Energy	Loss dB	VSWR
IS-PSP	120 VAC line	50-60 Hz	3 wire (solder)	12,000 A	N/A	N/A	N/A
IS-75F-C1	Ch 2-83 TV	50-800 MHz	75Ω F58	20,000 A	≤ 600uJ	0.2	1.2 to 1
IS-300T-C2	TV Ribbon line	50-750 MHz	300 Ω Screws	10,000 A	≤ 600uJ	1.0	1.5 to 1
IS-RCT	Rotor Cable 8 lines	N/A	24 VAC Max 8 Screws/lugs	2 KA ea. line 16 KA total	N/A	N/A	N/A

*Based on 8us rise/20us decay wave form; †also available in UHF; **also available in N/Male on Antenna port; ***also available in type F connector

New products coming soon: **Field Impulse Suppressor Tester, DC Remote/Telephone Line Protector, Suppressors for 1.7 GHz - 2.3 GHz.**

For complete information and application assistance contact:

PolyPhaser Corporation

1420 Industrial Way • P.O. Box 1237E • Gardnerville, NV 89410
Phone: (702) 782-2511 RCA Telex: 215406 TBYT UR Attn: POLYPHASER

Power Dynamics, Inc.

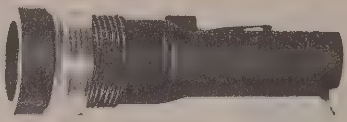
177 Valley Street, South Orange, New Jersey 07079 • (201) 762-6886 • TWX: 136567 (PDI)

COMBINATION FUSE HOLDERS

COMBI FUSE-HOLDER
with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41 571, IEC 127 and 6.3 x 32 mm (¼″ x 1¼″).

APPROVALS
UL, CSA, VDE, SEMKO

19780



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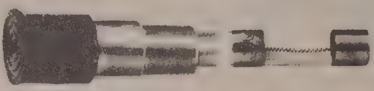

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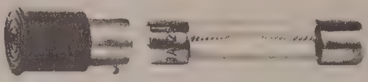


Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40 to DIN 40050

COMBI FUSE-HOLDER
for printed circuit boards with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41571, IEC 127 and 6.3 x 32 mm (¼″ x 1¼″)

APPROVALS
UL, CSA, VDE, SEMKO

19781
19785
19786

19782
19785
19786

Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40 to DIN 40050

COMBI FUSE-HOLDER
for printed circuit boards with bayonet caps according to IEC 257, VDE 0820/2 and UL 512 for miniature fuses 5 x 20 mm acc. to DIN 41571, IEC 127 and 6.3 x 32 mm (¼″ x 1¼″)

APPROVALS
UL, CSA, VDE, SEMKO

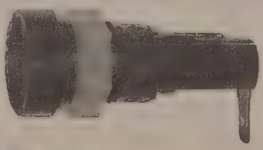
19783
19785
19786

Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 16A acc. to UL, CSA and VDE
Testing voltage 4 kV, 50 Hz, 1 min., dry protection mode IP 40

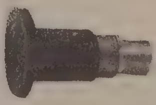
COMBI FUSE-HOLDER
with bayonet cap according to IEC 257 and VDE 0820/2 suitable for miniature fuses 5 x 20 mm according to DIN 41571 and IEC 127

APPROVALS
UL, CSA, VDE, SEMKO

19601



19602



19522

Electrical Data:
Rated voltage 250V
Rated current 6.3A acc. to IEC, 10A acc. to VDE, 16A acc. to UL, 12.5A acc. to CSA
Testing voltage 4 kV, 50 Hz, 1 min., protection mode IP 40

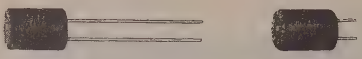
CALL OR WRITE POWER DYNAMICS, INC. FOR COMPLETE ENGINEERING CATALOG • FSC60046

Power Dynamics, Inc.

77 Valley Street, South Orange, New Jersey 07079 • (201) 762-6886 • TWX: 136567 (PDI)

SUB-MINIATURE FUSES

Type TR 3

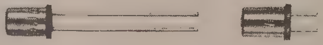


Catalog numbers:
TR3-F No. 19300 (Pigtails)
TR3-F No. 19300 K (Plug-in-pins)
Holders No. 19556, 19557 and 19561

The TR 3 construction evolved from our well-established microfuse. Because of more economic production the TR 3 offers the advantage of automatic insertion. TR 3 construction meets UL 1986 and international standard 32C (CO34).

Rated current range: 50 mA, 5A
Rated voltage: 125V
Characteristic: F (quick acting)
Breaking capacity: 50A
Pin distance: 2.54 mm, round pins, surface
Pluggable into (miniature) holder No. 19556, No. 19557, No. 19558 and **solderable**
Body: Temperature resistant thermoplastics, black
Temperature range: −55°C to +125°C
Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude
Acceleration test: up to 50g
Weight: 100 pieces = 36g (No. 19300); 100 pieces = 29g (No. 19303)
Packaging: boxes of 100 pieces; industrial boxes of each 1000 pieces resp. taped
Approvals: application for UL approval has been filed

Microfuses



Catalog numbers:
278 (pigtails)
278 K (plug-in- pins)
274 acc. to MIL-F-23419 Type FM 02, (on request)

Rated current range: 2 mA, 5A (acc. to UL)
Rated voltage: 125V
Characteristic: F
Breaking capacity: 10,000A (acc. to UL); 40A art 1/16 and 1/20A
Pin distance: 2.54 mm, round pins, tin plated
Socket: 278 and 278 K, rated current 1/500, 132A, temperature resistant glass socket with Vacon pins
278 and 278 K, rated current 1/20, 5A, temperature resistant plastic socket with copper pins
274, rated current 1/500, 5A, temperature resistant plastic socket with copper pins
Temperature range: −55°C to +125°C
Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude
Acceleration test: up to 50g
Pluggable into different holder and **solderable**
Also available with UL approval (on request)
Weight: 100 pieces = 50g
Packaging: 50 pieces resp. 100 pieces

Picofuses

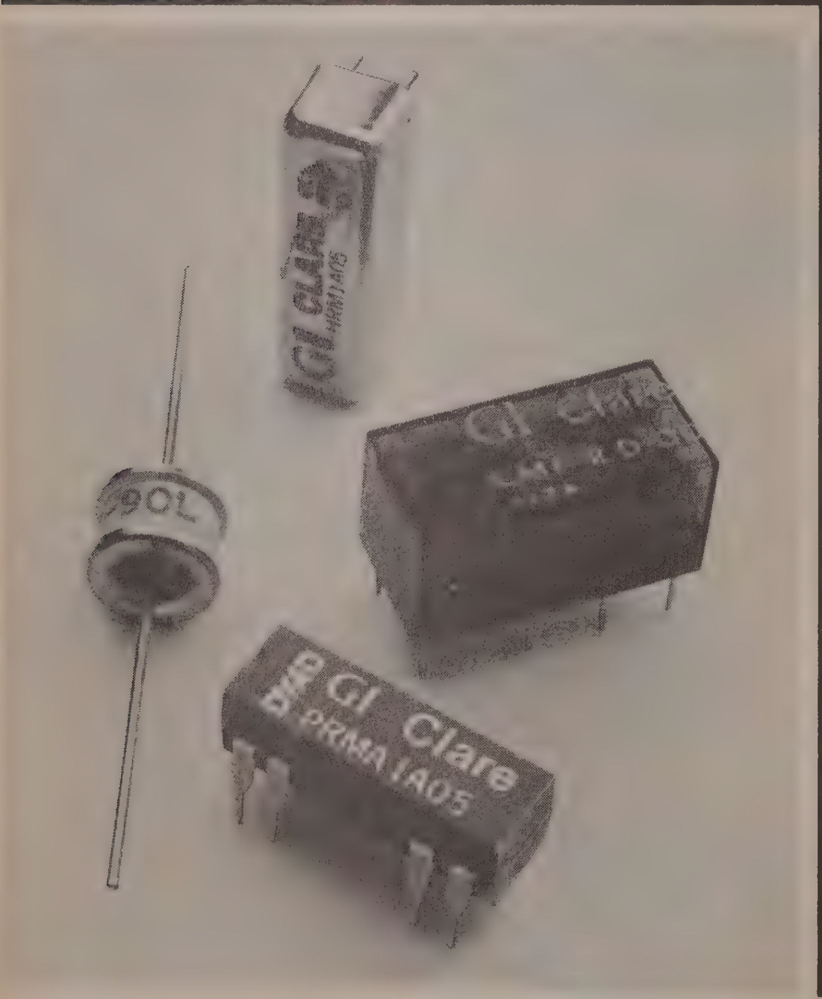
Catalog numbers:
275 axial
277 according to MIL-F-23419 (Type FM 04)

Rated current range: 62 mA, 10A acc. to UL (15A)
Rated voltage: 125 VDC (32V)
Characteristic: FF
Breaking capacity: 300A
Temperature range: −55°C to +125°C
Vibration test: from 10-2000 Hz at 10g-0.06 inch amplitude
Acceleration test: up to 50g
Solderable, wire leads tin-coated, **pluggable** into tubular receptacles No. 19555
Weight: 100 pieces = 50g
Packaging: 100 pieces; 200 resp. 5000 pieces taped

CALL OR WRITE POWER DYNAMICS, INC. FOR COMPLETE ENGINEERING CATALOG • FSC60046

The Clare Division Family Of Quality Products.

Reliability Through Technology.



Quality in the Clare Tradition.

Clare Division has earned the position of being the world's largest supplier of mercury-wetted and dry reed relays.

This leadership position has not come easy, but has come as a result of Clare Division's total commitment to products offering improved technology through innovation . . . and to the quality and performance you expect from the leader in switching technology.

Couple this with high volume manufacturing capabilities, and you get superior quality products, at competitive prices, with fast off-the-shelf delivery.

Call your local Clare Representative or authorized Clare Distributor for more information about:

- Mercury-wetted contact relays
- Dry reed relays
- Electromechanical relays
- Surge arresters

Clare Division
General Instrument Corporation
3101 W. Pratt Avenue
Chicago, IL 60645
312/262-7700

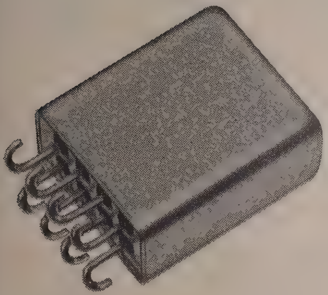
We Help You Compete®

GENERAL
INSTRUMENT

Manufacturer	EEM Page No.	Reed		Solid State	Hybrid	Thermal	Time Delay	Vacuum	I/O Module	General Purpose	Latching	Current Sensing	Sensitive	Power	High Voltage	RF	Plug-in	PC Mount	DIP/SIP	Low Profile	Crystal Can	Sealed	Ratings/Approvals		
		Dry Contacts	Mercury Wetted Contacts																				UL	CSA	Mil.
Advanced Transformers	1B•1473													●				●							
Airpax	1B•1291									●			●	●			●	●			●		●	●	●
American Zettler	1B•1322 1B•1520- 1B•1530	●								●		●	●	●			●	●	●	●		●	●	●	
Applied Electro Technology	1B•1293			●													●	●				●			●
Aromat	1B•1294- 1B•1309	●								●			●	●		●	●	●	●	●		●	●	●	
Bosch	1B•1310 1B•1311									●				●			●	●							
Clare Division	1B•1312- 1B•1316	●	●							●			●	●			●	●	●	●		●			
Communications Instruments	1B•1318- 1B•1321									●			●	●		●		●		●	●	●			●
Computer Components	1B•1323	●				●				●					●			●	●		●	●	●		●
Coto	1B•1324 1B•1330	●											●					●				●			
Crouzet Controls	1B•1332 1B•1333						●																		
Deltrol Controls	1B•1334 1B•1335									●	●			●			●						●	●	
Diversified Electronics	1B•1336						●										●						●		
Douglas Randall	1B•1337- 1B•1345	●	●	●					●	●	●	●	●	●	●			●	●	●		●	●		
Dow-Key	1B•1346 1B•1347													●		●									
Elec-Trol	1B•1352- 1B•1362	●		●		●			●	●	●			●	●	●		●	●	●		●			
Electronic Instr. & Spec.	1B•1364 1B•1365	●		●						●				●				●	●	●		●			
Electronic Specialty	1B•1348 1B•1349									●	●		●			●		●			●	●			●
Fifth Dimension	1B•1366		●							●								●				●			

Manufacturer	EEM Page No.	Reed		Solid State	Hybrid	Thermal	Time Delay	Vacuum	I/O Module	General Purpose	Latching	Current Sensing	Sensitive	Power	High Voltage	RF	Plug-in	PC Mount	DIP/SIP	Low Profile	Crystal Can	Sealed	Ratings/Approvals		
		Dry Contacts	Mercury Wetted Contacts																				UL	CSA	Mil.
Fujitsu America	1B•1367- 1B•1385	●	●							●	●		●	●			●	●	●	●		●	●	●	
Genicom	1B•1386 1B•1387				●					●	●		●			●		●		●	●	●			
Gordos Arkansas	1B•1388- 1B•1403	●	●	●	●					●				●	●			●	●	●		●			
Gould	1B•1404- 1B•1413			●			●			●	●		●	●			●	●		●	●	●	●	●	●
Grayhill	1B•1414 1B•1415			●										●			●	●		●			●	●	
Guardian Electric	1B•1417- 1B•1431			●						●	●						●	●				●	●	●	
Hamlin	1B•1433	●	●							●									●	●					
Hasco Components	1B•1436- 1B•1442	●								●	●			●				●	●	●	●	●			
Iskra Elctrns.	1B•1443									●				●			●						●		
ITT Components	1B•1444- 1B•1450								●	●			●					●				●			
ITT Jennings	1B•1452- 1B•1454						●							●	●	●									
Kilovac	1B•1456 1B•1457							●						●	●							●			
Leach	1B•1458- 1B•1465				●		●			●	●			●							●	●			●
Logitek	1B•1466 1B•1467						●																		●
Magnecraft	1B•1469	●	●	●						●	●	●	●	●		●	●	●	●	●					
Opto 22	1B•1470 1B•1471			●					●	●				●	●			●		●					
Ross Engineering	1B•1472							●						●	●										
Stancor	1B•1474									●			●	●				●							
Standex Elctrns.	1B•1475		●															●							
Struthers-Dunn	1B•1477	●		●	●		●			●	●			●			●	●	●	●	●				
Wabash Relay & Elctrns.	1B•1478 1B•1479	●								●								●	●	●			●	●	

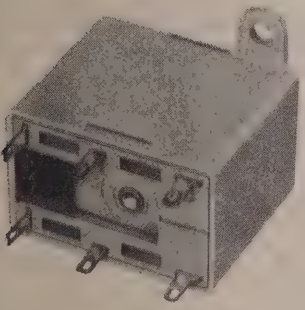
Relays and Solenoids



eries 07—Crystal Can

eveloped specifically for the aerospace
ndustry. The standard unit features a solder
erminal arrangement, 26.5Vdc coil voltage
nd 10 amp contacts.

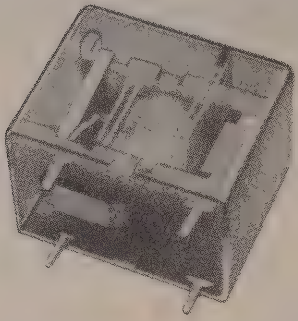
eatures:
Qualified to MIL-R-5757, M5757/23,
MS 27245, MS 27247 and MIL-R-6106.
Withstands severe vibration and shock.
DPDT Contacts.



eries 39—2 Pole, 10 Amp Relay

his low-cost relay features 2 heavy-duty,
0 amp contacts available in a number of
aterials and configurations. Fast-on/solder
ombination terminals aid installation and
ervice replacement. Ideal for home appliance
here heavy work loads are common, but
ower to drive coils is at a premium.

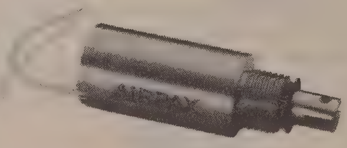
eatures:
Contact ratings available up to 15 amps.
Can be furnished with DPNO, DPNC, DPDT.
470 milliwatts sensitivity.
Available with one heavy-duty contact and
one signal contact for economy.
Approval: ЯU Ⓢ



Series 27—Miniature General Purpose Relay

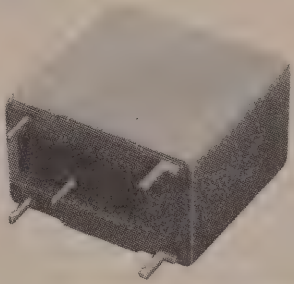
This small relay is well suited for appliance controls, remote TV tuning, automotive controls, office equipment and many types of instrumentation. Form A, B or C contact configurations. Coil voltages from 3Vdc to 24Vdc may also be specified. These relays are especially suited for use as output devices for microprocessors. They not only give complete isolation from noisy environments but can handle hi-inductive loads with ease.

Features:
- Small size—.526 cubic inches.
- Sensitive—as little as 180 milliwatts coil power.
- Powerful—can switch up to 1/3 HP at 125Vac.
- Inexpensive—under $1 typically.
- TV 5 rating available.
- Approval: ЯU Ⓢ



7019 Solenoid

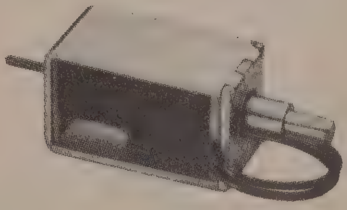
This direct Current Tubular Pull Type Solenoid is designed to provide up to 50 ozs. of force with a maximum stroke of .437".
Actual usable force will depend on the stoke and power level. Coils are available from 6Vdc to 115Vdc with a continuous duty power level of 5 watts and an intermittent (25%) duty power of 15 watts.



Series 28—Sensitive Control Relay

Applications of this relay include automotive control functions (electronic fuel injection, intermittent windshield wiper, etc.), entertainment equipment—remote TV tuning—and other communication switching functions. A variety of D.C. coil voltages and contact configurations are available. Ratings up to 15 amp, 120Vac may also be specified.

Features:
- High amperage ratings in small package.
- Super sensitivity—44 milliwatts coil power.
- Variety of contact materials.
- TV 5 rating available.
- Approval: ЯU Ⓢ



7007ED33-0013 D.C. Box-Frame Push-Type Solenoid

Provides up to 20 ozs. of force with a maximum stroke of .200". Actual usable force will depend on the stroke and power level. Coils are available from 6 to 115Vdc with a continuous duty power level of 3.0 watts and an intermittent (25%) duty power level of 9.0 watts.

AIRPAX®

We give you control.

Airpax Corporation
a North American Philips Company,
Frederick Division
Husky Park,
Frederick, MD 21701

eem

MINIGLOSSARY ELECTROMECHANICAL RELAYS

RELAYS

Hybrid: Isolated input and output either with a solid-state input and an electromechanical output or vice versa. Typically a reed switch is used to trigger a solid-state output or a solid-state amplifier is used to trigger an electromechanical relay.

Differential: Have multiple windings to function when voltage, current and/or power difference reaches a specific level or value.

Close-differential: The dropout value is specified close to the pickup value.

Frequency sensitive: Operates at a set frequency or within specific frequency bands. A resonant reed, for example.

Hermetically sealed: Totally sealed by glass-to-metal or metal-to-metal seals to ensure very low rates of gas leakage over long time periods.

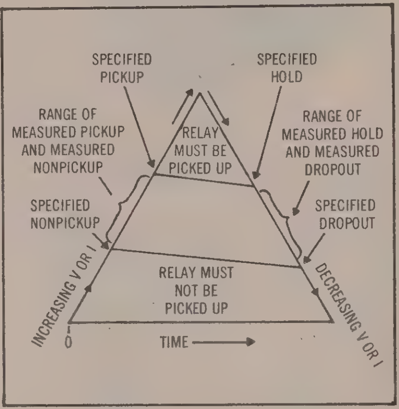
Encapsulated: Imbedded in a suitable potting compound.

Sealed: Enclosed in a relatively airtight cover. (Not the same as hermetically sealed.)

Covered: Unsealed metal or plastic enclosure or housing.

CONTACTS

Dry circuit: contacts that carry current but do not open or close during energizing of the load circuit. Often wrongly used in reference to low level contacts.


SPECIFIED PICKUP
SPECIFIED HOLD
RANGE OF MEASURED PICKUP AND MEASURED NONPICKUP
RELAY MUST BE PICKED UP
RANGE OF MEASURED HOLD AND MEASURED DROPOUT
SPECIFIED NONPICKUP
SPECIFIED DROPOUT
RELAY MUST NOT BE PICKED UP
INCREASING V OR I
DECREASING V OR I
0
TIME

Low Level: Contacts controlling relatively low voltages and low currents. Generally below 5 Vdc and 10mA.

OPERATING CHARACTERISTICS

Measured dropout: The value at which all contacts restore to their unoperated position as current or voltage decreases.

Specified dropout: The value at or *above* which all contacts *must* restore to their unoperated position as voltage or current is decreased.

Specified hold: The value that *must* be reached before any contact change occurs as voltage or current is decreased on an operated relay.

Specified nonpickup: The value that *must* be reached before any contact change occurs as voltage or current decreases on an unoperated relay.

Measured pickup: The value at which all contacts function as voltage or current increases on an unoperated relay.

Specified pickup. The value at or *below* which all contacts *must* function as voltage or current increases on an unoperated relay.

Sensitivity: Specified pickup expressed in watts.

Normal bridging: The make-before-break action between adjacent contacts on relays designed for this purpose.

Abnormal bridging: The undesired closing of contacts caused by a metal bridge or protrusion developed by arcing.

Magnetic freezing: Sticking of the armature to the core as a result of residual magnetism.

TIME

Actuation: The interval from coil energization or de-energization to the functioning of a specified contact.

Initial actuation: The interval from coil energization or de-energization to the *first* closing or opening of a previously open or closed contact.

Final actuation: Sum of initial actuation *and* bounce intervals following an actuation.

Contact bounce: The interval from close or opening of a contact to the end of the bounce of "chatter."

Chatter: See bounce.

Operate: Normally taken as the interval between energization and the opening or closing of the last contact to function not including bounce.

Release: Normally taken as the interval between de-energization and the opening or closing of the last contact to function excluding bounce.

Transfer: The interval between opening a closed contact and closing an open contact of a break-before-make relay.

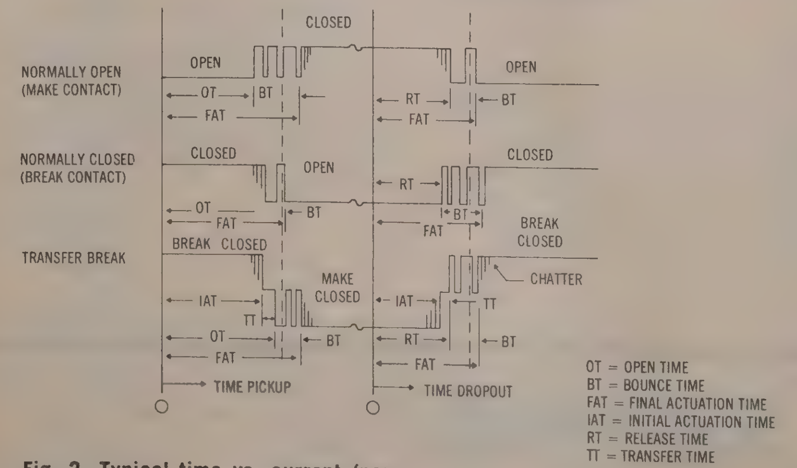
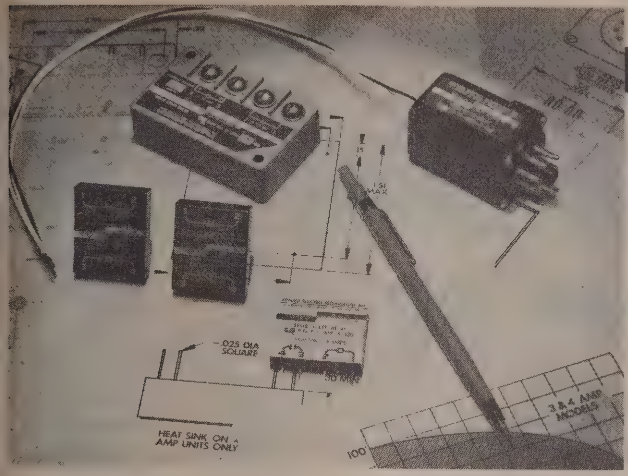

NORMALLY OPEN (MAKE CONTACT)
NORMALLY CLOSED (BREAK CONTACT)
TRANSFER BREAK
OPEN
CLOSED
OPEN
CLOSED
OPEN
CLOSED
BREAK CLOSED
MAKE CLOSED
BREAK CLOSED
CHATTER
OT
BT
FAT
RT
IAT
TT
TIME PICKUP
TIME DROPOUT
OT = OPEN TIME
BT = BOUNCE TIME
FAT = FINAL ACTUATION TIME
IAT = INITIAL ACTUATION TIME
RT = RELEASE TIME
TT = TRANSFER TIME

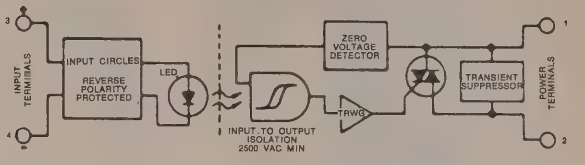
Fig. 2. Typical time vs. current (non-inductive load)


.025 DIA SQUARE
1.51 MAX
HEAT SINK ON 4 AMP UNITS ONLY
3 & 4 AMP MODELS

Optoswitch™

GENERAL PURPOSE AC SOLID STATE RELAYS OPTO-ISOLATED

SCHEMATIC DIAGRAM


3
4
INPUT TERMINALS
INPUT CIRCLES
REVERSE POLARITY PROTECTED
LED
INPUT TO OUTPUT ISOLATION 2500 VAC MIN
ZERO VOLTAGE DETECTOR
TRWG
TRANSIENT SUPPRESSOR
POWER TERMINALS
1
2

The OPTOSWITCH™ general purpose AC solid state relays have been specifically designed to meet or exceed commercial requirements. Applied Electro Technology Int. has a long history of manufacturing aerospace and military high reliability solid state relays and this high quality experience has influenced a new design in solid state relays with stringent manufacturing and testing.

Use these relays in all your commercial applications such as copiers, instruments, controls, gas pumps, microprocessor controllers, automated machinery, etc.

The OPTOSWITCH™ totally solid state AC relays are total encapsulated and especially recommended for harsh industrial environments where high shock or severe temperature excursions are encountered. All inputs are opto-isolated and turn-on is synchronized with load voltage zero crossing to minimize radio frequency interference.

In many instances these relays have been replaced and are constantly replacing mechanical relays very successfully.

Our special features are:

- Operating temperature range of −40 to 100°C.
- Optical isolation of 2500 Vrms between control and load circuits.
- Zero voltage turn-on for reduced EMI.
- High transient immunity to prevent false turn-on.
- Maximum control current of 2 ma DC (rms for AC control type) to turn on relay over temperature range.
- Optional DC control voltage range of 4-32 VDC.
- Optional AC control voltage range of 90-140 VAC or 90-280 VAC.

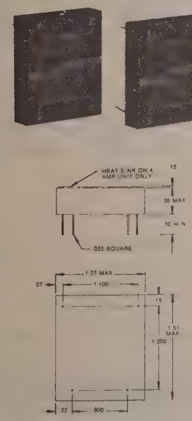
These relays are available in 6, 10, 15, 25 and 40 amp switching capacity at 120, 240 or 480 VAC.

In addition, the user has a choice of DC control or AC control as stated above.

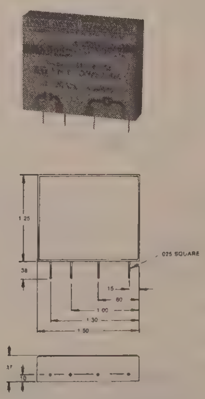
For further information please contact AET directly.

Some models available are shown below:

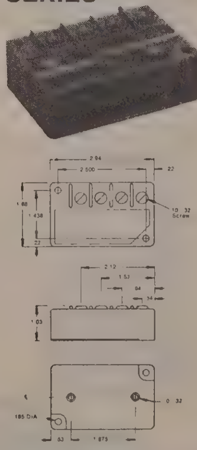
12-OPC SERIES


HEAT SINK ON 4 AMP UNIT ONLY
.025 SQUARE
1.27 MAX
1.100
1.51 MAX
1.200
.22
.800

12-OEM SERIES


1.25
.025 SQUARE
1.00
1.30
1.50

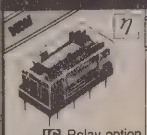
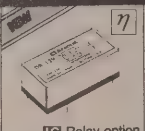
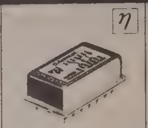
12-OTM SERIES


2.94
2.500
10-32 Screw
2.12
1.51
.185 DIA

APPLIED ELECTRO TECHNOLOGY, INT.
AN Sti® COMPANY

2220 S. Anne St. / Santa Ana, CA 92704 / Tel (714) 556-6570 / TWX 910-595-1797

Aromat Relay Selector Chart

		High Breakdown Voltage Capacity DS-RELAY	Half-Size Amber R-RELAY	Highly Reliable DIP DR-RELAY	Hermetically Sealed DX-RELAY	Economical Reed DA-RELAY	High Density Amber SEB-RELAY	Field Switching Power STE-RELAY
• Type of relay		 IC Relay option	IC Relay option	 IC Relay option			IC Relay option	IC Relay option
• Features		• 1500V FCC surge satisfied • High sensitivity • High switching power • Ag-Pd contact type available	• Magnetically shielded • High sensitivity • High speed operation	• High sensitivity • High sticking resistance • High break-down voltage • High speed operation	• High radio frequency characteristics • High sensitivity • High insulation resistance • High shock and vibration resistance • Bifurcated contacts	• DIP terminal • Glass encapsulated reed switch	• High sensitivity • High vibration and shock resistance • Low thermal electromotive force • DIL terminal	• High sensitivity • Large capacity in small size • Capable of switching field inductive loads • High inrush capability
• Amber sealed types availability		●	●	●	●		●	●
• Latching types availability		●	●	●	●		●	●
• Mounting method	Plug-in							
	PC board	●	●	●	●	●	●	●
	Top-mount							
• Contact arrangement		1C, 2C, 4C	1C	1C	2C	1a, 2a	2a2b, 4a	1a1b, 2a
• Contact rating (resistive)		0.6A 125VAC 0.6A 110VDC 2A 30VDC	0.3A 110VAC 1A 20VDC	0.3A 110VAC 1A 20VDC	1A 30VDC 0.5A 30VDC 0.1A 12VDC	0.1A 100VAC	4A 250VAC 3A 30VDC	8A 250VAC 5A 30VDC 1/4 HP 125VAC
• Contact material		Gold-clad silver	Gold cobalt	Gold cobalt	Gold-clad silver alloy	Rh-plated nickel-iron alloy	Gold-clad silver alloy	Silver alloy
• Life (min. operations)	Electrical (at rated load)	5×10^5 at 0.3A 220VAC 5×10^5 at 2A 30VDC	10^6	10^6	2×10^5 at 1A 30VDC	10^6	10^5 at 4A 250VAC	10^5 at 8A 250VAC
	Mech.	10^8	10^9	10^9	3×10^7	10^8	10^8	10^7
• Breakdown voltage	Between open contacts	1000Vrms (500 Vrms for DS1-S)	350Vrms or 500VDC	750Vrms	500Vrms	200VDC	750Vrms	1200Vrms
	Between contact sets	1000Vrms	—	—	500Vrms	—	1000Vrms	2000Vrms
	Between contacts and coil	1500Vrms (1000 Vrms for DS1-S)	1000Vrms	1500Vrms	500Vrms	500VDC	1500Vrms	3750Vrms
	Between live parts and ground	—	1000Vrms	1000Vrms	—	—	—	—
• Surge withstand voltage		1500V FCC						
• Coil voltage		(DC) 1.5, 3, 5, 6, 9, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24V	(DC) 5, 6, 12, 24V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V
• Nominal operating power		M: (Single) 400mW (−ML2) 360mW S: (Single) 200mW (−SL2) 180mW	(Single) 150 to 280mW (−L) 70 to 100mW (−L2) 150 to 230mW	(Single) 96 to 209mW (−L) 56 to 109mW (−L2) 111 to 290mW	(Single) 125 to 144mW (−L) 125 to 144mW (−L2) 250 to 288mW	(1a) 230mW (2a) 325mW	192 to 355mW	240mW
• UL, CSA, VDE		UL/CSA	UL/CSA	—	—	—	UL/CSA	*UL/*CSA
• Page								

Notes: 1. When ordering, please specify UL/CSA or VDE. 2. *denotes UL/CSA or VDE application under way.

Relays for Advanced Technology

Aromat
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Aromat Corporation

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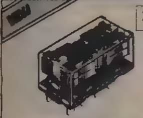
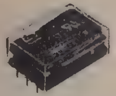
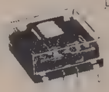
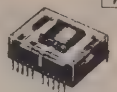
Tel: (408) 446-5000 • TWX: 910-338-0534

Southwest Sales Offices
11542 Knott Street, Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

Compact Power Sensitive	Flatpack	Thin 1 Form C	Flatpack/Lean line 5 Amp	6PDT Flatpack 2A	Lean Line	High sensitivity [illegible]
SP-RELAY	NF-RELAY	NB-RELAY	NC-RELAY	NL-RELAY	NT-RELAY	K-RELAY
 η IC Relay option		η	η 	η 		
• High sensitivity • High vibration and shock resistance • Wide switching range	• 1500V FCC surge satisfied • Low profile • High sensitivity • MBB contacts available • Ag-Pd contacts type available	• 1500V FCC surge staisfied • Thin height • 5A contact rating • DIL terminal	• Flatpack and Lean line • DIL terminal • Bifurcated contacts	• 6PDT Flat-pack • Low operating power • DIL terminal • MBB contacts available	• Large capacity 8A • Compact size	• Patented magnetic system • Long life • Bifurcated contact
	●	●	●	●		●
●		●	●	●		
● (Faston) No. 187			●			●
	●	●	●	●	●	●
2C, 4C	2C, 4C	1C	2C, 4C	6C	1C	2C, 4C, 6C
(2C) 15A 250VAC 10A 30VDC 1/2HP 125VAC (4C) 10A 250VAC 10A 30VDC 1/3HP 125VAC	0.5A 125VAC 2A 30VDC	(Single) 5A 250VAC 5A 30VDC 1/10HP 125VAC (bifurcated) 3A 250VAC 3A 30VDC 1/20HP 125VAC	(2C) 5A 250VAC 5A 30VDC 1/10HP 125VAC (4C) 5A 125VAC 5A 30VDC 1/10HP 125VAC	2A 30VDC 0.6A 100VDC	8A 250VAC 8A 24VDC 1/10HP 125VAC	2A 28VDC
Silver alloy/gold-plated silver alloy	Gold-clad silver	(Single) Silver nickel (Bifurcated) Gold-clad silver nickel	Gold-clad Silver nickel	Gold-clad silver	Gold-clad silver nickel	Gold-clad silver/silver
10^5	10^6 at 2A 30VDC	2×10^5	(2C) 10^5 at 5A 250VAC (4C) 10^5 at 5A 125VAC	5×10^5 at 2A 30VDC	10^5	10^6
5×10^7	(2C) 3×10^8 (4C) 10^8	10^7	2×10^7	5×10^7	10^7	10^8
1500Vrms	750Vrms	1000Vrms	1000Vrms	1000Vrms	1000Vrms	750Vrms
3000Vrms	1000Vrms	—	1000Vrms	1000Vrms	—	750Vrms
3000Vrms	1000Vrms	2000Vrms	2000Vrms	2000Vrms	2000Vrms	1500Vrms
—	1000Vrms	—	—	—	—	1250Vrms
	1500V FCC	1500V FCC				
(DC) 3, 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 3, 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V (AC) 6, 12, 24, 48, 115V	(DC) 6, 12, 24, 48, 60, 110V
300mW	(2C) 300mW (4C) 480mW	400mW	(Single) (2C) 360mW (4C) 720mW (−L2) (2C) 800mW (4C) 1,600mW	(single) 720mW (−L2) 1,600mW	(DC) 290mW (AC) 0.75VA	(2C) 200 to 400mW (4C) 500 to 700mW (6C) 1,300mW
UL/CSA	UL/**CSA or VDE	UL/CSA	UL/CSA or VDE	UL/CSA or VDE	UL/CSA	UL/CSA or VDE

3. **CSA is approved under NF-A (without grounding terminal) types.

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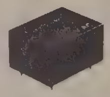
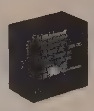
Tel: (714) 895-7707

Aromat Relay Selector Chart

		High Frequency **RF-RELAY**	Slim Type Power **JR-RELAY**	Compact Power **JB-RELAY**	Compact High Power **JC-RELAY**	1 HP Compact Power **JA-RELAY**	Compact High Power **JH-RELAY**
• Type of relay							
• Features		• Excellent high frequency • High reliability and long life • Flux-resistant molded construction • DIL terminal	• Wide insulation distance • High dielectric withstanding: 10,000 V surge • High inrush current capability	• High dielectric withstanding 10,000V surge • Large capacity 8A in compact size • Flux-resistant	• High inrush current capability • TV-rated type available • High dielectric withstanding: 10,000V surge	• High switching capacity 55A inrush, 15A steady • TV-rated type available • High dielectric withstanding: 5,000V surge	• Many safety-oriented characteristics incorporated • High dielectric withstanding: 10,000V surge • High inrush resistance
• Amber sealed types availability		●					
• Latching types availability							
• Mounting method	Plug-in				●		
	PC board	●	●	●	●	●	
	Top-mount				●	●	●
• Contact arrangement		1C	1a, 1c	1C	1a, 2a, 1a1b	1a, 1b, 1C	1X, 2X
• Contact rating (resistive)		0.01A 24VAC 0.01A 24VDC	10A 250VAC 10A 30VDC	8A 250VAC 5A 30VDC 1/6HP 125VAC	(1a) 10A 250VAC 1/2HP 125VAC (2a, 1a1b) 5A 250VAC 1/4HP 125VAC	10A 250VAC 15A 125VAC 1HP 125VAC	(1X) 30A 250VAC 1HP 125VAC (2X) 20A 250VAC 1HP 125VAC
• Contact material		(Stationary contact) Gold-plated nickel silver (Movable contact) Gold-clad phosphorus bronze	Silver alloy	Silver alloy	Silver alloy	Silver alloy	Silver alloy
• Life (min. operations)	Electrical (at rated load)	10^5	10^5	10^5	10^5	10^5	10^5
	Mech.	5×10^6	5×10^6	10^7	5×10^6	5×10^6	5×10^6
• Breakdown voltage	Between open contacts	1000Vrms	1,000Vrms	1000Vrms	2000Vrms	1000Vrms	2000Vrms
	Between contact sets	—	—	—	2000Vrms	—	2000Vrms
	Between contacts and coil	2000Vrms	5,000Vrms	2500Vrms	4000Vrms	2000Vrms	5000Vrms
	Between live parts and ground		—	—	—	—	—
• Surge withstand voltage		—	10,000V surge	10,000V surge	10,000V surge	5,000V surge	10,000V surge
• Coil voltage		(DC) 5, 6, 9, 12, 24, 48V	(DC) 6, 12, 24, 48V	(DC) 5, 6, 12, 24, 48V	(DC) 6, 12, 24, 48V	(DC) 6, 12, 24V (AC) 6, 12, 24, 115V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 120, 220, 240V
• Nominal operating power		450mW	530mW	(Up to DC24V) 480mW (DC48V) 560mW	(1a) 0.9W (2a) 1W	(DC) 1.2W (AC) 1.3VA	(DC) 1.9W (AC) 3.2VA
• UL, CSA, VDE		—	UL/CSA	UL/CSA	UL/CSA or VDE	UL/CSA	UL/CSA or *VDE
• Page							

Notes: 1. When ordering, please specify UL/CSA or VDE. 2. *denotes UL/CSA or VDE application under way.

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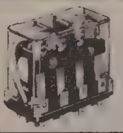
11542 Knott Street, Suite 2, Garden Grove, CA 92641
Tel: (714) 895-7707

[illegible]	Subminiature	Multipole Power	Compact Power	10 Amp Power	20 Amp Power	Heavy Duty Power
HB-RELAY	**HA-RELAY**	**HC-RELAY**	**HL-RELAY**	**HP-RELAY**	**HG-RELAY**	**VC-RELAY**
						
• DIP terminal • Flux-resistant • Ag-Pd contacts type available	• Compact size • Flux-resistant	• Wide applications • Versatile range	• Large capacity • Compact size	• Long life	• Large capacity 20A	• 20A type
●	●	●				
		●	● (Faston No. 187	● (Faston) No. 187	● (Faston) No. 250	● (Faston) No. 250
●	●	●	●			
		●	●			
1C, 2C	1C	1C, 2C, 3C, 4C	1C, 2C	1C, 2C, 3C	2C, 3C, 4C	1X, 2X, 3X
1A 125VAC 2A 30VDC 1/20HP 125VAC	3A 250VAC 3A 30VDC	(1C) 10A 250VAC 1/3HP 125VAC (2C) 7A 250VAC 1/6HP 125VAC (3C) 7A 250VAC 1/6HP 125VAC (4C) 5A 250VAC 1/10HP 125VAC	(1C) 15A 125VAC 3A 30VDC 1/3HP 125VAC (2C) 10A 250VAC 3A 30VDC 1/3HP 125VAC	10A 250VAC 7.5A 24VDC 1/3HP 125VAC	20A 250VAC 15A 24VDC 3/4HP 125VAC	20A 200VAC
Silver nickel	Silver nickel	Gold-flashed silver alloy	Silver alloy	Silver alloy	Silver-cadmium-oxide	Silver-cadmium-oxide
2×10⁵	10⁵ at 3A 250VAC	2×10⁵	5×10⁷	2×10⁵ at 10A 125VAC	2×10⁵ at 20A 250VAC	2.5×10⁵
10⁷	10⁷	(DC) 10⁸ (AC) 5×10⁷	(DC) 10⁸ (AC) 5×10⁷	10⁷	(DC) 10⁶ (AC) 10⁷	10⁶
500Vrms	750Vrms	700Vrms	1000Vrms	(HP31,32)1000Vrms (HP33) 2000Vrms	2000Vrms	2500Vrms
500Vrms	—	700Vrms	1500Vrms	2000Vrms	2000Vrms	2500Vrms
1000Vrms	1500Vrms	1500Vrms	1500Vrms	2000Vrms	2000Vrms	2500Vrms
—	—	1500Vrms	—	—	—	—
(DC) 5, 6, 12, 24, 48V	(DC) 5, 6, 9, 12, 24, 48V (AC) 6, 12, 24, 48, 115V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V	(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V		(DC) 6, 12, 24, 48, 110V (AC) 6, 12, 24, 48, 115, 220, 240V	(AC) 24, 120, 240V
(1C) 360mW (2C) 580mW	(DC) 360mW (AC) 0.9VA	(DC) 0.9W (AC) 1.2VA	(DC) 0.9 to 1.0W (AC) 1.2 to 1.3VA	(DC) 1.5W (AC) 2.0VA	(2C) 1.4W (DC) 3.6VA (AC) (3C) 1.6W (DC) 5.2VA (AC) (4C) 2.0W (DC) 7.6VA (AC)	5.0 to 6.6VA
UL/CSA	UL/CSA	UL/CSA or VDE (1C, 2C, 4C)	UL/CSA	UL/CSA or VDE	UL/CSA	UL/CSA

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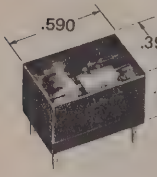
NEW

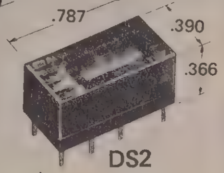
Highly Sensitive 1,500 V FCC Surge Withstanding Miniature Relays

DS-RELAYS

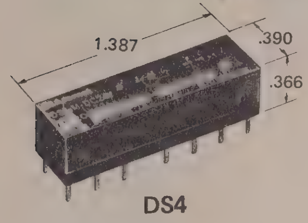
η Relay Efficiency



DS1

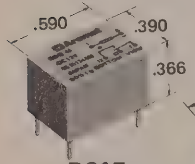


DS2

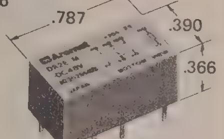


DS4

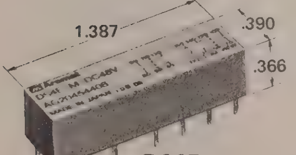
DSE Amber Relays



DS1E



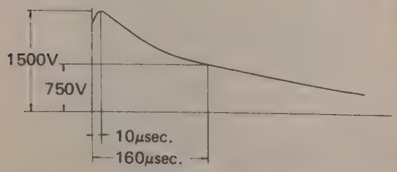
DS2E



DS4E

- High sensitivity
- High switching capacity
- High breakdown voltage –1,500V FCC surge between open contacts, 1,000VAC between open contacts
- DIP terminal arrangement
- Latching types available

* FCC (Federal Communication Commission) requests following standard as Breakdown Voltage specification



Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable	DC5V	5VDC	62.5	400	1C	2
DS1–M–	DC6V	6	90			
DS1E–M–	DC9V	9	203			
	DC12V	12	360			
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4	360	1C	2
DS1–ML2–	DC6V	6	100			
DS1E–ML2–	DC9V	9	225			
	DC12V	12	400			
	DC24V	24	1600			
Single side stable	DC5V	5VDC	62.5	400	2C	2
DS2–M–	DC6V	6	90			
DS2E–M–	DC9V	9	203			
	DC12V	12	360			
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4	360	2C	2
DS2–ML2–	DC6V	6	100			
DS2E–ML2–	DC9V	9	225			
	DC12V	12	400			
	DC24V	24	1600			
	DC48V	48	6400			
Single side stable	DC5V	5VDC	125	200	2C	2
DS2–S–	DC6V	6	180			
DS2E–S–	DC9V	9	405			
	DC12V	12	720			
	DC24V	24	2880			
	DC48V	48	11520			
2 coil latching	DC5C	5VDC	139	180	2C	2
DS2–SL2–	DC6V	6	200			
DS2E–SL2–	DC9V	9	450			
	DC12V	12	800			
	DC24V	24	3200			
	DC48V	48	12800			
Single side stable	DC5V	5VDC	62.5	400	4C	2
DS4–M–	DC6V	6	90			
DS4E–M–	DC9V	9	203			
	DC12V	12	360			
	DC24V	24	1440			
	DC48V	48	5760			
2 coil latching	DC5V	5VDC	69.4	360	4C	2
DS4–ML2–	DC6V	6	100			
DS4E–ML2–	DC9V	9	225			
	DC12V	12	400			
	DC24V	24	1600			
	DC48V	48	6400			
Single site stable	DC5V	5VDC	125	200	4C	2
DS4–S–	DC6V	6	180			
DS4E–S–	DC9V	9	405			
	DC12V	12	720			
	DC24V	24	2880			
	DC48V	48	11520			
2 coil latching	DC5V	5VDC	139	180	4C	2
DS4–SL2–	DC6V	6	200			
DS4E–SL2–	DC9V	9	450			
	DC12V	12	800			
	DC24V	24	3200			
	DC48V	48	12800			

Note:
1. Reverse polarity types available
2. Gold capped silver pallarium contacts available
3. For UL/CSA recognized types : 2 Form C and 4 form C, add suffix UL/CSA.
4. Standard packing → Carton : 50 pcs./Case: 500 pcs.

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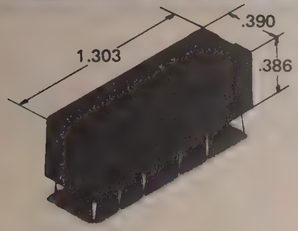
IC Built-in Power Saving Relays for Battery Devices DS-C UNIT RELAYS

Relay Efficiency


1.303
.390
.386

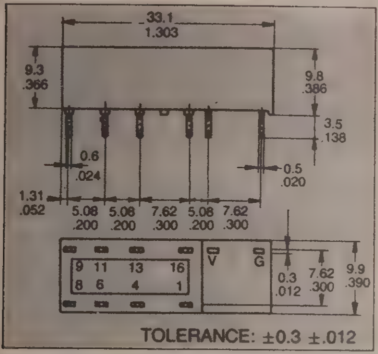
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrangement	Rating (A)
DS2–C–9V DS2–C–12V DS2–C–24V	9 12 24	0.54 1.2 2.64	2C	2

Note: Standard packing → Carton : 50 pcs./Case : 500 pcs.

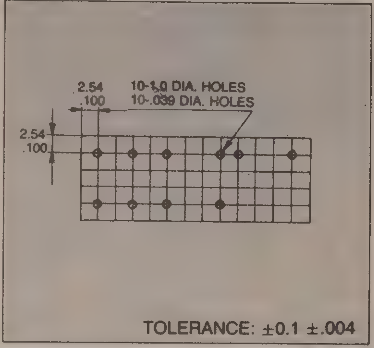
Dimensions

mm inch


33.1
1.303
9.3
.366
9.8
.386
3.5
.138
0.6
.024
0.5
.020
1.31
.052
5.08 5.08 7.62 5.08 7.62
.200 .200 .300 .200 .300
9 11 13 16 V G
8 6 4 1
0.3
.012
7.62
.300
9.9
.390

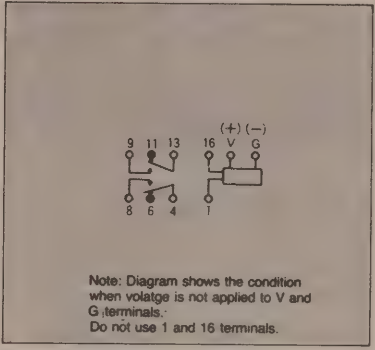
TOLERANCE: ±0.3 ±.012

PC board pattern (Copper side view)


2.54
.100
10-1.0 DIA. HOLES
10-.039 DIA. HOLES
2.54
.100

TOLERANCE: ±0.1 ±.004

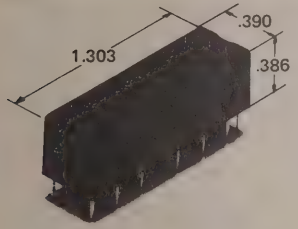
Schematic (Bottom view)


(+) (−)
9 11 13 16 V G
8 6 4 1

Note: Diagram shows the condition when volatge is not applied to V and G terminals.
Do not use 1 and 16 terminals.

IC Built-in Relays for Intelligent Systems DS-C3-RELAYS

Relay Efficiency

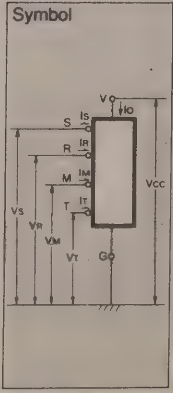

1.303
.390
.386

Type	Contacts	
	Arrangement	Rating (A)
DS2–C3–5V	2C	2

Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

Input Data

Symbol


V
IO
S
IS
R
IR
M
IM
T
IT
VS
VR
VM
VT
G
VCC

A. Absolute maximum rating

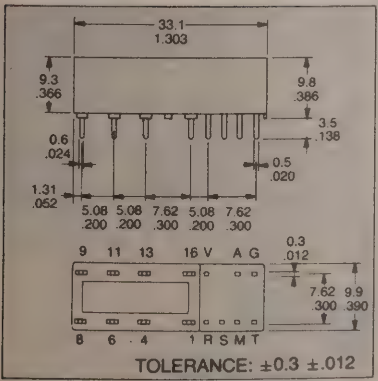
Item	Symbol	Value	Unit
Max. power source voltage	Vcc	14	V
Max. Input Voltage	VHS, VHR, VHM, VHT	Vcc	V
Max. power source current	I_0	100	mA

B. Operation conditions

Item		Sumbol	Condition	Allowable value			Unit
				Min.	Center	Max.	
Rated power source voltage		Vcc		4.75	5	14	V
Power source current	Operating	I_0	Vcc=5V (when relay is operating)			45	mA
	Steady		Vcc=5V			2	mA
L level voltage		VS, VR, VT, VM	Vcc=5V	−0.5		0.8	V
H level voltage		VS, VR, VM, VT	Vcc=5V	2.0		Vcc	V
Input current		IR, IS, IT, IM	Vcc=5V, Input is 5V			50	μA
			Vcc=5V, Input is 0V	−200			μA

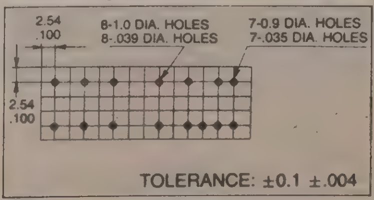
Dimensions

mm inch


33.1
1.303
9.3
.366
9.8
.386
3.5
.138
0.6
.024
0.5
.020
1.31
.052
5.08 5.08 7.62 5.08 7.62
.200 .200 .300 .200 .300
9 11 13 16 V A G
0.3
.012
7.62
.300
9.9
.390
8 6 4 1 R S M T

TOLERANCE: ±0.3 ±.012

PC board pattern (Copper side view)


2.54
.100
8-1.0 DIA. HOLES
8-.039 DIA. HOLES
7-0.9 DIA. HOLES
7-.035 DIA. HOLES
2.54
.100

TOLERANCE: ±0.1 ±.004

Schematic (Bottom view)

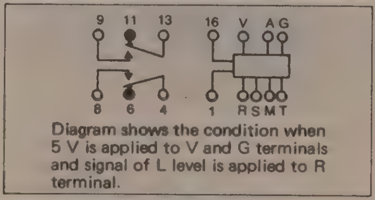

9 11 13 16 V A G
8 6 4 1 R S M T

Diagram shows the condition when 5 V is applied to V and G terminals and signal of L level is applied to R terminal.

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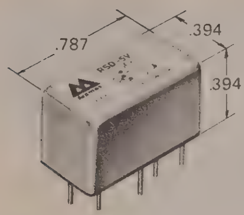
Half Size Amber Relays
More than 50 Million Units around the World

R-RELAYS

η Relay Efficiency



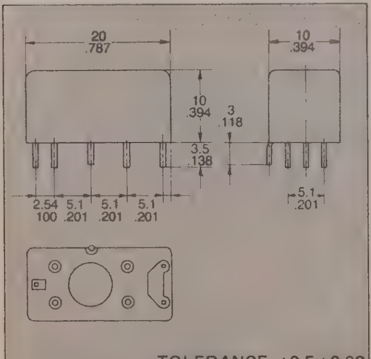
- Amber sealed construction
- High sensitivity
- High speed: 1 msec. max.
- Wide switching range and high welding resistance
- Small size
- High reliability and long life
- Latching types available

Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrangement	Rating (A)
Single side stable RSD– DC5V DC6V DC12V DC24V DC48V	5VDC 6 12 24 48	170 220 890 2,000 8,000	147 164 162 288 221	1C	1
1-coil latching RSLD– DC5V DC6V DC12V DC24V DC48V	5VDC 6 12 24 48	340 450 1,500 6,000 12,000	74 80 96 96 147	1C	1
2-coil latching RSL2D– DC5V DC6V DC12V DC24V DC48V	5VDC 6 12 24 48	170 225 650 2,700 6,500	147 160 230 213 321	1C	1

Note: 1. R1a (1 Form a contact) types available
2. Standard packing → Carton: 50 pcs./Case: 500 pcs.

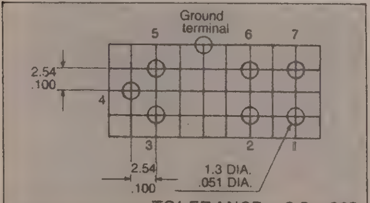
Dimensions mm inch



20
.787
10
.394
10
.394
3
.118
3.5
.138
2.54
.100
5.1
.201
5.1
.201
5.1
.201
5.1
.201

TOLERANCE: ±0.5 ±0.02

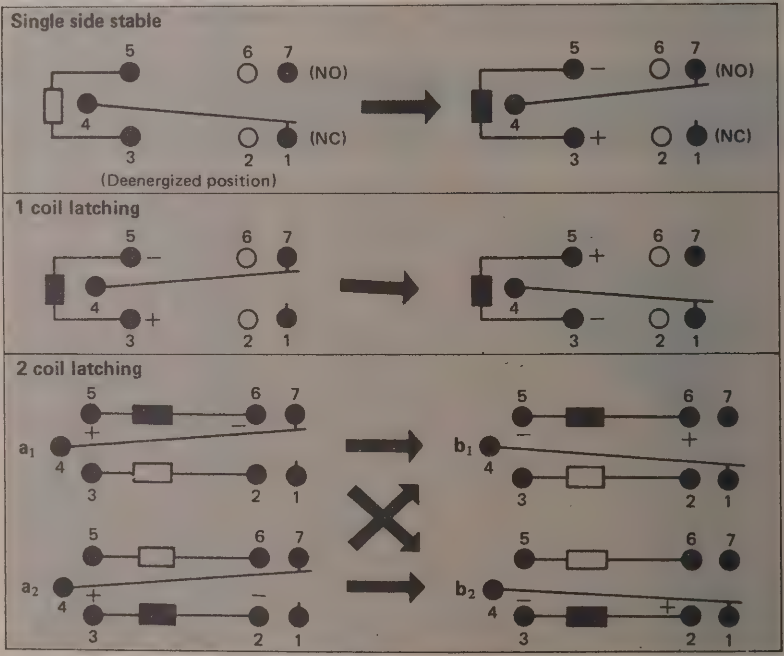
PC board pattern (Copper side view)



Ground terminal
5
6
7
2.54
.100
4
3
2
1
2.54
.100
1.3 DIA.
.051 DIA.

TOLERANCE: ±0.2 ±.008

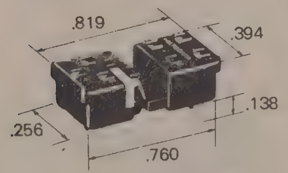
Schematic (Bottom view)



Single side stable
5
6
7
(NO)
4
(NC)
3
2
1
(Deenergized position)
5
–
6
7
(NO)
4
+
(NC)
3
2
1
1 coil latching
5
–
6
7
4
+
3
2
1
5
+
6
7
4
–
3
2
1
2 coil latching
5
6
7
+
–
a₁
4
3
2
1
5
6
7
a₂
4
+
–
3
2
1
5
6
7
b₁
–
+
4
3
2
1
5
6
7
b₂
4
–
+
3
2
1

R Socket

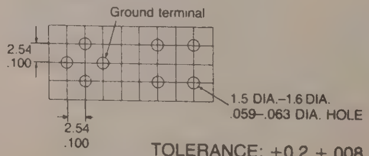
R–PS	PC terminal



.819
.394
.138
.256
.760

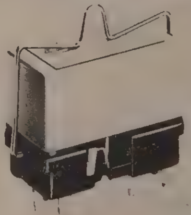
R-PS

PC board pattern



Ground terminal
2.54
.100
1.5 DIA.–1.6 DIA.
.059–.063 DIA. HOLE
2.54
.100

TOLERANCE: ±0.2 ±.008



The R-Relay with R-PS attached

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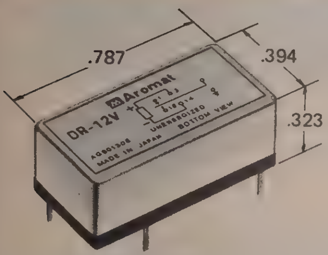
Highly Reliable Miniature DIP Relays

DR-RELAYS

Relay Efficiency


.787
.394
.323
Aromat
DR-12V
UNENERGIZED
BOTTOM VIEW
MADE IN JAPAN

- High breakdown voltage: 750 Vrms between open contacts
- High sensitivity
- High sticking resistance
- Miniature size and flat form
- High speed — Operate time: Approx. 1 msec.
- DIP terminal arrangement
- Latching types available

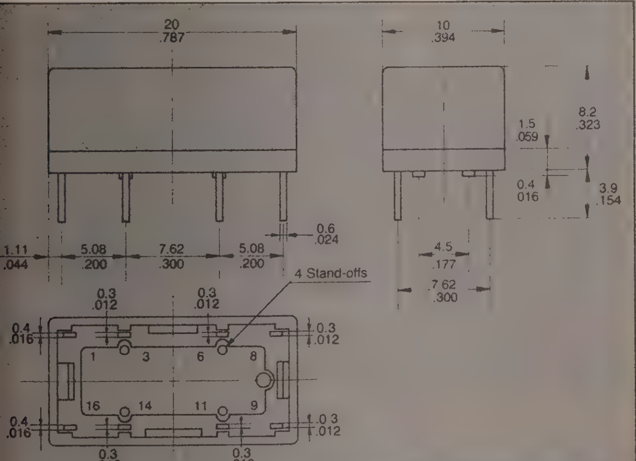
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable DR–	5V	5VDC	240	104	1C	1
	6V	6	330	109		
	12V	12	1,400	103		
	24V	24	3,600	160		
	48V	48	11,000	209		
1-coil latching DR–L–	5V	5VDC	420	59	1C	1
	6V	6	610	59		
	12V	12	2,300	62		
	24V	24	5,800	99		
	48V	48	21,100	109		
2-coil latching DR–L2–	5V	5VDC	225	111	1C	1
	6V	6	290	124		
	12V	12	1,210	119		
	24V	24	3,840	150		
	48V	48	7,950	290		

Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

imensions

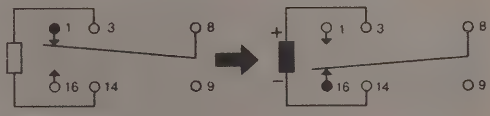
mm inch


20
.787
10
.394
8.2
.323
1.5
.059
0.4
.016
3.9
.154
0.6
.024
1.11
.044
5.08
.200
7.62
.300
5.08
.200
4 Stand-offs
4.5
.177
7.62
.300
0.3
.012
0.4
.016
1
3
6
8
16
14
11
9

TOLERANCE: ±0.3 ±.012

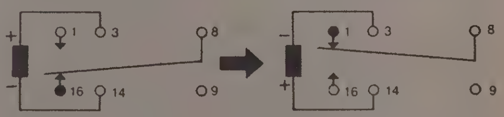
Schematic (Bottom view)

Single side stable

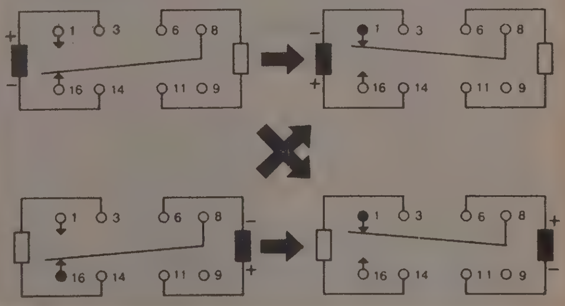


(Deenergized condition) (Energized condition)

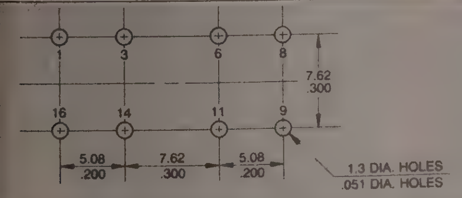
1 coil latching



2 coil latching


+
–
1
3
6
8
16
14
11
9

C board pattern (Copper side view)


1
3
6
8
16
14
11
9
7.62
.300
5.08
.200
7.62
.300
5.08
.200
1.3 DIA. HOLES
.051 DIA. HOLES

TOLERANCE: ±0.3 ±.012

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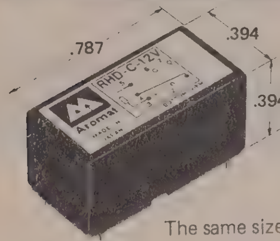
NEW

IC Built-in Power Saving Relays for Battery Devices

R-C UNIT RELAYS

Relay Efficiency



.787
.394
.394
RHD-C-12V
Aromat

The same size as R relay.

- Ultra low operating power
- Little heat generation
- Wider operating voltage range
- Low bounce

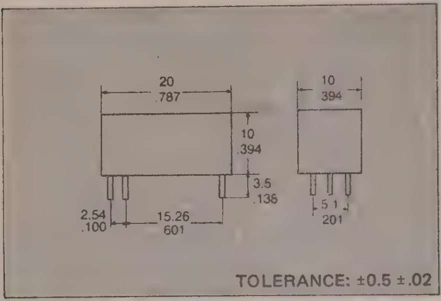
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrangement	Rating (A)
RHD–C– 5V	5	0.3 to 0.78	1C	1
RHD–C–12V	12	1.56 to 3.12		

Note: Standard packing → Carton : 50 pcs./Case : 500 pcs.

Dimensions

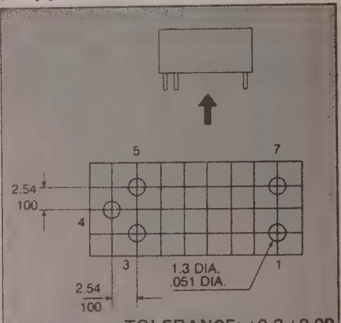
mm inch



20
.787
10
.394
10
.394
3.5
.138
2.54
.100
15.26
.601
5.1
.201

TOLERANCE: ±0.5 ±.02

P/C board pattern (Copper side view)

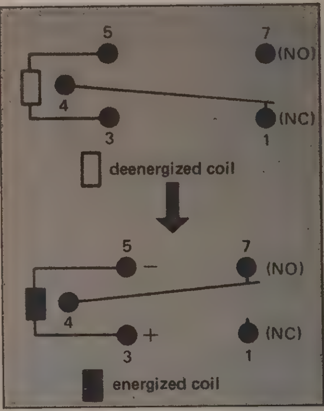


5
7
4
3
1
2.54
.100
2.54
.100
1.3 DIA.
.051 DIA.

TOLERANCE: ±0.2 ±0.08

Note: A standard pattern: P/C board with a pitch of .100 inch is suitable for mounting RHD-C relays.

Schematic (Bottom view)



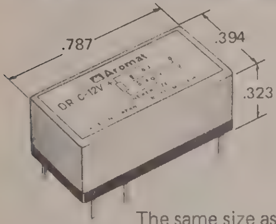
5
7
(NO)
4
3
1
(NC)
deenergized coil
5
–
7
(NO)
4
+
3
1
(NC)
energized coil

NEW

IC Built-in Power Saving Relays for Battery Devices

DR-C UNIT RELAYS

Relay Efficiency



.787
.394
.323
Aromat
DR C-12V

The same size as DR relay.

- Ultra low operating power
- Little heat generation
- Wider operating voltage range
- Low bounce

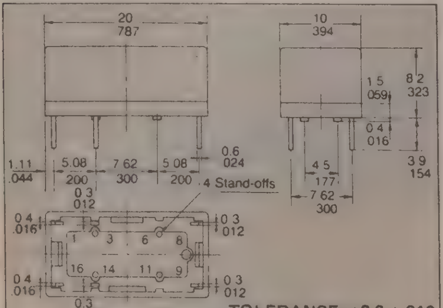
Types and Data

Type	Coils		Contacts	
	Voltage	Nom. Power (mW)	Arrangement	Rating (A)
DR–C– 5V	5	0.175 to 0.245	1C	1
DR–C–12V	12	1.56 to 3.38		

Note: Standard packing → Carton: 50 pcs./Case : 500 pcs.

Dimensions

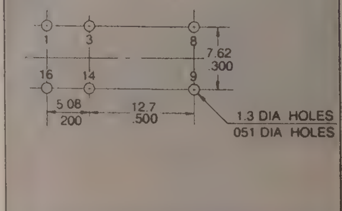
mm inch



20
.787
10
.394
1.5
.059
8.2
.323
0.4
.016
3.9
.154
1.11
.044
5.08
.200
7.62
.300
5.08
.200
0.6
.024
4 Stand-offs
4.5
.177
7.62
.300
0.3
.012
0.4
.016
0.4
.016
0.3
.012
0.3
.012
0.3
.012
1
3
6
8
16
14
11
9

TOLERANCE: ±0.3 ±.012

PC board pattern (Copper-side view)

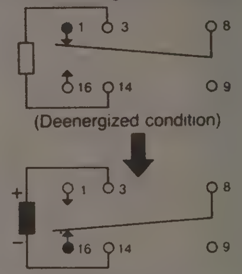


1
3
8
16
14
9
7.62
.300
5.08
.200
12.7
.500
1.3 DIA HOLES
.051 DIA HOLES

TOLERANCE: ±0.3 ±0.12

Schematic (Bottom view)

Same operations as the conventional magnetic relays.



1
3
8
16
14
9
(Deenergized condition)
+
–
1
3
8
16
14
9
(Energized condition)

Note: Energization with an opposite polarity does not switch the contact. The reverse polarity may damage the built-in IC. Apply proper polarity to switch the contact.

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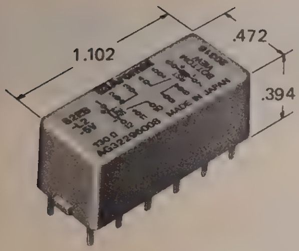
4 Amp Polarized High Density Relays with High Sensitivity

SEB-RELAYS

Relay Efficiency


1.102
.472
.394

- Amber sealed construction
- High sensitivity in small size
- Wide switching range: 100μA to 4A
- High shock/vibration resistance: 50G/ 18G (10 to 55 Hz at double amplitude of 3 mm)
- A variety of contact arrangement
- Low thermal electromotive force: Approx. 3μV
- DIL terminal arrangement
- Multiple latching

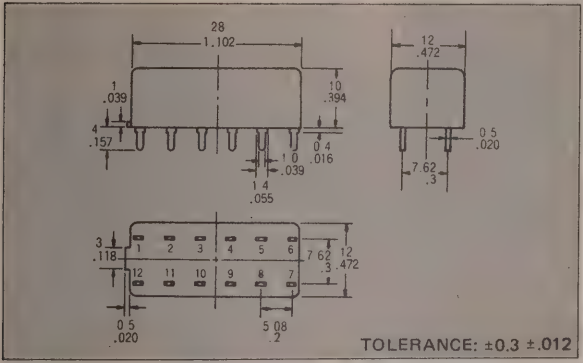
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
Single side stable S2EB–	5V	5VDC	130	192	2a2b	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	8,500	271		
2 coil latching S2EB–L2–	5V	5VDC	130	192	2a2b	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	6,500	355		
Single side stable S4EB–	5V	5VDC	130	192	4a	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	8,500	271		
2 coil latching S4EB–L2–	5V	5VDC	130	192	4a	4
	6V	6	180	200		
	12V	12	720	200		
	24V	24	2,850	202		
	48V	48	6,500	355		

Note: Standard packing → Carton: 50 pcs./Case: 500 pcs.

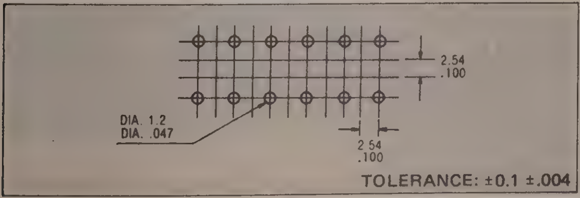
Dimensions

mm inch


28
1.102
1
.039
10
.394
4
.157
1.0
.039
0.4
.016
1.4
.055
12
.472
0.5
.020
7.62
.3
3
.118
1 2 3 4 5 6
12 11 10 9 8 7
7.62
.3
12
.472
0.5
.020
5.08
.2

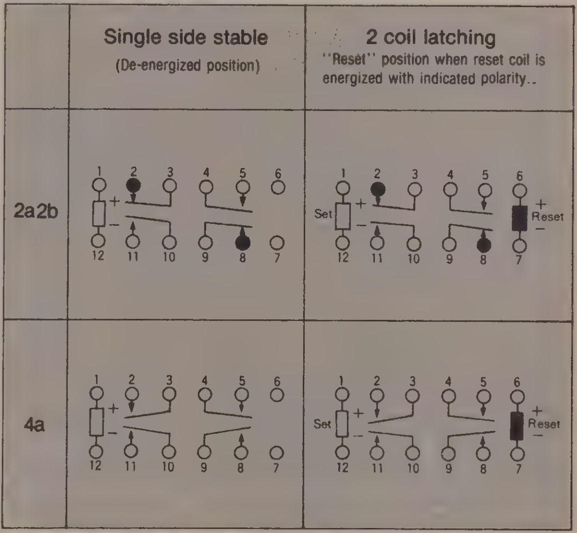
TOLERANCE: ±0.3 ±.012

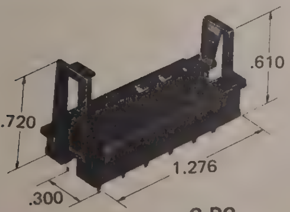
PC board pattern (Copper side view)


2.54
.100
DIA. 1.2
DIA. .047
2.54
.100

TOLERANCE: ±0.1 ±.004

Schematic (Bottom view)


Single side stable
(De-energized position)
2 coil latching
"Reset" position when reset coil is energized with indicated polarity.
2a2b
4a
1 2 3 4 5 6
12 11 10 9 8 7
Set
Reset
+
–


.610
.720
1.276
.300

S-PS

S Socket

S–PS	PC terminal

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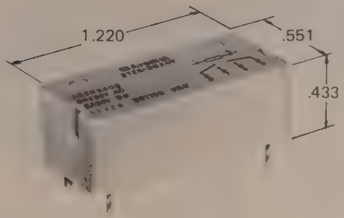
IC Drivable PC Board Relays for Field Load Switching

STE-RELAYS

Relay Efficiency


1.220
.551
.433

- Amber sealed construction
- High switching capacity—8A
- High sensitivity
- Miniature size
- High shock/vibration resistance – 20G/12G (10 to 55 Hz at double amplitude of 2 mm)
- Latching types available

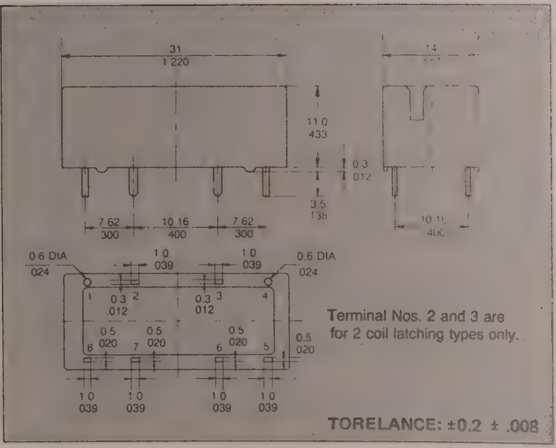
Types and Data

Type		Coils			Contacts	
		Voltage	Res. (Ω)	Nom Power (mW)	Arrangement	Rating (A)
Single side stable ST1E–	DC 5V	5VDC	110	240	1a1b	8
	DC 6V	6	150			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,400			
	DC48V	48	9,000			
2 coil latching ST1E–L2–	DC 5V	5VDC	110	240	1a1b	8
	DC 6V	6	160			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,440			
	DC48V	48	10,200			
Single side stable ST2E–	DC 5V	5VDC	110	240	2a	8
	DC 6V	6	150			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,400			
	DC48V	48	9,000			
2 coil latching ST2E–L2–	DC 5V	5VDC	110	240	2a	8
	DC 6V	6	160			
	DC 9V	9	360			
	DC12V	12	640			
	DC24V	24	2,440			
	DC48V	48	10,200			

Note: Standard packing→Carton: 50 pcs./Case: 500 pcs.

Dimensions

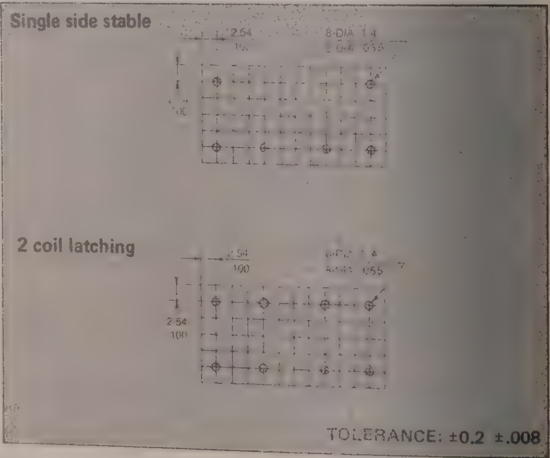
mm inch


31
1.220
14
11.0
.433
0.3
.012
3.5
.138
7.62
.300
10.16
.400
7.62
.300
10.16
.400
0.6 DIA
.024
1.0
.039
1.0
.039
0.6 DIA
.024
0.3
.012
0.3
.012
0.5
.020
0.5
.020
0.5
.020
0.5
.020
1.0
.039
1.0
.039
1.0
.039
1.0
.039
1
2
3
4
8
7
6
5

Terminal Nos. 2 and 3 are for 2 coil latching types only.

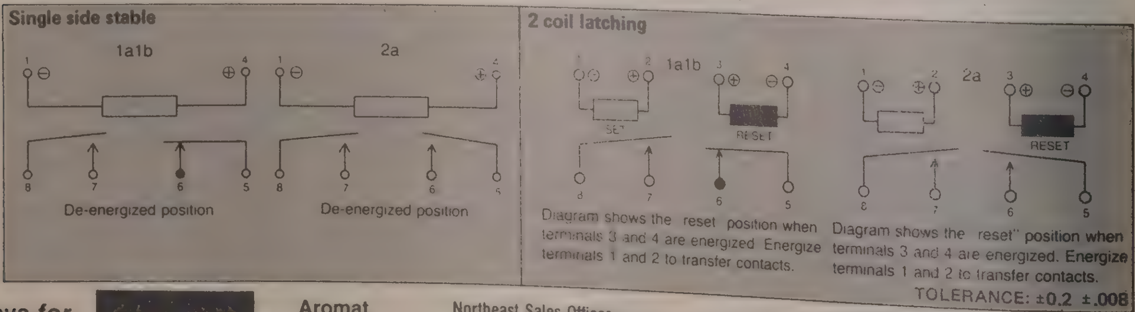
TORELANCE: ±0.2 ± .008

PC board pattern (Copper side view)


Single side stable
2.54
.100
8-DIA 1.4
8-DIA .055
2 coil latching
2.54
.100
8-DIA 1.4
8-DIA .055
2.54
.100

TOLERANCE: ±0.2 ±.008

Schematic (Bottom view)


Single side stable
1a1b
2a
1
4
8
7
6
5
2 coil latching
1a1b
2a
1
2
3
4
SET
RESET
8
7
6
5

De-energized position

De-energized position

Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.

Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.

TOLERANCE: ±0.2 ±.008

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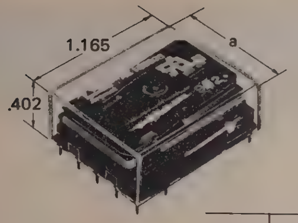
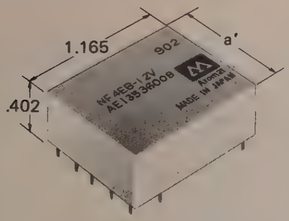
High Sensitivity Flatpack Relays with High Reliability

NF-RELAYS



	a
NF2	.764
NF4	.945

NFEB Amber Relays


1.165
a'
.402
NF4EB-12V
AE13536008
902
Aromat
MADE IN JAPAN

	a'
NF2EB	.772
NF4EB	.953

More than 30,000,000 pcs. in use all over the world

- Low profile — stands only .402 inches high
  Ideal for high packaging density
- High sensitivity — minimum operating power
  NF2/150mW, NF4/240mW
- Variety of available lines —
  Amber Sealed types
  MBB (Form D) contact types
  High breakdown voltage types for transient protection — 1,000V rms between open contacts, contact sets
- Gold capped silver palladium contacts available.

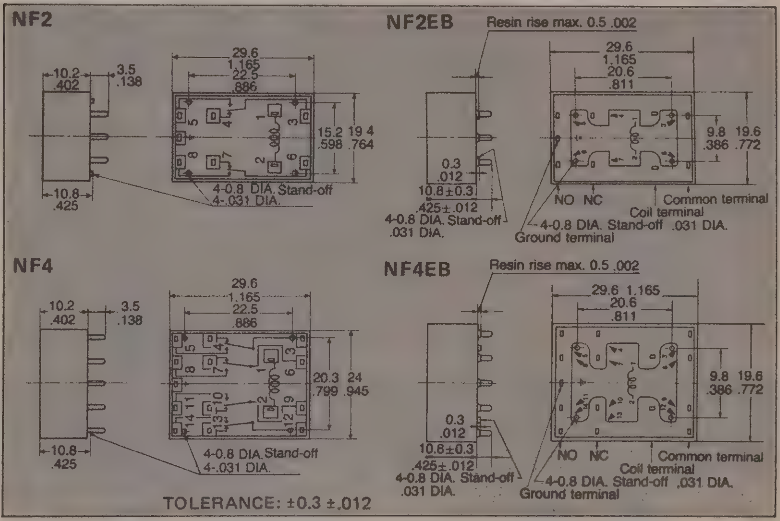
Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrangement	Rating (A)
NF2— 5V	5VDC	90	278	2C	2
NF2EB— 6V	6	137	260		
12V	12	500	290		
24V	14	2,000	290		
48V	48	7,000	330		
NF4— 5V	5VDC	53	472	4C	2
NF4EB— 6V	6	90	400		
12V	12	330	440		
24V	24	1,200	480		
48V	48	4,200	550		

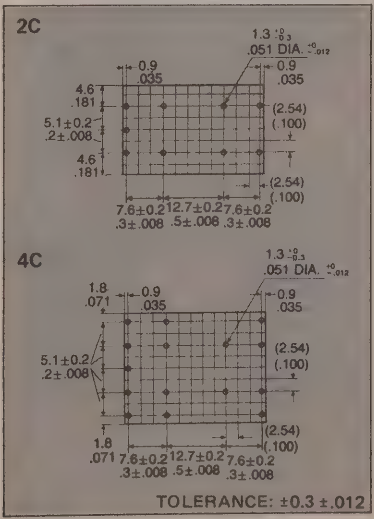
Notes: 1. MBB (Form D) contact types available.
2. Standard packing → Carton: 20 pcs./Case: 200 pcs.

Dimensions

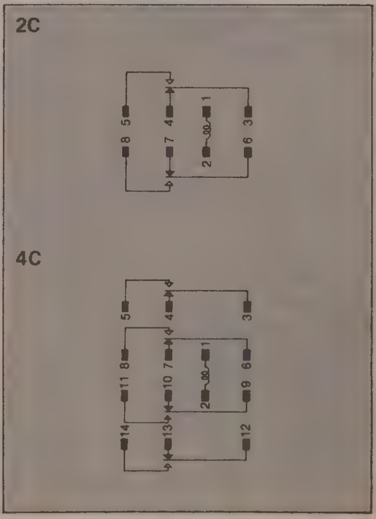
mm inch


NF2
10.2
.402
3.5
.138
29.6
1.165
22.5
.886
15.2 19.4
.598 .764
10.8
.425
4-0.8 DIA. Stand-off
4-.031 DIA.
NF2EB
Resin rise max. 0.5 .002
29.6
1.165
20.6
.811
9.8 19.6
.386 .772
0.3
.012
10.8±0.3
.425±.012
4-0.8 DIA. Stand-off
.031 DIA.
NO NC
Common terminal
Coil terminal
4-0.8 DIA. Stand-off .031 DIA.
Ground terminal
NF4
10.2
.402
3.5
.138
29.6
1.165
22.5
.886
20.3 24
.799 .945
10.8
.425
4-0.8 DIA Stand-off
4-.031 DIA.
NF4EB
Resin rise max. 0.5 .002
29.6 1.165
20.6
.811
9.8 19.6
.386 .772
0.3
.012
10.8±0.3
.425±.012
4-0.8 DIA. Stand-off
.031 DIA.
NO NC
Common terminal
Coil terminal
4-0.8 DIA. Stand-off .031 DIA.
Ground terminal
TOLERANCE: ±0.3 ±.012

PC board pattern (Copper side view)


2C
1.3 +0.1/-0
.051 DIA. +.004/-0
0.9
.035
0.9
.035
4.6
.181
5.1±0.2
.2±.008
4.6
.181
(2.54)
(.100)
(2.54)
(.100)
7.6±0.2 12.7±0.2 7.6±0.2
.3±.008 .5±.008 .3±.008
4C
1.3 +0.1/-0
.051 DIA. +.004/-0
1.8
.071
0.9
.035
0.9
.035
5.1±0.2
.2±.008
(2.54)
(.100)
(2.54)
(.100)
1.8
.071
7.6±0.2 12.7±0.2 7.6±0.2
.3±.008 .5±.008 .3±.008
TOLERANCE: ±0.3 ±.012

Schematic (Bottom view)


2C
8 5 7 4 2 1 6 3
4C
5 4 3
11 8 10 7 2 1 9 6
14 13 12

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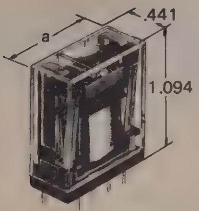
Flat/Lean Line High Power Bifurcated Contact Relays

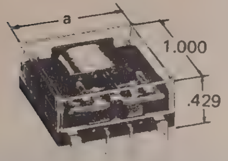
NC-RELAYS

η Relay Efficiency



	a
2C	1.000
4C	1.500

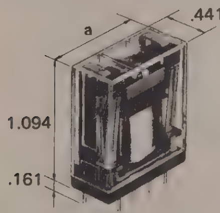
Lean line



Flatpack

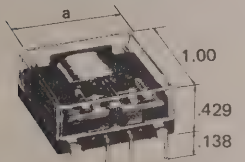
	a
2C	1.000
4C	1.500

NCED Amber Relays



	a
2C	1.000
4C	1.500

Lean line (PC board)



Flatpack

	a
2C	1.000
4C	1.500

- Space saver — Flatpack and Lean line
- High contact capacity—5A 250VAC(2C) 5A 125VAC(4C)
- Low operating power — 2C, 230 mW 4C, 460mW (single-side stable)
- Flux-resistant
- High breakdown voltage for transient protection — 1,000V rms between open contacts, sets
- Latching types available

Types and Data

	Type	Coils			Contacts		
		Voltage	Res. (Ω)	Nom. Power (mW)	Arrangement	Rating (A)	
						Standard	Amber
Flatpack	Single side stable DC5V	5VDC	69.4	360	2C	5	3
	NC2D–JP– DC6V	6	100	360			
	NC2ED–JP– DC12V	12	400	360			
	DC24V	24	1,600	360			
	DC48V	48	6,400	360			
	2 coil latching DC5V	5VDC	31.3	800	2C	5	3
	NC2D–JPL2– DC6V	6	45	800			
	NC2ED– DC12V	12	180	800			
	JPL2– DC24V	24	720	800			
	DC48V	48	2,880	800			
	Single side stable DC5V	5VDC	34.7	720	4C	5	2
	NC4D–JP– DC6V	6	50	720			
	NC4ED–JP– DC12V	12	200	720			
	DC24V	24	800	720			
	DC48V	48	3,200	720			
	2 coil latching DC5V	5VDC	15.6	1,600	4C	5	2
	NC4D–JPL2– DC6V	6	22.5	1,600			
	NC4ED– DC12V	12	90	1,600			
	JPL2– DC24V	24	360	1,600			
	DC48V	48	1,440	1,600			
Lean line	Single side stable DC5V	5VDC	69.4	360	2C	5	3
	NC2D–P– DC6V	6	100	360			
	NC2ED–P– DC12V	12	400	360			
	DC24V	24	1,600	360			
	DC48V	48	6,400	360			
	2 coil latching DC5V	5VDC	31.3	800	2C	5	3
	NC2D–PL2– DC6V	6	45	800			
	NC2ED–PL2–DC12V	12	180	800			
	DC24V	24	720	800			
	DC48V	48	2,880	800			
	Single side stable DC5V	5VDC	34.7	720	4C	5	2
	NC4D–P– DC6V	6	50	720			
	NC4ED–P– DC12V	12	200	720			
	DC24V	24	800	720			
	DC48V	48	3,200	720			
	2 coil latching DC5V	5VDC	15.6	1,600	4C	5	2
	NC4D–PL2– DC6V	6	22.5	1,600			
	NC4ED–PL2–DC12V	12	90	1,600			
	DC24V	24	360	1,600			
	DC48V	48	1,440	1,600			

Note: Standard packing → Carton: 20 pcs./Case : 200 pcs.

NC Sockets

For Flat series

Catalog No.	Terminals	Mating relay
NC2-JPS	P/C board	NC2D-JP
NC4-JPS	P/C board	NC4D-JP
NC2-JPL2S	P/C board	NC2D-JPL2
NC4-JPL2S	P/C board	NC4D-JPL2

For Slim series

Catalog No.	Terminals	Mating relay
NC2-PS	P/C board	NC2D-P
NC4-PS	P/C board	NC4D-P
NC2-SS	Solder	NC2D
NC4-SS	Solder	NC4D
NC2-LP2S	P/C board	NC2D-PL2
NC4-L2PS	P/C board	NC4D-PL2
NC2-L2SS	Solder	NC2D-L2
NC4-L2SS	Solder	NC4D-L2

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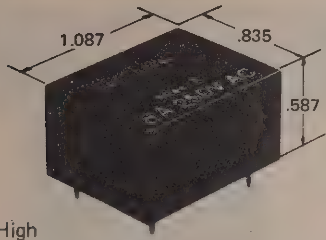
Compact Power Relays JB-RELAYS


1.087
.835
.587

- High dielectric strength –10,000V surge in 1x40 μsec. between coil and contact
- Flux resistant construction
- More than 0.3″ terminal pitch

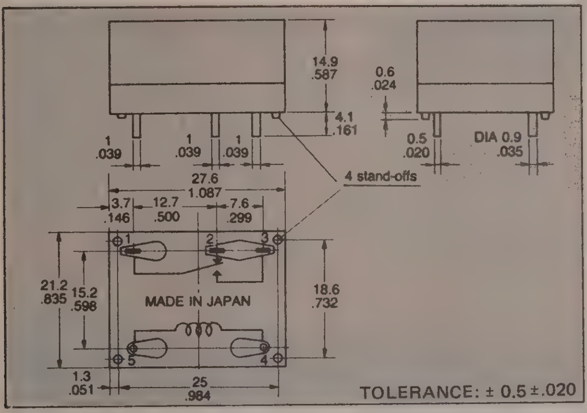
Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrangement	Rating (A)
JB1F— DC 5V	5VDC	52	480	1C	8
DC 6V	6	75	480		
DC12V	12	300	480		
DC24V	24	1,200	480		
DC48V	48	4,100	560		

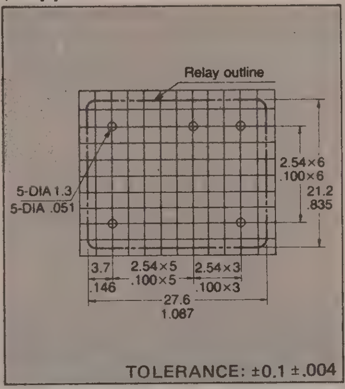
Note: Standard packing → Carton: 20 pcs./Case: 200 pcs.

Dimensions

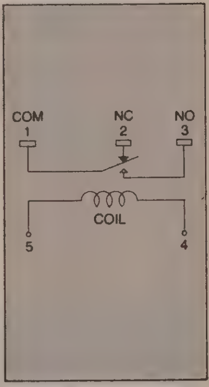
mm inch


14.9
.587
0.6
.024
4.1
.161
1
.039
1
.039
1
.039
0.5
.020
DIA 0.9
.035
4 stand-offs
27.6
1.087
3.7
.146
12.7
.500
7.6
.299
1
2
3
21.2
.835
15.2
.598
MADE IN JAPAN
18.6
.732
5
4
1.3
.051
25
.984
TOLERANCE: ± 0.5 ±.020

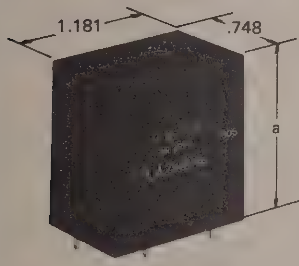
PC board pattern (Copper side view)


Relay outline
2.54×6
.100×6
21.2
.835
5-DIA 1.3
5-DIA .051
3.7
.146
2.54×5
.100×5
2.54×3
.100×3
27.6
1.087
TOLERANCE: ±0.1 ±.004

Schematic (Bottom view)


COM
1
NC
2
NO
3
COIL
5
4

Compact Power Relays JC-RELAYS



	a
PC board type	1.181
Top mount type	1.201
Plug-in type	1.181

- High inrush current capacity.
  1a : 111A inrush (TV-5), 10A steady
  2a : 71A inrush (TV-3), 5A steady
- High dielectric withstanding for transient protection.
  JC can withstand 10,000V surge in 1 x 40 μsec. between coil and contact
- TV-rated types available

Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrangement	Rating (A)
JC1a— DC 6V	6VDC	40	900	1a	10
(JC1a–S*) 12V	12	160			
(JC1a–TM*) 24V	24	640			
JC2a— DC 6V	6VDC	36	1,000	2a	5
(JC2a–S*) 12V	12	144			
(JC2a–TM*) 24V	24	576			
JC1a1b— DC 6V	6VDC	36	1,000	1a1b	5
(JC1a1b–S*) 12V	12	144			
(JC1a1b–TM*) 24V	24	576			

Notes:
1. S* : Denotes Plug-in terminal types.
2. TM*: Denotes Top mounting types.
3. Sockets for plug-in types also available
4. Upgraded rating types available as JC-F types.
   15A 250VAC 1 HP 125VAC (JC1aF)
   10A 250VAC 1/3 HP 125VAC (JC2aF)
   5A 250VAC 1/3 HP 125VAC (JC1a1bF)
5. Standard packing → Carton: 50 pcs./Case: 200 pcs.

JC Sockets

JC1-SS	PC terminal
JC2-SS	PC terminal
JC1-PS	Solder terminal
JC2-PS	Solder terminal

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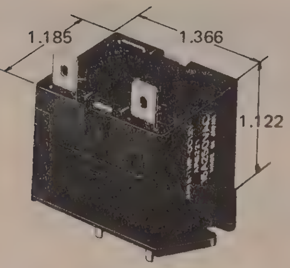
1 Horse Power Compact Power Relays

JA-RELAYS


1.185
1.366
1.122

- High switching capacity — 55A inrush, 15A steady state inductive load
- Particularly suitable for air conditioners, dish waters, copiers and other consumer and office equipment
- Two types available
  "TM" type for direct chassis mounting
  "TMP" types for PCB mounting
- TV-rated types available

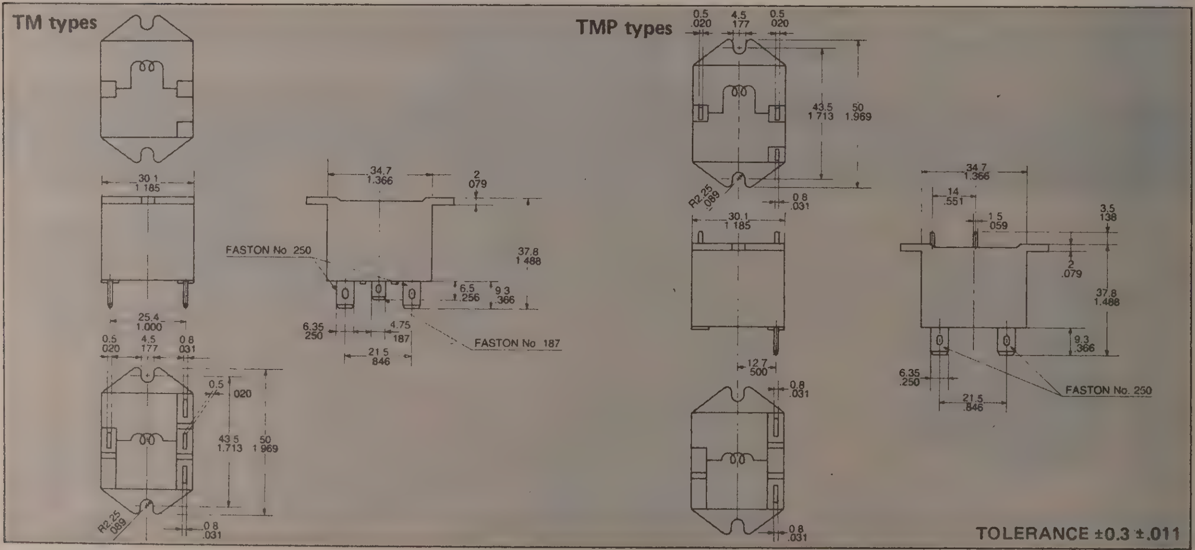
Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JA1a–TM– DC 6V DC12V DC24V	6VDC 12 24	30 120 480	1.2W 1.2 1.2	1a	1 HP
JA1a–TM– AC24V AC115V AC240V	24VAC 115 240	– – –	*1.4VA 1.4 1.4	1a	1 HP
JA1a–TMP– DC 6V DC12V DC24V	6VDC 12 24	30 120 480	1.2W 1.2 1.2	1a	1 HP
JA1a–TMP– AC24V AC115V AC240V	24VAC 115 240	– – –	1.4VA 1.4 1.4	1a	1 HP

Notes: 1. *1.4VA is nominal operating power at 50Hz.
In case of 60Hz, nominal operating power is 1.3VA.
2. JA1b (1 Form B) and JA1C (1 Form C) versions are available.
3. Terminals
"TM" type : .187" quick-connect terminals for coil and .250" for contacts.
"TMP" type : PC board terminals for coils nd .250" quick connect terminals for contacts.
4. Upgraded rating types available as JA-P types.
(25A 250VAC 1HP 125, 250VAC)
5. Standard packing → Carton: 20 pcs./Case: 200 pcs.

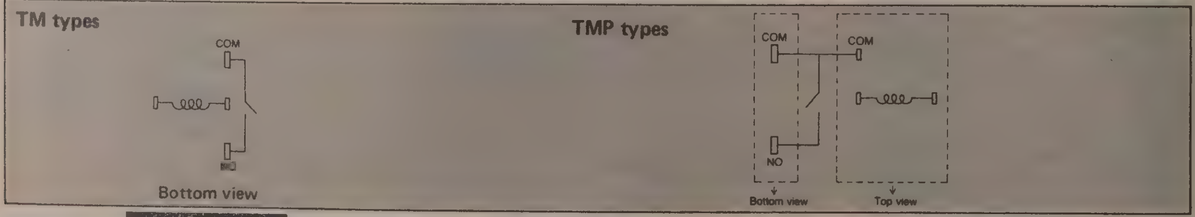
Dimensions

mm inch


TM types
TMP types
30.1 1.185
34.7 1.366
2 .079
FASTON No. 250
37.8 1.488
6.5 .256
9.3 .366
6.35 .250
4.75 .187
21.5 .846
FASTON No. 187
25.4 1.000
0.5 .020
4.5 .177
0.8 .031
43.5 1.713
50 1.969
R2.25 .089
14 .551
1.5 .059
3.5 .138
12.7 .500
FASTON No. 250

TOLERANCE ±0.3 ±.011

Schematic


TM types
COM
TMP types
COM
COM
NO
Bottom view
Bottom view
Top view

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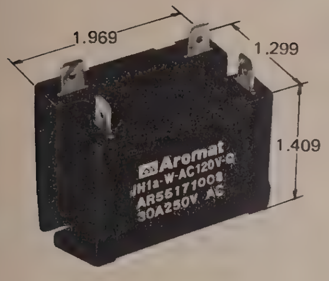
Power Relays with Space Saving Design

JH-RELAYS


1.969
1.299
1.409
Aromat
JH1a-W-AC120V-Q
AR55171008
30A250V AC

- Many safety-oriented characteristics incorporated.
- High dielectric strength — 10,000V surge in µsec.
- High inrush resistance —
  1X : 117A (TV-8 equivalence)
  2X : 91A (TV-6 equivalence)

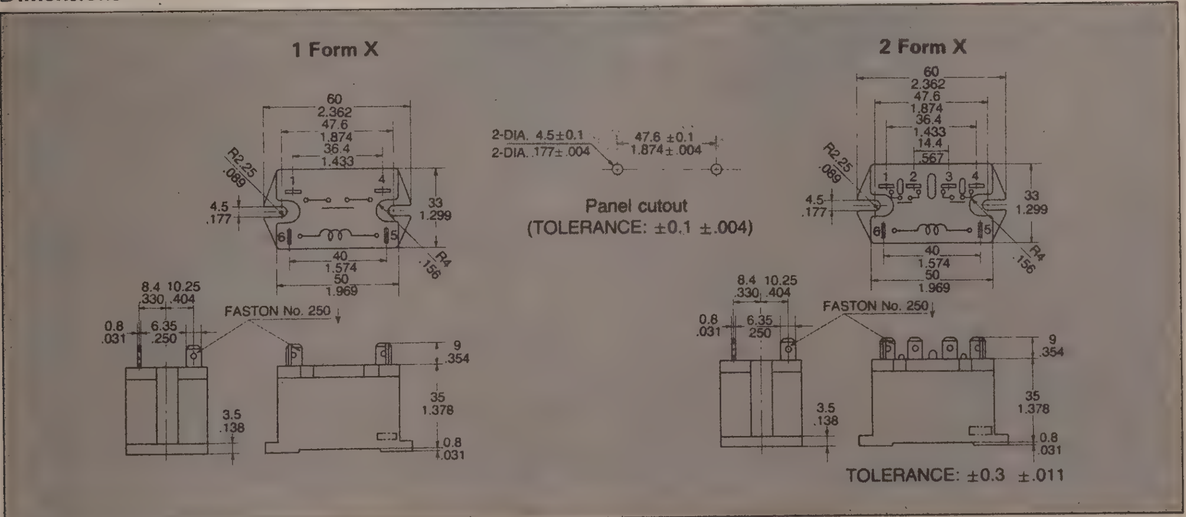
Types and Data

Type	Coils			Contacts	
	Voltage	Res. (Ω)	Nom. Power (mW)	Arrange-ment	Rating (A)
JH1a–W– DC 6V-Q	6VDC	18.7	1.9 W	1X	30
DC12V-Q	12	75			
DC24V-Q	24	300			
DC110V-Q	110	6,300			
JH1a–W– AC 6V-Q	6	–	3.2 VA	1X	30
AC12V-Q	12	–			
AC24V-Q	24	–			
AC120V-Q	120	–			
JH2a–W– DC 6V-Q	6VDC	18.7	1.9 W	2X	20
DC12V-Q	12	75			
DC24V-Q	24	300			
DC110V-Q	110	6,300			
JH2a–W– AC 6V-Q	6VAC	–	3.2 VA	2X	20
AC12V-Q	12	–			
AC24V-Q	24	–			
AC120V-Q	120	–			

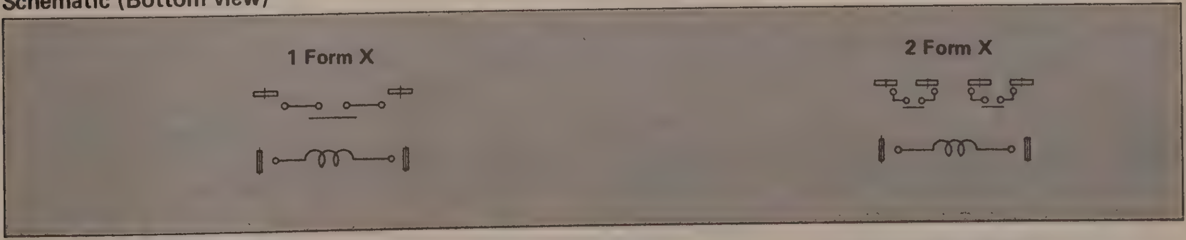
Note: Standard packing→Carton: 20 pcs./Case: 100 pcs.

Dimensions

mm inch


1 Form X
60
2.362
47.6
1.874
36.4
1.433
R2.25
.089
4.5
.177
33
1.299
40
1.574
50
1.969
R4
.156
8.4 10.25
.330 .404
0.8
.031
6.35
.250
FASTON No. 250
9
.354
35
1.378
3.5
.138
0.8
.031
2-DIA. 4.5±0.1
2-DIA. .177±.004
47.6 ±0.1
1.874±.004
Panel cutout
(TOLERANCE: ±0.1 ±.004)
2 Form X
60
2.362
47.6
1.874
36.4
1.433
14.4
.567
R2.25
.089
4.5
.177
33
1.299
40
1.574
50
1.969
R4
.156
8.4 10.25
.330 .404
0.8
.031
6.35
.250
FASTON No. 250
9
.354
35
1.378
3.5
.138
0.8
.031
TOLERANCE: ±0.3 ±.011

Schematic (Bottom view)


1 Form X
2 Form X

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Whether it's plug-in relays (30 amp; 6, 12 and 24 VDC) or PCBs (15 or 30 amp), let's talk.

Whether your main concern is quality (automated production keeps Mini-Giant® Relays quality consistent) or price (we'll match any of our competitors), let's talk.

Whether delivery is needed in 24 days or 24 hours, let's talk.

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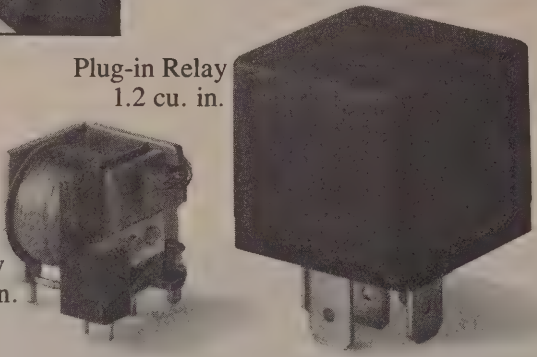
Dept. O/SHE
2800 So. 25th Avenue
Broadview, Ill. 60153



Plug-in Relay
1.2 cu. in.

PCB Relay
0.56 cu. in.

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Carter, McCormic & Peirce, Inc.
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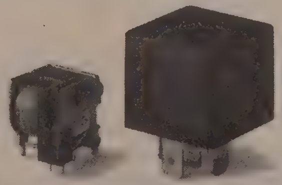
Bosch Mini-Giant® Relays

Technical Specifications

	LINE NO.	PART NUMBER	TYPE	VOLTAGE	CURRENT SWITCHING MAKE/BREAK CONTACT		SWITCHING CYCLE LIFE		COIL	
					RESISTIVE	LAMP, MOTOR LOAD	RESISTIVE	LAMP, MOTOR INDUCTIVE	RESISTANCE	OPERATING CURRENT
PLUG IN METAL CAP	1	0 332 014 101	SPST Flasher	12V		100W		5,000,000[1]	85±5 Ω	140mA
	2	0 332 014 107	SPST Flasher/W.B.	12V		100W		5,000,000	85±5 Ω	140mA
	3	0 332 014 113	SPST	12V	30/A	24/A	250,000	100,000	85±5 Ω	140mA
	4	0 332 014 125	SPST with Bracket	12V	30/A	24/A	250,000	100,000	85±5 Ω	140mA
	5	0 332 014 213	SPST	24V	20/A	16/A	250,000	100,000	305±15Ω	80mA
	6	0 332 014 203	SPST with Bracket	24V	20/A	16/A	250,000	100,000	305±15Ω	80mA
	7	0 332 015 001	SPST Dual Make Cont.	12V	2x15/A	2x55/W	100,000	50,000	63±3 Ω	200mA
	8	0 332 015 002	SPST Dual Make Cont.	24V	2x10/A	2x70/W	100,000	50,000	210±12Ω	120mA
	9	0 332 015 006	SPST Dual Make Cont. w/o Bracket	12V	2x15/A	2x55/W	100,000	50,000	63±3 Ω	200mA
	10	0 332 204 001	SPDT with Bracket	6V	30/20A	24/16A	250,000	100,000	22±2 Ω	300mA
	11	0 332 204 101	SPDT	12V	30/20A	24/16A	250,000	100,000	85±5 Ω	140mA
	12	0 332 204 125	SPDT with Bracket	12V	30/20A	24/16A	250,000	100,000	85±5 Ω	140mA
	13	0 332 204 201	SPDT	24V	20/10A	16/8A	250,000	100,000	305±15Ω	80mA
	14	0 332 204 203	SPDT with Bracket	24V	20/10A	16/8A	250,000	100,000	305±15Ω	80mA
CAP	15	0 332 014 150	SPST with Bracket	12V	30A	24/A	100,000	50,000	85±5 Ω	140mA
	16	0 332 014 151	SPST	12V	30A	24/A	100,000	50,000	85±5 Ω	140mA
	17	0 332 204 150	SPDT with Bracket	12V	30/20A	24/16A	100,000	50,000	85±5 Ω	140mA
	18	0 332 204 151	SPDT	12V	30/20A	24/16A	100,000	50,000	85±5 Ω	140mA
	19	0 332 016 102	SPST	12V	15/A	12/A	250,000	100,000	85±5 Ω	140mA
	20	0 332 206 001	SPDT Emergency light	6V	15/10A	37/10A	250,000	6,000	32±4 Ω	200mA
	21	0 332 206 101	SPDT	12V	15/10A	12/8A	250,000	100,000	85±5 Ω	140mA
	22	0 332 206 102	SPDT High Resistance	12V	8/4A	6/3A	250,000	100,000	200±10Ω	60mA
	23	0 332 206 105	SPDT Flasher	12V		100W		5,000,000[1]	85±5 Ω	140mA
	24	0 332 206 106	SPDT High Current	12V	30/10A	24/8A	50,000	50,000	85±10Ω	140mA
	25	0 332 206 201	SPDT	24V	10/7A	8/5A	250,000	100,000	305±15Ω	80mA



BOSCH

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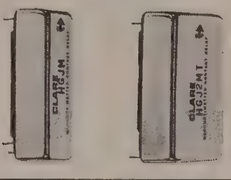
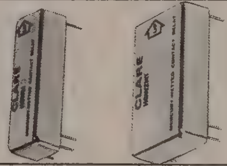
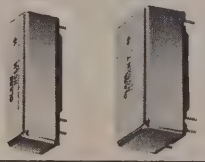
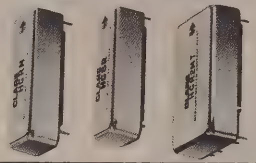
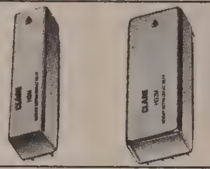
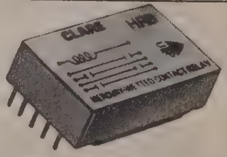
CLARE Mercury-Wetted Contact Relays

GENERA
INSTRUMEN

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
HGJM **HGJ2MT** 	1.400/1.200 x .100 staggered	1C 2C (Break-Before-Make)	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Highest speed mercury-wetted con tact relay. Life at 2A, 100VA rate load: 20 billion operations with con tact protection. Low noise, high rep etition rate. Stable at 200 Hz.
HGWM **HGW2MT** 	1.20 x .100	1C 2C	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Compact package mercury-wette relay. Life at rated load: 20 billio operations. Same characteristic as HGJM
HGSM **HGS2MT** 	1.800/1.500 x .200 staggered	1C 1D 2C 2D	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Sensitive mercury-wetted relay Life at 2A rated load: 20 billion op erations with contact protection 120 Hz repetition rate.
HGRM **HGR2MT** **HGSR** 	1.400/1.200 x .100 staggered	1C 1D 2C 2D	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Small mercury-wetted relay. Life a rated load: 20 billion operation with contact protection. Same con tact characteristics of HGSM.
HGM **HG2M** 	3.000/2.400 x .200 staggered	1D 2D (Make-Before-Break)	12 Vdc 24 Vdc 48 Vdc	High current (5.0A, 250VA) mer cury-wetted module. Life at rate load: 20 billion operations with con tact protection. 80 Hz maximun repetition rate.
HG **HGP** **HG2A** **HG3A** **HG4A**	8, 11 and 14 Pin Plugs	1D 2D 3D 4D	As Required	Heavy duty (5.0A, 250VA) mercury wetted plug-in relays. Life at rate load: 20 billion operations with con tact protection.
HGS	8 Pin Octal Plug	1C 1D	As Required	Sensitive mercury-wetted plug-i relay. Life at rated load: 20 billio operations with contact protection 2A, 100VA contact rating.
851	1.300 x .100	1A 2A 4A (Normally Open)	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted reed, epox molded. End lead construction. Lif at rated load: 1 billion operations .5A, 50VA contact rating.
HRB 	1.00 x .150	1A thru 5A	5 Vdc 12 Vdc 24 Vdc	Mercury-wetted reed, metal cove Standard grid spacing. Life at rate load: 1 billion operations. .5A 50VA contact rating.
HRM	.800 x .150	1A	5 Vdc 12 Vdc 24 Vdc	Subminiature form A module fo PCB mounting. Life at rated load: 1 billion operations with contact pro-tection. .5A, 50VA contact rating.

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CLARE Mercury-Wetted Contact Relays

GENERAL INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
MSS2	DIP, .3 x .10	1A	5 Vdc 12 Vdc 24 Vdc	Mercury wetted contact relay that can be mounted in any position. Epoxy molded construction, dual-in-line package. Life at rated load: 100 million operations with proper contact protection.
CUP (5)	Staggered	1A–5A 1B 2B	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Mercury wetted contact relay. Staggered pin-out. Life at rated load: 100 million with proper contact protection. 2A, 30VA contact rating.
CUP (6)	Staggered	1A–5A 1B 2B	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Mercury wetted contact relay that can be mounted in any position. Fully sealed construction, staggered pin-out. Non-conductive plastic cover with internal magnetic shield. Life at rated load: 100 million operations with proper contact protection.
MMRB	1 x .1, 1 x .15	1A–6A	5 Vdc 12 Vdc 24 Vdc	Mercury wetted contact relay that can be mounted in any position. Electromagnetic shielding standard on a 1 x .10 inch in-line pin-out. Life at rated load: 100 million operations with proper contact protection.
MHC	1 x .10	1C 2C	5 Vdc 12 Vdc 24 Vdc 48 Vdc	Miniature mercury Form C relay. Fully sealed construction, 1 x .10 inch in-line pin-out. Life at rated load: 1 billion operations. 1A, 50VA contact rating.

CLARE CIRCUIT PROTECTION

Surge Arrester Selection Guide

PRODUCT	VOLTAGE RATINGS	APPROXIMATE SIZE AND MOUNTING METHOD	PHYSICAL CONSTRUCTION	SPECIAL FEATURES
Comgap (CG)	75V–1000VDC	.265" L x .380" Dia. Solder Leads .892" L P/C Mtg. Mtg. Clips for Units w/o Leads	Ceramic/Metal	Small Size Rugged Ceramic Construction Low Capacitance < 1 5 pF High Peak Current Capability > 10 kA
Uni-Imp® (UBD, UGT, UBT)	550V–20kVDC	2.20" L x .560" Dia. Solder Lugs	Glass/Metal	Ultra Fast Protection No Overshoot (DC to 200kV/μS) Life Thousands of Operations
Spark Gaps (SB & SG)	400V–40kVDC	3.562" L x 1.202" Dia. Solder Lugs Ferruled Ends for Clip Mtg.	Glass/Metal	Sub-Microsecond Responsive Time Electrical Energy Transfer DC Overvoltage Protection
Triggered Spark Gaps (TA & TB)	1.0kV–2kVDC	3/4" H x 21/22" Dia. Solder Lugs 2.10" H x 2.82" Dia. Stud Screw Mtg.	Ceramic/Metal	Command Energy Switching DC Overvoltage Protection Rugged Construction
ESP1	Plasma surge arresters in a dual-in-line, automatically insertable package. Epoxy molded construction. Available in voltages from 90 to 470 volts. Printed circuit board mountable.			
ESP2	Dual-in-line signal line protector that combines the high current capability of the surge arrester with the fast operating speed and low voltage capability of the "superzorb." Available in voltage 5 to 150 volts. Epoxy molded construction. Printed circuit board mountable.			

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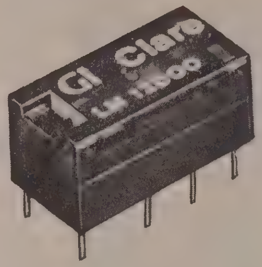
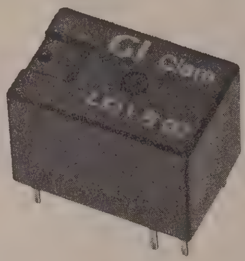
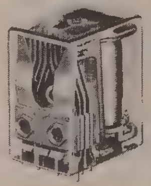
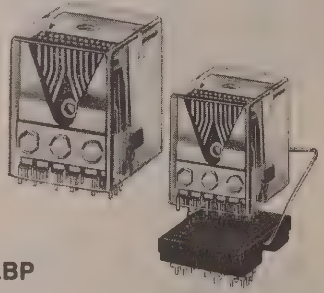
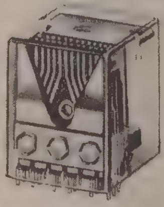
CLARE Electromechanical Relays

GENERAL INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
 **LM**	Dual-in-line Package (DIP)	1C 2C 1C Latch 2C Latch	3 Vdc 5 Vdc 6 Vdc 12 Vdc 24 Vdc 48 Vdc	Miniature dual-in-line package. Epoxy sealed. Bifurcated contacts for more reliable switching 1 and 2 coil latching versions available. Life at low to signal level loads: 10 million operations.
 **LX**	Dual-in-line Package (DIP)	1 Form C	3 Vdc 5 Vdc 6 Vdc 12 Vdc 24 Vdc	Subminiature "sugar cube" relay. Epoxy sealed. Contact rating: 1 Amp. Life at full rated load: 100,000 operations.
 **LA**	.100 in-Line	4 Form C	6 Vdc 12 Vdc 24 Vdc 30 Vdc 48 Vdc	Low-cost miniature relays offer high switching capacity and versatility for their size. Bifurcated contacts switch from low level to 2 ampere full rated loads. Life at rated load: 100 thousand operations.
 **LB, LBP**	.100 in-Line	6 Form C	6 Vdc 12 Vdc 15 Vdc 18 Vdc 24 Vdc 30 Vdc 36 Vdc 48 Vdc	Miniature relays offer high switching capacity and versatility at low cost. Bifurcated contacts switch from low level to 2 ampere full rated loads. LB series are designed for direct plug into socket mounting. Life at rated load: 100 thousand operations.
 **LC**	.10 in-Line	12A 6A6C 6B6C 6A6D 6B6D 6A4C2D	As Required	Low-cost relay offering the highest switching capacity—to 12 poles. Bifurcated contacts switch from low level to 2 Amps. Versatility allows combinations of contact forms A, B, C, and D. Life at low to signal loads: 10 million operations.

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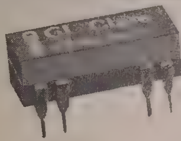
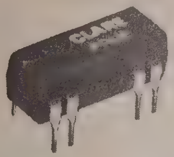
CLARE Dry Reed Relays

GENERAL
INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
 **DYAD PRMA**	.300 x .100 Dual-in-line Package (DIP)	Form A (1 & 2) Form B (1 only)	5 Vdc 12 Vdc 24Vdc	The new bifurcated DYAD® series yields improvements in speed and contact life reliability. Life at signal load: 250 million operations.
 PRMA	.300 x .100 Dual-in-line Package (DIP)	Form A (1 & 2) Form B (1 only) Form C (1 only)	5 Vdc 12Vdc 24Vcd	Molded construction. Diode and electrostatic shield options. Life at rated load: 5 million operations.
 **PRME**	.300 x .100 Dual-in-line Package (DIP)	Form A (1 only)	5 Vdc 12 Vdc 24 Vdc	Low profile molded construction. Available with diode and/or shield. Life at rated load: 5 million operations.
 MRB/922	1.00 x .100 1.00 x .150	Form A (1 to 6) Form B (1 & 2) Form A/B (1 & 2) Form C (1 to 4) Form AL (1 & 2)	5 Vdc 6 Vdc 12 Vdc 24 Vdc	Industry standard in "microreed" size reed relays. Metal cover and versatile design. Life at rated load: 10 million operations.
 MRBT	1.00 x 0.10	Form A (2 & 3)	5 Vdc 12 Vdc 15 Vdc	Microreed relay designed to minimize thermal voltage errors in low-level circuits. Life at rated load: 10 million operations.
 951	1.00 x .100	Form A (1, 2 & 4) 3-pole and 5-pole available	5 Vdc 12 Vdc 24 Vdc	Epoxy molded equivalent of MRB metal covered relay. Rugged lead frame construction. Life at rated load: 5 million operations.
 PRB	.700 x .100	Form A (1 & 2) Form B (1 only)	5 Vdc 6 Vdc 12 Vdc 24 Vdc	Magnetic shielding option with a ferrous cover in a high density package design. Life at rated load: 5 million operations.
 CRTN	2.50 x .218	Form A (1 to 6) 7 to 12 poles available Form B (1 & 2) Form A/B (1 & 2) Form AL (1 & 2)	6 Vdc 12 Vdc 24 Vdc 48 Vdc	Industry standard in large size reed relays. Life at rated load: 20 million operations.

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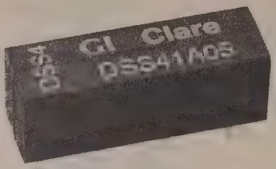
CLARE Dry Reed Relays

GENERAL
INSTRUMENT

RELAY TYPE	TERMINAL TYPE/GRID	CONTACT FORMS AVAILABLE	NOMINAL VOLTAGE	DESCRIPTION
 DSS3	.7 x .10	1A	5 Vdc 12 Vdc 24 Vdc	Low profile, fully sealed with an insulated metal cover for electromagnetic shielding. RF shield and electrostatic shield options. Low dielectric absorption. Life at low to signal loads: 250 million operations minimum.
 **DSS4**	SIP, .2 x .2 x .2	1A	5 Vdc 12 Vdc 15 Vdc 24 Vdc	Molded, single in-line. Diode option. High isolation input to output. Life at low to signal loads: 250 million operations.
No Photo. Available **CUP (1), CUP (V)**	Staggered	1A–5A 1B 2B 1AB 1A1B 2AB 1A Latch 2A Latch	5 Vdc 6 Vdc 12 Vdc 24 Vdc 48 Vdc	Open, plastic and metal cover types available. Fully sealed versions available upon request. Staggered pin-out. Life at low to signal loads: 100 million operations. CUP (V) version offers 2000 VRMS Breakdown contact to coil and has British standards approvals.
No Photo. Available **MRBS**	1 x .10	1A	4 Vdc 5 Vdc 12 Vdc	Can be driven directly from CMOS circuits. A line loop version which allows a permanent and direct loop-control without the need of being disconnected from the circuit is also available. Life at low to signal loads: 20 million operations.

Sales Office Listing

United States

Clare Division
General Instrument Corporation
36 Commerce Way
Woburn, MA 01801
Tel. (617) 938-0666

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General Instrument Corporation
2355 S. Arlington Heights Rd.
Arlington Heights, IL 60005
Tel. (312) 981-0630

Clare Division
General Instrument Corporation
3322 S. Memorial Pkwy.
Huntsville, AL 35801
Tel. (205) 883-9130

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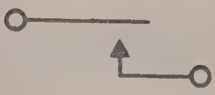
MINIGLOSSARY
RELAY CONTACT FORMS

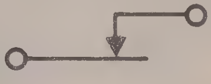
A

Make
SPST-NO



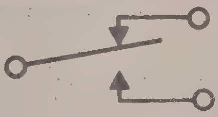
B

Break
SPST-NC



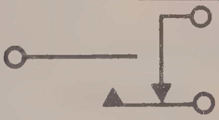
C

Break, Make
(Transfer)
SPDT



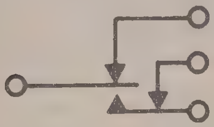
D

Make, Break
(Continuity
Transfer)



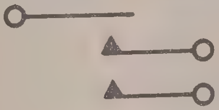
E

Break,
Make,
Break



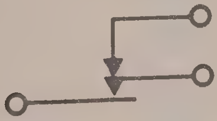
F

Make,
Make



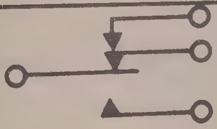
G

Break,
Make



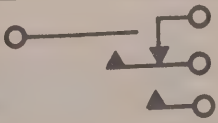
H

Break,
Break,
Make



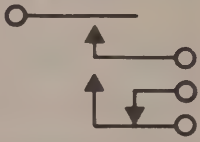
I

Make,
Break,
Make



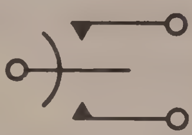
J

Make,
Make,
Break



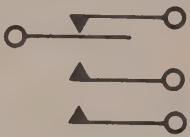
K

Center off
SPDT



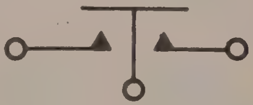
L

Break,
Make,
Make



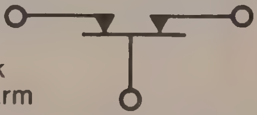
U

Double
make
Contact
on arm



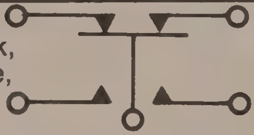
V

Double break
Contact on arm



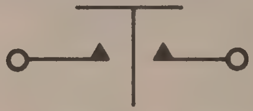
W

Double break,
Double make,
Contact
on arm



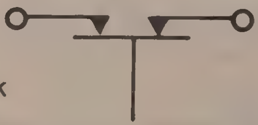
X

Double
make



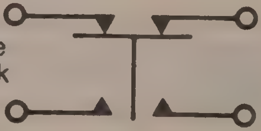
Y

Double break



Z

Double make
Double break
SPDT-DB



HIGH PERFORMANCE RELAYS
from
COMMUNICATIONS INSTRUMENTS, INC.

MIGHTY MICRO MM

THE SMALLEST MICRO-MINIATURE HIGH RELIABILITY INDUSTRIAL GRADE RELAY

Special Features

- Two Form C bifurcated contacts gold clad silver-palladium.
- Rated for low level to 2.0 amp switching.
- Requires only .155 square inch circuit board space, thus permitting a mounting density of more than six relays per square inch.
- Long Life – Mechanical life expectancy more than 100 million operations.
- High shock/high vibration resistance.
- Footprint compatible with .1 inch (2.54 mm) grid arrangement.
- Total volume less than a cubic centimeter.
- Fast operate and release time.
- Low contact resistance.

Electrical Characteristics

Contact Arrangement
CII Type MM relays are suitable for RF switching. The choice of contact materials and careful design assures consistently low contact resistance of 50 milliohms max.

Enclosure
All Communications Instruments type MM relays are epoxy sealed thus permitting automatic printed circuit board processing.

Flammability Rating
All plastic materials used in the construction of Communications Instruments type MM conform to UL 94-VO.

Contact Rating & Life Expectancy

Communications Instruments type MM relay is designed for long life, high reliability switching from low level (Microwatts) up to 2.0 amps. Mechanical life expectancy is 100 million operations.

Maximum voltage: 120 VAC, 150 VDC.
Maximum power switched: 60 watts or 120 VA.

Environmental Characteristics

Ambient Temperature Rating
−35° to +70°C.

Vibration Resistance
Functional:
MML 20Gs 10 to 2000 Hz
MMS 15Gs 10 to 2000 Hz
Destructive: 50G, both types

Shock Resistance
Functional:
MML 100G 6 mS Half Sine
MMS 50G 6 mS Half Sine
Destructive: 150G, both types

Operate & Release Time
When tested at nominal rated voltage, the maximum operate time is 3 milliseconds and the maximum release time is 1.5 milliseconds.

Insulation Resistance
Insulation resistance at 500 VDC exceeds 1000 megohms.

Dielectric Withstanding Voltage
All mutually insulated points – 500 VAC – 1 minute.

Contact Bounce
Typical contact bounce characteristics are 0.5 mS on operate and 3.0 mS on release.

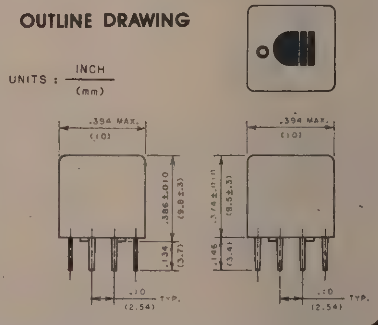
Standard Sensitivity, 2 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%	Pickup Voltage (Max)	Dropout Voltage (Min)
MML203	3	20	2.2	0.3
MML205	5	55	3.7	0.5
MML206	6	80	4.2	0.6
MML209	9	180	6.7	0.9
MML212	12	320	9.0	1.2
MML224	24	1280	18.0	2.4

High Sensitivity, 2 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%	Pickup Voltage (Max)	Dropout Voltage (Min)
MMS203	3	45	2.2	0.3
MMS205	5	125	3.7	0.5
MMS206	6	180	4.2	0.6
MMS209	9	405	6.7	0.9
MMS212	12	720	9.0	1.2
MMS224	24	1920	18.0	2.4

OUTLINE DRAWING



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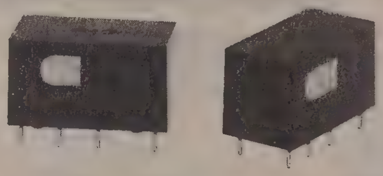
HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.

MINIATURE SEALED DUAL IN-LINE RELAY

MD



Special Features

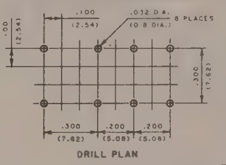
- Two Form C bifurcated contacts – gold clad silver-palladium.
- Standard and high sensitivity models.
- Completely sealed or with optional dust cover.
- Contact rating from low level to 2.0 amps switching – 3.0 amps carry.
- Super clean construction – inert gas filled.
- Designed for low contact resistance and contact resistance stability during life.
- UL recognized component.
- Maximum voltage: 125 VAC, 150 VDC. Maximum power switched: 60 watts or 120 VA.
- Surge resistance – Type MD relay conforms to FCC Part 68-1500 V Peak.

Part Number	Coil Resistance Ohms ±10%
MDL05H	45
MDL06H	66
MDL09H	140
MDL12H	280
MDL24H	1070
MDL48H	4000

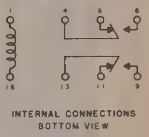
High Sensitivity, 2 Form C

Part Number	Coil Resistance Ohms ±10%
MDS05H	164
MDS06H	240
MDS09H	540
MDS12H	960
MDS24H	2880
MDS48H	7680

PC BOARD PATTERN

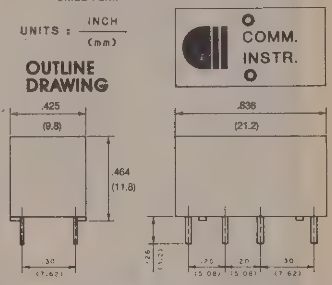

.100
(2.54)
.032 D.A.
(0.8 DIA.)
8 PLACES
.100 (2.54)
.300 (7.62)
.300 (7.62)
.200 (5.08)
.200 (5.08)
DRILL PLAN

SCHEMATIC


INTERNAL CONNECTIONS
BOTTOM VIEW

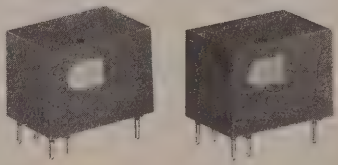
UNITS : INCH / (mm)

OUTLINE DRAWING


COMM.
INSTR.
.425
(9.8)
.838
(21.2)
.464
(11.8)
.30
(7.62)
.126
(3.2)
.20
(5.08)
.20
(5.08)
.30
(7.62)

SEALED SINGLE POLE DUAL IN-LINE RELAY

MS



Special Features

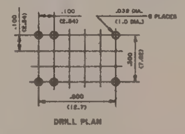
- High reliability switching at low cost.
- Standard and high sensitivity models.
- Gold clad silver-palladium contacts.
- Low contact resistance.
- High shock and high vibration resistance.
- Super clean construction – inert gas filled.
- Low level to 2.0 amps contact switching – 3.0 amps carry.
- UL recognized component.
- Maximum voltage: 120 VAC, 100 VDC. Maximum power switched: 60 watts or 120 VA.

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%
MSL03	3	20
MSL05	5	56
MSL06	6	80
MSL09	9	180
MSL12	12	320
MSL24	24	1280
MSL48	48	5120

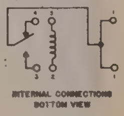
High Sensitivity, 1 Form C

Part Number	Nominal Voltage (DC)	Coil Resistance Ohms ±10%
MSS03	3	45
MSS05	5	120
MSS06	6	180
MSS09	9	400
MSS12	12	700
MSS24	24	2800

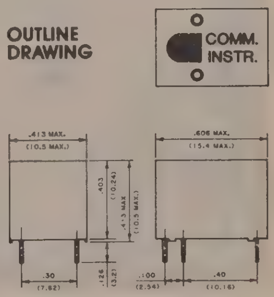
PC BOARD PATTERN



SCHEMATIC


INTERNAL CONNECTIONS
BOTTOM VIEW

OUTLINE DRAWING


COMM.
INSTR.
.413 MAX.
(10.5 MAX.)
.606 MAX.
(15.4 MAX.)
.403
(10.24)
.30
(7.62)
.126
(3.2)
.100
(2.54)
.40
(10.16)

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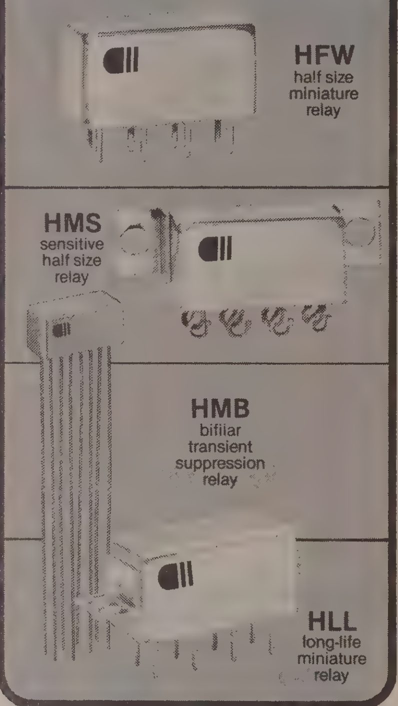
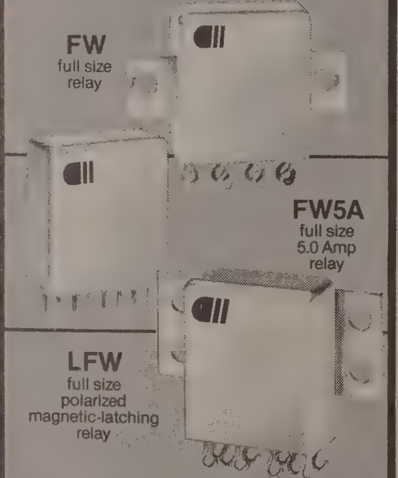
HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.

Half Size Relays


HFW
half size miniature relay
HMS
sensitive half size relay
HMB
bifilar transient suppression relay
HLL
long-life miniature relay

Contact Data	Coil Voltage	Features
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 4.0 Amps	5 to 48.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Sensitive version available • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/6 level L, M & P *(Request Data Sheet HFW-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 2.0 Amps	5 to 36.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Energy-saving 100/125 milliwatt sensitivity • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/44 level L, M & P *(Request Data Sheet HMS-83)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	6 to 32.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Bifilar transient suppression • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-39016/22 level L, M & P *(Request Data Sheet HMB-83)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 2.0 Amps	6 to 26.5 VDC Life: 100 million operations at low level	• Welded, hermetically sealed enclosures • Low contact resistance • Sensitive version available • Excellent RF switching • Ambient temp rating −65°C to +125°C • Shock and vibration resistant *(Request Data Sheet HLL-83)*

Full Size Relays



Note: All relays available in a variety of terminals and mountings.

Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • Sensitive version available • Excellent RF switching • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-5757/10 *(Request Data Sheet FW-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 5.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • 5.0 Amp version of FW • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757 *(Request Data Sheet FW5A-81)*
Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	3.2 to 110 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • One and two coil operation • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/53 *(Request Data Sheet LFW-81)*

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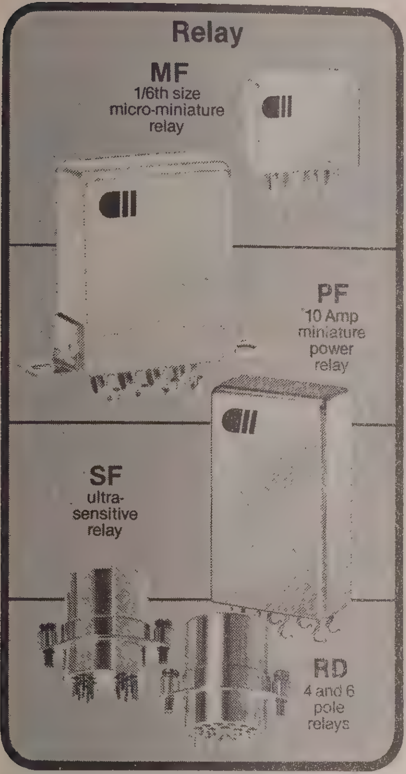
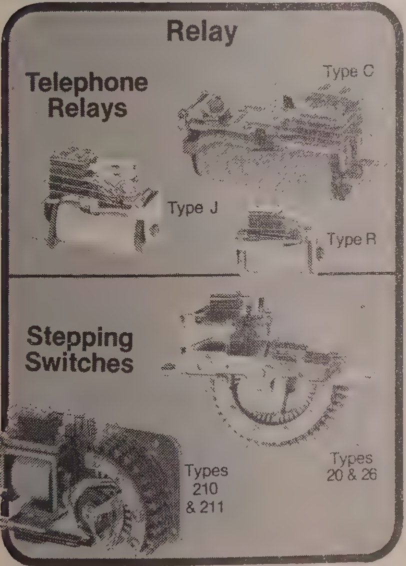
For samples and information
on our products, contact:
DAVE ARROWOOD
Product Manager for Crystal Can Relays

HIGH PERFORMANCE RELAYS from COMMUNICATIONS INSTRUMENTS, INC.



Relay	Contact Data	Coil Voltage	Features
MF 1/6th size micro-miniature relay	Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 1.0 Amp	3.4 to 53.0 VDC	• Hermetically sealed enclosures • Low contact resistance • Total volume only .046 cubic inch • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-39016/34 *(Request Data Sheet MF-81)*
PF 10 Amp miniature power relay	Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 10.0 Amps	6.3 to 110 VDC	• Welded, hermetically sealed enclosures • Very low contact resistance • Package volume .72 cubic inch • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/23 & 28 *(Request Data Sheet PF-83)*
SF ultra-sensitive relay	Contact Arrangements: 1 Form C, 2 Form C, 2 Form B, 2 Form A. Contact rating: low level to 3.0 Amps	1.8 to 48.0 VDC	• Welded, hermetically sealed enclosures • Low contact resistance • 40 milliwatt sensitivity • Excellent RF switching • Ambient temp rating −65°C to +125°C • Designed to MIL-R-5757/13 *(Request Data Sheet SF-81)*
RD 4 and 6 pole relays	Contact Arrangements: 4 Form C 6 Form C Contact rating: low level to 2.0 Amps	18.0 to 36.0 VDC	• Hermetically sealed enclosures • Low contact resistance • Optional all-welded construction • 100 G shock • Ambient temp rating −65°C to +125°C • Qualified to MIL-R-5757/1 & 7 *(Request Data Sheet RD-83)*



Relay			
Telephone Relays	Contact Arrangements: Long frame: up to 8 Form C Med. frame: up to 8 Form C Short frame: up to 4 Form C Contact rating: low level to 10.0 Amps	6 to 250 VDC	• Optional hermetic sealing • Ac or dc operation • Fast operate and fast release • Variety of accessories • Ambient temp rating −55°C to +85°C • Custom designs available *(Request Catalog 502)*
Stepping Switches	Point variations: 10 to 52 point operation Contact rating: 0.1 Amp at 115 VAC or 30 VDC resistive Carry: 3.0 Amps	6 to 110 VDC	• Optional sealing • Insulation resistance $10^9\Omega$ at 500 VDC • Fast operate and release times • Variety of switch mounting accessories • Operating temperature −0°C to +85°C • Custom designed models available *(Request Catalog 601)*

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For samples and information on our products, contact:
DAVE ARROWOOD: Product Manager for Crystal Can Relays
BOB MILLER: Product Manager for Telephone Relays and Stepping Switches

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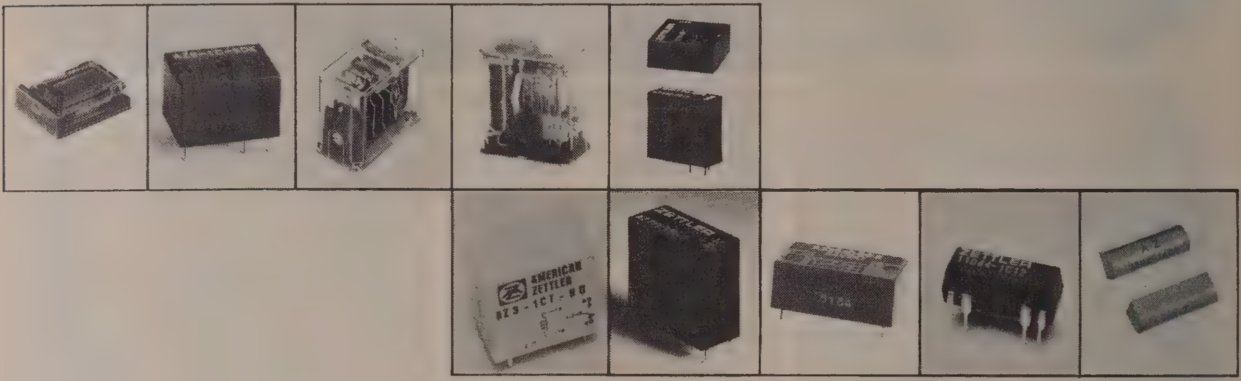

	See Page
Relays, Crystal Can, ½ Crystal Can	**1B**•1524
Relays, Current Sensing	**1B**•1524, **1B**•1525
Relays, General Purpose	**1B**•1520-**1B**•1530
Relays, Plug-in	**1B**•1524
Relays, Power	**1B**•1521, **1B**•1522, **1B**•1524, **1B**•1529, **1B**•1530
Relays, Printed Circuit Mounting	**1B**•1520-**1B**•1530
Relays, Reed	**1B**•1529, **1B**•1530
Relays, Sealed	**1B**•1520-**1B**•1523, **1B**•1527-1530
Relays, Sensitive	**1B**•1523-**1B**•1528

SEE OUR PAGES IN VOLUME 1B (1B•1520 THROUGH 1B•1530)

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REED
RELAYS

Introducing "REEDLAYS"
Solid State Relays Built to Customer Specification

- OPEN STYLES
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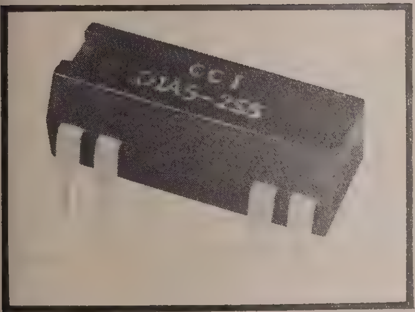
- MOLDED IC COMPATIBLE
- EPOXY OR METAL HOUSINGS
- REED RELAYS TO MIL. SPECS.
- FULLY OR PARTIALLY ENCAPSULATED
- CHOICE OF 5 DIFFERENT FORM A & 4 DIFFERENT FORM C SWITCHES

QUALITY
INTEGRITY
RELIABILITY

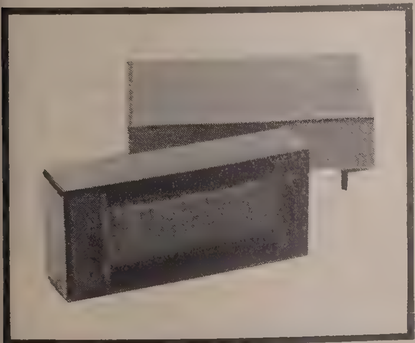
HP (Also 101, 201, 301, & 401 Series)

LOW PROFILE REED RELAY, MECHANICAL & ELECTRICAL REPLACEMENT FOR IBM 766 SERIES PLUG-IN, REPLACE REEDS, NO TOOLS-NO SOLDERING

"D" SERIES



Introducing our "D" series, fully moulded D.I.P. compatible relay. Also formed surface mounting.



"LTE" series—Low Thermal Reed Relays

SPECIAL DESIGNS

In view of the difficulty in offering a product line that is complete enough to cover every application and physical layout, Computer Components, Inc. maintains special engineering and design facilities to provide the project or design engineer with REED RELAYS specifically tailored to his particular requirements.

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COTO
CORPORATION

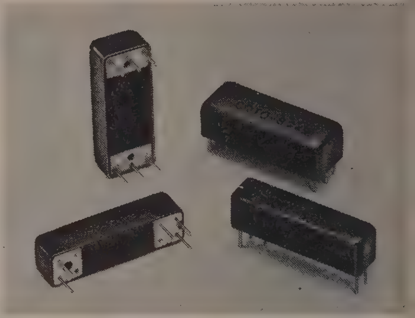
MICROMINIATURE REED RELAYS

SERIES 2200

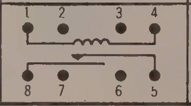
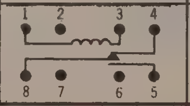
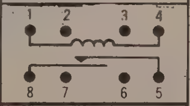
Coto's microminiature 2200 series relays are now available with greater than 10^{12} ohm insulation resistance.

Utilizing a new low moisture absorbant bobbin material, Coto's special cleaning process and screening assures you of the most reliable high impedance relay available. This new microminiature design has been engineered to provide an improved system to lock in the terminal pins (up to 2 lbs. pull test prior to encapsulation).

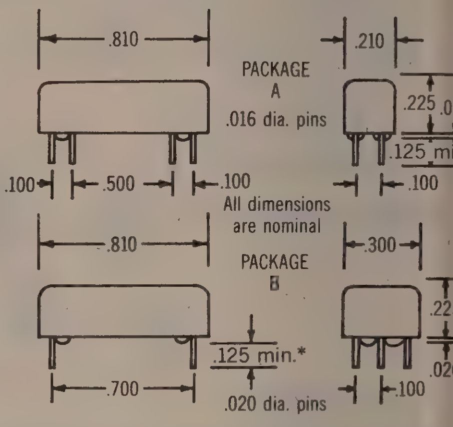
The 2200 series reed relays, long recognized as the smallest high reliability relays in the industry, offer a wide variety of contact forms and coil resistances while occupying only .17 sq. in. of PC board space. Switching speeds of less than 500 micro seconds typical on most models and optional electrostatic or co-axial shielding contribute further to the versatility of the 2200 series.



RELAY SPECIFICATIONS

Model Number & Coil Voltage		2204- 05, 12	2211- 05, 12	2231† 05, 12
Contact Form		1A	1C	1A
Package Size		A	A	A
Available Coil Options		*2, 3, 4	2, 3	2, 3
Available Shield Options		Electrostatic or Co-Axial*	N/A	N/A
Parameter	Test Conditions	VALUES		
Max. Switch Voltage	DC/Peak AC	200	100	200
Max. Switch Current (Amps)	DC/Peak AC Resistive	0.5	0.25	0.5
Max. Carry Current (Amps)		1.0	0.5	1.0
Max. Contact Rating (Watts)	DC Resistive	10	3	10
Life Expectancy (Operations)	At Signal Level	500 x 10^6	100 x 10^6	500 x 10^6
	At Rated Level	5 x 10^6	5 x 10^6	5 x 10^6
Static Cont. (Ohms) Resistance (Initial)	0.050 Volt, 10 mA Contact Load	0.100 Max.	0.150 Max.	0.150 Max.
Dynamic Contact Resistance (Initial) (Ohms)	0.5 Volt, 50 mA Load 100 Hz, 1.5 msec. after coil energized	0.200 Max.	0.200 Max.	0.200 Max.
Insulation Resistance (Ohms)	Between all isolated pins @ 100V, 25 deg C, 40% relative humidity.	10^{10} Min. 10^{12} Optional	10^9 Min. 10^{11} Optional	10^{10} Min. 10^{12} Optional
Open Contact Capacitance (pf)	Shield Floating	.9	1.8	.9
	Shield Guarded	.2	N/A	N/A
Dielectric Strength (Min.) (Volts): Between Contacts / Contacts to Shield	DC/Peak AC Static Conditions	250	200	400
Dielectric Strength (Min.) (Volts): Contacts and Shield to Coil	AC VRMS	1,000	1,000	1,000
Oper. Time (msec) (Including Bounce)	At Nominal Voltage 30 Hz Sq. wave	0.5 Typical	1.0 Typical	0.5 Typical
Release Time (msec)	Zener-Diode Clamp Coil Suppression	0.1 Typical	2.0 Typical	0.1 Typical
Schematics (Bottom View) Not to scale				

Unused pins are omitted.
Pin numbers for reference only.
Black dot on top of relay denotes pin #1.
*On model 2204 pin #7 is the optional electrostatic shield pin, pins #6 and #7 are the optional co-axial shield pins.
†Model 2231 offers a higher contact to contact breakdown voltage especially useful in European applications.


.810
PACKAGE A
.016 dia. pins
.210
.225
.125 mi
.100
.500
.100
.100
All dimensions are nominal
.810
PACKAGE B
.300
.22
.125 min.*
.02
.700
.020 dia. pins
.100

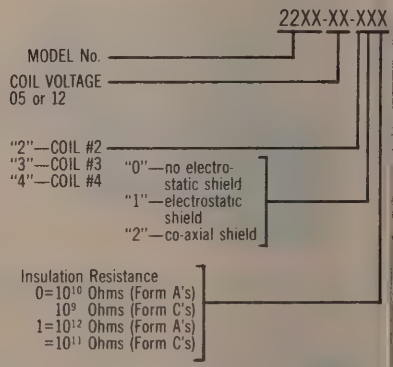
*.105 ±.015 for models #2200-2310 and #2200-2

OPERATING PARAMETERS @ 25°C		
Nominal Volts	05	12
Must Operate Volts	3.75	9.0
Must Release Volts	0.4	1.0
Coil #2 Resistance Ohms*	150	900
Coil #3 Resistance Ohms*	230	1500
Coil #4 Resistance Ohms*	370	—

*Resistance figures are ± 10%

ORDERING INFORMATION

To order a Coto relay, assemble a part number from the data below to describe the desired parameters.


22XX-XX-XXX
MODEL No.
COIL VOLTAGE 05 or 12
"2"—COIL #2
"3"—COIL #3
"4"—COIL #4
"0"—no electrostatic shield
"1"—electrostatic shield
"2"—co-axial shield
Insulation Resistance
0=10¹⁰ Ohms (Form A's)
10⁹ Ohms (Form C's)
1=10¹² Ohms (Form A's)
=10¹¹ Ohms (Form C's)

COTO
CORPORATION

MICROMINIATURE REED RELAYS FOR ATE

SERIES 2200

Relay models 2200-2301, -2302, -2310, 2311 and -2314 are specifically designed to meet the rigorous specifications of the component Automatic Test Equipment industry.

Available from stock, these relays are ideal for use in new OEM designs or by the ATE user for new test fixturing as well as maintenance of existing production fixtures.

Coto's quality workmanship and designed-in reliability have become the standard in the ATE industry.

PACKAGING

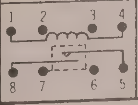
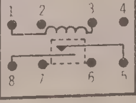
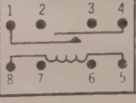
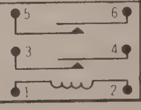
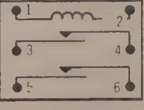
Series 2200 reed relays are fully encapsulated in a magnetically shielding steel shell coated with a bright red, chemically resistant and insulating epoxy finish. A new proprietary potting process provides stress-free encapsulation of both coil and reed switch.

TESTING AND RELIABILITY: Optimizing the 2200 Series Relays' operating parameters are coil windings carefully designed for power conservation.

All reed switch capsules are dry buzzed in a test coil for one million cycles and then tested for dynamic contact resistance. This process eliminates weak, contaminated or damaged reed switches which are subject to early failure. The switches utilize a contact plating which eliminates the low-level contact sticking failure mode.

- Dynamic contact resistance as described above, at the must-operate voltage and 100 Hz.
- Must operate time at 100 Hz.
- Insulation resistance at rated breakdown voltage between each isolated pin to all other pins tied together.
- Coil Resistance.
- See Engineering Bulletins #1 and #2 for further information on Coto testing procedures.

RELAY SPECIFICATIONS

Model Number			2200-2301	2200-2302	2200-2310	2200-2311	2200-2314-05 or -12
Available Coil Options			5 volt 150 ohms	5 volt 150 ohms	5 volt 550 ohms	5 volt 250 ohms	5 volt, 200 ohms — or — 12 volt 800 ohms
Contact Form			1A	1A	1A	2A	2A
Package Size			A	A	A	B	B
Standard Shielding			Electrostatic 5 pin relay	Co-Axial 6 pin relay	N/A	N/A	N/A
Parameter		Test Conditions	VALUES				
Must Operate Volts		Volts DC	3.6	3.6	4.0	4.0	4.0 (5V) 9.0 (12V)
Must Release Volts		Volts DC	0.5	0.5	1.0	1.0	0.4 (5V) 1.0 (12V)
Max. Switch Voltage		DC/Peak AC	150	150	200	200	200
Max. Switch Current (Amps)		DC/Peak AC Resistive	0.5	0.5	0.5	0.5	0.5
Max. Carry Current (Amps)			1.0	1.0	1.0	1.0	1.0
Max. Contact Rating (Watts)		DC Resistive	10	10	10	10	10
Life Expectancy (Operations)		At Signal Level	500 x 10^6	500 x 10^6	500 x 10^6	500 x 10^6	500 x 10^6
		At Rated Level	5 x 10^6	5 x 10^6	5 x 10^6	5 x 10^6	5 x 10^6
Static Cont. (Ohms) Resistance (Initial)		0.050 Volt, 10 mA Contact Load	0.150 Max.	0.150 Max	0.100 Max.	0.100 Max.	0.150 Max.
Dynamic Contact Resistance (Initial) (Ohms)		0.5 Volt, 50 mA Load 100 Hz, 1.5 msec. after coil energized	0.200 Max	0.200 Max.	0.200 Max.	0.200 Max.	0.200 Max.
Insulation Resistance (Ohms)		Between all isolated pins @ 100V, 25 deg C, 40% relative humidity.	10^{11} Min.	10^{11} Min.	10^{10} Min.	10^{10} Min.	10^{10} Min.
Open Contact Capacitance (pf)		Shield Floating	.9	.9	.9	1.0	1.0
		Shield Guarded	.2	.2	N/A	N/A	N/A
Dielectric Strength (Min.) (Volts)	Between Contacts Contacts to Shield	DC/Peak AC Static Conditions	250	250	250	250	250
	Contacts and Shield to Coil	AC VRMS	1,000	1,000	1,000	1,000	1,000
Oper. Time (msec) (Including Bounce)		At Nominal Voltage 30 Hz Sq. wave	0.55 Max	0.55 Max.	0.650 Max.	0.650 Max	1.0 Typical
Release Time (msec)		Zener-Diode Clamp Coil Suppression	0.1 Typical	0.1 Typical	0.020 Nominal	0.020 Nominal	0.10 Typical
Schematics (Bottom View) Not to scale							

Unused pins are omitted.
Pin numbers for reference only.
Black dot on top of relay denotes pin #1.

ENVIRONMENTAL RATINGS

Storage Temperature:
-50°C to +100°C
Operating Temperature:
-20°C to +70°C

Note: (The must-operate and must-release voltages and the coil resistance are specified at 25°C. These values vary by approximately 0.4%/°C as the ambient temperature varies.)

Vibration: 20 G's to 2000hz
Shock: 50 G's

ORDERING INFORMATION

2200-2301 through 2200-2311 are complete part numbers.

For 2200-2314 indicate coil voltage. Example, 2200-2314-05 or 2200-2314-12.

MOUNTING SOCKETS

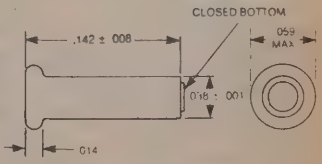
Miniature Spring Sockets suitable for use with 2301/2302 reed relays and the single pole versions of the 2200 series

MATERIAL

Spring: Tin plated Beryllium Copper
Eyelet: Tin Plated Copper

PART NUMBER

0116-0100



NOTE
- FOR .014-.017 DIA PIN
- RECOMMENDED MOUNTING HOLE .040 ± .002

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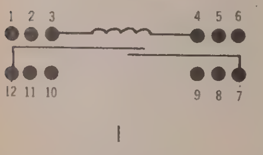
SERIES 2400
MINIATURE REED RELAYS

Model Number			2404		2405		2406		2411		2420		2430		2431	
Features			High Sensitivity		High Power		ATE		High Sensitivity		Mercury Wetted		Telephone Switching		High Voltage	
Contact Form			1A		1A		1A		1C		1A*		1A		1A	
Electrostatic Shield Available			Yes		Yes		Yes		Yes		Yes		No		Yes	
Co-Axial Shield Available			Yes		Yes		No		Yes		Yes		No		Yes	
Parameter	Test Conditions	Units	Values at 25°C Unless Otherwise Stated													
Nominal Coil Voltage		VDC	5	12	5	12	5	12	5	12	5	12	5	12	5	12
Coil Resistance	±10%	Ohms	1000	2000	400	2000	400	600	400	2000	170	1000	400	2000	400	2000
Operate Voltage	Must Operate By	VDC	3.8	9.0	3.8	9.0	3.8	9.0	3.8	9.0	3.8	9.0	3.8	9.0	3.8	9.0
Release Voltage	Must Release By	VDC	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0
Switching Voltage	Max. DC/Peak AC	Volts	200		200		200		150		500		250		500	
Switching Current	Max. DC/Peak AC Resistive	Amps	0.5		1.0		0.5		0.25		1.0		0.5		0.5	
Carry Current	Max. DC/Peak AC	Amps	2.0		2.5		2.0		1.0		2.0		2.5		2.0	
Contact Rating	Max. DC Resistive	Watts	10		50		10		3		50		20		10	
Life** Expectancy	Typical at Low Level	10^6 cyc.	500		100		500		100		1000		500		100	
	Typical at Max. Rated Loads	10^6 cyc.	5		5		5		5		100		5		5	
Static Contact Resistance	0.050 Volts, 10 mA Contact Load (Initial) Max.	Ohms	0.100		0.150		0.100		0.150		0.050		0.150		0.150	
Dynamic Contact Resistance	0.5 Volts, 50 mA Load, 100 Hz., 1.5 ms After Coil is Energized (Initial) Max.	Ohms	0.200		0.200		0.200		0.200		0.100		0.200		0.200	
Insulation Resistance	Between all Isolated Pins @100 V, 40% Rel. Humidity (min.)	Ohms	10^{10}		10^{10}		10^{10}		10^{9}		10^{10}		10^{10}		10^{10}	
			10^{12} Optional		10^{12} Optional		10^{12} Optional		10^{11} Optional		10^{12} Optional		10^{12} Optional		10^{12} Optional	
Open Contact Capacitance	Without shield (typ)	pf	1.0		1.0		1.0		2.5		1.0		1.0		1.0	
	Shield Guarded (typ)	pf	0.2		0.2		0.2		1.5		0.1		0.2		0.2	
Dielectric Strength: Between Contacts / Contacts to Shield	DC/Peak AC Static Conditions (min.)	Volts	350		250		350		200		1000		800		1500	
Dielectric Strength: Contacts and Shield to Coil	(min.)	VRMS	1000		1500		1000		1000		1000		1500		1500	
Operate Time Incl. Bounce	At Nominal Voltage 30 Hz. Sq. Wave (typ.)	msec	0.5		1.0		0.5		1.0		1.5		1.0		1.0	
Release Time	Zener Diode Clamp Coil Suspension (typ.)	msec	0.1		0.2		0.1		2.0		1.0		0.2		0.2	
Schematic† Style	Bottom View		I		I		II		III		I		I		I	



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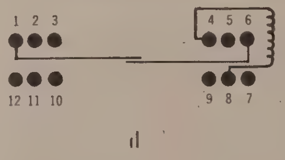
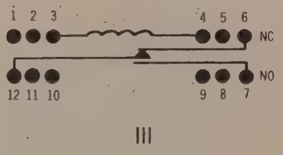


II



III

Notes:

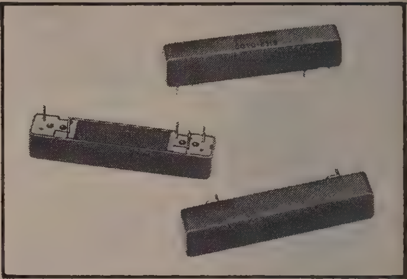
*Must be mounted vertically Pin #12 is up

†Consult factory for other available pin patterns

Unused pins are omitted

Pin numbers for reference only

**Life expectancy at full rated loads is dependant upon the combination current/voltage switched. While typical life expectancy is >5 x 10⁶, consult factory for life data at your load levels.



Coto's new series 2400 miniature reed relays are ideal for use in Telephone Switching and ATE applications (such as Texas Instruments ATE equipment) or in applications where high sensitivity, high power or high voltage relays are required.

Slightly larger than the Series 2200 microminiature relays, the Series 2400 units are available in a wide variety of custom pin configurations In addition, wider pin spacing allows better contact to coil isolation on the PCB.

Ordering Information

Model No. — 24XX-XX-X X

Coil Voltage 05 or 12

"0" — No Electrostatic Shield

"1" — Electrostatic Shield connected to pin #10

"2" — Co-Axial Shield connected to pins #9 & #10

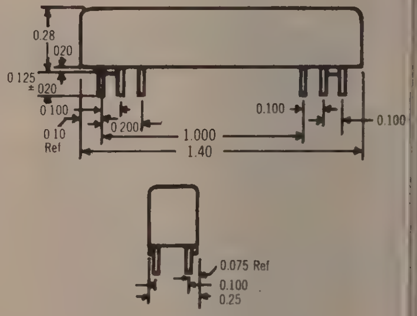
Insulation Resistance

"0" — $10^{10}\Omega$ (Form A's)

— $10^{9}\Omega$ (Form C's)

"1" — $10^{12}\Omega$ (Form A's)

— $10^{11}\Omega$ (Form C's)



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MICROMINIATURE REED RELAYS

SERIES 2900

Coto's microminiature 2900 series reed relays are specially designed and constructed for maximum versatility and dependability.

Almost one third smaller than a DIP (only .20 sq. in. of P.C. board space), these microminiature relays offer the same switching capabilities as larger "miniature" relays. With the electrostatic or co-axial shield options, these relays are ideal for switching fast digital pulses (without significant degredation of pulse edges) or R.F. to 1000 MHz with minimal insertion loss.

The 2900 relays exhibit a characteristic impedance of 50 ohms, typical. Their ability to carry one amp makes them ideal for use in A.T.E. Force/Sense applications, digital switching matrixes and other applications requiring small size, fast switching speeds (less than 300 μsec. typical w/#2 coil option) and high reliability.

PACKAGING: The package size of the 2900 allows utilization of a form C capsule as well as a mercury wetted form A capsule. The series incorporates Coto's quality engineered package designs. Relays are encapsulated in a magnetically shielding steel shell coated with a bright, chemically-resistant and insulating epoxy. A proprietary potting process provides stress-free encapsulation, avoiding problems common to many "molded" relays. The 2900 has a polyester bobbin material for superior insulation resistance and has rugged .022" diameter terminal pins.

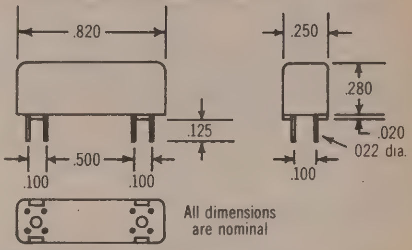
Careful attention to reed capsule cleanliness and packaging material selection assures insulation resistances of greater than 10^{12} ohms, even under elevated temperature and humidity conditions (40°C, 95% RH).

All non-mercury wetted versions are supplied with a new contact plating material that eliminates low level contact sticking, which is a common problem with other reed relays.

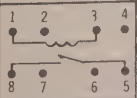
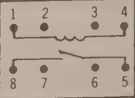
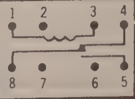
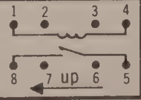
TESTING & RELIABILITY: Each reed switch and completed relay is dry-buzzed a minimum of one million operations and tested for dynamic contact resistance, enhancing their reliability for low level switching and long life. The dry form A versions have been life tested to one billion* operations. The average contact resistance after one billion operations was less than .250 ohms.

Various contact configurations and coil resistances are available as well as electrostatic and co-axial shielding.

* Hot switching 1 VDC, 1mA, at a rate of 500Hz.



RELAY SPECIFICATIONS

Model Number & Coil Voltage		2902-05, 12	2904-05, 12	2911-05, 12	2920-05, 12
Contact Form		1A	1A	1C	1A* Hg Wet
Available Coil Options		2, 3, 4	2, 3, 4	2, 3	1
Parameter	Test Conditions	VALUES			
Max. Switch Voltage	DC/Peak AC	200 V	200 V	150 V	500 V
Max. Switch Current	DC/Peak AC Resistive	.500 A	.500 A	.250 A	1:0 A
Max. Carry Current		1.5 A	1.5 A	1.0 A	2.0 A
Max. Contact Rating	DC Resistive	10 Watts	10 Watts	3 Watts	28 Watts
Life Expectancy	At Signal Level	500 x 10^6	500 x 10^6	100 x 10^6	1 x 10^9 Operations
	At Rated Level	5 x 10^6	5 x 10^6	5 x 10^6	1 x 10^8 Operations
Static Contact Resistance (Initial)	0.050 Volt, 10 mA Contact Load	.100 Ω Max.	.100 Ω Max.	.150 Ω Max.	0.050 Ω Max.
Dynamic Contact Resistance (Initial)	0.5 Volt, 50 mA Load 100 Hz, 1.5 msec. after coil energized	.200 Ω Max.	.200 Ω Max.	.200 Ω Max.	0.100 Ω Max.
Insulation Resistance	Between all isolated pins @ 100V, 25 deg C, 40% relative humidity.	10^{10} Ω Min. 10^{12} Ω Optional	10^{10} Ω Min. 10^{12} Ω Optional	10^9 Ω Min. 10^{11} Ω Optional	10^{10} Ω Min. 10^{12} Ω Optional
Open Contact Capacitance	Without Shield	1.0 pf Typ.	1.0 pf Typ.	2 pf Typ.	1.4 pf Typ.
	Shield Guarded	0.3 pf Typ.	0.3 pf Typ.	1 pf Typ.	0.2 pf Typ.
Dielectric Strength (Min.) Between Contacts	DC/Peak AC Static Conditions	350 V Min.	350 V Min.	200 V Min.	1000 V Min.
Contacts to Shield					
Contacts and Shield to Coil	AC VRMS	1000 V Min.	1000 V Min.	1000 V Min.	1000 V Min.
Operating Time (Including Bounce)	At Nominal Voltage 30 Hz Sq. wave	500 μsec Typ.	500 μsec Typ.	1.0 msec. Typ.	1.5 msec. Typ.
Release Time	Zener-Diode Clamp Coil Suppression	100 μsec Typ.	100 μsec Typ.	2.0 msec. Typ.	1.0 msec. Typ.
Schematics (Bottom View)					

*NOTE: This relay is mercury wetted and must be mounted vertically. See schematic.

OPTIONS: Electrostatic shield terminated to pin #7.
Co-axial shield terminated to pins #6 and #7.

Unused pins are omitted.
Pin numbers for reference only.
Black dot on top of relay denotes pin #1.

ENVIRONMENTAL RATINGS

Storage Temperature: -50°C to +100°C
Operating Temperature: -20°C to +70°C
Note: (The must-operate and must-release voltages and the coil resistance are specified at 25 degrees C. These values vary by approximately 0.4%/degrees C as the ambient temperature varies.)
Vibration: 20 G's to 2000hz
Shock: 50 G's

OPERATING PARAMETERS @ 25°C		
Nominal Volts	5	12
Must Operate Volts	3.8	9.0
Must Release Volts	0.4	1.0
Coil #1 Resistance Ohms*	50	250
Coil #2 Resistance Ohms*	170	900
Coil #3 Resistance Ohms*	230	1500
Coil #4 Resistance Ohms*	370	—

*Resistance figures are ± 10%

ORDERING INFORMATION

To order a Coto relay, assemble a part number from the data below to describe the desired parameters.

29XX-XX-XXX

MODEL No.
COIL VOLTAGE

"1"—COIL #1
"2"—COIL #2
"3"—COIL #3
"4"—COIL #4

"0"—no electrostatic shield
"1"—electrostatic shield
"2"—co-axial shield

Insulation Resistance
0=10^{10} Ohms (Form A's)
10^9 Ohms (Form C's)
1=10^{12} Ohms (Form A's)
10^{11} Ohms (Form C's)

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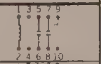
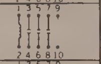
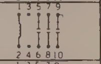
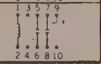
ULTRA-LOW THERMAL EMF REED RELAYS
SERIES 3400

Coto, the pioneer in low thermal EMF technology, announces the enhancement of its Series 3200, Low Thermal EMF Reed Relays. CR-3200 Relays feature superior thermal EMF performance with 1 microvolt thermals and 200 nanovolt stability. In addition, 3200 relays offer the advantages of encapsulated reed relays, such as high isolation, speed and improved reed contact stability to provide increased reliability and long life performance.

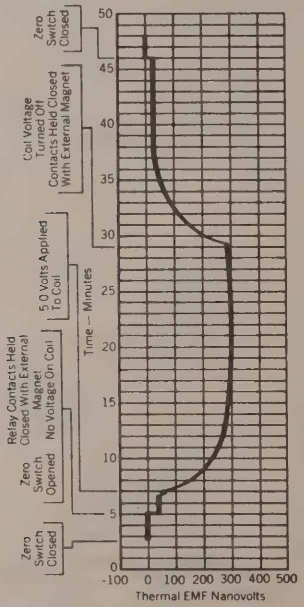
Series 3200 relays are designed for scanning low-level analog and digital signals, multiplexing, data acquisition and automatic testing of components and systems. Coto's new contact material eliminates contact sticking and unstable contact resistance usually associated with reed relays.

- contacts especially conditioned for reliable low-level switching
- contact plating material eliminates "sticking" and unstable contact resistance
- choice of stable low thermal EMF ratings: $<10\mu V$, $<5\mu V$, $<3\mu V$, $<1\mu V$, $<500nV$
- fully encapsulated in a steel shell
- high insulation resistance — greater than 10^{12} ohms
- designed to meet industrial component standards
- 1500 VRMS control to signal isolation
- 100% dynamic testing and burn-in for ultra-high reliability
- less than 1.0 msec. switching speed typical

RELAY SPECIFICATIONS

Contact Form	Model Number	Nominal Coil VDC	Coil Res. Ohms ±10%	Must Operate VDC	Pin Dia. Bottom View
2A Dry	CR-3402-5	5	350	3.8	
	CR-3402-12	12	2000	9.0	
3A Dry	CR-3450-5	5	350	3.8	
	CR-3450-12	12	2000	9.0	
3A Dry	CR-3460-5	5	350	3.8	
	CR-3460-12	12	2000	9.0	
2A HG Wet	CR-3432-5	5	105	3.8	
	CR-3432-12	12	600	9.0	

TYPICAL RECORDER TRACE OF THERMAL EMF OF CR-3450-5 AS A FUNCTION OF TIME



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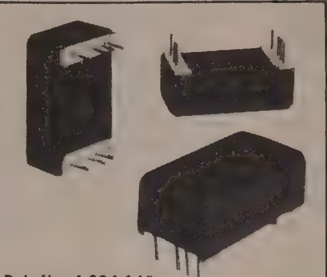
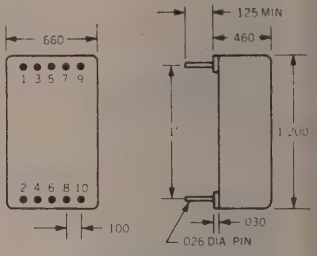
CORPORATION

55 DuPont Drive, Providence, R.I. 02907
(401) 943-2686 TWX 710-381-8016



Pat. No. 4,084,142



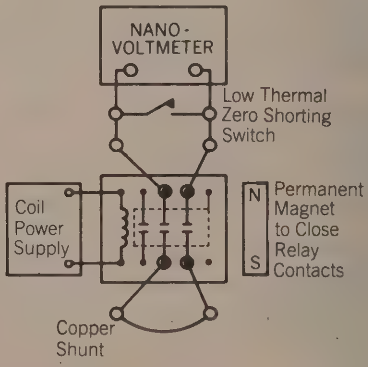
All dimensions are nominal
Pin 9 is the electrostatic shield pin.

OPERATING PARAMETERS

Parameter		Test Conditions	Value	Mercury Wet Value
Max. Switch Voltage		DC/Peak AC	150 Volts	500 Volts
Max. Switch Current		DC/Peak AC Resistive	250 mA	1.0 Amp
Max. Carry Current			1.5 Amps	2.0 Amps
Max. Contact Rating		DC Resistive	5 Watts	50 Watts
Life Expectancy		At Signal Level	100 x 10^6 Cyc.	10^9 Cyc.
		At Rated Load	10 x 10^6 Cyc.	100 x 10^6 Cyc.
Static Contact Resistance (Initial)		0.050 Volt, 10 mA Contact Load	0.100 Ohms Max.	0.050 Ohms Max.
Dynamic Contact Resistance (Initial)		0.5 Volt, 50 mA Load 100 Hz, 1.5 msec. after coil energized	0.200 Ohms Max.	0.100 Ohms Max.
Insulation Resistance		Between all isolated Pins @ 100V, 25 deg. C, 40% relative humidity	10^{10} Ohms min. 10^{12} Ohms Typ.	10^{10} Ohms min.
Open Contact Capacitance		Shield Floating	1.0 pf Typ.	1.0 pf Typ.
		Shield as Guard	0.4 pf Typ.	0.5 pf Typ.
Contact-to-Shield Capacitance		Contacts Open	1.5 pf Typ.	1.5 pf Typ.
		Shield and Coil shorted together	1.5 pf Typ.	1.5 pf Typ.
Dielectric Strength (Minimum)	Between Contacts	DC/Peak AC Static Conditions	250 Volts	1000 Volts
	Contacts to Shield		500 Volts	1000 Volts
	Contacts and Shield to Coil	AC VRMS	1500 Volts	1500 Volts
Operating Time (Including Bounce)		At Nominal Voltage 30 Hz Sq. wave	1.0 msec. Typ.	2.0 msec. Typ.
Release Time		Zener Diode Clamp Coil Suppression*	100 µsec Typ.	1.0 msec Typ.

* Consists of 20V Zener — diode and 1N4002 diode in series connected in parallel to coil.

THERMAL EMF TEST CIRCUIT


NANO-VOLTMETER
Low Thermal Zero Shorting Switch
Coil Power Supply
N
S
Permanent Magnet to Close Relay Contacts
Copper Shunt

ORDERING INFORMATION

XXXX — XX — XX

Model No.
Coil Voltage
*Thermal
Contact Isolation (Ohms)
10^{10} — Suffix "0"
10^{12} — Suffix "1"

*$<10\mu V$ — Suffix 1 Hg Wet
$<5\mu V$ — Suffix 9 Dry & Hg Wet
$<3\mu V$ — Suffix 8 Dry Only
$<1\mu V$ — Suffix 7 Dry Only
$<500nV$ — Suffix 5 Dry Only

COTO
CORPORATION

DIP REED RELAYS
2600

Coto Dip Reed Relays (CR-2600 Series), designed for versatility and reliability, are offered in a wide variety of contact types and coil resistances to meet most switching applications.

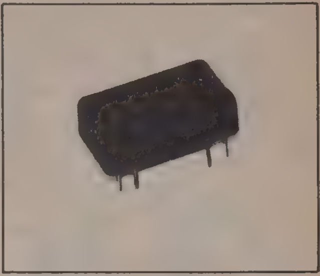
Relays are available with electrostatic shielding, alternate switch and coil connections and diode coil suppression.

Highly reliable, CR-2600 relays are excellent for new designs or to retro-fit lesser quality molded DIP relays.

All 2600 relays are pre-conditioned and dynamically screened before encapsulation.

All relays are epoxy encapsulated utilizing a proprietary potting process to provide stress-free encapsulation. Premium grade, contamination-free reed switches are used throughout. A new contact plating material eliminates low-level "sticking" and unstable contact resistance.

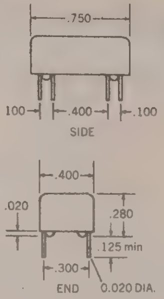
2600 Dip Reed Relays are encapsulated in a magnetically-shielding steel shell coated with a bright, chemically-resistant and insulating epoxy. All coil connections are coated with a silicone rubber to ensure stress-free encapsulation.



OPERATING PARAMETERS @ 25°C

Nominal Volts	05	12
Must Operate Volts	3.7	9.0
Must Release Volts	0.4	1.0
Coil #2 Resistance Ohms	150	900
Coil #3 Resistance Ohms	230	1500
Coil #4 Resistance Ohms	500	—

Insulation Resistance 10^{10} Ohms min @ 100VDC, 25°C, 40% Rel. Humidity
10^{12} Ohms available — contact factory

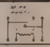
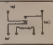


ORDERING INFORMATION

26XX — XX — XXX

Model No.
Coil Voltage
"1" — Coil #1 "3" — Coil #3
"2" — Coil #2 "4" — Coil #4
"0" — no diode
"1" — diode
"0" — no electrostatic shield
"1" — electrostatic shield
"2" — co-axial shield

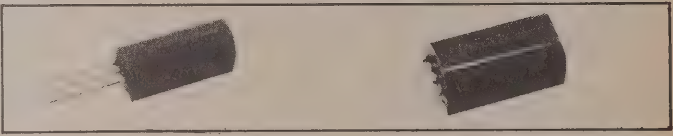
2600

Relay Contact Type	Model Number and Coil Voltage	Initial Contact Resist. Ohms Max.	Contact Rating Watts Max.	Switch Volts DC Max.	Switch Amps Max. Resist.	Break-down Volts DC Min.	Avail. Coils #	Electro-static Shield Avail.	Pin Diagrams (Top View)
1A	CR-2604 -5, 12	.100	10	200	.5	250	2, 3, 4	Yes	
1C	CR-2610 -5, 12	.150	4	100	.200	250	2, 3	No	
1C	CR-2611 -5, 12	.150	3	100	.250	200	2, 3	Yes	
1A High Voltage	CR-2631 -5, 12	.150	10	250	.5	400	2, 3	No	
2A*	CR-2653 -5, 12	.150	10	100	.5	250	2, 3	Yes	

COTO
CORPORATION

QUALITY PROVEN REED RELAYS
SERIES 4000/4200

These uniquely designed reed relays are manufactured and tested by the most advanced production techniques, which result in minimum customer costs and a high standard of quality and performance. Relays are completely encased in a tough, flame-retardant shell with only premium grade catalogued reed switches used throughout. Switches, coils and completed relays undergo 100% high reliability testing.



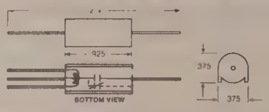
OPERATING PARAMETERS @ 25°C

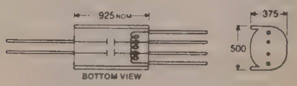
Parameter	CR4000				CR4200			
Nominal Volts	5	6	12	24	5	6	12	24
Must operate Volts	3.7	4.5	9.0	18.0	3.7	4.5	9.0	18.0
Must Release Volts	0.4	0.5	1.0	2.0	0.4	0.5	1.0	2.0
Coil #0 Resistance Ohms	65	105	500	1800	60	100	400	1600
Coil #1	175	300	1000	4000	150	250	1000	4000
Coil #2	105	175	800	2700	100	150	600	2400
Coil #3	300	500	1800	—	250	400	1600	—
Coil #4	500	800	2700	—	400	600	2400	—

ORDERING INFORMATION

4XXX — XX — XXXX

Model No.
Coil Voltage
"0" — axial leads
"1" — bent and cut leads, .100"
"2" — bent and cut leads, .150"
"0" — no electrostatic shield
"1" — electrostatic shield
"0" — no magnetic shield
"1" — magnetic shield
Coil #0, 1, 2, 3, 4





SPECIFICATIONS

Relay Contact Type CR4000	Relay Contact Type CR4200	Model Number	Initial Contact Resist. Ohms Max.	Contact Rating Watts Max.	Switch Volts DC Max.	Switch Amps Max. Resist.	Break-down Volts DC Min.
1A‡ Standard	2A‡ Standard	CR-4003 CR-4203	.150	10	200	.5	300
1A‡ High Reliability	2A‡ High Reliability	CR-4004 CR-4204	.100	10	200	.5	300
1A High Power		CR-4005	.150	50	150	1.0	200
1C Standard	2C Standard	CR-4011 CR-4211	.150	3	150	.250	200
1A* Mercury Wet		CR-4020	.050	50	500	2.0	1000
1A High Voltage Low Cost	2A High Voltage Low Cost	CR-4030 CR-4230	.150	10	300	.5	800
1A‡ High Voltage Standard	2A‡ High Voltage Standard	CR-4031 CR-4231	.150	10	500	.5	1200
1B Standard		CR-4240	.150	10	200	.5	300

* Standard coil only. Mount Hg Wet relay vertically with coil leads down.
‡ Recognized under the component program of Underwriter's Laboratory.
Insulation Resistance 10^9 Ohms min. @ 100 VDC, 25°C, 40% Relative Humidity.

COTO
CORPORATION
55 DuPont Drive, Providence, R.I. 02907
(401) 943-2686 TWX 710-381-8016

COTO
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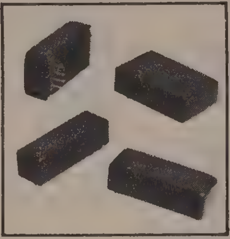
MINIATURE REED RELAYS
SERIES 7000 1" x .100"

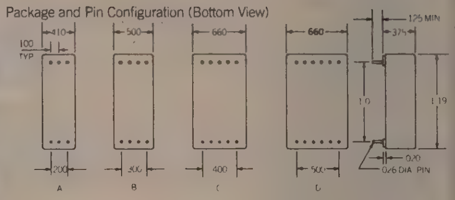
This totally new series of highly reliable reed relays incorporates more than 10 years of Coto design experience, a feature that has helped make Coto a leading manufacturer of low-thermal EMF relays.

All relays are encapsulated in a magnetically-shielding steel shell coated with a bright, chemically-resistant, insulating epoxy.

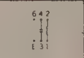
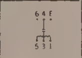
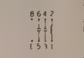
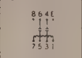
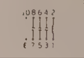
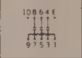
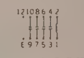
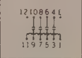
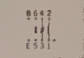
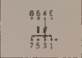
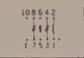
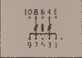
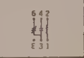
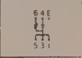
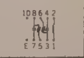
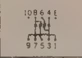
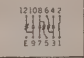
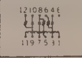
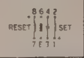
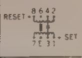
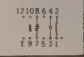
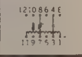
The bobbin and epoxy materials are specifically designed for low-moisture absorbency. Round .026" terminals are used throughout. All reeds are dry buzzed a minimum of 1 x 10⁶ operations and subjected to Coto's Dynamic Resistance Test before, during and after relay assembly. Standard and custom configurations are available.

A broad range of contact ratings and types are available: Dry Standard; High Voltage; Mercury Wetted.





CR-7100 DRY STANDARD RELAYS

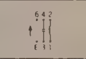
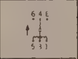
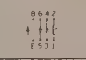
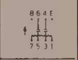
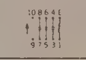
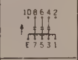
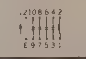
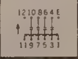
Contact Form	Part No.	Coil VDC	Res. Ohms ±10% @ 25°C	Max. Pick-up VDC @ 25°C	Min. Drop-out V.D.C. @ 25°C	Pin Diagram Bottom View End to End	Pin Diagram Bottom View Same End
1A	CR-7101	5 12 24	300 1600 4200	3.75 9 18	0.4 1.0 2.0		
2A	CR-7102	5 12 24	150 1000 3500	3.75 9 18	0.4 1.0 2.0		
3A	CR-7103	5 12 24	100 800 2400	3.75 9 18	0.4 1.0 2.0		
4A	CR-7104	5 12 24	80 550 2000	3.75 9 18	0.4 1.0 2.0		
1B *	CR-7121	5 12 24	150 1000 3500	3.75 9 18	0.4 1.0 2.0		
2B *	CR-7122	5 12 24	100 800 2400	3.75 9 18	0.4 1.0 2.0		
1C	CR-7141	5 12 24	175 1100 4200	3.75 9 18	0.4 1.0 2.0		
2C	CR-7142	5 12 24	65 490 1550	3.75 9 18	0.4 1.0 2.0		
3C	CR-7143	5 12 24	55 300 1350	3.75 9 18	0.4 1.0 2.0		
1A Latch *	CR-7150	5 12	550/550 1750/1750	3.75 9	0.4 1.0		
1A 1B *‡	CR-7160	5 12 24	80 550 2000	3.75 9 18	0.4 1.0 2.0		

- Black dot on top of relay denotes Pin #1.

* These relays contain bias magnets. Correct polarity must be observed. Diode coil suppression is required for proper operation of latching relays. If internal diode option is selected on CR-7150 Pins #1 and #8 are positive. On all other relays Pin #1 is Positive.

‡ Break before make not guaranteed. Unused pins are omitted.

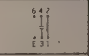
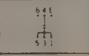
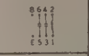
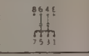
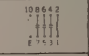
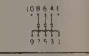
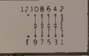
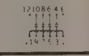
CR-7200 MERCURY-WETTED RELAYS

Contact Form	Part No.	Coil VDC	Res. Ohms ±10% @ 25°C	Max. Pick-up VDC @ 25°C	Min. Drop-out VDC @ 25°C	Pin Diagram Bottom View End to End	Pin Diagram Bottom View Same End
1A	CR-7201	5 12 24	70 450 1785	3.75 9 18	0.4 1.0 2.0		
2A	CR-7202	5 12 24	60 340 1330	3.75 9 18	0.4 1.0 2.0		
3A	CR-7203	5 12 24	50 300 1200	3.75 9 18	0.4 1.0 2.0		
4A	CR-7204	5 12 24	40 250 960	3.75 9 18	0.4 1.0 2.0		

- Black dot on top of relay denotes Pin #1.
  On relays ordered with diode option Pin #1 is Positive.

COTO
CORPORATION
55 DuPont Drive, Providence, R.I. 02907
(401) 943-2686 TWX 710-381-8016

CR-7300 HIGH VOLTAGE RELAYS

Contact Form	Part No.	Coil VDC	Res. Ohms ±10% @ 25°C	Max. Pick-up VDC @ 25°C	Min. Drop-out VDC @ 25°C	Pin Diagram Bottom View End to End	Pin Diagram Bottom View Same End
1A	CR-7301	5 12 24	175 1100 4200	3.75 9 18	0.4 1.0 2.0		
2A	CR-7302	5 12 24	100 640 2450	3.75 9 18	0.4 1.0 2.0		
3A	CR-7303	5 12 24	65 490 1550	3.75 9 18	0.4 1.0 2.0		
4A	CR-7304	5 12 24	55 300 1350	3.75 9 18	0.4 1.0 2.0		

- Black dot on top of relay denotes Pin #1.
  On relays ordered with diode option Pin #1 is Positive.

CR-7000 SERIES SPECIFICATIONS

Relay Model		CR-7100		CR-7200	CR-7300
Contact Type		Dry Standard		Hg Wet	Hi Volt
Contact Form		A's & B's	C's	A's	A's
Parameter	Test Conditions	Value			
Max. Switch Voltage	DC/Peak AC	200 Volts	150 Volts	500 Volts	500 Volts
Max. Switch Current	DC/Peak AC Resistive	.5 Amps	.250 Amps	1.0 Amps	.5 Amps
Max. Carry Current		2.0 Amps	1.0 Amps	2.0 Amps	2.0 Amps
Max. Contact Rating	DC Resistive	10 Watts	3 Watts	50 Watts	10 Watts
Life Expectancy	At Signal Level	10^6 cyc	10^8 cyc	10^9 cyc	10^8 cyc
	At Rated Load	*	*	10^8 cyc	*
Static Contact Resistance (Initial)	0.050 Volt, 10 mA Contact Load	.100 Ohms Max.	.150 Ohms Max.	.050 Ohms	.100 Ohms Max.
Dynamic Contact Resistance (Initial)	0.5 Volt, 50 mA Load 100 Hz, 1.5 msec. after coil energized	.150 Ohms Max.	.200 Ohms Max.	.100 Ohms	.150 Ohms Max.
Insulation Resistance	Between all isolated pins @ 100V, 25 deg C, 40% relative humidity	10^{10} Ohms Min. 10^{12} Ohms Typ.	10^9 Ohms Min. 10^{11} Ohms Typ.	10^{10} Ohms Min. 10^{12} Ohms Typ.	10^{10} Ohms Min. 10^{12} Ohms Typ.
Open Contact Capacitance	Without Shield	1 pf Typ.	2 pf Typ.	1 pf Typ.	1.0 pf Typ
	Shield Grounded	0.2 pf Typ.	1 pf Typ.	0.2 pf Typ.	0.2 pf Typ.
Dielectric Strength (Min.) Between Contacts	DC/Peak AC Static Conditions	250 Volts	200 Volts	1000 Volts	1200 Volts
Contacts to Shield		500 Volts	500 Volts	500 Volts	500 Volts
Contacts & Shield to Coil	AC VRMS	1500 Volts	1500 Volts	1500 Volts	1500 Volts
Operating Time (Including Bounce)	At Nominal Voltage 30 Hz Sq. wave	1.0 msec. Typ.	2.0 msec. Typ.	2.0 msec. Typ.	1.0 msec. Typ.
Release Time	Zener-Diode Clamp Coil Suppression‡	100 μsec. Typ.	2.5 msec. Typ.	1.0 msec. Typ.	100 μsec. Typ.

* Life expectancy at full rated load is dependent upon the combination current/voltage switched. While typical life expectancy is >5 x 10⁶, consult factory for life data at your load levels.

‡ Consists of 20V Zener-Diode and IN4002 Diode in series, connected in parallel to coil.

ORDERING INFORMATION

7XXX — XX — XXXX

Contact Type:
Dry Standard = 1
Mercury Wet = 2
High Voltage = 3

Contact Form

Coil Voltage

Options:

Diode
0 = Omit
1 = Include

Electrostatic Shield*
0 = Omit
1 = Include

Coil Termination
0 = End to End
1 = Same End

Insulation Resistance
0 = 10^{10} Ohms (Form A's)
10^9 Ohms (Form C's)
1 = 10^{12} Ohms (Form A's)
10^{11} Ohms (Form C's)

E-pin indicates electrostatic shield pin.

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

Octal Cycle Progress Timer

OCTAL PLUG-IN interchangeable with most octal timers

CYCLE PROGRESS shows time remaining in the cycle

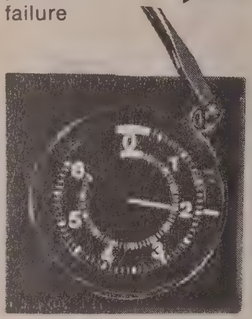
CROUZET
OCTAL TIMER
TYPE 88 226.510
110-127V 60Hz

±2% SETTING ACCURACY

MEMORY holds setting during power failure

TRANSIENT IMMUNITY built-in

MULTI-FUNCTION on-delay, interval and single shot in one timer!



MULTI-RANGE 2 models cover from 0.3 sec. to 12 hours

OCTAL LOCK prevents module from vibrating out of its socket

Easy **PANEL MOUNT** with no additional hardware

HOW TO ORDER

OCTAL CYCLE PROGRESS TIMER - part no. 88 226.5
(Example - 88 226.5 - 115V 60Hz Model 1)

VOLTAGE	FREQUENCY	TIME RANGES
115V	60Hz	Model 1: 6 sec./60 sec./12 min.
24V	60Hz	Model 2: 6 min./60 min./12 hrs.
240V	60Hz	
220V	50Hz	

CERTIFICATIONS

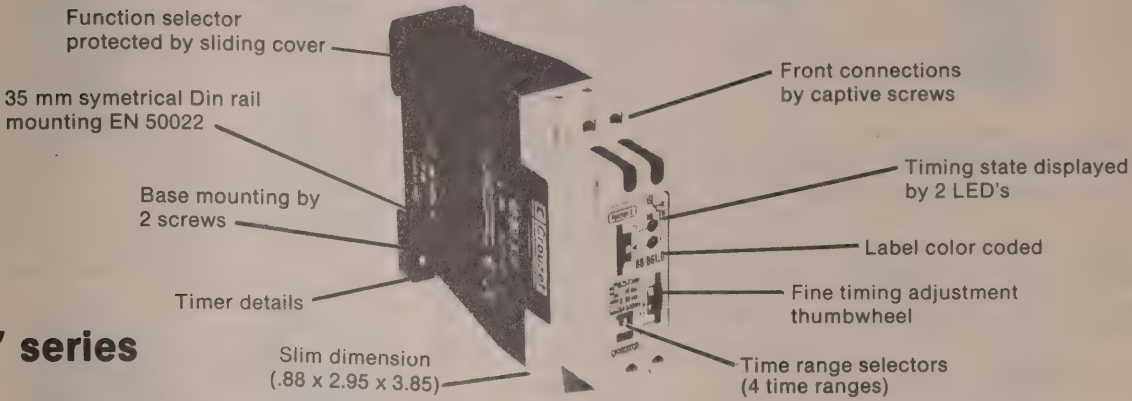
UL and CSA — Most European standards.

Crouzet

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

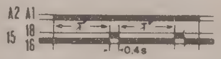
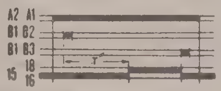
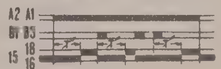
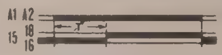
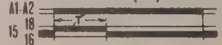
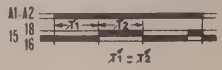
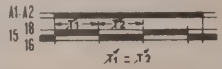
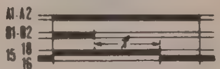
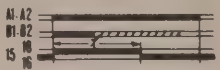
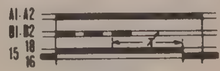
Solid State Timers

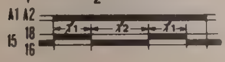
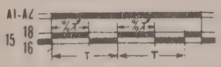
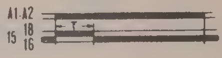
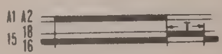
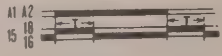
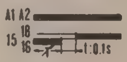
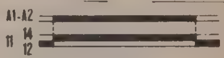
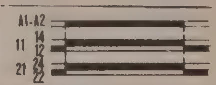
Multifunction — Multirange


Function selector protected by sliding cover
35 mm symetrical Din rail mounting EN 50022
Base mounting by 2 screws
Timer details
Slim dimension (.88 x 2.95 x 3.85)
Front connections by captive screws
Timing state displayed by 2 LED's
Label color coded
Fine timing adjustment thumbwheel
Time range selectors (4 time ranges)
Crouzet
88 861.0

"M" series

unctions Available

MARKING	1 Red label		2 Yellow label		3 Green label	
SELECTABLE POSSIBLE FUNCTIONS	Pulse Generator (I)  Pulse Change-over (F)  Pulse Monitor (O) 		On-delay (A)  Interval (H)  Repeat Cycle (D)  Repeat Cycle (E) 		Off-delay (C)  Interval (B)  Pulse Monitoring (N) 	
PART NO.	88 860 01	88 860 03	88 860 21	88 860 23	88 860 81	88 860 83
RANGE OF SELECTABLE TIMES	0.06 to 160 s	0.25 to 640 min.	0.06 to 160 s	0.25 to 640 min.	0.06 to 160 s	0.25 to 640min.

4 Blue label		5 Orange label		6 Pink label	7 Lime green label	8 White label	
Repeat Cycle (L) (T$_1$ and T$_2$ Adjustable) 		Percentage Timer (G)  Setting in percentage Adjustable 3 - 97 %		Pulse Output (M) Ma  Mb  Mc  T : 0,5 s ± 0,2 s	Wye-Delta Motor Start (S)  t : 0,1 s or t : 0,035 s bridge B1 B2	Relay 88 863 0 SPDT  88 863 1 DPDT 	
88 861 01	88 861 03	88 861 21	88 861 23	88 861 41	88 862 01	88 863 0	88 863 1
0.06 to 160 s	0.25 to 640 min.	0.6-2.5-20 and 160 s	2.5-10-80 & 640 min.		3 to 30 s - 6 to 60 s		

Standard supply voltages: 24 or 48V, DC and 50/60 Hz, 110V or 240V, 50/60 Hz, ± 15% nominal
Accuracy: ± 5% — Relay current rating: 10A~(1A —) — Max. admissible current: 15A< 10ms

Also available: "S" series timers: multivoltage (10 to 254V AC/DC) — multirange, single function
"SE" series timers: single range, single function, single voltage, custom built

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

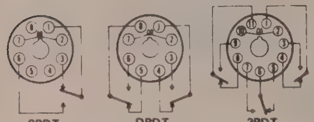
DELTROL RELAYS

SEE SECTION 4550 FOR SOLENOIDS

105 Series

L = 1-3/8
W = 1-3/8
H = 2

General purpose plug-in relay for continuous duty operation. Plastic cover. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).



BASE DIAGRAMS FOR 105 SERIES

B-3 HOLD DOWN SPRING
S/N 20171-00

105 SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20106-82	105	SPDT	10A	24VAC	82	2.0VA
20106-84	105	SPDT	10A	120VAC	2,250	2.0VA
20107-84	105	DPDT	5A	120VAC	1,800	2.2VA
20108-81	105	DPDT	10A	12VAC	19	2.0VA
20108-82	105	DPDT	10A	24VAC	74	2.0VA
20108-84	105	DPDT	10A	120VAC	1,800	2.0VA
20108-85	105	DPDT	10A	240VAC	6,800	2.0VA
20110-82	105	3PDT	10A	24VAC	74	2.2VA
20110-84	105	3PDT	10A	120VAC	1,800	2.2VA
20110-85	105	3PDT	10A	240VAC	6,800	2.2VA
20114-80	105	DPDT	10A	6VDC	30	1.2W
20114-81	105	DPDT	10A	12VDC	120	1.2W
20114-82	105	DPDT	10A	24VDC	472	1.2W
20114-83	105	DPDT	10A	48VDC	1,800	1.2W
20114-84	105	DPDT	10A	110VDC	10,000	1.2W
20116-81	105	3PDT	10A	12VDC	120	1.2W
20116-82	105	3PDT	10A	24VDC	472	1.2W

105A Series

L = 1-3/8
W = 1-3/8
H = 2

General purpose plug-in relay with a lamp connected across relay coil; indicates voltage applied to coil. Recognized under the components Program of Underwriters Laboratories, Inc. (File No. E37066).

105A SERIES (w/Indicator Lamp)

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20117-82	105A	DPDT	10A	24VAC	74	2.2VA
20117-84	105A	DPDT	10A	120VAC	1,800	2.2VA
20117-85	105A	DPDT	10A	240VAC	6,800	2.2VA
20118-84	105A	3PDT	10A	120VAC	1,800	2.2VA

165/166 Series

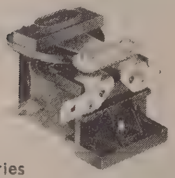
L = 1-13/32
W = 1-1/2
H = 2-3/16

Plastic covered general purpose plug-in relay. Molded nylon coil. Continuous duty operation. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). Also CSA Recognized.

165/166 SERIES

Flange-Mount Versions are Also Available.

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20307-82	166	DPDT	10A	24VAC	74	2.2VA
20307-84	166	DPDT	10A	120VAC	1,800	2.2VA
20307-85	166	DPDT	10A	240VAC	6,800	2.2VA
20308-82	166	3PDT	10A	24VAC	74	2.2VA
20308-84	166	3PDT	10A	120VAC	1,800	2.2VA
20308-85	166	3PDT	10A	240VAC	6,800	2.2VA
20310-80	166	DPDT	10A	6VDC	30	1.2W
20310-81	166	DPDT	10A	12VDC	120	1.2W
20310-82	166	DPDT	10A	24VDC	472	1.2W
20325-84	165	3PDT	5A	120VAC	1,800	2.2VA
20311-81	166	3PDT	10A	12VDC	120	1.2W
20311-82	166	3PDT	10A	24VDC	472	1.2W
20311-84	166	3PDT	10A	110VDC	9,500	1.2W
20381-82	166A	3PDT	10A	24VAC	74	2.2VA
20381-83	166A	3PDT	10A	120VAC	1,800	2.2VA



170 Series

L = 1-7/8
W = 1-5/8
H = 1-1/4

High current relays for industrial control applications. Molded nylon encapsulated coil is resistant to fungus and moisture. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).

170 SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20392-82	170	SPST-NO-DM	30A	24VAC	44	4.7VA
20392-83	170		30A	120VAC	1,100	4.7VA
20394-81	170	SPST-NO-DM	30A	12VDC	72	2W
20394-82	170		30A	24VDC	288	2W

275F Series

General purpose relays with plastic dust cover with flange mounting, barrier-type .250" quick-connect terminals and molded-nylon coil. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA Recognized.

275F SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20844-84	275F	DPDT	20A	120VAC	1,670	2.4VA
20848-82	275F	SPST-NO-DM	30A	24VDC	320	1.8W
20852-82	275F	DPDT	20A	24VDC	320	1.8W

DELTROL RELAYS

SEE SECTION 4550 FOR SOLENOIDS

NEW! 20-AMP POWER RELAYS

L = 2.07 Max.
W = .940 Max.
H = 2.42 Max.

20-Amp Power Relays with molded nylon coils. 0.187 or 0.250 quick-connect terminals. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA Certified (File No. 20690).

871 SERIES

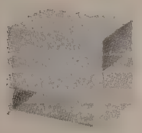
		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20886-82	871	SPDT	20A	24VAC	32	5.0VA
20886-84	871	SPDT	20A	120VAC	800	5.0VA
20886-85	871	SPDT	20A	240VAC	3,000	5.0VA
20887-82	871	DPDT	20A	24VAC	32	5.0VA
20887-84	871	DPDT	20A	120VAC	800	5.0VA
20887-85	871	DPDT	20A	240VAC	3,200	5.0VA
20888-81	871	SPDT	20A	12VDC	50	2.9W
20888-82	871	SPDT	20A	24VDC	200	2.9W
20889-82	871	DPDT	20A	24VDC	128	4.5W

Single Pole
L = 2-1/2
W = 2-1/2
H = 2-3/16

Double Pole
L = 3-11/32
W = 2-1/2
H = 2-3/8

Heavy duty power relay for industrial control applications. Particularly suited for motor controls, heater loads, welder loads, and other power switching applications. Molded nylon coil resists fungus and moisture. Long life, rugged construction. Rating: 25 amps, 1-1/2 hp, 120/240 VAC. Heavy duty screw-type terminals. Mounting: two 3/16" holes on 1-7/8" centers. Listed under the Components Program of Underwriters Laboratories, Inc. (File No. E37066). CSA listed (File No. 20690).

B-5 DUST COVER



L = 5
W = 4
H = 3

S/N 20257-80

Sealed knock-out holes for standard conduit fittings. Relay mounts on pre-drilled base. Constructed of Aluminum. Snap action cover release. Accommodates relay series 900.

900 SERIES

Auxiliary Switch Models are Also Available.

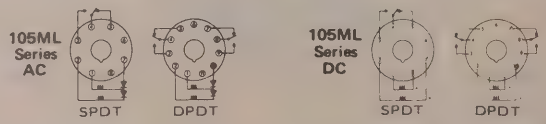
		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20237-82	900	SPST-NO	30A	24VAC	12	9.5VA
20237-83	900	SPST-NO	30A	120VAC	290	9.5VA
20238-82	900	SPST NO-DM	30A	24VAC	12	9.5VA
20238-83	900		30A	120VAC	290	9.5VA
20238-84	900		30A	240VAC	1,200	9.5VA
20239-82	900	SPDT	30A	24VAC	12	9.5VA
20239-83	900	SPDT	30A	120VAC	290	9.5VA
20239-84	900	SPDT	30A	240VAC	1,200	9.5VA
20240-82	900	DPST-NO	30A	24VAC	12	9.5VA
20240-83	900	DPST-NO	30A	120VAC	290	9.5VA
20240-84	900	DPST-NO	30A	240VAC	1,200	9.5VA
20241-82	900	DPDT	30A	24VAC	12	9.5VA
20241-83	900	DPDT	30A	120VAC	290	9.5VA
20241-84	900	DPDT	30A	240VAC	1,200	9.5VA
20243-81	900	SPDT	30A	12VDC	72	2W
20244-81	900	DPST-NO	30A	12VDC	72	2W
20244-82	900	DPST-NO	30A	24VDC	290	2W
20245-81	900	DPDT	30A	12VDC	72	2W
20245-82	900	DPDT	30A	24VDC	290	2W
20245-84	900	DPDT	30A	110VDC	6,050	2W

L = 1-15/16
W = 1-15/16
H = 3-1/4

General purpose magnetic latching plug-in relay. Positive snap-action, one-piece armature eliminates interconnections. Standard 8-pin octal-type plug for SPDT, 11-pin for DPDT. Recommended receptacles: Amphenol 77MIP Series, or equivalent.

105ML SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20034-83	105ML	SPDT	10A	120VAC	1,800	3.5VA
20035-83	105ML	DPDT	10A	120VAC	1,800	3.5VA
20038-82	105ML	DPDT	10A	24VDC	300	2W

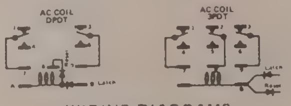


L = 1-13/32
W = 1-1/2
H = 2-3/16

Latching relays especially suited for AC power supplies. Units have moisture and fungus-resistant nylon encapsulated coil. Recognized under the Components Program of Underwriters Laboratories, Inc. (File No. E37066).

166ML SERIES

		Contacts		Coil		
Stock No.	Series	Arrang.	Rating (Amps)	Input Voltages	Resistance (Ohms)	Nominal Power
20525-84	166ML	DPDT	10A	120VAC	1,800	4VA
20527-84	166ML	3PDT	10A	120VAC	1,800	4VA



WIRING DIAGRAMS
FOR 166ML SERIES

Diodes are Externally
Wired and Supplied by customer.
Type IN4005 or
equivalent recommended.
3PDT ONLY

All Dimensions are Nominal.

DELTROL
controls / DIVISION OF DELTROL CORP

2745 S. 19th Street, Milwaukee, Wisconsin 53215 Phone (414) 671-6800, Telex 2-6871

DIVERSIFIED ELECTRONICS, INC.

INDUSTRIAL CONTROLS DIVISION

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P.O. Box 207
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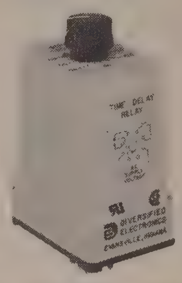
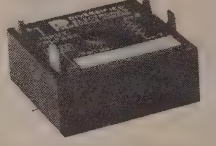
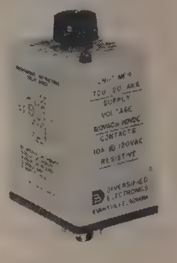
In Florida (904) 787-7259

TIME DELAY RELAYS and SOLID STATE TIMERS

	OCTAL TYPE/PLUG IN TD SERIES	BLADE TYPE/PLUG IN TD SERIES	SOLID STATE TS SERIES	UNITIMER TDU SERIES
				
Delay on Operate	●	●	●	●
Interval on Operate	●	●	●	●
Delay on Release	●	●	●	●
Single Shot	●	●	●	●
Repeat Cycle	●	●	●	
Delayed Interval	●	●	●	
Delayed Single Shot	●	●		
Delay on Operate/ Delay on Release	●	●		
Flasher	●	●	●	●
Energy Conservation	●	●	●	
Percentage Timer	●	●		

FEATURES

OCTAL TYPE/PLUG IN TD SERIES

- CMOS CIRCUITRY
- FAST RECYCLE TIME
- VIRTUALLY UNLIMITED DELAYS
- NO FALSE TRANSFER
- CONTINUOUS DUTY CYCLE
- MOST MODELS - UL & CSA
- OCTAL TYPE, PLUG IN BASE
- LEXAN DUST COVER
- FACTORY STOCK

BLADE TYPE/PLUG IN TD SERIES

- CMOS CIRCUITRY
- FAST RECYCLE TIME
- VIRTUALLY UNLIMITED DELAYS
- NO FALSE TRANSFER
- CONTINUOUS DUTY CYCLE
- BLADE TYPE, PLUG IN BASE
- LOW POWER CONSUMPTION
- BOTH AC OR DC TYPES
- FACTORY STOCK

SOLID STATE TS SERIES

- CMOS CIRCUITRY
- NINE (9) OPERATING MODES
- ALL MODELS UL
- TOTALLY SOLID STATE
- DELAYS UP TO 2 HOURS
- SMALL SIZE
- EASY INSTALLATION
- TOTALLY ENCAPSULATED
- FACTORY STOCK

UNITIMER TDU SERIES

- FIELD PROGRAMMABLE
- OPERATES ON AC OR DC VOLTAGES
- FOUR (4) TIMING RANGES
- FIVE (5) OPERATING MODES
- NO FALSE TRANSFER
- LED GLOWS WHEN RELAY IS ENERGIZED
- FACTORY STOCK

DESCRIPTION

The TD Time Delay Relay series features a CMOS integrated circuit consisting of an RC oscillator, a binary counter and an output logic that operates an electromechanical relay. The delay period is adjustable by varying the oscillator frequency which is represented by the variable control on the enclosure. A dial is silk screened under the control providing a reference point. Extremely fast recycle times, along with high accuracy and repeatability make the TD series ideally suited for all applications encountered in the industry.

The TD series described here is electrically identical to the octal plug in types. The package and type of termination is the difference. This too features the CMOS integrated circuit providing extremely long delays, fast recycle times, high repeatability and accuracy. As with all other DEI timers, these will not false transfer when power is removed prior to completion of the timing cycle. They plug into standard blade type sockets. Specify QC-11.

The TS series offers a solid state addition to the existing broad line of DEI timers. Their small size and low cost provide an inexpensive alternative to the electro-mechanical types. Nine (9) different operations are offered. The totally encapsulated package features CMOS technology, allowing long timing ranges, 100% solid state circuitry, no moving parts to wear, and quick connect terminals for ease of installation. The same fast recycle times and accuracy employed in the other DEI timers make the TS series also ideally suited for all applications encountered in the industry. All models have UL

The TDU series Unitimer offers the most versatile single timer available today. 1 model replaces 40 standard devices. 4 wide range delays X 5 most common modes of operation X 2 supply voltages, since it will operate on both AC and DC. The CMOS digital circuitry provides high accuracy, repeatability and fast reset times. The long life, heavy duty relay output is rated to carry currents of 10 amps at 24VDC or 120VAC. All programming is easily accomplished externally by using one or more jumpers between designated base pins -no trap doors to open, no switches to set or disassembly required.

SPECIFICATIONS

	OCTAL TYPE/PLUG IN TD SERIES	BLADE TYPE/PLUG IN TD SERIES	SOLID STATE TS SERIES	UNITIMER TDU SERIES
SUPPLY VOLTAGE:	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC	24 or 120 VAC, 50/60 Hz; Some Models Available in DC	24 or 120 VAC, 50/60 Hz; 24 or 110 VDC
TIME DELAYS:	Virtually Unlimited	Virtually Unlimited	Up to 2 Hours	Field Programmable to 1 Hour
TEMPERATURES				
Operate	0°C to +55°C	0°C to +55°C	0°C to +55°C	0°C to +55°C
Storage:	-45°C to +85°C	-45°C to +85°C	-45°C to +85°C	-45°C to +85°C
OUTPUT:	DPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC	DPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC	1 Amp Continuous; 10 Amps Inrush	SPDT, 10 Amps Resistive; 211 VA Inductive, 1/6 HP @ 120 VAC or 24 VDC
REPEATABILITY:	1% Including First Cycle	1% Including First Cycle	1% Including First Cycle	1% Including First Cycle
ACCURACY:	± 10%	± 10%	± 10%	± 10%
RESET TIMES				
Before Time Out:	100 Milliseconds	100 Milliseconds	100 Milliseconds	100 Milliseconds
After Time Out:	50 Milliseconds	50 Milliseconds	50 Milliseconds	50 Milliseconds
Recycle:	40 Milliseconds	40 Milliseconds	40 Milliseconds	40 Milliseconds
FALSE TRANSFER:	No	No	No	No
REVERSE POLARITY PROTECTED:	Yes	Yes	Yes	Yes
DUTY CYCLE:	Continuous	Continuous	Continuous	Continuous
POWER CONSUMPTION:	3 Watts (Approximately)	3 Watts (Approximately)	3 Watts (Approximately)	3 Watts (Approximately)
LIFE EXPECTANCY				
Mechanical:	10 Million Operations (Minimum)	10 Million Operations (Minimum)	N/A - No Moving Parts to Wear	10 Million Operations (Minimum)
Electrical	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load	100,000 Operations @ Rated Load
ENCLOSURE STYLE:	"A" Lexan Dust Cover	"B" Lexan Dust Cover	"C" Totally Encapsulated	"A" Lexan Dust Cover
TERMINATIONS:	8 or 11 Pin Octal Plug In; (Use RB-08 or RB-11 Relay Sockets)	11 Pin Blade Plug In; (Use QC-11 Relay Socket)	¼" Quick Disconnect Terminals	11 Pin Octal Plug In; (Use RB-11 Relay Socket)
UL:	Most Models Recognized, File #E55826, Consult Factory	Recognition Forthcoming; Consult Factory	All Models Recognized File #E55826	UL Recognized, File # E55826

DOUGLAS RANDALL REED RELAYS

Division of Kidde, Inc.
KIDDE
6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

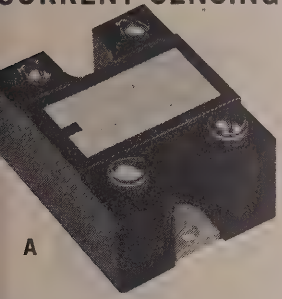
SPECIAL DESIGNS

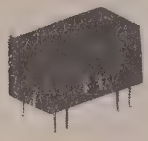
ouglas Randall makes custom designed relays to solve difficult problems. A few models are shown below to illustrate he variety available. Special molding techniques make it possible to manufacture unusual sizes, shapes and terminal arrangements with low tooling costs.

The electrical variatiohs possible with Reed Relays are practically limitless.

Douglas Randall will gladly review your applications and offer rapid engineering and prototype service.

CURRENT SENSING RELAYS


A

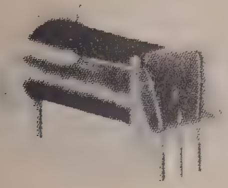

B

Douglas Randall offers a line of relays with coils capable of handling 25 Amperes DC. Contact arrangements can be Form 1A, Form 1B, or Form 1C.

Relay A has a Form B contact which opens at 1 ADC closes at .5 ADC and can operate continuously at 15 ADC coil current. It has screw terminals and can be bolted to a heat sink.

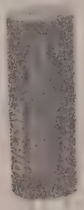
Relay B has standard DIP terminals. It has a Form B contact which opens at 2.3 ADC and closes at 1.7 ADC.

SENSITIVE RELAYS



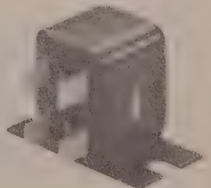
Proper switch selection and tight coil design result in relays operable at lowest coil power. The one shown operates at only 3.5 milliwatts.

VERTICAL MOUNTING



This relay is a miniature molded mercury wetted type .450″ Diameter x 1¼″. High designed for vertical mounting.

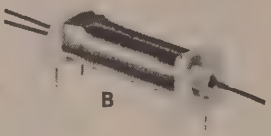
SPECIAL HOUSING



This relay is designed with spade terminals and epoxy molded into a steel case with welded mounting bracket.

HIGH INSULATION RESISTANCE RELAYS

A


B

Two typical designs are shown above:

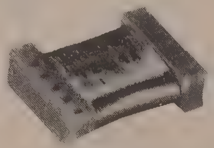
A — A miniature reed relay with a floating lead to maintain high IR.

B — This is a relay using Form A and Form B switches timed to provide a Form C (break before make) function with flying leads to maintain 10^{13} ohms. Up to 5 Form A contacts are available @ 10^{13} ohms.

SPECIAL HIGH VOLTAGE RELAY

This relay has three separate coils, each containing a 5,000VDC and a 10,000VDC switch. The package is molded with a flame retardant epoxy and constructed to withstand 18,500VDC between the switches and all other conductors. The relay is 3⅞″ L x 2⅜″ W x 1½″ H.

SNAP-IN RELAYS



This 4 pole relay mounts in Berg-clips, like the Series SI on page3
Douglas Randall can now duplicate the following discontinued IBM models:

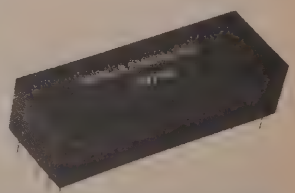
1 — Position: 766040, 766042, 766059, 766060, 766065, 766068 and 766086

2 — Position: 766043, 766044, 766057, 766067, 766072 and 766087

4 — Position: 766046, 766047, 766066, 766071 and 766079

DOUBLE COIL RELAY

This is a special Form 2C relay with two coils. Either coil when energized at 90% nominal voltage must be able to cancel the other coil when energized at 110% nominal voltage. The relay must be able to withstand 600VRMS.



DOUGLAS RANDALL

Division of Kidde, Inc

KIDDE

REED RELAYS

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

new

Form 1C (SPDT) and Form 2C (DPDT) UL RECOGNIZED REED RELAYS FILE NO. E/54552; C.C. NRNT2

Fig.	Part No.	Nom. Volt.	DCR Ohms ±10%	Contact Rating
1 & A	377885 377455 377886	6 12-19 24	250 1200 4000	10W, .5A or 200VDC 120VAC @ .275 Amp Use for gating triacs @ 120VAC
1 & B	377472 375388 377471	6 12-19 24	250 1200 4000	
1 & C	377327 377806 377807	5 12 24	250 1000 4000	240VAC @ .040 Amp. Use for gating triacs @ 240VAC
2 & D	377307 377410 377201 CSA Certified — File LR 34149	6 12 24	175 700 2880	3A @ 17VDC 1A @ 100VDC .3A @ 300VDC For inductive AC loads up to the ratings shown.
3	377808 377809 377810 373350	6 12 24 48	250 1000 2150 2150	20W, .5A or 500VDC 240VAC @ .040 Amp. Use for triac gating ± 240VAC
4 & B	378510 378511 378512	6 12 24	170 675 2700	10W, .5A or 200VDC 120VAC @ .275A Used for gating triacs @ 120VAC
4 & B	378513 378514 378515	6 12 24	170 675 2700	As above, supplied with dust cover
1 & E	378193 378194 378195	6 12 24	170 675 2700	Form 2C .05A @ 20VAC or VDC
5 & F	378196 378197 378198	6 12 24	250 1000 4000	Form 1C .05A @ 20VAC or VDC

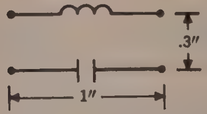


FIG. A

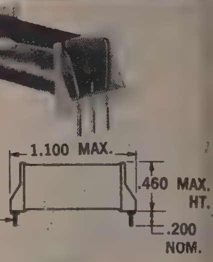


FIG. 1

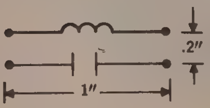


FIG. B

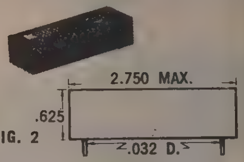


FIG. 2

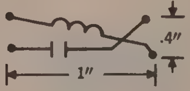


FIG. C

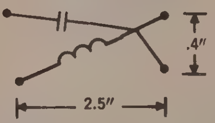


FIG. D

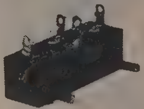


FIG. 3

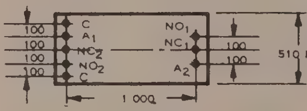


FIG. E

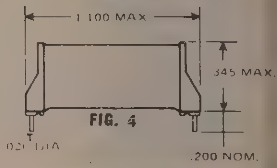


FIG. 4

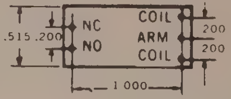


FIG. F

FIG. 5

PROXIMITY SWITCHES

Douglas Randall manufactures standard and custom switches to meet many applications, a few of which are illustrated. All proximity switches are tested for operation by external magnets at specified distances.

MINIATURE LATCHING

This is a switch and magnet combination shown 3 times actual size. The length, excluding leads is only .350". This assembly will latch in either the open or closed state when approached by an external magnet.

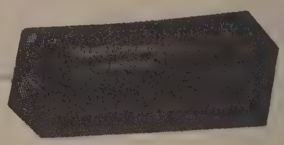
FORM B

This is a Form B switch and magnet assembly, .7" L x .150" Sq. The normally closed switch opens, when approached by an ⅛" Sq. steel rod.

STEP MOUNTING

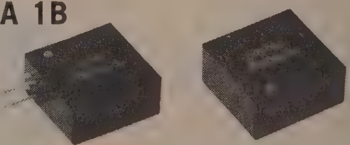
This encapsulated switch is available with Form 1A, Form 1B, Form 1C or Form 2A contacts. It can be supplied with dry reed, mercury wet, high voltage (to 1,000VDC) or high power (to 100VA) contacts. The one shown was designed for low contact resistance and low level switching.

HEAVY DUTY



The proximity switch shown above has heavy duty contacts rated at 100VA. This switch and matching magnet are epoxy encapsulated for heavy duty use on outdoor machinery.

FORM 1A 1B



This is a switch and magnet combination. The switch has Form 1A and Form 1B contacts designed so that one set of contacts is always open as the magnet approaches it.

DOUGLAS RANDALL
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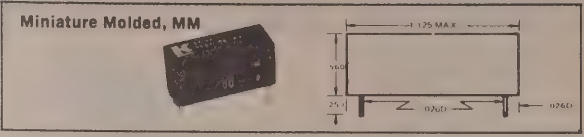
KIDDE
1 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814050 / CABLE: DORANIC

REED RELAYS

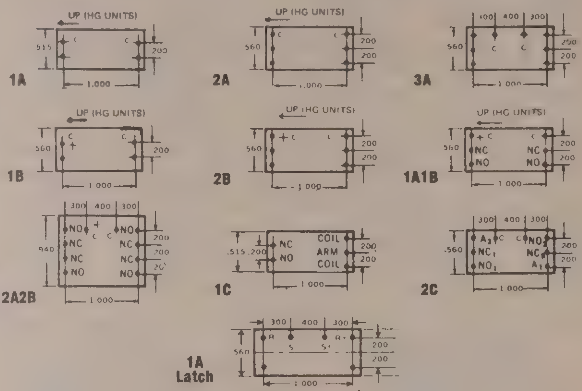
MINIATURE REED RELAYS

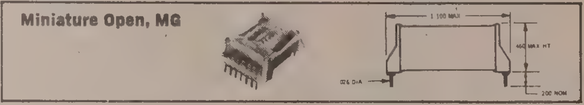
Molded — Series MM Dry, HgM Mercury Wet*
Open — Series MG Dry Reed, HgMG Mercury Wet*

Form	Nominal Voltage	DCR Ohms ±10%	MM Series Part Number	MG Series Part Number
1A	6 12 24	250 1000 4000	6MM1A 12MM1A 24MM1A	6MG1A 12MG1A 24MG1A
2A	6 12 24	170 675 2700	6MM2A 12MM2A 24MM2A	6MG2A 12MG2A 24MG2A
3A	6 12 24	110 450 1800	6MM3A 12MM3A 24MM3A	6MG3A 12MG3A 24MG3A
4A	6 12 24	60 250 1000	— — —	6MG4A 12MG4A 24MG4A
5A	6 12 24	50 200 800	— — —	6MG5A 12MG5A 24MG5A
6A	6 12 24	50 200 800	— — —	6MG6A 12MG6A 24MG6A
1B	6 12 24	170 675 2700	6MM1B 12MM1B 24MM1B	6MG1B 12MG1B 24MG1B
2B	6 12 24	110 450 1800	6MM2B 12MM2B 24MM2B	6MG2B 12MG2B 24MG2B
1A1B	6 12 24	110 450 1800	6MM1A1B 12MM1A1B 24MM1A1B	6MG1A1B 12MG1A1B 24MG1A1B
2A2B	6 12 24	50 200 800	6MM2A2B 12MM2A2B 24MM2A2B	6MG2A2B 12MG2A2B 24MG2A2B
1C	6 12 24	250 1000 4000	6MM1C 12MM1C 24MM1C	6MG1C 12MG1C 24MG1C
2C	6 12 24	170 675 2700	6MM2C 12MM2C 24MM2C	6MG2C 12MG2C 24MG2C
3C	6 12 24	60 250 1000	— — —	6MG3C 12MG3C 24MG3C
4C	6 12 24	50 200 800	— — —	6MG4C 12MG4C 24MG4C
1A Latch	6 12 24	85/85 340/340 1350/1350	6MML1A 12MML1A 24MML1A	6MGL1A 12MGL1A 24MGL1A

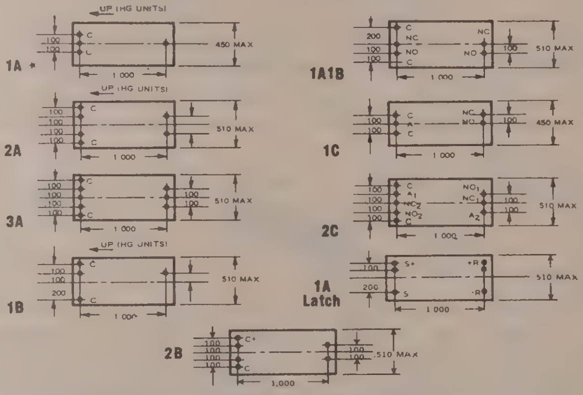

Miniature Molded, MM

Terminal Layout Series MM (Bottom View)




Miniature Open, MG

Terminal Layout Series MG (Bottom View)



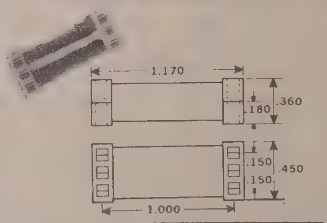
Contact Data — Series MM, SI, MG, XMG and Hg Versions

Contact Type	Contact Rating Form A	Form B	Form C
Dry	10W 12VA .5A 250VDC .15Ω*	10W 12VA .5A 250VDC .15Ω*	3W 3VA .25A 100VDC .2Ω*
Hg Wet	28W — 1A 1000VDC .05Ω*	28W — 1A 1000VDC .05Ω*	14W 14VA .5A 1000VDC .05Ω*
All Position Hg Wet	3W 2.5VA .25A 1000VDC .05Ω*	— — — —	— — — —

* Initial Resistance

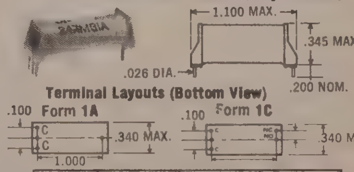
SNAP-IN RELAYS SERIES SI

For use with BERG-PAC 45590 terminals



Form	Nominal Voltage	Part Number	DCR Ohms ±10%
1A	6 12 24	6SI1A 12SI1A 24SI1A	250 1000 4000

LOW PROFILE OPEN RELAYS SERIES XMG (Dry Reed)



Terminal Layouts (Bottom View)

Form	Nominal Voltage	Part Number	DCR Ohms ±10%
1A*	6 12 24	6XMG1A 12XMG1A 24XMG1A	168 675 2700
1C*	6 12 24	6XMG1C 12XMG1C 24XMG1C	168 675 2700

Note: Nylon Cover Available.
* Hg wet switches available.

NOTES

E/M shields std. all Series MM and all Form B and Form L.
E/S shields optional.
1000VDC switches available all Form A and B relays.
Premium run-in switches available all models.
5. Ultra sensitive relays available.
6. Series MML/1A, have internal diodes.

*Hg Wet, Form C, & Non-Position Sensitive available

OPERATING DATA — All Series

Must Operate — 70% Nominal
Must Release — 10% Nominal
Maximum Voltage —
Form A and C — 200% Nominal
Form B and Latching — 130% Nominal
Environmental Data: −20°C to +65°C; vibration 35g to 2000cps; shock, 30g.

DOUGLAS RANDALL

Division of Kidde, Inc

KIDDE

REED RELAYS

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

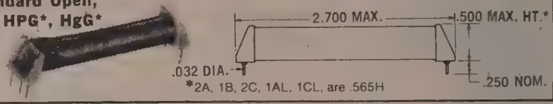
STANDARD SIZE REED RELAYS

Molded — Series SM, HP*, Hg*
Open — Series SG, HPG*, HgG*

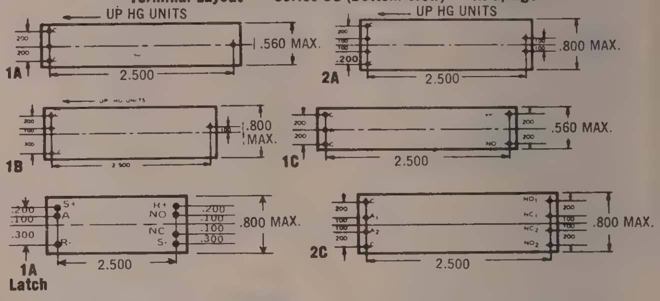
		SM Series	Molded	SG Series	Open
Form	Nominal Voltage	Part Number	DCR Ohms ±10%	Part Number	DCR Ohms ±10%
1A	6 12 24	6SM1A 12SM1A 24SM1A	180 725 2900	6SG1A 12SG1A 24SG1A	180 720 2880
2A	6 12 24	6SM2A 12SM2A 24SM2A	175 700 2750	6SG2A 12SG2A 24SG2A	110 440 1760
1B	6 12 24	6SM1B 12SM1B 24SM1B	175 700 2750	6SG1B 12SG1B 24SG1B	110 440 1760
2B	6 12 24	6SM2B 12SM2B 24SM2B	140 550 2200		
1C	6 12 24	6SM1C 12SM1C 24SM1C	180 725 2900	6SG1C 12SG1C 24SG1C	180 720 2880
2C	6 12 24	6SM2C 12SM2C 24SM2C	175 700 2750	6SG2C 12SG2C 24SG2C	110 440 1760
1A Latch	6 12 24	6SML1A 12SML1A 24SML1A	85/85 340/340 1350/1350	6SGL1A 12SGL1A 24SGL1A	85/85 340/340 1350/1350

*For part numbers and DCR values contact factory. See specification table for contact ratings.

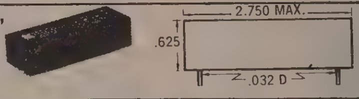
Standard Open, SG, HPG*, HgG*


2.700 MAX.
.500 MAX. HT.*
.032 DIA.
*2A, 1B, 2C, 1AL, 1CL, are .565H
.250 NOM.

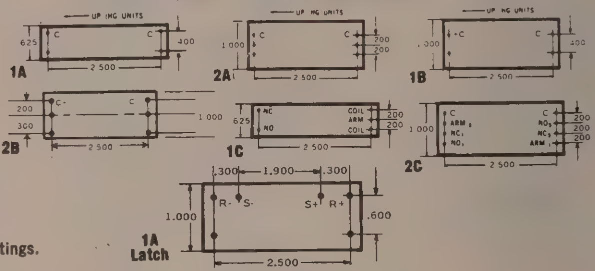
Terminal Layout Series SG (Bottom View) — HPG, HgG


UP HG UNITS
.560 MAX.
2.500
1A
.800 MAX.
2A
1B
1C
S+
A
R-
H+
NO
NC
S-
.200
.100
.300
1A Latch
2C

Standard Molded, SM, HP*, HG

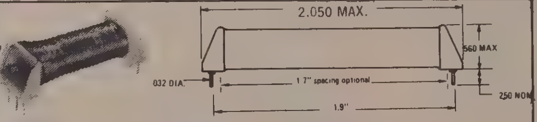

2.750 MAX.
.625
.032 D

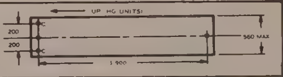
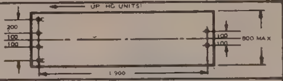
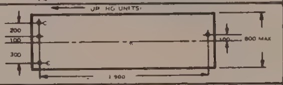
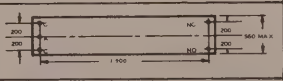
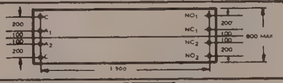
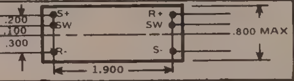
Terminal Layout Series SM (Bottom View)


UP HG UNITS
1A
2A
1B
2B
1C
2C
2 500
.300
1.900
.300
R-
S-
S+
R+
1.000
.600
2.500
1A Latch

COMPACT OPEN REED RELAYS

CG Dry Reed, HPCG*, High Power


2.050 MAX.
.560 MAX
.032 DIA.
1.7" spacing optional
.250 NOM
1.9"

Form	Nom. Volt.	Part Number	DCR Ohms ±10%	Part Number	DCR Ohms ±10%	Terminal Layout (Bottom View)
1A	6 12 24	6CG1A 12CG1A 24CG1A	165 660 2640	6HPCG1A 12HPCG1A 24HPCG1A	105 420 1680	
2A	6 12 24	6CG2A 12CG2A 24CG2A	100 400 1600	6HPCG2A 12HPCG2A 24HPCG2A	65 260 1040	
1B	6 12 24	6CG1B 12CG1B 24CG1B	100 400 1600	6HPCG1B 12HPCG1B 24HPCG1B	65 260 1040	
1C	6 12 24	6CG1C 12CG1C 24CG1C	165 660 2640	6HPCG1C 12HPCG1C 24HPCG1C	105 420 1680	
2C	6 12 24	6CG2C 12CG2C 24CG2C	100 400 1600	6HPCG2C 12HPCG2C 24HPCG2C	65 260 1040	
1A Latch	6 12 24	6CGL1A 12CGL1A 24CGL1A	60/60 250/250 1000/1000			

Common Specifications, All Series

OPERATING DATA
Must Operate — 70% Nominal
Must Release — 10% Nominal
Max. Voltage — Form A & C — 200% Nominal
Form B & Latch — 130% Nominal

ENVIRONMENTAL DATA
Temperature — 20°C to +65°C
Shock — 30g
Vibration — 35g to 2000 Hz

CONTACT RATINGS
Series SM, SG, CG (Standard)

Form	Max. Res. Load	Initial Contact Resistance
A & B	15W, 1.0A, 400VDC	.100Ω
C	10W, .5A, 200VDC	.150Ω

Series HG*, HgG* (Mercury Wet)

A & B	50W, 3.0A, 400VDC	.050Ω

Series HP*, HPG*, HPCG*

Form	Suffix	Max. Res. Load	Initial Contact Resistance
A & B	−25	25W, 1.0A, 1000VDC	.100Ω
A & B	−50	50W, 3.0A, 1000VDC	.200Ω
A & B	−100	110VA, 3.0A, 110VAC	—
C	—	20W. 1.5A, 500VDC	.200Ω

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KIDDE

REED RELAYS

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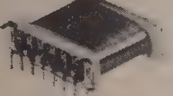
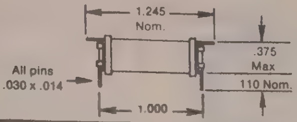
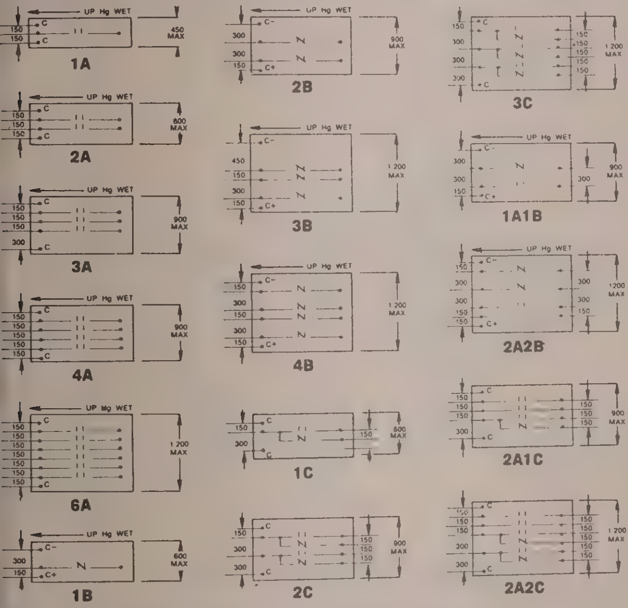
LOW PROFILE—LP, HgLP SERIES




1.245
Nom.
.375
Max
All pins
.030 x .014
110 Nom.
1.000

Form	Nominal Voltage	Part Number	DCR Ohms ±10%	Form	Part Number	DCR Ohms ±10%
1A	6 12 24	6LP1A 12LP1A 24LP1A	240 950 3800	4B	6LP4B 12LP4B 24LP4B	45 180 700
2A	6 12 24	6LP2A 12LP2A 24LP2A	155 625 2500	1C	6LP1C 12LP1C 24LP1C	155 625 2500
3A	6 12 24	6LP3A 12LP3A 24LP3A	80 325 1300	2C	6LP2C 12LP2C 24LP2C	80 325 1300
4A	6 12 24	6LP4A 12LP4A 24LP4A	80 325 1300	3C	6LP3C 12LP3C 24LP3C	45 180 700
6A	6 12 24	6LP6A 12LP6A 24LP6A	45 180 700	1A1B	6LP1A1B 12LP1A1B 24LP1A1B	80 325 1300
1B	6 12 24	6LP1B 12LP1B 24LP1B	155 625 2500	2A2B	6LP2A2B 12LP2A2B 24LP2A2B	45 180 700
2B	6 12 24	6LP2B 12LP2B 24LP2B	80 325 1300	2A1C	6LP2A1C 12LP2A1C 24LP2A1C	80 325 1300
3B	6 12 24	6LP3B 12LP3B 24LP3B	45 180 700	2A2C	6LP2A2C 12LP2A2C 24LP2A2C	45 180 700

TERMINAL LAYOUT (Bottom View)

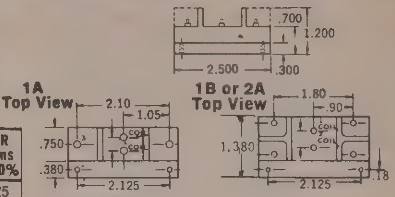

UP Hg WET
1A
2A
3A
4A
6A
1B
2B
3B
4B
1C
2C
3C
1A1B
2A2B
2A1C
2A2C
450 MAX
600 MAX
900 MAX
1 200 MAX
150
300
C
C+

CONTACT DATA — Series LP, and Hg Versions

Contact Type	Contact Rating		
	Form A	Form B	Form C
Dry	10W 12VA .5A 250VDC .15Ω*	10W 12VA .5A 250VDC .15Ω*	3W 4VA .25A 28VDC .2Ω*
Hg Wet	28W — 1A 1000VDC .05Ω*	28W — 1A 1000VDC .05Ω*	14W — .5A 1000VDC .05Ω*
All Position Hg Wet	3W 2.5VA .25A 1000VDC .05Ω*	— — — — —	— — — — —

OPERATING DATA — Series LP, HgLP
Must Operate — 70% Nom. Must Release — 10% Nom.
Maximum Voltage — Form A & C — 200% Nominal
Form B — 130% Nominal

HIGH VOLTAGE RELAYS — HV SERIES


.700
1.200
2.500
.300
1A
Top View
2.10
1.05
.750
.380
2.125
1B or 2A
Top View
1.80
.90
1.380
COIL
COIL
2.125
.18

Form	Nom. Volt.	Part Number	DCR Ohms ±10%
1A (1B*)	6 12 24	6HV1A 12HV1A 24HV1A	25 100 400
2A	6 12 24	6HV2A 12HV2A 24HV2A	20 80 320

OPTION:
* Relays available in Form B up to 7,500V.

Note: To order, specify as follows: 6HV1A 35 is a 6HV1A relay with 3,500VDC switch.

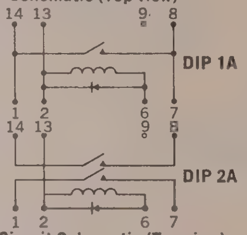
CONTACT DATA

Series	Maximum Resistive Rating			Breakdown Voltage (min.)	Initial Resistance
35 75 100	3,500VDC 7,500VDC 10,000VDC	3.0A 3.0A 3.0A	50W 50W 50W	5,000VDC 10,000VDC 12,500VDC	.100 Ohms .100 Ohms .100 Ohms

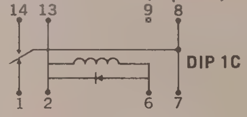
SERIES DIP RELAYS

Fit all standard DIP sockets.
Compatible with logic inputs.
Packaged for Automatic Insertion.

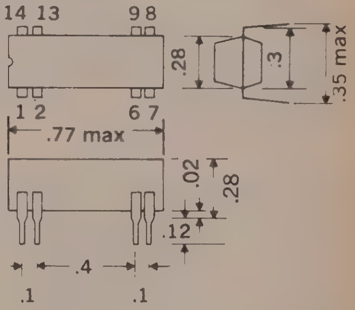
Schematic (Top view)


14 13
9 8
DIP 1A
1 2
6 7
14 13
9 8
DIP 2A
1 2
6 7

Circuit Schematic (Top view)


14 13
9 8
DIP 1C
1 2
6 7

Mechanical Layout


14 13
9 8
1 2
6 7
.28
.3
.35 max
.77 max
.02
.28
.12
.4
.1
.1

SERIES DIP RELAYS

Contact Form	Nominal Voltage	DCR Ω±10%	*Part Number
1A	5 VDC 12 VDC 24 VDC	500 800 2000	5 DIP 1A 12 DIP 1A 24 DIP 1A
2A	5 VDC 12 VDC 24 VDC	140 400 1300	5 DIP 2A 12 DIP 2A 24 DIP 2A
1C	5 VDC 12 VDC 24 VDC	200 500 1500	5 DIP 1C 12 DIP 1C 24 DIP 1C

*Clamp Diode Available, add D to Part Number e.g. 5 DIP 1AD.

Contact Rating — 1A & 2A 10 VA @ .3A or 100 VDC
1C 3 VA @ .2A or 30 VDC

Initial Control Resistance — 1A & 2A .150Ω
1C .150Ω

Must Operate — 75% Nominal

Must Release — 10% Nominal

DOUGLAS RANDALL SOLID STATE COMPONENTS

Division of Kidde Inc

KIDDE

STOCKED FOR IMMEDIATE DELIVERY

6 PAWCATUCK AVENUE / PAWCATUCK, CONNECTICUT 02891 / (203) 599-2075 / TELEX: 6814060 / CABLE: DORANIC

SOLID STATE RELAYS SERIES K

DC OUTPUT / DC CONTROL SIGNAL

NEW Output to 250 VDC

Douglas Randall Series K are SPST (NO) or (NC) relays which will switch loads of 4, 8 or 12 Amps to 250 VDC. They provide rapid switching and opto-isolation between input and output. The sensitive inputs are compatible with DTL or TTL logic. Arc-free switching makes these relays suitable for hazardous atmospheres.

MODEL NUMBERS

Output Voltage	Current	Model
2-32VDC	4 Amp 8 Amp 12 Amp	K04A K08A K12A
2-55VDC	4 Amp 8 Amp 12 Amp	K04B K08B K12B
2-250 VDC	6 Amp	K06D

*Inductive loads must be diode suppressed.

† Normally closed add — (NC) K04A-NC.

INPUT SIGNAL DATA

Range	3-32VDC
Must Operate	3VDC
Must Release	1VDC
Input Impedance	1000Ω Min.
Isolation	
Signal to Load	1500V
Signal to Base	1500V
Temperature	−30°C to +80°C

MECHANICAL ARRANGEMENT

See AC output relays on page 7

OUTPUT DATA

Continuous Current	4A, 8A, or 12A
DC Line Voltage	2-32VDC or 2-55VDC
Off State Leakage	2mA DC
Turn On Time	50 Micro Sec.
Turn Off Time	500 Micro Sec.
Voltage Drop @ Rate Current	1.5VDC Max.
Isolation Load to Base	1500V

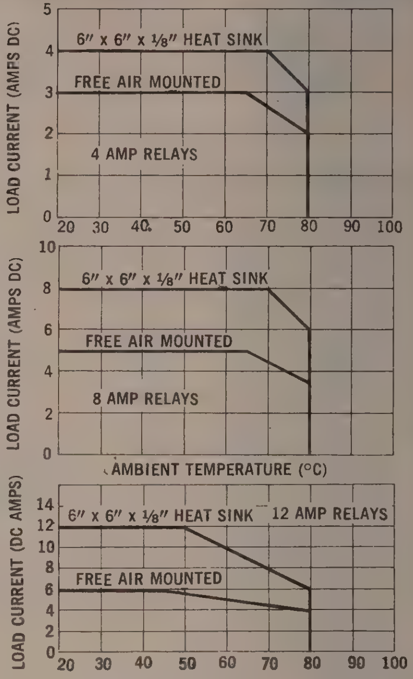
SIZE:
2¼L x 1¾W x 1⅛H Max.

WEIGHT:
4 Ounces Max.

TERMINATION:
Standard Models —
Control Signal:
6-32 Screws
Output:
8-32 Screws

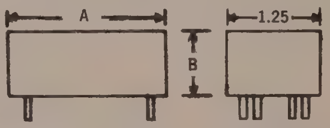
Special Models can be provided with lead wires or other types of termination in OEM quantities. Consult the factory & see pg.7 for mechanical details.

LOAD CURRENT VS TEMPERATURE



SOLID STATE RELAYS — SERIES CV

PC MOUNTED —



INPUT DATA			OUTPUT DATA	
	CV1	CV2		CV1 & CV2
Nominal Voltage	5.5VDC	28VDC	Current	3A RMS
Voltage Range	4-10VDC	10-32VDC	Surge Current	80A Peak
Must Operate	4VDC	10VDC	Minimum Current	50mA
Must Release	.4VDC	.4VDC	Off State Leakage	8mA
Impedance	1000Ω	4000Ω	Voltage	24 to 240VAC @ 47 to 63 Hz
Isolation (Input to Output)	1500V	1500V		
Capacitance	15pF	15pF	Voltage Drop	2.0VAC
			Offstate dv/dt	100V/µsec.
			Turn On Time	8.3msec.
			Turn Off Time	16 msec.

INPUT DATA			OUTPUT DATA	
	CV3	CV6		CV3 & CV6
Nominal Voltage	5.5VDC	28VDC	Maximum Current	3A DC
Voltage Range	4-10VDC	10-32VDC	Voltage Range	4-55VDC
Must Operate	4VDC	10VDC	Voltage Drop	1.6VDC
Must Release	.4VDC	.4VDC	Off State Leakage	10mA DC
Impedance	1000Ω	4000Ω	Turn On Time	500µsec.
			Turn Off Time	1.5msec.

INPUT DATA			OUTPUT DATA	
	CV4	CV5		CV4 & CV5
Voltage Range	10-55VDC	90-130VAC	Voltage	30VDC
Current	10mA	10mA	Current	16mA Max.
Must Not Operate	3mADC	.8mA RMS	Leakage	100µA
Isolation	1500V	1500V	Voltage Drop	.4VDC
Capacitance	10pF	10pF	Logic Supply Volt.	4-5-6VDC
Impedance	—	40KΩ	Logic Supply Cur.	10mA @ 6VDC

MODELS CV-1 & CV-2

3 Amp output @ 120/240 VAC
Zero crossover, Opto-isolation
Dim. A — 2.00" Max, B — .650" Max.

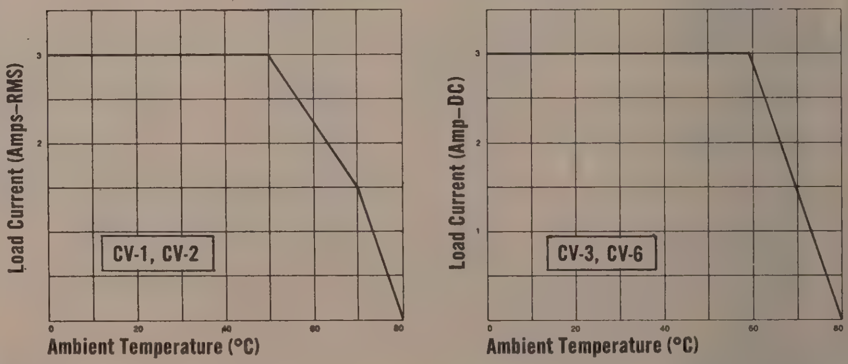
MODELS CV-3 & CV-6

3 Amp output @ 4 to 55 Volts DC
Opto-isolation
Dim. A — 2.00", B — .75"

MODELS CV-4 & CV-5

Convert 10-55 VDC (CV-4)
Convert 90-130 VAC (CV-5)
to Logic Level outputs
Opto-isolation
Dim. A — 1.25", B — .50"

LOAD CURRENT VS TEMPERATURE



AC Output CV-1 & CV-2 U/L Recognized, File E60556, C.C.NMFT2
CSA Certified File LR34149

DOUGLAS RANDALL SOLID STATE COMPONENTS

Division of Kidde Inc
KIDDE

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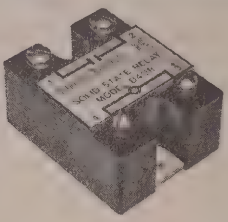
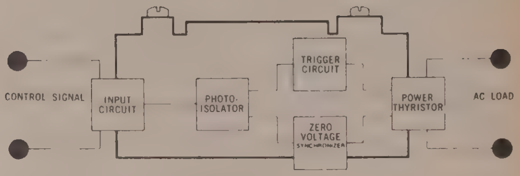
OLID STATE RELAYS ATINGS TO 40 AMPS

C OUTPUT / DC OR AC CONTROL
L RECOGNIZED / FILE NO. E60556 / .C. NMFT2
SA CERTIFIED FILE LR34149





ouglas Randall's line of solid state AC output relays are UL recognized r resistive, lamp and motor loads. Featuring opto-isolation and zero-ltage switching models are available to handle up to 40 Amp. DC or AC ntrol signals can be specified and Form A or B output.

PUT SIGNAL DATA (AC OR DC)

	DC	AC
Range	3-32V[5]	90-240VAC (80-140VDC)
Must Operate	3VDC	90VAC (80VDC)
Must Release	1VDC	10VAC (10VDC)
Input Impedance	1000Ω Min., 40KΩ Min.	
Isolation		
Signal to Load	1500V, $10^{10}\Omega$ DC	
Signal to Base	1500V, $10^{10}\Omega$ DC	
Capacitance	15 pF Signal to Load	
Temperature Range	−30°C to +80°C	

MODEL NUMBERS (NOTE 4)

Output Rating	Current	DC Signal	AC Signal
90-140VAC	4A	D04A	A04A
	8A	D08A	A08A
	12A	D12A	A12A
	25A	D25A	A25A
	40A	D40A	A40A
200-280VAC	4A	D04B	A04B
	8A	D08B	A08B
	12A	D12B	A12B
	25A	D25B	A25B
	40A	D40B	A40B
400-480VAC*	12A	D12D	A12D

* Not U/L Recognized No Internal Snubber   Not CSA Certified

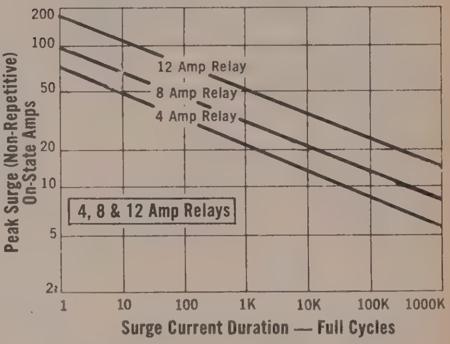
UTPUT DATA (AC OUTPUT)

Maximum Current	4A	8A	12A	25A	40A
One Cycle Surge Current	75A	100A	150A	250A	400A
Overload (1 sec., RMS)	20A	30A	50A	40A	75A
Minimum Holding Current	50mA Typ.	50mA Typ.	50mA Typ.	50mA Typ.	50mA Typ.

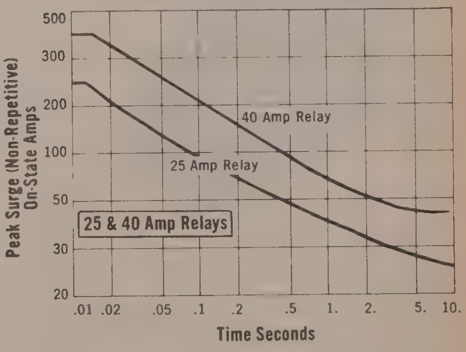
Line Voltage: 90/140V or 200/280V[1] @ 47-63 Hz[2]
ltage Drop @ Rated Current: 1.6V Max.
pical Turn-on Voltage: 5V
sponse Time (DC Signal): ½ Cycle Max.
/dt[6] Off State: 100V/μsec.
mmutating: 5V/μsec.

Off State Leakage Current:
90/140VAC — 4.5mA Typ.
200/280VAC — 5.5mA Typ.
400/480VAC — 1.5mA Typ.
Isolation Output to Base: 1500V, $10^{10}\Omega$ DC[3]
Contact Form: SPST (NO)[4]

SURGE CURRENT VS TIME



SURGE CURRENT VS TIME



OTES AND OPTIONS

Special wide range models can be made which will switch loads from 18V to 140V. These relays can handle either 24VAC or 120VAC loads.

2500VAC isolation between input and output.

Form A (SPST-NO) relays are standard. Form B (SPST-NC) switching is optional. Models incorporating this feature are designated by NC. e.g. A40B-NC.

All DC models are TTL compatible over the full operating temperature range.

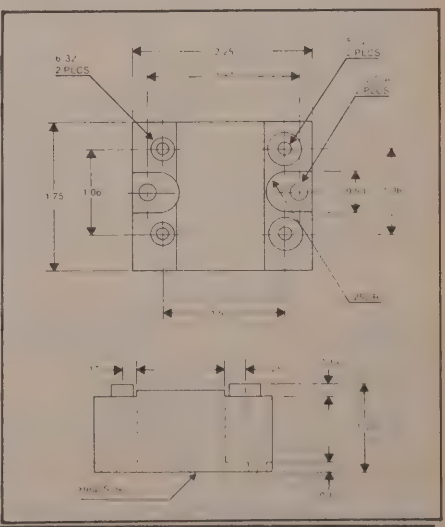
All relays except 480VAC Models incorporate an RC snubber network which prevents false operation from transients up to the dv/dt level shown. More severe transients may require additional external protection. We will review your application and recommend the additional protection needed.

ECHANICAL SPECIFICATIONS

ze: 2¼"L x 1¾"W x 1⅛" maximum.

eight: 4 ounces maximum.

rmination: Standard Models — Control Signal: 6-32 screws. Output: 8-32 screws. Special Models can be provided with lead wires or other types of termination in OEM quantities. Consult the factory for details.



PECIAL DESIGNS

ouglas Randall has designed many special solid state relays, such as a polarized, latching, SPDT unit which ill switch 12A at 28VDC. We also have the capability of making special package sizes and terminal arrange-ents for our solid state relays at moderate tool cost. Your inquiries will be reviewed promptly.

DOUGLAS RANDALL SOLID STATE COMPONENTS

Division of Kidde, Inc.
KIDDE

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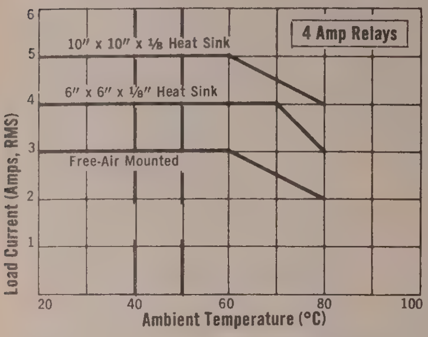
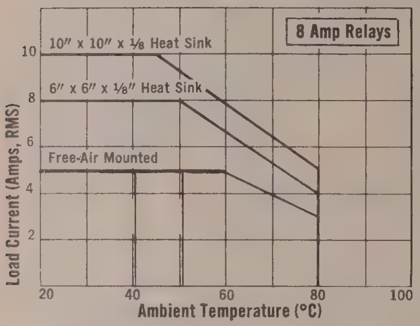
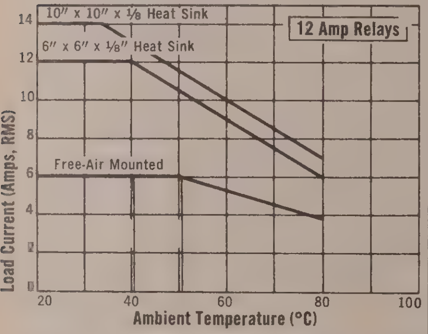
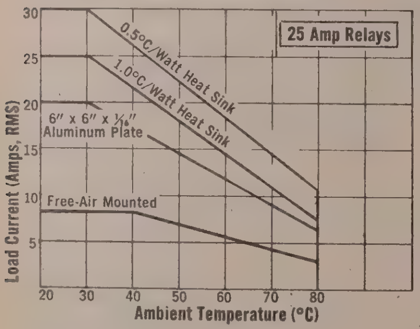
AC OUTPUT (Cont'd)

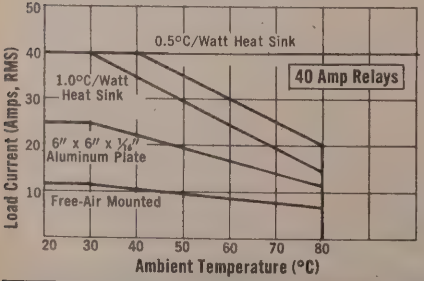
LOAD CURRENT VS TEMPERATURE











PROPORTIONAL CONTROLS

40 AMP @ 480 VDC

Douglas Randall Proportional Control vary loads up to 40 Amp @ 480 VAC from 0 to 99%.

Mechanical Specifications on page 7

SERIES R — RESISTOR CONTROLS

These controls operate by connecting a variable resistor to the input terminals. See Figs. 1 & 2.

INPUT*

Variable Resistor (150,000Ω, 1 watt) — For 120VAC
Variable Resistor (1 Megohm, ½ watt) — For 240VAC, 277VAC or 480VAC

Output Voltage		CURRENT				
		5A	10A	15A	25A	40A
90-130 VAC	Models	R05A	R10A	R15A	R25A	R40A
200-240 VAC	Models	R05B	R10B	R15B	R25B	R40B
400-480 VAC	Models*	R05D	R10D	R15D	R25D	R40D

OUTPUT DATA

Maximum Current	5A	10A	15A	25A	40A
One Cycle Surge Current	75A	100A	150A	225A	400A
Overload (1 Sec., RMS)	20A	30A	50A	70A	150A
Minimum Holding Current	.05A	.05A	.07A	.08A	.09A
AC Line: 90/130 VAC, 200/240 VAC, 250/300 VAC or 400/480 VAC					
Typical Leakage: 90/130 VAC — 10 mA; 200-240 VAC — 7 mA; 250-300 VAC — 6 mA; 400-480 VAC — 3 mA*					

* Models R05D, R10D, R15D, R25D and R40D have no snubbers.

SERIES RD / LOGIC INPUT CONTROL

Series RD provide full control from 0% to 99% when energized by 0-10 VDC or 0-15m ADC signals.

MODEL RD04A AND MODEL RD04B

INPUT SIGNAL	0-10 VDC or 0-15 ma DC(2)	
OUTPUT DATA	RD04A	RD04B
Maximum Current	4A	4A
One Cycle Surge Current	100A	100A
One Second Overload Current	40A	40A
Minimum Holding Current	.05A	.05A
AC Line Voltage	90-130 VAC @ 47-63 Hz	200-240 VAC
Off State Leakage	.01A (typical)	.01A (typical)
Response Time	150 m sec @ 10 VDC (typical)	300 m sec @ 10 VDC
Isolation (Input to Output)	500 VRMS	500 VRMS

Notes: 1. All data is measured at 25°C.
2. The input is not polarity sensitive, but **must be protected against voltages above 10 VDC.**

INPUT MODULES RDA, RDB & RDD

These modules accept 0-10 VDC signals. Their output is connected to the input terminals of Series R — Resistor Modules, which in turn controls loads up to 40 Amp @ 480 VAC. See Fig. 3.

NOMINAL PERCENTAGES OUTPUT VS INPUT RESISTANCE @ 25°C

Models R05 to R40A

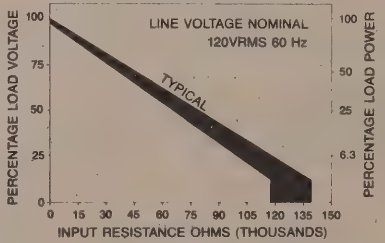


Fig. 1

Models R05 to R40B, R05 to R40D

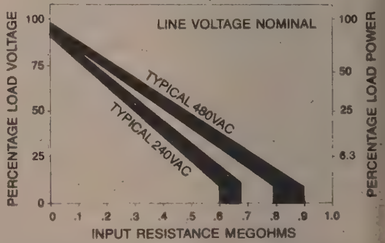


Fig. 2

PERCENT OUTPUT VOLTAGE VS INPUT VOLTAGE

Models RDA, RDB, RDD, RD04A, RD04B

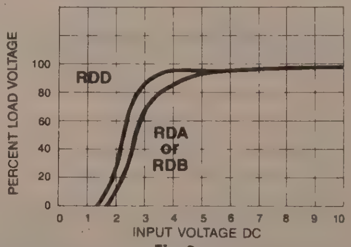


Fig. 3

CONSTANT CURRENT CONTROLS

Constant Current Controls combined with Series R Proportional Controls eliminate current fluctuations regardless of changes in AC voltages or changing load demands. They control loads up to 40 Amps @ 120 or 240 VAC and are available in five ranges listed in the Table.

These controls will maintain uniform current and light intensity for lamp loads as shown in Figures A and B, as well as for resistive loads as shown in Figure C. The Constant Current Controls will also maintain a constant speed in universal and other types of AC motors regardless of changing line voltage.

Constant Current Controls provide overload protection by limiting the current to a preset maximum. This makes them especially useful for keeping motor current at a safe level even under lock or stall rotor conditions (see Figure E).

The controls are encapsulated in small-sized packages for use in harsh environments.

Control Range*	Proportional Control		Fixed Resistor @ Terminals1-2
	120 VAC	240 VAC	
2-4 Amp	R05A	R05B	None
4-8 Amp	R10A	R10B	6.65K ±1%
6-12 Amp	R15A	R15B	3.40K ±1%
10-20 Amp	R25A	R25B	1.74K ±1%
16-32 Amp	R40A	R40B	953 ±1%

* The lower end of the control range can be extended by additional loops of wire.

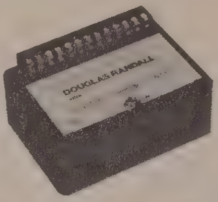


FIG. A

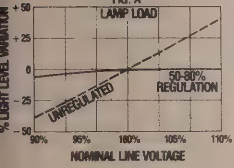


FIG. B

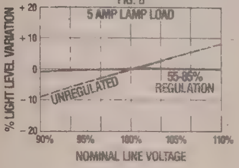


FIG. C

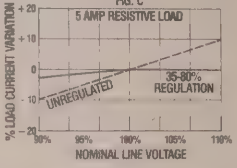


FIG. D

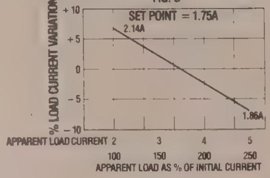
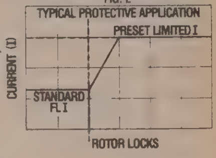


FIG. E



TIME BASE PROPORTIONAL DRIVERS

Time based proportional drivers transform any conventional DC-input solid state relay into a proportional controller. The driven relay may be a DC or AC output type. External power is derived from the controlled source. If the driven relay is a zero cross-over device, zero cross-over characteristics are maintained to reduce EMI caused by switching transients. Applications for time base proportional drivers include proportional control of heaters, platers, DC motors, universal wound DC-operated motors and certain AC motors. They are compact, epoxy encapsulated in the standard hockey puck design to withstand harsh environments. Two hole mounting is provided.

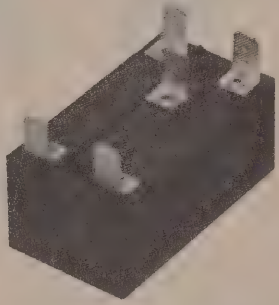
Shown at approximately 70 percent of full value is the load current and PDM control signal voltage of a typical time base proportional control of a zero cross-over relay, such as Douglas Randall D25B.

PDMA accepts external power from a 120 VAC controlled source, PDMB accepts power from a 240 VAC source and PDMD accepts power from a 10-32 VDC source.

Control Range*	Proportional Control		Fixed Resistor @ Terminals1-2
	120 VAC	240 VAC	
2-4 Amp	R05A	R05B	None
4-8 Amp	R10A	R10B	6.65K ±1%
6-12 Amp	R15A	R15B	3.40K ±1%
10-20 Amp	R25A	R25B	1.74K ±1%
16-32 Amp	R40A	R40B	953 ±1%

* The lower end of the control range can be extended by additional loops of wire.

PROPORTIONAL CONTROL TRIAC DRIVERS



Douglas Randall Proportional Control Triac Drivers control the firing angle of separate Triacs. They vary output voltages from 0 to 95% to AC loads up to 300 Amps @ 120, 240 or 480 VAC. Five models are available, two which accept 0-10 VDC inputs and three which operate from potentiometer inputs. They are compact epoxy encapsulated in phenolic cases to withstand harsh environments and designed to accept spade or solder termination. Two hole mounting is provided.

Models DPDA and DPDB accept DC inputs, and when connected to a Triac, will **increase the percentage load voltage as the DC input voltage is increased.** They provide 500 mAmps @ 6 V peak to the Triac's gate. Input to output isolation is 500 VRMS.

Models RPDA, RPDB and RPDD accept potentiometer inputs and when connected to a Triac, will **reduce the percentage load voltage as the potentiometer resistance is increased.** They provide 500 mAmps @ 6 V peak to the Triac's gate. There is no isolation between input and output.

Model	Input	Output
DPDA	0-10 VDC*	120 VAC
DPDB	0-10 VDC*	240 VAC
RPDA	Potentiometer 1W, 150 KΩ	120 VAC
RPDB	Potentiometer ½W, 1 MegΩ	240 VAC
RPDD	Potentiometer ½W, 1 MegΩ	480 VAC

* The input is not polarity sensitive but must be limited to 10 VDC.

Coaxial Relays

Applications
Dow-Key® relays are widely used for applications in air traffic control radios, CATV and CCTV systems, microwave communications, remote tone signal switches, satellite terminals, switching matrices, and RF test equipment.

Options
Each relay series has a variety of options available including different connector types, coil voltages, and auxiliary (indicator circuit) contacts. Standard coil voltages are 12 VDC, 26.5 VDC, and 115 VAC on most relay series. Other coil voltages are available on special order; consult the factory customer service representative for any special requirements you may have.

Power Switching (Hot-Switching)
Power ratings are for CW power carry only. Dow-Key relays are not designed for switching under load, although it may be possible to do so at low power levels. Consult the factory for information about power switching requirements.

Relay Impedance
Relay impedance is nominally 50 ohms unless otherwise specified. The addition of a 50 ohm relay in a 75 ohm or higher impedance line will generally result in negligible discontinuity at frequencies up to 300 MHz, because the length of the RF path through the relay is a small fraction of the signal wave length. Above 300 MHz it is increasingly important that the relay impedance be the same as the line impedance.

Dow-Key Series No.	60	61	66	77	169	260	78	115 116	310	312	313
Contact Arrangement	SPDT	SPDT	SPDT	SPDT	SPDT	DPDT	Multi-Throw Manual	115: 3 position 116: 4 position	SPDT	By-Pass	Transfer
Connector Options	BNC, N, UHF, C[3]	BNC	F	BNC, F	BNC	UHF, N, BNC	UHF, BNC	BNC	SC, HN, N	SC, HN, N	SC, HN, N
Frequency, max	1000 MHz	1000 MHz	500 MHz[2]	1000 MHz	1000 MHz	1000 MHz	500 MHz	3000 MHz	400 MHz	400 MHz	400 MHz
Power Rating (CW) at 30 MHz	1000W	150W	45W	150W	150W	1000W	1000W	200W	3000W	3000W	3000W
Power Rating (CW) at max freq	350W	50W	20W	50W	50W	350W	450W	30W	850W	850W	850W
VSWR	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.4	1.1	1.1	1.1
Impedance (ohms)	50	50	75	50/75	50	50	50	50	50	50	50
Size (LxWxH, inches)[1]	3.0 x 1.16 x 1.9	1.6 x .64 x 1.67	3.0 x 1.1 x 1.35	1.88 x .75 x 1.63	1.55 x .63 x 1.2	3.0 x 2.03 x 1.75	3.0D x 1.0H	2.5 Sq x 1.4H	2.0 x 1.68 x 1.3	2.0 x 2.13 x 1.3	2.0 x 2.13 x 1.3
Approx Weight (oz)	10	4.5	10	3	3.5	12	10	12	8	12	12

(1) Does not include connectors.
(2) Minimum −100 dB Isolation dc to 500 MHz.
(3) Special connectors producing −100 dB isolation available. Power rating is reduced to 20 CW.

Send for Dow-Key catalog

Dow-Key Division of Kilovac Corporation
P.O. Box 4422EM Santa Barbara, CA 93103 USA
(805) 684-4560 • TWX 910-336-1141

DowKey®
Division of Kilovac Corporation

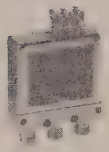
Microwave Relays

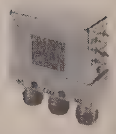
Applications
Dow-Key 400 series relays are designed for superior performance in microwave communications networks, laboratory instrumentation, high frequency test equipment, and CATV and satellite terminals.

Mechanical VS Solid State
Compared to diode or ferrite switches, coaxial relays offer the advantage of higher power handling capability, higher isolation and lower insertion loss over a broad frequency range. Operate time for Dow-Key relays is typically 10-15 ms.

Reliability
Dow-Key relays have been preferred for rugged military applications and commercial communications equipment for nearly thirty years. A balanced armature design makes Dow-Key Microwave relays well-suited for operation in severe environments. All connectors and sub-assemblies are manufactured by Dow-Key to ensure optimum conductivity and low insertion loss throughout the life of the relay.

If You Don't See What You Need
Call us. Kilovac® has many products in addition to the ones shown on this page. If we don't have a relay to fit your exact requirements, Kilovac has an experienced engineering staff available to design and produce a relay to your specifications.





ow-Key Series No.	401	402	411	412
ontact Arrangement	SPDT	SPDT	Transfer	Transfer
onnector Options	SMA	N	SMA	N
equency, max	18 GHz	12.4 GHz	18 GHz	12.4 GHz
olation-dB, min 0-1 GHz	80	85	80	85
olation-dB, min at max freq	60	60	60	60
SWR, max	1.5	1.5	1.5	1.5
sertion Loss-dB, max	0.5	0.5	0.5	0.5
ze (inches)*	1.6H x 1.18L x .55W	2.2H x 2.64L x 1.09W	2.1L x 1.26 Sq	3.0L x 1.75 Sq
pprox Weight (oz)	2	9	6	16

Excludes mounting bracket, terminals, and connectors.

Send for Dow-Key catalog

Dow-Key Division of Kilovac Corporation
P.O. Box 4422EM Santa Barbara, CA 93103 USA
(805) 684-4560 • TWX 910-336-1141

DowKey®
Division of Kilovac Corporation

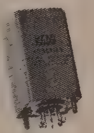
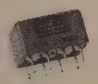
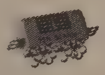
ELECTRONIC SPECIALTY DIVISION

ELECSPEC CORP. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97230 / (Area Code 503) 665-0121 / TWX 910-469-8782

The Nation's Most Advanced Facility for the Development, Production and Testing of Relays

With over 25 years of relay experience our product line now consists of more than 20 standard relays. Within the 67,000 square feet of manufacturing space we service the switching needs for major military and industrial accounts. Quality Control is not an accident here. We believe in and practice total control of all factors which could affect the end quality of our product. Continual emphasis is placed on utilizing state-of-the-art in new designs. We encourage all of our customers to visit our facility and view the operation first hand.

STANDARD HERMETIC SEALED RELAY SPECIFICATION

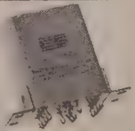
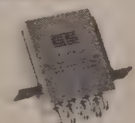
	General Information	Contact Form	Contact Rating	Size	Sensitivity	Shock	Vibration	Coil Voltage	Coil Resistance ± 10%	Max. Pick Up/ Latch Voltage/ Current @ +25°C	Min. Drop Out Voltage/ Current @ +25°C	Operate Time Max.	Release Time Max.
40 	Especially designed for low power input, as low as 15 mw, with dry circuit to 5 amps switching capability.	1PDT or 2PDT	Dry Circuit to 5 Amp 28 VDC Resistive	.970 x .970 x 1.781	20 mw 1PDT 40 mw 2PDT	50 G's 11±1.0 ms	10 G's 40 to 500 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14 MADC 6.3 MADC 2.8 MADC	5 MADC 2.3 MADC 1.0 MADC	35.0 ms	15.0 ms
50 	Qualified to M5757/9 and M39016/6.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .41 x .800	250 mw Pick Up	100 G's 10 ms ±2.0 ms	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	40 Ohms 150 Ohms 700 Ohms	3.0 VDC 6.0 VDC 13.0 VDC	0.6 VDC 1.2 VDC 2.3 VDC	4.0 ms	4.0 ms
55N 	½ size sensitive latching relay qualified to MIL-R-39016/46 and /47, all dash numbers.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .41 x .800	90 mw Latch/Reset	100 G's 10 ms ±2.0 ms	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	100 Ohms 500 Ohms 1800 Ohms	3.0 VDC 6.7 VDC 12.7 VDC	N/A	5 ms	N/A
68N	Crystal can "Lazy S" header.	2PDT	D/C to 2A 28 VDC Resistive	.359 x .797 x .875	300 mw Pick Up	20 G's 10 ±2 Amps	30 G's 56 to 3000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	35 Ohms 140 Ohms 552 Ohms	3.2 VDC 6.5 VDC 13.0 VDC	0.5 VDC 1.1 VDC 2.3 VDC	5 ms	5 ms
71N	Sensitive crystal can relay.	2PDT	D/C to 2A 28 VDC Resistive	.4 x .8 x 1.280	40 mw Pick Up	50 G's 10 ±2 ms	10 G's 10 to 500 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14.2 MADC 6.3 MADC 2.8 MADC	1.42 MADC 0.63 MADC 0.28 MADC	15 ms	10 ms
77R	Crystal can. Sensitive latching relay.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.4 x .8 x .875	90 mw Latch/Reset	50 G's 11 ±1 ms	50 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	100 Ohms 500 Ohms 1800 Ohms	3.0 VDC 6.7 VDC 12.7 VDC	N/A	5 ms	5 ms

Note: Contact factory for specific mounting or header style.

ELECTRONIC SPECIALTY DIVISION

ELECSPEC CORP. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97230 / (Area Code 503) 665-0121 / TWX 910-469-8782

STANDARD HERMETIC SEALED RELAY SPECIFICATION

	General Information	Contact Form	Contact Rating	Size	Sensitivity	Shock	Vibration	Coil Voltage	Coil Resistance ± 10%	Max. Pick Up/ Latch Voltage/ Current @ +25°C	Min. Drop Out Voltage/ Current @ +25°C	Operate Time Max.	Release Time Max.
79N	Crystal can. Non-latching relay.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.4 x .8 x .875	250 mw Pick Up	100 G's 11 ±2 ms	20 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	35 Ohms 140 Ohms 600 Ohms	3.0 VDC 5.9 VDC 12.5 VDC	0.3 VDC 0.6 VDC 1.5 VDC	5 ms	5 ms
80N	Sensitive — double seal construction. Coils are in hermetically sealed compartments, separate from contact chamber.	2PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.41 x .915 x 1.281	40 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	6.0 VDC 12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms 5000 Ohms	14.2 MADC 6.3 MADC 2.8 MADC	1.42 MADC 0.63 MADC 0.28 MADC	15 ms	10 ms
90N 	90N Series — Non-latching.	4PDT	Dry Circuit to3 Amps 28 VDC Resistive	.602 x 1.032 x 1.278	80 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	500 Ohms 2000 Ohms	12.6 MADC 6.3 MADC	1.26 MADC 0.63 MADC	20 ms	5 ms
92N	92N Series — Latching.				80 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	500 Ohms 2000 Ohms	6.3 VDC 12.6 VDC	N/A	9 ms	N/A
93 	93 Series — Non-latching.	2PDT	10 Amps 28 VDC Resistive	.515 x 1.032 x 1.300	500 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	65 Ohms 300 Ohms	5.8 VDC 12.5 VDC	1.1 VDC 2.3 VDC	7 ms	3 ms
94	94 Series — Latching.				150 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	240 Ohms 1000 Ohms	6.0 VDC 12.3 VDC	N/A	10 ms	N/A
100N	100N Series — Non-latching.	6PDT	Dry Circuit to 3 Amps 28 VDC Resistive	.852 x 1.032 x 1.278	150 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	200 Ohms 1000 Ohms	27.4 MADC 12.2 MADC	2.74 MADC 1.22 MADC	18 ms	5 ms
102N	102N Series — Latching.				150 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	250 Ohms 1000 Ohms	6.1 VDC 12.3 VDC	N/A	8 ms	N/A
103	103 Series — Non-latching.	4PDT	10 Amps 28 VDC Resistive	.852 x 1.032 x 1.3	1000 mw Pick Up	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	32 Ohms 150 Ohms	5.8 VDC 12.5 VDC	1.1 VDC 2.3 VDC	8 ms	5 ms
104	104 Series — Latching.				300 mw Latch/Reset	50 G's 11 ±1 ms	20 G's 56-2000 Hz	12.0 VDC 26.5 VDC	125 Ohms 500 Ohms	6.1 VDC 12.3 VDC	N/A	9 ms	N/A
F	Miniature coaxial relays with 8" min. RG178 B/U cables attached.	1PDT RF Plus Auxiliary 1PDT or 2PDT RF	RF to 1.5 Amps 50 Watt Max.	Frequency Range to 500 MHz VSWR — 1:1.1 Typical. Characteristic Impedance — 50 Ohm Typical. Cross Talk — 50 dB Typical.				12.0 VDC 26.5 VDC	140 Ohms 600 Ohms	5.9 VDC 12.5 VDC	1.0 VDC 2.3 VDC	5 ms	5 ms
H	Welded sealing.							12.0 VDC 26.5 VDC	150 Ohms 700 Ohms	6.0 VDC 13.0 VDC	1.2 VDC 2.3 VDC	5 ms	5 ms

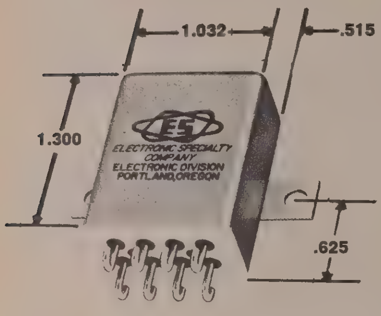
Note: Contact factory for specific mounting or header style.

ELECTRONIC SPECIALTY DIVISION

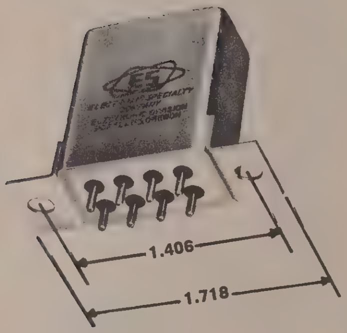
ELECSPEC CORP. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97230
(Area Code 503) 665-0121 / TWX 910-469-8782

93 SERIES
ARC-BARRIER
2PDT

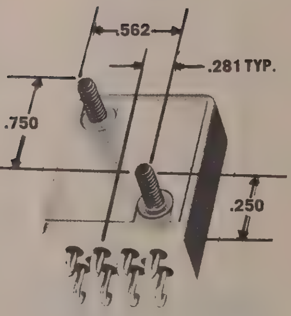
- 500 MW PICKUP
- 10 AMPERE DC LOADS
- 5 AMPERE AC LOADS
- CASE GROUNDED


1.032
.515
1.300
.625
ES
ELECTRONIC SPECIALTY COMPANY
ELECTRONIC DIVISION
PORTLAND, OREGON

93GB183



93GB1813
93GB1861


.562
.281 TYP.
.750
.250

93GB184
93GB1810

MICRO-MINIATURE HIGH CURRENT TYPE WITH INTERNAL ARC BARRIER FOR GROUNDED CASE APPLICATIONS

SPECIFICATIONS (METHODS PER MIL-R-5757)

Weight: 2.0 ounces maximum.

Terminal Finish: Electro-Tin, Type 1 per MIL-T-10727, followed by a Flow Process.

Terminal Strength (Pull): 5.0 ±0.5 pound in any direction.

Case Finish: Non Corrosive.

Sealing: Seal Test per MIL-R-5757 (10^{-6} SCCPS)*

DC Coil Resistance: ±10% rated value at +25°C.

Shock: Per MIL-R-5757, Level 4.
50 G's for 11.0±1.0 Millisecond.
No contact closures of open contacts.
10 Microseconds max. chatter of closed contacts.

Minimum Contact Life (Case Grounded): Tested at +125°C, with rated contact loads.
DC Resistive: 100,000 operations at 20 CPM.
DC Inductive: 100,000 operations at 10 CPM.
DC Lamp: 100,000 operations at 3 CPM.
AC Resistive: 50,000 operations at 20 CPM.

Contact Overload: Two times rated contact loads for 100 operations.

Vibration: Per MIL-R-5757, level 4 except 0.125 inch double amplitude, 10 to 56 Hz.
20 G's max. at 56 to 2,000 Hz.
No closures of open contacts.
10 microseconds max. chatter of closed contacts.

Centrifugal Acceleration: 50 G's: No closures of open contacts.
10 microseconds max. chatter of closed contacts.

Moisture Resistance: Per MIL-R-5757, (Coil to case polarized at 100VDC).

Dielectric Strength (Sea Level): 1000 VRMS between open contacts, 500 VRMS Post Life.
500 VRMS between coil and case.
1000 VRMS between all other combinations.

Dielectric Strength (1.3" Hg): 500 VRMS (Open contacts 350 VRMS)

Insulation Resistance: 1000 Megohms minimum at 500 VDC (Coil to case 500 Megohms at +125°C), 10 Megohms Post Life

Coil Overvoltage: Reference Max. rated operate voltage.

Maximum Coil Dissipation: 3.5 Watts maximum continuous at +125°C.

Standard Pickup Power: 500 Milliwatts at +25°C.

Contact Ratings (Max. Amperes Per Pole) Case Grounded*: Contacts monitored per dynamic contact res. limits.

Res: 28 VDC, Connected Form C: 10.0 Amperes.

Res: 115 VRMS 1ϕ, Connected Form A or B: 7.5 Amperes at 400 Hz.

Res: 115 VRMS 1ϕ, Connected Form C: 5.0 Amperes at 400 Hz.

Res: 240 VRMS 1ϕ, Connected Form C: 3.5 Amperes at 400 Hz.

Inductive: 20 Millihenries, 28 VDC: 5.0 Amperes (Load spikes suppressed below 10 VDC).

Lamp: 28 VDC: 1.5 Amperes (18.0 Amperes inrush for 15 MSEC.)

Static Contact Resistance High Level: 0.01 OHM maximum; 0.02 maximum after life (Measured at or above 100 milliamperes and 6 VDC).

Dynamic Contact Resistance High Level: 1.0 OHM max. at or above 500 MA & 28 VAC or VDC.

Contact Operate Time: 7.0 Milliseconds max.

Contact Operate Bounce Time: 2.0 MSEC. Max. (Contacts above ½ Ampere)

Contact Release Time: 3.0 MSEC. max. (Contacts below ½ Ampere)
5.0 Millisecond maximum.

Contact Release Bounce Time: 3.0 MSEC. max. (Contacts above ½ Ampere).
4.0 MSEC. Max. (Contacts below ½ Ampere).

Duty Cycle: Continuous.

Rated Miss Detection: 5,000 cycles at 5 Hz maximum.
Current: 0.5 Ampere.
Voltage: 28 VDC.
Miss Level: 2.0 OHMS max.

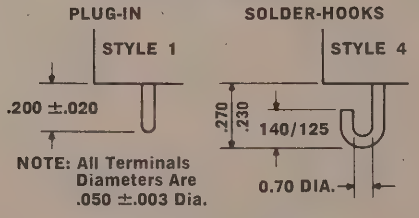
* Unless otherwise indicated, values apply throughout the ambient temperature range and with nominal voltage.

GROUNDED CASE APPLICATIONS MAY HAVE THE LOAD AND COIL SUPPLIES ELECTRICALLY CONNECTED TO CASE COMMON

STANDARD ADJUSTMENT SCHEDULE

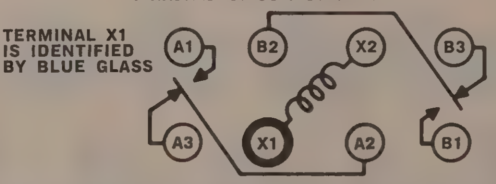
Coil Resistance DC Ohms +25°C	93 SERIES 2PDT ADJUSTMENT "X" 500 MW							
	RATED OPERATE VOLTAGE		MAXIMUM PICKUP VOLTAGE		MAXIMUM DROP-OUT VOLTAGE		MINIMUM DROP-OUT VOLTAGE	
	NOMINAL	MAXIMUM	+125°C	+25°C	+125°C	+25°C	+25°C	−65°C
16	6.0	7.2	4.35	3.0	2.17	1.5	0.6	0.4
65	12.0	14.4	8.35	5.8	4.17	2.9	1.1	0.7
300	26.5	32.0	18.0	12.5	9.0	6.2	2.3	1.5
950	48.0	57.6	37.0	22.0	18.5	11.0	4.0	2.6
5500	110.0	132.0	75.0	53.0	37.5	26.5	9.8	6.4

STANDARD TERMINALS


PLUG-IN
SOLDER-HOOKS
STYLE 1
STYLE 4
.200 ±.020
.270
.230
140/125
0.70 DIA.

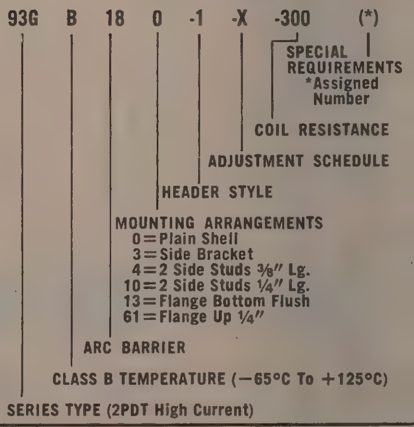
NOTE: All Terminals Diameters Are .050 ±.003 Dia.

STANDARD CIRCUIT DIAGRAM


A1
B2
X2
B3
A3
X1
A2
B1

TERMINAL X1 IS IDENTIFIED BY BLUE GLASS

HOW TO ORDER


93G B 18 0 -1 -X -300 (*)
SPECIAL REQUIREMENTS *Assigned Number
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENTS
0=Plain Shell
3=Side Bracket
4=2 Side Studs ⅜" Lg.
10=2 Side Studs ¼" Lg.
13=Flange Bottom Flush
61=Flange Up ¼"
ARC BARRIER
CLASS B TEMPERATURE (−65°C To +125°C)
SERIES TYPE (2PDT High Current)

24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
PRODUCTS
PAGE NO.
2800
TRW
moo

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The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

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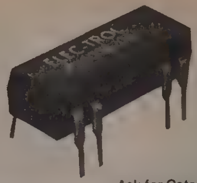
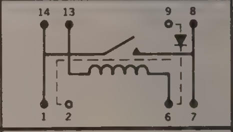
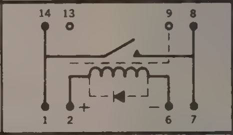
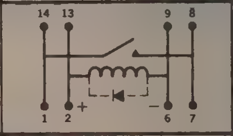
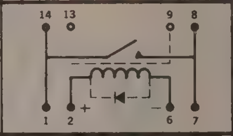
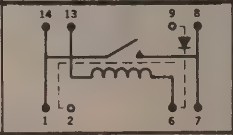
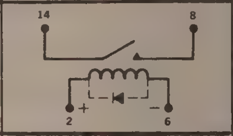
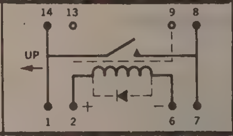
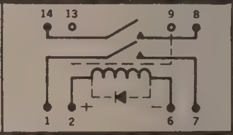
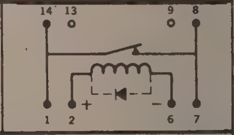
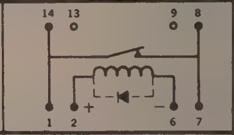
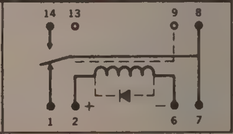
645 stewart ave., garden city, ny 11530

ELECTROL
DIP REED RELAYS



Ask for Catalog No. 103

CONTACT FORM	CONTACT RATING	PART NUMBER		COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	PHYSICAL		E.S. OPTION *	CIRCUIT DIAGRAM (Top View of Relay)
	MAX. LOAD (Resistive)	NO DIODE	WITH DIODE					HEIGHT	NO. TERM.		
1A SPST-NO	3W .11A 28V	RA30921051	RA31201051	5	500	3.8	1.0	.225"	8 Pin DIP	YES	
		RA30921061	RA31201061	6	500	4.0	1.0				
		RA30921121	RA31201121	12	500	8.0	2.0				
		RA30921241	RA31201241	24	1400	16.0	4.0				
		RA30381051	RA30391051	5	500	3.8	1.0	.225"	8 Pin DIP	YES	
		RA30381061	RA30391061	6	500	4.0	1.0				
		RA30381121	RA30391121	12	500	8.0	2.0				
		RA30381241	RA30391241	24	1400	16.0	4.0				
		RA30231051	RA31191051	5	500	3.8	1.0	.225"	8 Pin DIP	NO	
		RA30231061	RA31191061	6	500	4.0	1.0				
		RA30231121	RA31191121	12	500	8.0	2.0				
		RA30231241	RA31191241	24	1400	16.0	4.0				
	10W .5A 100V	RA30451051	RA30461051	5	500	3.8	1.0	.275"	8 Pin DIP	YES	
		RA30451061	RA30461061	6	500	4.0	0.5				
		RA30451121	RA30461121	12	500	8.0	1.0				
		RA30451241	RA30461241	24	2150	16.0	2.0				
		RA31541051	RA31551051	5	500	3.8	1.0	.275"	8 Pin DIP	YES	
		RA31541061	RA31551061	6	500	4.0	1.0				
		RA31541121	RA31551121	12	500	8.0	2.0				
		RA31541241	RA31551241	24	2150	16.0	4.0				
		RA31151051	RA31171051	5	500	3.8	1.0	.275"	4 Pin DIP	NO	
		RA31151061	RA31171061	6	500	4.0	0.5				
		RA31151121	RA31171121	12	500	8.0	1.0				
		RA31151241	RA31171241	24	2150	16.0	2.0				
1A Mercury Wetted	50W 1.0A 100V	RA31501051	RA31511051	5	55	3.8	0.5	.275"	8 Pin DIP	YES	
		RA31501061	RA31511061	6	55	4.5	0.5				
		RA31501121	RA31511121	12	300	9.0	1.0				
		RA31501241	RA31511241	24	1100	18.0	2.0				
2A DPST-NO	3W .11A 28V	RA30982051	RA31232051	5	200	3.8	1.0	.275"	8 Pin DIP	YES	
		RA30982061	RA31232061	6	200	4.0	1.0				
		RA30982121	RA31232121	12	500	8.0	2.0				
		RA30982241	RA31232241	24	2150	16.0	4.0				
1B SPST-NC	3W .11A 28V	RA31001051	RA31251051	5	500	3.8	1.0	.225"	8 Pin DIP	NO	
		RA31001061	RA31251061	6	500	4.0	0.5				
		RA31001121	RA31251121	12	500	8.0	1.0				
		RA31001241	RA31251241	24	1400	16.0	2.0				
	10W .5A 100V	RA30511051	RA30521051	5	500	3.8	1.0	.275"	8 Pin DIP	NO	
		RA30511061	RA30521061	6	500	4.0	0.5				
		RA30511121	RA30521121	12	500	8.0	1.0				
		RA30511241	RA30521241	24	2150	16.0	2.0				
1C SPDT	3W .25A 28V	RA30421051	RA30441051	5	200	4.0	0.5	.275"	8 Pin DIP	YES	
		RA30421061	RA30441061	6	80	4.0	0.5				
		RA30421121	RA30441121	12	500	8.0	1.0				
		RA30421241	RA30441241	24	2000	16.0	2.0				

*For electrostatic shielding add −02 to P/N

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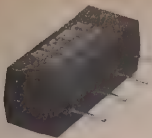
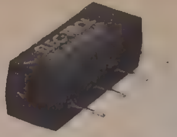
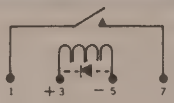
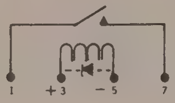
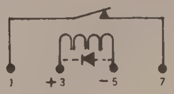


ELECTROL
SIP REED RELAYS

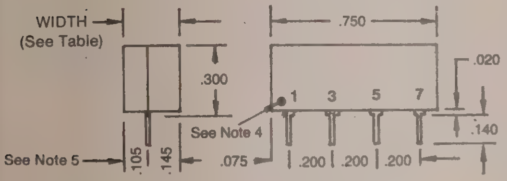


Ask for Catalog No. 103

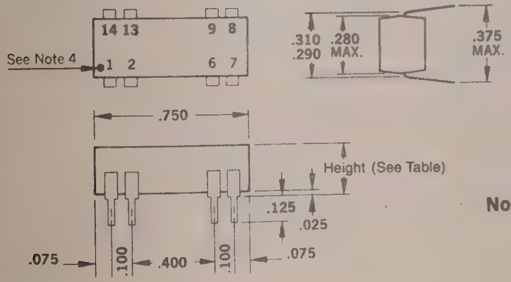
PRELIMINARY

CONTACT FORM	CONTACT RATING MAX. LOAD (Resistive)	PART NUMBER NO DIODE	PART NUMBER WITH DIODE	COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	PHYSICAL WIDTH	PHYSICAL NO. TERM.	E.S. OPTION *	CIRCUIT DIAGRAM (Top View of Relay)
1A SPST-NO	10W .5A 100V	RA32041051	RA32051051	5	500	3.8	1.0	.200"	4 Pin SIP	NO	
		RA32041061	RA32051061	6	500	4.0	0.5				
		RA32041121	RA32051121	12	500	8.0	1.0				
		RA32041241	RA32051241	24	2150	16.0	2.0				
		RA31301051	RA31311051	5	500	3.8	1.0	.250"	4 Pin SIP	NO	
		RA31301061	RA31311061	6	500	4.0	0.5				
		RA31301121	RA31311121	12	500	8.0	1.0				
		RA31301241	RA31311241	24	2150	16.0	2.0				
1B SPST-NC		RA31321051	RA31331051	5	500	3.8	1.0	.250"	4 Pin SIP	NO	
		RA31321061	RA31331061	6	500	4.0	0.5				
		RA31321121	RA31331121	12	500	8.0	1.0				
		RA31321241	RA31331241	24	2150	16.0	2.0				

SIP PHYSICAL



DIP PHYSICAL



DIP/SIP Part Number Description

RA3045 1 05 1 – 02

Series #

Number of Poles

Coil Voltage – 05, 06, 12, 24

Contact Options
- 1 – Standard Contact
- 2 – Contact Preconditioning
- 3 – Low Level Contact

Shielding Options
- Omit – No Shielding
- 02 – Electrostatic Shield

Notes:
1. All dimensions are in inches.
2. Tolerances unless otherwise specified are ±.015".
3. Terminals are .010" ±.005" X .020" ±.005"; solderable.
4. Dot indicates terminal No. 1.
5. RA3204/RA3205 Series, leads are centered on relay body.

DIP and SIP RATINGS

CONTACT FORM	RATING WATTS D.C.	LIFE ($X10^6$ Operations) RATED LOAD	LIFE ($X10^6$ Operations) LOW LEVELS	MAX. INITIAL CONTACT RES. (ohms)	MINIMUM BREAKDOWN VDC OPEN CONTACTS	MINIMUM BREAKDOWN VDC INSULATED TERMINALS	MIN. INS. RES. @20 C (ohms)	ACTUATE TIME MAX. (Millisec.)	DE-ACTUATE TIME SUPPRESSED MAX (Millisec.)	BOUNCE TIME MAX. (Millisec.)
A or B	3 10	10	200	0.2	200	1500	10^{10}	.5	.5	.5
C	3	5	50	0.2	200	1500	10^9	.5	.5	NO 1.0 NC 2.0
A – Mercury Wetted	50	100	1000	0.1	1000	1500	10^{10}	2.0	2.0	0

CONTACT FORM		OPERATING TEMPERATURE	STORAGE TEMPERATURE	VIBRATION	SHOCK	ORIENTATION
A, B or C	DIP	−40 to +85°C	−55 to +105°C	20G to 2000 Hz	50G	Any Position
	SIP			10G to 2000 Hz	20G	
A – Mercury Wetted		−30 to +85°C	−30 to +105°C	Not Applicable	Not Applicable	±30° Max. from vertical

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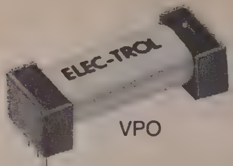


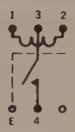
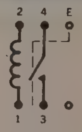
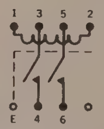
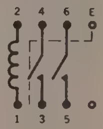
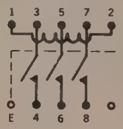
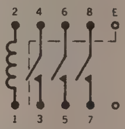
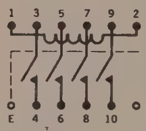
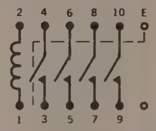
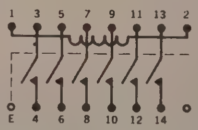
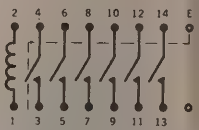
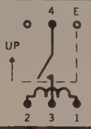
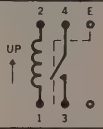
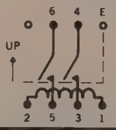
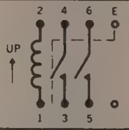
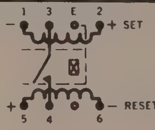
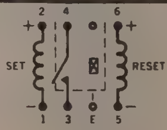
VPO

ELECTROL
VARI-PACK REED RELAYS

General Description:
Elec-Trol Vari-Pack Reed Relays are specially designed to meet high performance and quality standards at low cost. They are available in both open and sealed versions and with coil terminals at the same end or opposite ends of the relay. The sealed version is the open version placed within a polyester cover then encapsulated. Optional features include magnetic shielding, electrostatic shielding and contact preconditioning.

The relay body is made of durable molded polyester with the reed contacts and terminals securely held in place at each end of the relay with epoxy. These relays are available with contact forms 1A through 6A, 1A and 2A mercury wetted, 1A latching, 1B, 2B, 1A1B, 2A2B and 1C through 4C. Consult factory for other coil or switch configurations.

Ask for Catalog No. 1

CONTACT FORM	CONTACT RATING (Resistive)	PART NUMBER		COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	WIDTH		CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No.	
		OPEN	SEALED					OPEN	SEALED	A	B
1A*	10W .5A 200V	VPO1A05X10	VPS1A05X10	5	500	3.8	0.5	.36	.41		
		VPO1A06X10	VPS1A06X10	6	125	4.0	0.5				
		VPO1A12X10	VPS1A12X10	12	500	8.0	1.0				
		VPO1A24X10	VPS1A24X10	24	2000	16.0	2.0				
		VPO1A48X10	VPS1A48X10	48	8000	32.0	4.0				
2A*		VPO2A05X10	VPS2A05X10	5	200	3.8	0.5	.44	.49		
		VPO2A06X10	VPS2A06X10	6	110	4.0	0.5				
		VPO2A12X10	VPS2A12X10	12	440	8.0	1.0				
		VPO2A24X10	VPS2A24X10	24	1750	16.0	2.0				
		VPO2A48X10	VPS2A48X10	48	7000	32.0	4.0				
3A*		VPO3A05X10	VPS3A05X10	5	200	3.8	0.5	.55	.60		
		VPO3A06X10	VPS3A06X10	6	85	4.0	0.5				
		VPO3A12X10	VPS3A12X10	12	340	8.0	1.0				
		VPO3A24X10	VPS3A24X10	24	1350	16.0	2.0				
		VPO3A48X10	VPS3A48X10	48	5400	32.0	4.0				
4A*		VPO4A05X10	VPS4A05X10	5	120	3.8	0.5	.66	.71		
		VPO4A06X10	VPS4A06X10	6	60	4.0	0.5				
		VPO4A12X10	VPS4A12X10	12	250	8.0	1.0				
		VPO4A24X10	VPS4A24X10	24	1000	16.0	2.0				
		VPO4A48X10	VPS4A48X10	48	4000	32.0	4.0				
6A*		VPO6A05X10	VPS6A05X10	5	70	3.8	0.5	.86	.91		
		VPO6A06X10	VPS6A06X10	6	35	4.0	0.5				
		VPO6A12X10	VPS6A12X10	12	135	8.0	1.0				
		VPO6A24X10	VPS6A24X10	24	550	16.0	2.0				
		VPO6A48X10	VPS6A48X10	48	2200	32.0	4.0				
1A MERCURY WETTED	50W 1.0A 100V	VPO1M06X10	VPS1M06X10	6	75	4.0	0.5	.44	.49		
		VPO1M12X10	VPS1M12X10	12	300	8.0	1.0				
		VPO1M24X10	VPS1M24X10	24	1200	16.0	2.0				
		VPO1M48X10	VPS1M48X10	48	4800	32.0	4.0				
2A MERCURY WETTED		VPO2M06X10	VPS2M06X10	6	45	4.0	0.5	.55	.60		
		VPO2M12X10	VPS2M12X10	12	175	8.0	1.0				
		VPO2M24X10	VPS2M24X10	24	700	16.0	2.0				
		VPO2M48X10	VPS2M48X10	48	2800	32.0	4.0				
1AL* MAGNETIC LATCH	10W .5A 200V	VPO1L05X10	VPS1L05X10	5	500 ea	3.8	1.5 MS MIN. PULSE WIDTH	.44	.49		
		VPO1L06X10	VPS1L06X10	6	300 ea	4.0					
		VPO1L12X10	VPS1L12X10	12	1200 ea	8.0					
		VPO1L24X10	VPS1L24X10	24	4800 ea	16.0					

*UL Recognized

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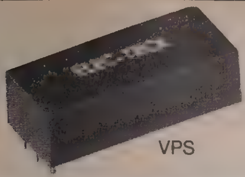
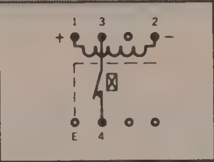
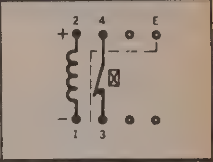
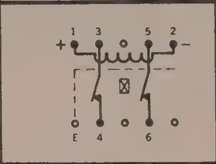
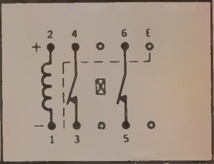
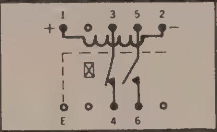
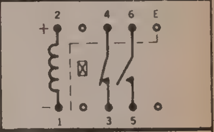
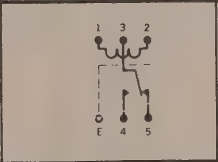
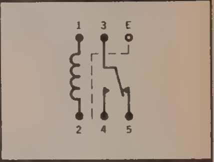
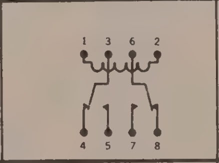
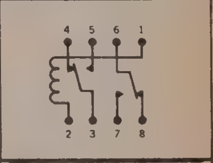
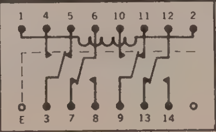
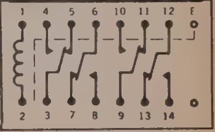

VPS

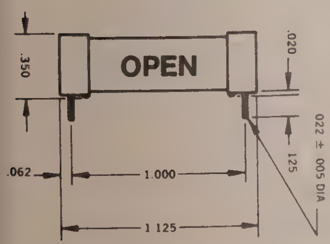
ELECTROL
VARI-PACK REED RELAYS

Ask for Catalog No. 121

CONTACT FORM	CONTACT RATING (Resistive)	PART NUMBER		COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @ 20°C	MIN DROP-OUT V.D.C. @20°C	WIDTH		CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No.	
		OPEN	SEALED					OPEN	SEALED	A	B
1B*	10W .5A 200V	VPO1B05X10	VPS1B05X10	5	200	3.8	0.5	.44	.49		
		VPO1B06X10	VPS1B06X10	6	110	4.0	0.5				
		VPO1B12X10	VPS1B12X10	12	440	8.0	1.0				
		VPO1B24X10	VPS1B24X10	24	1750	16.0	2.0				
		VPO1B48X10	VPS1B48X10	48	7000	32.0	4.0				
2B*		VPO2B05X10	VPS2B05X10	5	200	3.8	0.5	.55	.60		
		VPO2B06X10	VPS2B06X10	6	110	4.0	0.5				
		VPO2B12X10	VPS2B12X10	12	440	8.0	1.0				
		VPO2B24X10	VPS2B24X10	24	1750	16.0	2.0				
		VPO2B48X10	VPS2B48X10	48	7000	32.0	4.0				
1A1B*		VPO1F06X10	VPS1F06X10	6	110	4.0	0.5	.55	.60		
		VPO1F12X10	VPS1F12X10	12	440	8.0	1.0				
		VPO1F24X10	VPS1F24X10	24	1750	16.0	2.0				
		VPO1F48X10	VPS1F48X10	48	7000	32.0	4.0				
1C	3W .25A 28V	VPO1C05X10	VPS1C05X10	5	500	3.8	0.5	.44	.49		
		VPO1C06X10	VPS1C06X10	6	125	4.0	0.5				
		VPO1C12X10	VPS1C12X10	12	500	8.0	1.0				
		VPO1C24X10	VPS1C24X10	24	2000	16.0	2.0				
		VPO1C48X10	VPS1C48X10	48	8000	32.0	4.0				
2C		VPO2C05X10	VPS2C05X10	5	200	3.8	0.5	.55	.60		
		VPO2C06X10	VPS2C06X10	6	80	4.0	0.5				
		VPO2C12X10	VPS2C12X10	12	310	8.0	1.0				
		VPO2C24X10	VPS2C24X10	24	1250	16.0	2.0				
		VPO2C48X10	VPS2C48X10	48	5000	32.0	4.0				
4C		VPO4C06X10	VPS4C06X10	6	30	4.0	0.5	.86	.91	 1 4 5 6 10 11 12 2 E 3 7 8 9 13 14	 1 4 5 6 10 11 12 E 2 3 7 8 9 13 14
		VPO4C12X10	VPS4C12X10	12	125	8.0	1.0				
		VPO4C24X10	VPS4C24X10	24	500	16.0	2.0				
		VPO4C48X10	VPS4C48X10	48	2000	32.0	4.0				

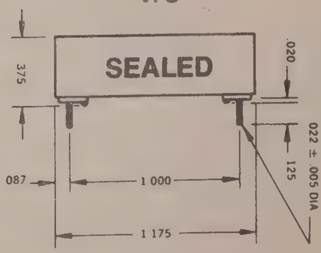
*UL Recognized

VPO

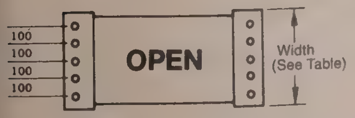


OPEN
.350
.020
.062
1.000
1 125
125
022 ± 005 DIA

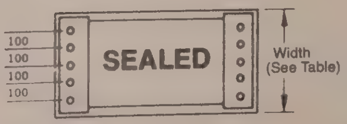
VPS



SEALED
375
.020
087
1 000
1 175
125
022 ± .005 DIA



100
100
100
100
OPEN
Width
(See Table)



100
100
100
100
SEALED
Width
(See Table)

Notes: 1. All dimensions are in inches.
2. Tolerance unless otherwise specified is ±.015".
3. Unused terminals are omitted.

VARI-PACK Part Number Description

VPO 1 A 05 A 1 0

VPO – Open
VPS – Sealed

Number of Poles

Contact Form

Coil Voltage – 05, 06, 12, 24, 48

Coil Termination
A – End Coil
B – Side Coil

Contact Options
1 – Standard Contact
2 – Contact Preconditioning
3 – Low Level Contact

Shielding Options
0 – No Shielding
1 – Magnetic Shield (MS)
2 – Electrostatic Shield (ES)
3 – MS & ES Shield

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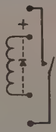
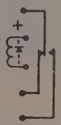
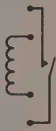
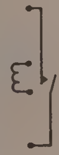
ELECTROL
BLUE BOY REED RELAYS

Ask for Catalog No. 2001

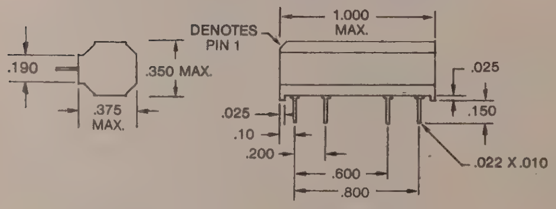
PART NUMBER	COIL V.D.C.	COIL RES. OHMS @20°C ±10%	MAX. OPERATE V.D.C. @20°C	MIN. RELEASE V.D.C. @20°C	NOMINAL TIMING MILLISECONDS OPERATE/ BOUNCE	NOMINAL TIMING MILLISECONDS SUPPRESSED RELEASE/ BOUNCE	MAX. COIL V.D.C.	MINIMUM BREAKDOWN V.D.C. OPEN CONTACTS	MINIMUM BREAKDOWN V.D.C. INSULATED TERMINALS	MAXIMUM DC RESISTIVE CONTACT RATING WATTS	MAXIMUM DC RESISTIVE CONTACT RATING AMPS	MAXIMUM DC RESISTIVE CONTACT RATING VOLTS	CIRCUIT DIAGRAM (TOP VIEW)
BBS1A SERIES**													
BBS1A05A10	5-6	500	3.8	0.5	0.4/0.3	0.1/ –	8.0	300	1500	10	0.5	200	
BBS1A06A10	5-6	125	3.8	0.5	0.4/0.3	0.1/ –	8.0	300	1500	10	0.5	200	
BBS1A12A10	12	500	8.0	1.0	0.4/0.3	0.1/ –	16.0	300	1500	10	0.5	200	
BBS1A24A10	24	2000	16.0	2.0	0.4/0.3	0.1/ –	32.0	300	1500	10	0.5	200	
BBS1A48A10	48	8000	32.0	4.0	0.4/0.3	0.1/ –	64.0	300	1500	10	0.5	200	
BBS1C SERIES**													
BBS1C05A10	5-6	200	4.0	0.5	0.6/0.4	0.5/1.2	8.0	250	1500	3.0	0.25	28	
BBS1C06A10	5-6	125	4.0	0.5	0.6/0.4	0.5/1.2	8.0	250	1500	3.0	0.25	28	
BBS1C12A10	12	500	8.0	1.0	0.6/0.4	0.5/1.2	16.0	250	1500	3.0	0.25	28	
BBS1C24A10	24	2000	16.0	2.0	0.6/0.4	0.5/1.2	32.0	250	1500	3.0	0.25	28	
BBW1A SERIES													
BBW1A05B30	5-6	400	3.8	0.5	0.7/0.3	0.3/ –	8.0	600	1500	50	1.0	200	
BBW1A06B30	5-6	100	3.8	0.5	0.7/0.3	0.3/ –	8.0	600	1500	50	1.0	200	
BBW1A12B30	12	400	8.0	1.0	0.7/0.3	0.3/ –	16.0	600	1500	50	1.0	200	
BBW1A24B30	24	1600	16.0	2.0	0.7/0.3	0.3/ –	32.0	600	1500	50	1.0	200	
BBW1A48B30	48	6400	32.0	4.0	0.7/0.3	0.3/ –	64.0	600	1500	50	1.0	200	
BBV1A SERIES*													
BBV1A05A10	5-6	500	3.8	0.5	0.4/0.3	0.1/ –	8.0	300	5000	10	0.5	200	
BBV1A06A10	5-6	280	3.8	0.5	0.4/0.3	0.1/ –	8.0	300	5000	10	0.5	200	
BBV1A12A10	12	1120	8.0	1.0	0.4/0.3	0.1/ –	16.0	300	5000	10	0.5	200	
BBV1A24A10	24	4480	16.0	2.0	0.4/0.3	0.1/ –	32.0	300	5000	10	0.5	200	
BBV1A05A30	5-6	500	3.8	0.5	0.4/0.3	0.1/ –	8.0	500	5000	10	0.5	350	
BBV1A06A30	5-6	280	3.8	0.5	0.4/0.3	0.1/ –	8.0	500	5000	10	0.5	350	
BBV1A12A30	12	1120	8.0	1.0	0.4/0.3	0.1/ –	16.0	500	5000	10	0.5	350	
BBV1A24A30	24	4480	16.0	2.0	0.4/0.3	0.1/ –	32.0	500	5000	10	0.5	350	

*UL and CSA Recognized **For diode option add "D" suffix to part number

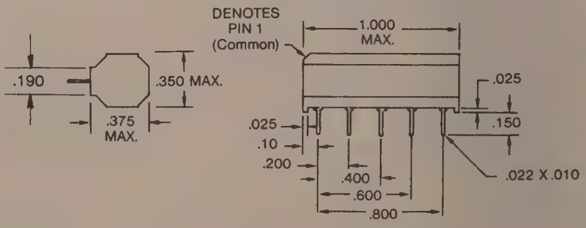
Random Vibration 10G, 20 to 2000 Hz
Maximimum Shock 25G
Maximum Initial Contact Resistance 200 Milliohms except
BBW1A and BBV1AXXA30 SERIES of 500 Milliohms

Minimum Insulation Resistance $10^{10}\Omega$ except
BBS1C SERIES of $10^{9}\Omega$

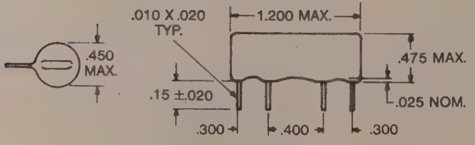
BBS1A SERIES


DENOTES PIN 1
1.000 MAX.
.190
.350 MAX.
.375 MAX.
.025
.150
.025
.10
.200
.600
.800
.022 X .010

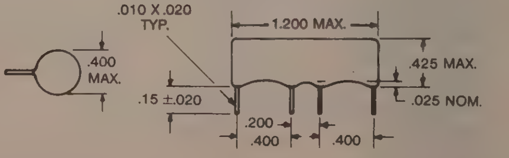
BBS1C SERIES


DENOTES PIN 1 (Common)
1.000 MAX.
.190
.350 MAX.
.375 MAX.
.025
.150
.025
.10
.200
.400
.600
.800
.022 X .010

BBW1A SERIES


.010 X .020 TYP.
1.200 MAX.
.450 MAX.
.475 MAX.
.15 ±.020
.025 NOM.
.300
.400
.300

BBV1A SERIES


.010 X .020 TYP.
1.200 MAX.
.400 MAX.
.425 MAX.
.15 ±.020
.025 NOM.
.200
.400
.400

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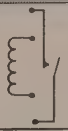
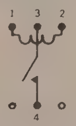
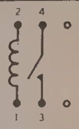
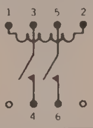
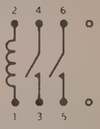
ELECTROL
TELECOMM REED RELAYS

Elec-Trol Telecomm Reed Relays are specifically designed to meet the demanding requirements of the telecommunications industry. They will all meet FCC Part 68 surge requirements from coil to contact. Contact symbol #3 will also meet the surge requirement across the open contacts. Like all Elec-Trol products, our Telecomm Reed Relays are built to the highest quality and performance standards.

The BBT Series offers a sealed package with .400" pin spacing between the coil and contact leads. This enables the circuit designer to handle isolation potentials of greater than 2500 VDC.

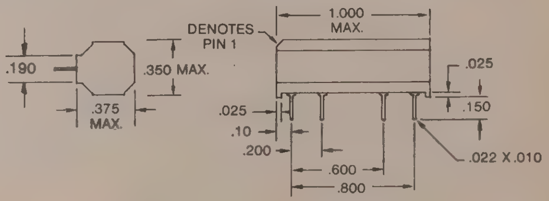
Other contact forms and pin configurations are available. Please consult the factory.

CONTACT FORM	CONTACT RATING	PART NUMBER		COIL V.D.C.	COIL RES. (ohms) @20°C ±10%	MAX. PICK-UP V.D.C. @20°C	MIN. DROP-OUT V.D.C. @20°C	WIDTH		CIRCUIT DIAGRAM (Top View of Relay) Replace "X" in Part No.	
		OPEN	SEALED					OPEN	SEALED	A	B
1A		N/A	BBT1A05AY0	5	500	4.0	0.5	N/A	.35		N/A
		N/A	BBT1A12AY0	12	500	8.0	1.0				
		N/A	BBT1A24AY0	24	2000	16.0	2.0				
		N/A	BBT1A48AY0	48	8000	32.0	4.0				
1A	10W	TCO1A05XY0	TCS1A05XY0	5	500	3.8	0.5	.44	.49		
		TCO1A12XY0	TCS1A12XY0	12	500	8.0	1.0				
		TCO1A24XY0	TCS1A24XY0	24	2000	16.0	2.0				
		TCO1A48XY0	TCS1A48XY0	48	8000	32.0	4.0				
2A		TCO2A05XY0	TCS2A05XY0	5	200	3.8	0.5	.55	.60		
		TCO2A12XY0	TCS2A12XY0	12	440	8.0	1.0				
		TCO2A24XY0	TCS2A24XY0	24	1750	16.0	2.0				
		TCO2A48XY0	TCS2A48XY0	48	7000	32.0	4.0				

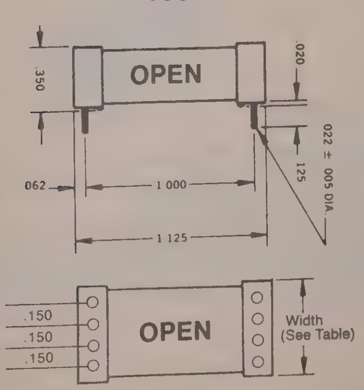
CONTACT RATINGS

CONTACT SYMBOL (Replace "Y" in Part No.)	CONTACT RATINGS (RES. LOAD)				MAX. INITIAL CR (ohms)	INITIAL BREAKDOWN VDC
	WATTS DC	MAX. AMP.	MAX. VDC	MAX. VAC		
1	50	0.75	200	240	.5	300
2	10	0.5	200	240	.2	800
3	10	0.5	500	500	.2	1500

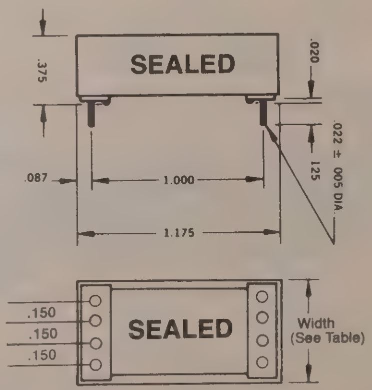
BBT SERIES


DENOTES PIN 1
1.000 MAX.
.190
.350 MAX.
.375 MAX.
.025
.150
.025
.10
.200
.600
.800
.022 X .010

TCO


.350
OPEN
.020
.022 ± .005 DIA.
.125
062
1 000
1 125
.150
.150
.150
OPEN
Width (See Table)

TCS

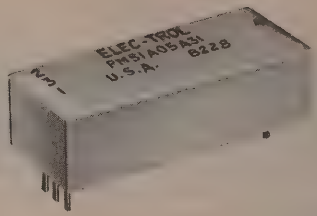

.375
SEALED
.020
.022 ± .005 DIA.
.125
.087
1.000
1.175
.150
.150
.150
SEALED
Width (See Table)

Notes: 1. All dimensions are in inches.
2. Tolerance unless otherwise specified is ±.015".
3. Unused terminals are omitted.

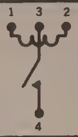
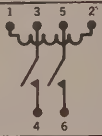
ELECTROL

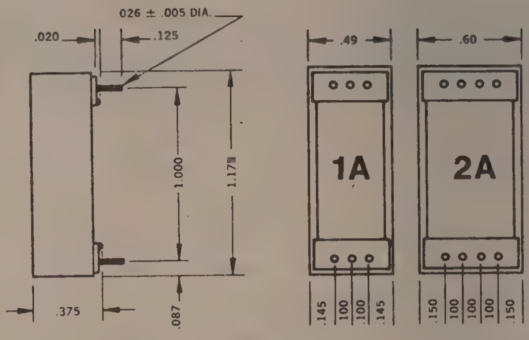
POWERMITE REED RELAYS

All Powermite Reed Relays are totally epoxy encapsulated in a five-sided metal cover providing magnetic shielding. There are five contacts available to meet almost any switching requirements. Other package styles and contact configurations are available upon request. Please contact the factory for further information.



Ask for Catalog No. 200103

CONTACT FORM	PART NUMBER X DESIGNATES CONTACT SYMBOL	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP V.D.C. @ 20°C	MIN. DROP-OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM (Top View of Relay)
1A	PMS1A05AX1	5/6	75	3.8	0.5	
	PMS1A12AX1	12	300	9.0	1.0	
	PMS1A24AX1	24	1200	18.0	2.0	
	PMS1A48AX1	48	4800	36.0	4.0	
2A	PMS2A05AX1	5/6	45	3.8	0.5	
	PMS2A12AX1	12	175	9.0	1.0	
	PMS2A24AX1	24	700	18.0	2.0	
	PMS2A48AX1	48	2800	36.0	4.0	



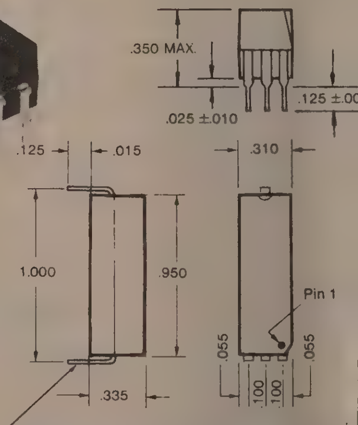
Notes: 1. All dimensions are in inches.
2. Tolerance unless otherwise specified is ±.015".
3. Unused terminals are omitted.

CONTACT RATINGS

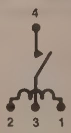
CONTACT SYMBOL NEXT TO LAST DIGIT OF P/N	CONTACT RATINGS (RES. LOAD) WATTS DC	MAX. AMP.	MAX. VDC	MAX. VAC	MAX. INITIAL CR (OHMS)	MIN. BREAKDOWN VDC	SWITCH STYLE	RECOMMENDED APPLICATION
1	50	1.0	200	240	.5	600	Pressurized Rhodium	General Purpose
2	50	1.0	200	240	.2	600	Pressurized Rhodium	Low CR
3	100	1.0	200	240	.5	600	Pressurized Tungsten	Hi Inrush
4	50	0.75	1000	700	.2	2500	Vacuum Rhodium	Hi Voltage
5	100	1.0	—	240	.2	600	RF Pressurized	RF Switching

ELECTROL

MOLDED-LINE REED RELAYS



Terminals are .010" ± .005"x .020" ± .005"; solderabl
All dimensions are in inches.
Tolerance unless otherwise specified is ± .015."

CONTACT FORM	NEW PART NUMBER	REPLACES OLD PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP V.D.C. @ 20°C	MIN. DROP-OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM (Top View of Relay)
1A 10W .5A 200V	MLS1A05A10	RA31571051	5	500	3.8	0.5	
	MLS1A06A10	RA31571061	6	125	4.0	0.5	
	MLS1A12A10	RA31571121	12	500	7.	1.0	
	MLS1A24A10	RA31571241	24	2000	15.0	2.0	
	MLS1A48A10	RA31571481	48	8000	30.0	4.0	

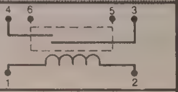
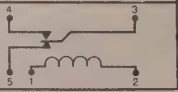
Note: Also available in a 2FA configuration.

Ask for Catalog No. 200105 (was No. 114)

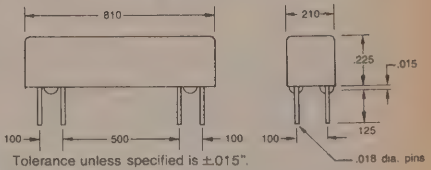
Elec-Trol, Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-115

ELECTROL
MICRO MINIATURE REED RELAYS

Standard features include metal cover, epoxy encapsulated and electrostatic shielding.

CONTACT FORM	CONTACT RATING MAX. LOAD	PART NUMBER X DESIGNATES CONTACT SYMBOL	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK UP V.D.C. @ 20°C	MIN. DROP OUT V.D.C. @ 20°C	CIRCUIT DIAGRAM BOTTOM VIEW
1A	See Table Below	MMS1A05AX3	5/6	150	3.7	0.4	
		MMS1A12AX3	12	900	9.0	1.0	
		MMS1A24AX3	24	3600	18.0	2.0	
1C	3W 0.25A 28VDC	MMS1C05A11	5/6	150	3.7	0.4	
		MMS1C12A11	12	900	9.0	1.0	
		MMS1C24A11	24	3600	18.0	2.0	

FORM A CONTACT SYMBOL NUMBERS	RATINGS (Res. Load)			LIFE (x10⁶ Operations)		MAX. INITIAL CONTACT RES. (ohms)	MIN. BREAK-DOWN V.D.C.	RECOMMENDED APPLICATION
	WATTS D.C	MAX. AMPS	MAX. VOLTS	RATED LOAD	LOW LEVELS			
1	10	0.5	100	5	20	.2	200	Standard
2	5	0.1	100	1	50	.2	300	Dry/Low Level
3	5	0.5	100	5	20	.2	200	RF Loads

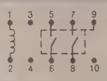
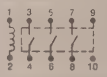
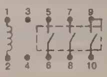


Tolerance unless specified is ±.015".

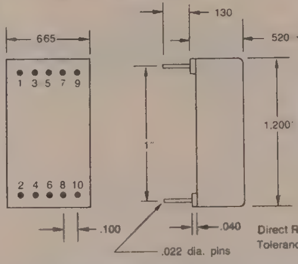
The Micro Miniature relays can be driven directly from TTL logic and have very fast operating time. High density packaging is possible since each relay is completely magnetically shielded. Electrostatic shielding is also featured in the standard package. Encapsulation provides protection from the environment as well as water wash systems.

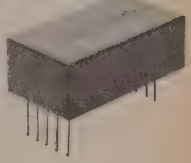
ELECTROL LOW THERMAL REED RELAYS

Ask for Catalog No. 200104

CONTACT FORM	CONTACT RATING	PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK UP V.D.C. @ 20°C	CIRCUIT DIAGRAM BOTTOM VIEW
2A	1W 200V 25A	LTS2A05BX3	5	350	3.8	
		LTS2A12BX3	12	2000	9.0	
3A		LTS3A05BX3	5	350	3.8	
		LTS3A12BX3	12	2000	9.0	
3A		LTS3A05CX3	5	350	3.8	
		LTS3A12CX3	12	2000	9.0	

x indicates Thermal EMF rating @ 20°C, measured at pins 5 & 7 with pins 6 & 8 shorted.
1 = < 1μV, 2 = < 3μV, 3 = < 5μV, 4 = < 10μV.





Direct Replacements for Coto Series CR-3400.
Tolerance unless specified is ±.015".

The LTS series of relays are designed for switching low level signals such as thermocouples and strain gauges. The low thermal offset of these relays assures minimum system errors and high signal accuracy. Magnetic shielding as well as electrostatic shielding are offered as standard features to maintain low noise. Two pole and three pole (with guard) models are shown.

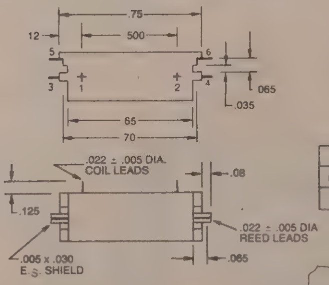
ELECTROL MICRO STRIP RF REED RELAYS

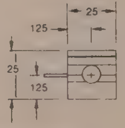
Ask for Catalog No. 200109

The new low cost Elec-Trol GHz Reed Relays with SPST-NO contacts will switch radio frequency and fast rise time pulse signals whose components extend into the GHz range with minimum signal degradation. A special reed switch designed for optimum performance at high frequencies and incorporated in a tubular shield to form a 50 ohms coaxial structure is uniquely packaged for low-loss GHz switching and ease of mounting. Input and output terminations are specifically designed to maintain low VSWR. The RFS series is designed for microstrip applications in both .032" and .062" circuit boards.

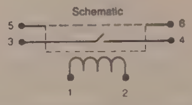
PART NUMBER	REPLACES OLD PART NUMBER	COIL V.D.C.	COIL RES. (ohms) @ 20°C	MAX. PICK-UP @ 20°C	MIN. DROP OUT V.D.C. @ 20°C
RFS1A05B12	RA31481051	5	125	3.8	.5
RFS1A06B12	RA31481061	6	125	4.0	.5
RFS1A12B12	RA31481121	12	500	8.0	1.0
RFS1A24B12	RA31481241	24	2000	16.0	2.0

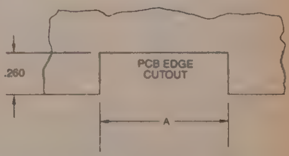
Isolation—20 dB @ 1GHz
Insertion Loss—0.1 dB @ 1GHz
VSWR—Less than 1.15:1





DIMENSION TABLE		
LTR	.032 PCB	.062 PCB
A	.670	720





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SC6 Series

ELECTROL
OPTO ELECTRONICS

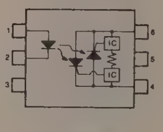
SB Series

SUBMINIATURE OPTICALLY COUPLED
SC6, & SB SERIES SOLID STATE RELAYS
FOR AC LOADS AND DIRECT OPERATION FROM LOW-LEVEL LOGIC CIRCUITS

ELECTRICAL CHARACTERISTICS (25°C free air unless otherwise specified)

	CHARACTERISTICS		MIN	TYP	MAX	UNITS	TEST CONDITIONS
INPUT	Forward voltage Vf			1.2	1.5	VDC	If=20 mA
	Reverse voltage Vr				3.0	VDC	
	Must operate current	SC6X0/SB542X		7	15	mADC	.5 Power Facter Inductive
		SC6X2		3	5	mADC	
	Must release current		0.1			mADC	
	Continuous forward current				40	mADC	
OUTPUT	Peak off-state leakage current	SC610/SB5421			200	µA	200V Peak
		SC620/SB5422			300	µA	400V Peak
		SC612			250	µA	300V Peak
		SC622			350	µA	500V Peak
	On voltage (V_{TM})				1.2	V	It=500mA
	Turn-on time (60 Hz)				8.4	ms	
	Turn-off time (60 Hz)				8.4	ms	
	Zero cross voltage turn-on				± 5	Vrms	.5 P.F. Inductive
	dV/dT ratings (off-state)		100	250		V/µ sec	70°C
	Rated Voltage	SC61X/SB5421	12		140	Vrms	
		SC62X/SB5422	24		280	Vrms	

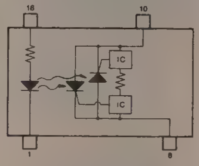
CIRCUIT DIAGRAMS
(Top View)


1
2
3
6
5
4
IC
IC

SC6 Series

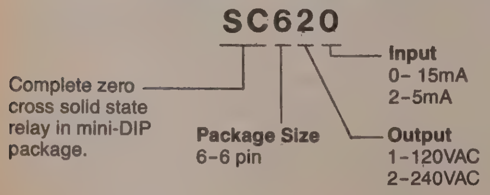
RATINGS

OUTPUT		SC SERIES RATING	SB SERIES RATING
Power dissipation @ 50°C		600mW	900mW
Derate linearly from 50°C		9mW/°C	14mW/°C
Continuous AC current		0.5A	0.75A
Peak ½ cycle current		5A	7.5A
Peak repetitve off-state voltage	SC610/SB5421	200V minimum	
	SC620/SB5422	400V minimum	
	SC612	300 V minimum	
	SC622	500V minimum	
ISOLATION		**MINIMUM RATING**	
Input to output breakdown voltage		2500Vrms/t = 1 min.	
Isolation resistance, input to output		10^{11} Ohms	
Coupling capacitance (input to output)		3pf typical	
TEMPERATURE RANGE		**RATING**	
Storage		-40°C to + 125°C	
Operating		-20°C to +85°C	
Max lead soldering time @ 260°C		7 seconds	

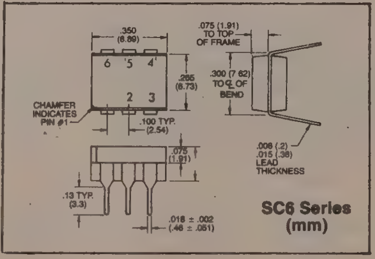

16
10
IC
IC
1
8

SB 5421/SB 5422

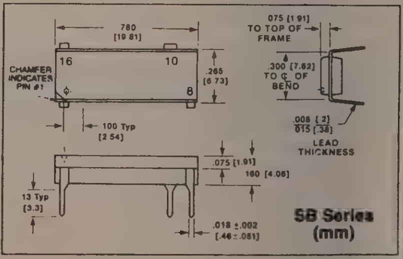
PART NUMBER DESCRIPTION:


SC620
Input
0– 15mA
2–5mA
Complete zero cross solid state relay in mini-DIP package.
Package Size
6–6 pin
Output
1–120VAC
2–240VAC

MAXIMUM DIMENSION
& PIN DESIGNATION


.350
(8.89)
.075 (1.91)
TO TOP OF FRAME
6
5
4
2
3
.265
(6.73)
.300 (7.62)
TO ℄ OF BEND
CHAMFER INDICATES PIN #1
.100 TYP.
(2.54)
.075
(1.91)
.008 (.2)
.015 (.38)
LEAD THICKNESS
.13 TYP.
(3.3)
.018 ± .002
(.46 ± .051)

SC6 Series
(mm)


780
[19 81]
075 [1 91]
TO TOP OF FRAME
16
10
8
CHAMFER INDICATES PIN #1
.265
[6 73]
.300 [7.62]
TO ℄ OF BEND
100 Typ
[2 54]
.008 [.2]
015 [.38]
LEAD THICKNESS
.075 [1.91]
160 [4.06]
13 Typ
[3.3]
.018 ±.002
[.46±.051]

SB Series
(mm)

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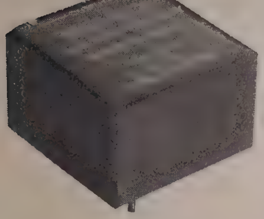
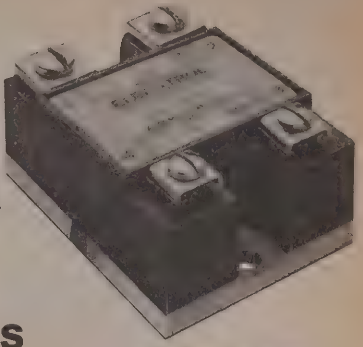


ELECTROL
OPTO ELECTRONICS

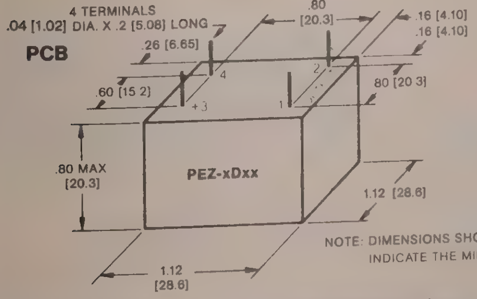


PCB AND HOCKEY PUCK SOLID STATE RELAYS

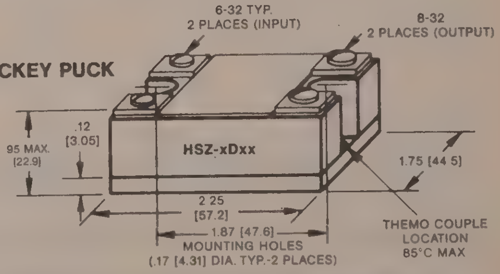
ELECTRICAL CHARACTERISTICS

Ask for Catalog No. 200003

PACKAGE AND TERMINAL CON-FIGURATION	CIRCUIT TYPE	BLOCKING VOLTAGE (PEAK)	INPUT VOLTAGE	RESISTIVE LOAD AMPS	PART NUMBER	NOMINAL LINE VOLTAGE (VRMS)	TUNGSTEN LAMP LOAD AMPS	MOTOR LOAD AMPS	ONE CYCLE NON REPETITIVE PEAK AMPS	ISOLATION VOLTAGE	MAXIMUM LEAKAGE	MAXIMUM OPERATE CURRENT	CONTACTOR LOADS NEMA SIZE	RECOMMENDED FUSES ALL FUSES ARE SLOW BLOW
PRINTED CIRCUIT BOARD MOUNT	OPTO ISOLATED ZERO-CROSS DC INPUT	300	3-18VDC	0.75	PEZ-1D00	120	0.5	0.5	4	2500 VDC	1	10MA @3VDC	4	AGC-.75
				3	PEZ-1D03		2	2	80		4		5	AGC-3
		500		0.75	PEZ-2D00	240	0.5	0.5	4		2		4	AGC-.75
				3	PEZ-2D03		2	2	80		8		5	AGC-3
HOCKEY PUCK	OPTO ISOLATED ZERO-CROSS DC INPUT	300	3-32VDC	10	HSZ-1D10	120	7	4.4	80	2500 VDC	4	10MA @3VDC 20MA @32 VDC	8	KAX-10
				25	HSZ-1D25		16	11	175		4		8	KAX-25
		500		10	HSZ-2D10	240	7	4.4	80		8		8	KAX-10
				25	HSZ-2D25		15	11	175		8		8	KAX-25
		800		10	HSZ-4D10	480	5	2.8	80	2500 VRMS	9	3MA @5 VDC	8	KTX-10
				25	HSZ-4D25		12	4.2	175		15		8	KTX-25
	OPTO ISOLATED ZERO-CROSS DC INPUT VDE SPACING	500		10	HSV-2D10	240	7	4.4	80	3750 VRMS	9		8	KAX-10
				25	HSV-2D25		16	11	175		15		8	KAX-25
		800		10	HSV-4D10	480	5	2.8	80		9		8	KTX-10
				25	HSV-4D25		12	5.2	175		15		8	KTX-25
	OPTO ISOLATED ZERO-CROSS AC INPUT	300	90-280 VRMS	10	HSZ-1A10	120	7	4.4	80	2500 VRMS	9	10MA @220 VRMS	8	KAX-10
				25	HSZ-1A25		16	11	175		15		8	KAX-25
		500		10	HSZ-2A10	240	7	4.4	80		9		8	KAX-10
				25	HSZ-2A25		16	11	175		15		8	KAX-25
		800		10	HSZ-4A10	480	5	2.8	80		9		8	KTX-10
				25	HSZ-4A25		12	5.2	175		15		8	KTX-25
	REED RELAY INPUT VDE SPACING NON ZERO-CROSS	500	4-6VDC	10	HSH-2D10	240	7	4.4	80	3750 VRMS	9	23MA @6VDC	8	KAX-10
				25	HSH-2D25		16	11	175		15		8	KAX-25
		800		10	HSH-4D10	480	7	4.4	80		9		8	KTX-10
				25	HSH-4D25		16	11	175		15		8	KTX-25


PCB
4 TERMINALS
.04 [1.02] DIA. X .2 [5.08] LONG
.80
[20.3]
.16 [4.10]
.16 [4.10]
.26 [6.65]
4
2
.60 [15 2]
+3
1
80 [20 3]
.80 MAX
[20.3]
PEZ-xDxx
1.12 [28.6]
1.12
[28.6]

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ]
INDICATE THE MILLIMETER EQUIVALENT


HOCKEY PUCK
6-32 TYP.
2 PLACES (INPUT)
8-32
2 PLACES (OUTPUT)
95 MAX.
[22.9]
.12
[3.05]
HSZ-xDxx
1.75 [44 5]
2 25
[57.2]
1.87 [47.6]
MOUNTING HOLES
(.17 [4.31] DIA. TYP.-2 PLACES)
THEMO COUPLE
LOCATION
85°C MAX

Only 1.27 sq inches of PCB area is taken by these small relays that have 3 ampere switching capability at 120 or 240VAC.

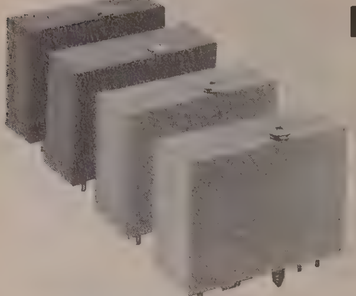
UL FILE
E58275

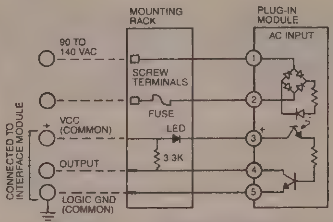
This industry standard design is available with outputs of 10 through 40 amperes and has 2500V isolation capability. Models with VDE spacings have 3750VRMS stand off. Opto-coupled and reed relay input circuits are offered.

ELECTROL

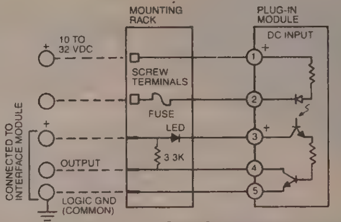
OPTO ELECTRONICS

INPUT/OUTPUT MODULES




MOUNTING RACK
PLUG-IN MODULE
AC INPUT
90 TO 140 VAC
SCREW TERMINALS
FUSE
VCC (COMMON)
LED
3 3K
OUTPUT
LOGIC GND (COMMON)
CONNECTED TO INTERFACE MODULE
1
2
3
4
5

Case Color: Yellow


MOUNTING RACK
PLUG-IN MODULE
DC INPUT
10 TO 32 VDC
SCREW TERMINALS
FUSE
LED
3 3K
OUTPUT
LOGIC GND (COMMON)
CONNECTED TO INTERFACE MODULE
1
2
3
4
5

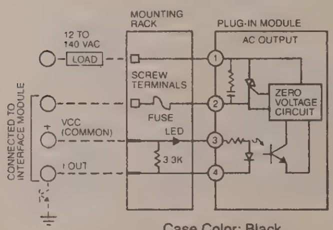
Case Color: White

AC Input Modules	**IAC5**	**IAC15**	**IAC24**	**IAC5A**	**IAC15A**	**IAC24A**	**IAC5E**
Output Characteristics							
Logic Supply Voltage DC	4.5-6 V	12-18 V	20-30 V	4.5-6 V	12-18 V	20-30 V	4.5-6 V
Maximum Logic Supply Current	12 mA at 6 V	15 mA at 18 V	18 mA at 30 V	12 mA at 6 V	15 mA at 18 V	18 mA at 30 V	12 mA
Output Transistor Breakdown Voltage DC	30 V						
Output Current	25 mA						
Output Leakage at 30 VDC No Input	100 μA						
Output Voltage Drop	0.4 V at 25 mA						
Input Characteristics							
Input Line Voltage AC	90-140 V			180-280 V			20-30 VAC
Input Current	10 mA at 140 VAC Maximum			6.5 mA at 280 VAC Maximum			10 mA
Allowable Input for No Output	1.0 mA*			.5 mA*			1.0
Isolation Characteristics							
Isolation Input to Output	2500 VAC min.						
Capacitance Input to Output	Resistance 10^{10} Ω min. 5 pF Maximum						
Timing Characteristics							
Turn-On	20 mS Maximum						
Turn-Off	20 mS Maximum						

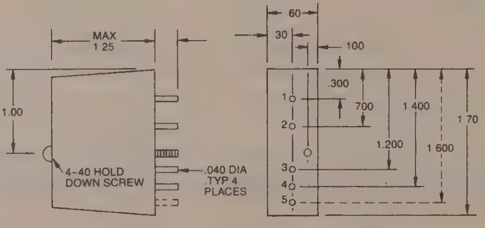
*Leakage Current of Limit Switches, etc.

DC Input Modules	**IDC5**	**IDC15**	**IDC24**
Output Characteristics			
Logic Supply Voltage DC	4.5-6 V	12-18 V	20-30 V
Maximum Logic Supply Current	12 mA at 6V	15 mA at 18V	18 mA at 30V
Output Transistor Breakdown Voltage DC	30 V		
Output Current	25 mA		
Out-put Leakage at 30 VDC No Input	100 μA		
Output Voltage Drop	0.4 V at 25 mA		
Input Characteristics			
Input Line Voltage DC	10-32 V		
Input Current	32 mA Maximum		
Allowable Input for No Output	2 mA*		
Isolation Characteristics			
Isolation Input to Output	2500 VAC		
Capacitance Input to Output	Resistance 10^{10} Ω min. 5 pF Max.		
Timing Characteristics			
Turn-On	5 mS Maximum		
Turn-Off	5 mS Maximum		

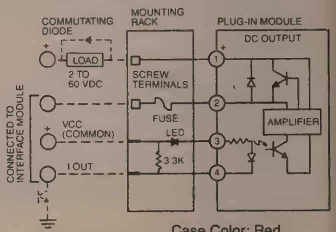
*Leakage Current of Limit Switches, etc.


MOUNTING RACK
PLUG-IN MODULE
AC OUTPUT
12 TO 140 VAC
LOAD
SCREW TERMINALS
ZERO VOLTAGE CIRCUIT
FUSE
VCC (COMMON)
LED
3 3K
I OUT
CONNECTED TO INTERFACE MODULE
1
2
3
4

Case Color: Black


MAX 1 25
1.00
4-40 HOLD DOWN SCREW
.040 DIA .TYP 4 PLACES
60
30
100
.300
700
1 400
1 70
1.200
1 600
1
2
3
4
5

Pin 5 on Input Modules only.


COMMUTATING DIODE
MOUNTING RACK
PLUG-IN MODULE
DC OUTPUT
LOAD
2 TO 60 VDC
SCREW TERMINALS
FUSE
AMPLIFIER
VCC (COMMON)
LED
3 3K
I OUT
CONNECTED TO INTERFACE MODULE
1
2
3
4

Case Color: Red

AC Output Modules	**OAC5**	**OAC15**	**OAC24**	**OAC5A**	**OAC15A**	**OAC24A**
Input Characteristics						
Input Voltage DC	3-8 V	12-18 V	20-30 V	3-8 V	12-18 V	20-30 V
Maximum Input Current	20 mA at 5 V	15 mA at 15 V	12 mA at 24 V	20 mA at 5 V	15 mA at 15 V	12 mA at 24 V
Nom. Impedence (ohms)	220	1000	2200	220	1000	2200
Signal Pick-Up Voltage DC	3 V	12 V	20 V	3 V	12 V	20 V
Signal Drop-Out Voltage DC	1V					
Output Characteristics						
Switching Voltage	12-140 VAC			24-280 VAC		
Peak Repetitive Voltage Blocking	400 V			500 V		
Off-State Leakage	5 mArms					
Line Frequency	50/60 Hz					
Current Rating	3 Arms at 5 power factor*					
1-Cycle Surge	80 A Peak					
Minimum Load Current	20 mArms					
Maximum Contact Drop	1.6 V					
Isolation Characteristics						
Isolation Input to Output	2500 VAC					
Capacitance Input to Output	Resistance 10^{10} Ω min. 5 pF Maximum					
Timing Characteristics						
Turn-On	½ Cycle					
Turn-Off	½ Cycle					

*Derate .05 A/°C above 40°C *For Buffered OAC versions consult factory.

DC Out-put Modules	**ODC5**	**ODC15**	**ODC24**
Input Characteristics			
Input Voltage DC	3-8 V	6-24 V	12-32 V
Maximum Input Current	18 mA at 5 V	14 mA at 15 V	10 mA at 24 V
Nominal Impedence (ohms)	220	1000	2200
Signal Pick-Up Voltage DC	3 V	9 V	18 V
Signal Drop-Out Voltage DC	1 V		
Output Characteristics			
Load Voltage Rating DC	60 V Maximum		
Output Current DC	3 A* Maximum		
Off-State Leakage	1 mA Maximum		
1-Second Surge	5 A Peak		
Isolation Characteristics			
Isolation Input to Output	2500 VAC		
Capacitance Input to Output	Resistance 10^{10} Ω min. 5 pF Max.		
Timing Characteristics			
Turn-On	100 μS Maximum		
Turn-Off	2 mS Maximum		

*Derate .05 A/°C above 40°C
Inductive loads must be diode suppressed.

*For industry standard plug-in boards consult factory.

*Narrow case (0.4") versions available.

Elec-Trol. Inc. • 26477 N. Golden Valley Rd., Saugus, CA 91350 • (818) 788-7292 • (805) 252-8330 • Telex: 18-1151

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

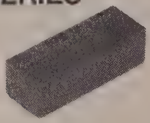
WPS word processing software

Y

YIG yttrium iron garnet

EI&S

Miniature Reed Relays

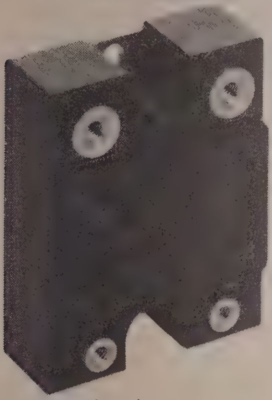
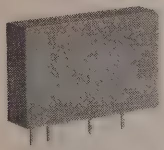
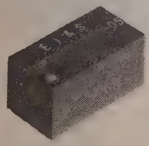
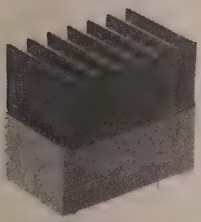
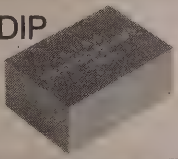
PRODUCT TYPES	PACKAGE DESCRIPTION	DATA SHEET	FEATURES & OPTIONS
DL SERIES 	MOLDED DIP IC Compatible	201	• 14 Pin DIP Mounting • Electrostatic Shield • Diode • Dry or Mercury Wetted Contacts
D SERIES 	ENCAPSULATED DIP Complements DL Series With Added Capabilities	202	• Magnetically Shielded • Electrostatic Shield • Diode • DPDT (2C) Switching • Metal or Plastic Cover
MS SERIES 	ENCAPSULATED IN-LINE (1.00 × 0.10 Grid Spacing)	203	• Multiple Switch Arrangemen • High IR to 10^{13} • High Voltage Switching • EMI/RFI Shielding
BV SERIES 	OPEN FRAME IN-LINE Low Cost	204	• Multiple Switch Arrangement • High Voltage Switching • Electrostatic Shielding
AL SERIES 	MOLDED AXIAL Low Cost	205	• High Voltage Switching • Lead Forming • 50 Watt Switching (Mercury Switch) • Low Contact Resistance
2000 SERIES 	ENCAPSULATED AXIAL Micro-Miniature Magnetically Shielded	206	• Electrostatic Shielding • Fast Operation • Low Contact Resistance
PS SERIES 	MOLDED PICO (0.1 × 0.7 Grid)	207	• Ideal For Low Power High Density Switching
PM SERIES 	ENCAPSULATED PICO (0.1 × 0.7 Grid)	208	• Magnetically Shielded • Electrostatic Shielding • Epoxy Coated Metal Cover
CUSTOM	**SPECIALTY DESIGNS TO MEET YOUR APPLICATION.**		

EI&S

EI&S . . . Where Innovation Sets Design Standards.

Electronic Instrument & Specialty Corp., 42 Pleasant Street, Stoneham, MA 02180 (617) 438-5300

AC Solid State Relays

PRODUCT TYPE	DESCRIPTION	DATA SHEET INPUT–OUTPUT	NO.	FEATURES & OPTIONS
CHASSIS MOUNT  UL Recognized CSA CERTIFIED EI, SS Series	**EI SERIES**—Optically Isolated Zero-Voltage Turn-On INPUT: 3-32 V dc / 24, 120 V ac OUTPUT: 6,10,25 A @ 120/240 V rms	DC–AC AC–AC	101 102	• AC or DC Inputs • For Resistive and Moderate Inductive Loads
	SS SERIES—SURGELESS™ 90°Phase Angle Turn-On INPUT: 3-32 V dc, Optically Isolated OUTPUT: 6,10,25 A @ 120/240 V rms	DC–AC	103	• For Highly Inductive Loads —Transformers —Motors —Contactors —Solenoids
	400 HZ SERIES—50-800Hz Zero-Voltage Turn-On INPUT: 3-32 V dc, Optically Isolated OUTPUT: 6,10,20 A @ 120/240 V rms	DC–AC	104	• For. . . ☆ Military 400 Hz Applications
	FB SERIES—Normally Closed Zero-Voltage Turn-On INPUT: 3-32 V dc / 24, 120 V ac Optically Isolated OUTPUT: 6,10,25 A @ 120/240 V rms	DC–AC AC–AC	105 106	• AC or DC Inputs • For In-Circuit Protection on: —Medical Inst. —Machine Tools —Temp. Controllers
PRINTED CIRCUIT MOUNT	OPTICALLY ISOLATED—ZERO-VOLTAGE TURN-ON			
SIP 	**SP SERIES**—Single-In-Line Standard SIP and I/O Pin Spacing INPUT: 5 V, 12 V, 24 V, 3-32 V dc OUTPUT: 3.0 A @ 120/240 V rms	DC–AC	107	• Space Saving PC Board Package
DIP 	**DP SERIES**—Dual-In-Line INPUT: 5 V, 12 V, 24 V dc OUTPUT: 1.5 A @ 120/240 V rms	DC–AC	108	• Ultra-Reliable Discrete Design • Internal RC Snubber Optional
Double DIP 	**DD SERIES**—Custom Standard 0.600 Pin Spacing With Output Pins Offset INPUT: 5V, 12V, 24V, 3-32 V dc OUTPUT: Up to 6 A @ 120/240 V rms CIRCUIT FUNCTION EI . . . . .Zero Cross ± 6V SS. . . . . .Surgeless FB. . . . . .SPST-NC (Form B) 2A . . . . .Dual Channel (2 Form A)	DC–AC DC–AC DC–AC DC–AC	109 110 111 112	• Inputs: 5, 12, 24, 3–32 Vdc • Outputs: Up to 6 AMPS @ 120/240 Vrms
Double DIP 	**PC SERIES** Standard 0.600 Pin Spacing With Input Pins Offset. INPUT: 5 V, 12 V, 24 V dc OUTPUT: 2.0 A @ 120/240 V rms	DC–AC	113	• Alternate Double DIP Package
CUSTOM	SPECIALTY DESIGNS TO MEET YOUR APPLICATION.			

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For manufacturers' sales offices, see yellow pages

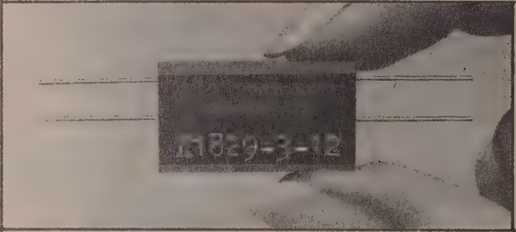
FIFTH DIMENSION, INC.

The Ultimate Modem Relay

Fifth Dimension mercury film relays exhibit excellent load-handling capabilities, 2-billion cycle reliability and operate in any position. These characteristics are augmented with features such as bounceless operation, compatibility with solid state circuitry and 2500 volts coil-to-contact breakdown which meets US and European lightning-surge standards. These are just a few of the reasons Fifth Dimension relays are repeatedly used in FCC-tested systems and in modem applications.

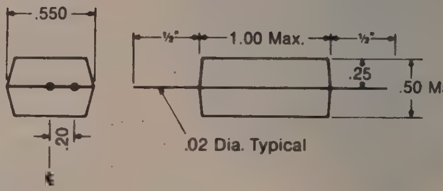
Since modems and autodialers are mounted in all sorts of positions — on walls, in racks or simply lying on a desk or table — the Series K is an ideal choice as an off-hook relay and line-pulsing relay because of its insensitivity to position. Unlike mercury-wetted reed relays (which cannot function if more than 30 degrees from vertical), there is no pool of mercury to bridge contacts or become separated from the contact parts. Instead, mercury on the contacts is replenished each operating cycle from a continuous film of mercury which covers the interior walls of the switch.

The Series K is bounceless and thus produces clean, square-wave pulses that cannot be misinterpreted by phone company dial receiver circuits. When contacts open, the mercury between the contact parts is drawn out into a thin thread by surface tension and ruptures, creating a clean break action which assures reliable dialing.



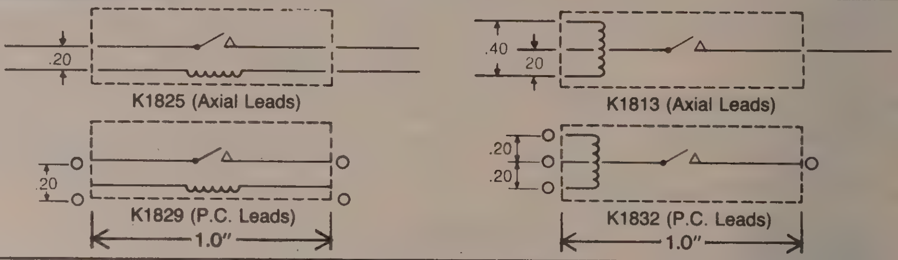
Series K Relays

Epoxy sealed, these miniature relays are available with axial leads or pins for PCB mounting.



Series K Relay Footprints

Axial distance between pins, all models, 1 inch nominal.



K1825 (Axial Leads)

K1813 (Axial Leads)

K1829 (P.C. Leads)

K1832 (P.C. Leads)

Specifications

Contact Form	SPST-NO	Contact Res. Stability	±0.02 Ohms
Bounce Time	None	Contact Breakdown Volts	1000 VAC PEAK
Life	Indefinite	Operational Temp. Range	−38°C to +85°C
Load Current to 52 VDC	0.25 Amperes	Storage Temp. Range	−55°C to +105°C
Load Current to 200 VDC	0.1 Amperes	Arc Suppression Suggested	Yes
Contact Resistance	0.20 Ohms*		

	Nominal Coil Volts	Coil Resistance (±10%)	Must Operate Volts	Must Release Volts	Operate Time (ms)	Release Time (ms)	Reliability (MCBF)	Coil to Contact Breakdown Volts	Vibration to 3000 CPS	Shock 11 ms Sawtooth	Epoxy Sealed Package	Magnetic Shield Standard/Optional (St) (Op)
K18XX-3-5	5	67	4	0.5	4	4	10^9	2500 Vac Rms	30g	40g	Yes	St
K18XX-3-12	12	384	9.6	1.2	4	4	10^9					St
K18XX-3-24	24	1536	19.2	2.4	4	4	10^9					St

(XX indicates footprint)

Reliability is based upon tests conducted on over 200 relays which were exercised a total of over 34 billion operations. Specified values should not be considered as a guaranteed performance for a single relay, but rather a prediction of the performance of the cumulative results of a universe of units.

*Contact resistance is measured at end of switching capsule and does not include terminal lead resistance.
All specifications typical and subject to change without notice.

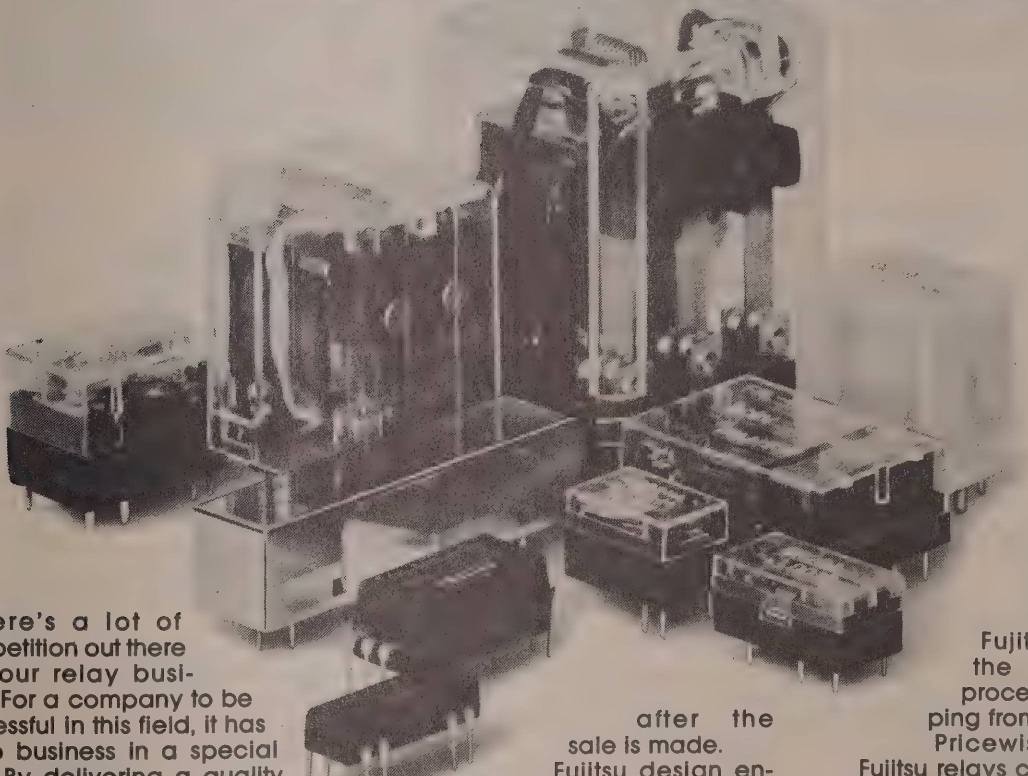
But not only for modems

Series K mercury film relays are particularly well suited for use in microprocessor input interfaces, telephone line switching test systems, touch-tone converters, automatic test equipment, data acquisition and industrial control systems and, in fact...in any application requiring low-noise, bounceless-switch, position-insensitive, outstandingly-reliable relays.

FIFTH DIMENSION, INC.

801 New York Avenue. Trenton. NJ 08638 • Tel: 609-393-8350 • TWX: 510-681-8412

FUJITSU: RELAYS



There's a lot of competition out there for your relay business. For a company to be successful in this field, it has to do business in a special way. By delivering a quality product with built-in reliability, price and service.

Fujitsu relays have it all. Our relays meet or surpass the quality of those made by the competition. They're built to do a job and do it right. And Fujitsu relays are compatible with most relays on the market.

As far as service, Fujitsu considers it a point of pride, as well as good business to cater to your company's needs before, during and after the sale is made.

Fujitsu design engineers have developed a complete line of all the most popular relays in use today. A supply of these standard relays is always readily available. We also offer a customizing service where we work with your engineers to design relays tailored specifically to your needs.

Our warehouse is stocked to supply your company with samples of our fine products. Quantity orders come directly from the factory. And Fujitsu can match the lead time for processing and shipping from any source.

Pricewise, you'll find Fujitsu relays cost the same or less than the competition, leaving little reason not to try us.

For general purpose to flat package relays, for Mercury-wetted contacts to molded inline package (regular reed) and DIPs (latched reed), it pays to switch to Fujitsu where quality, reliability, price and service are part of our product.

For more information on our superior components, call or write us today.

FUJITSU

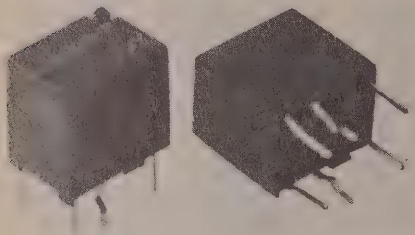
FUJITSU AMERICA, INC.
Component Sales Division
918 Sherwood Drive, Lake Bluff, IL 60044
(312) 295-2610, Telex: 206196, TWX 910-651-2259

FUJITSU

RELAYS

MICROMINIATURE RELAYS FOR P.C. BOARDS

FBR20 SERIES

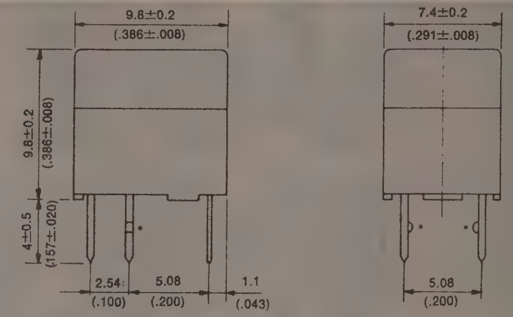


Fujitsu FBR20 series relays are designed for PC board mounting with 1A contact ratings — perfect for microminiature applications.

FEATURES

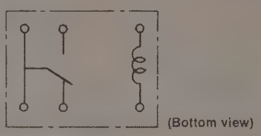
- **Microminiature size**
  Two FBR20 series relays can be mounted in the space now required for a single FBR210 series relay.
- **1A contact rating**
  Despite their microminiature size, FBR20 series relays have contact rating of 1A at 24 VDC for convenient installation.
- **Gold overlay bifurcated contact**
  Contact reliability is assured in low level applications by contact shapes and materials especially designed for signal switching applications.
- **Low power consumption**
  With a rated power consumption of only 0.3W, today's expensive energy costs can be reduced significantly.
- **Wide range of drive voltages**
  Drive voltages from 1.5 VDC to 24 VDC are available for a wide range of applications.
- **Strong shock resistance**
  Even with a 50G shock, FBR20 series relays never miss a switch.
- **Easy to pattern-design**
  Separate terminal connection with drive and output sections allow easy pattern design.
- **Formed terminal available for temporary lock**
  The unique design of the forming terminal allows FBR20 series relays to be temporary mounted for greater design flexibility.
- **Automatic soldering provision**
  The terminal is sealed to prevent flux from entering during automatic soldering.

DIMENSIONS

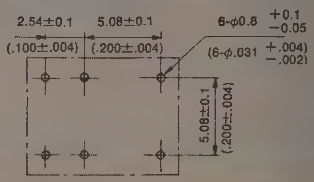


* Formed terminal for temporary mounting.

SCHEMATIC



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT (1 Form C)
Contact Shape	Single contact (FBR21), Bifurcated contact (FBR22)
Contact Material	Gold overlay silver, Gold overlay silver-palladium alloy (—P)
Contact Rating	24 VDC-1A, 120 VAC-0.5A (resistive load)
Maximum Carrying Current	2A
Maximum Switching Voltage	125 VDC, 125 VAC
Maximum Switching Power	24 WDC, 60 VA AC (resistive load)
Initial Contact Resistance	100mΩ max. (measured at 6V DC-0.1A)
Coil Power	0.3W (at rated voltage, 20°C)
Coil Temperature Rise	45°C (at rated voltage, 20°C)
Insulation Resistance	1,000MΩ min. (at 500 VDC)
Withstanding Voltage	Between contacts: 500 VAC for 1 minute Between contact and coil: 750 VAC for 1 minute
Vibration	20G, 10 ~ 300 Hz (dual amplitude, maximum 3.0 mm). No contact chatter longer than 1.0 ms.
Shock	Operation error: 50G (sine half-wave of 11 ms). No contact chatter longer than 1.0 ms.
Operate Time	5 ms max. (at rated voltage)
Release Time	3 ms max. (after rated operation)
Life Expectancy	Mechanical: 5 x 10^6 ops. min. Electrical: Gold-overlay silver contacts: 100 x 10^3 ops. min. Gold-overlay silver-palladium alloy contacts: 200 x 10^3 ops. min. (at rated contact load)
Maximum Switching Frequency	Mechanical: 18,000 operations/hour Electrical: 1,800 operations/hour (at contact rated load)
Ambient Temperature	—30°C ~ +65°C (at rated operation)
Ambient Humidity	45 ~ 85% RH
Weight	1.7 g (approx.)

SELECTION TABLE

Type	Voltage Specifications	Coil Rated Voltage	Coil resistance (±10%)	Coil Current (at Rated Voltage)	Pick-Up Voltage	Drop-Out Voltage	Maximum Voltage Allowance	Rated Power Consumption	Coil Temperature Rise	FBR21D01		RFBR21D01-P	
										Designation	Price	Designation	Price
Standard Type	D01	DC 1.5V	7.5Ω	approx. 200 mA	Less than 80% of rated voltage	More than 5% of rated voltage	160% of rated voltage	Approx. 300 mW (at rated voltage)	Approx. 45°C (at rated voltage)	FBR21D01	$1.98	FBR21D01-P	$2.32
	D03	DC 3 V	30 Ω	approx. 100 mA						FBR21D03	1.98	FBR21D03-P	2.32
	D05	DC 5 V	83 Ω	approx. 60 mA						FBR21D05	1.98	FBR21D05-P	2.32
	D06	DC 6 V	120 Ω	approx. 50 mA						FBR21D06	1.98	FBR21D06-P	2.32
	D09	DC 9 V	270 Ω	approx. 33 mA						FBR21D09	1.98	FBR21D09-P	2.32
	D12	DC 12 V	480 Ω	approx. 25 mA						FBR21D12	1.98	FBR21D12-P	2.32
	D18	DC 18 V	1,080 Ω	approx. 17 mA						FBR21D18	2.12	FBR21D18-P	2.46
	D24	DC 24 V	1,920 Ω	approx. 13 mA						FBR21D24	2.26	FBR21D24-P	2.60

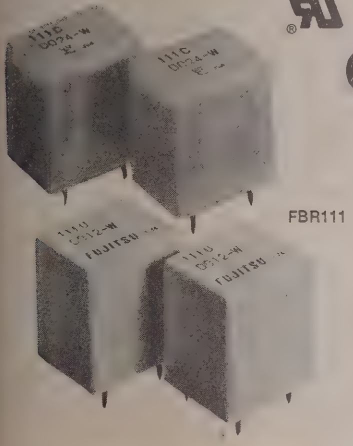
Note: Measured at 20°C.

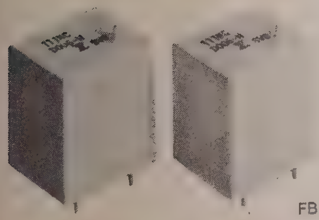
FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex: 206196, TWX 910-651-2259

MINIATURE RELAYS FOR P.C. BOARDS

FBR111 AND FBR111N SERIES

SPDT 3A-28V DC/120V AC, 6A-28V DC/120V AC


FBR111


FBR111N

The Fujitsu FBR111 and FBR111N Series are low cost SPDT relays with a versatile switching capability. The contact is rated 3A, 28V DC; 3A 120V AC for standard contact, or up to 6A, 28V DC; 6A, 120V AC for special heavy duty contact.

These small size, sensitive relays, designed to be mounted on printed circuit boards, feature simplified construction and a low power dissipation.

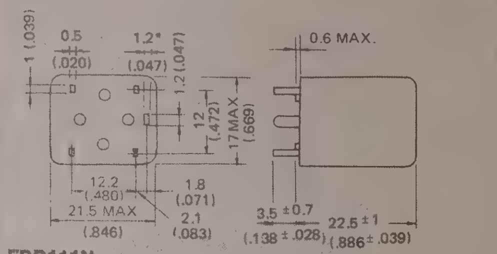
It is ideal for use in audio equipment, business machines, vending machines, security systems, game machines and automotive applications.

The FBR111N Series is the immersion cleanable version where printed circuit board cleaning is required.

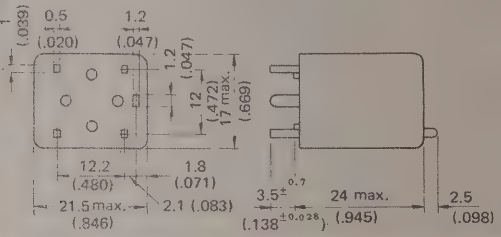
The relay specified FBR111U is UL recognized for office equipment and business machines. (File No. E63615.) CSA certified.

DIMENSIONS Unit: mm (inch)

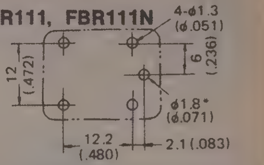
FBR111



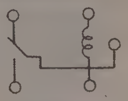
FBR111N



FBR111, FBR111N



MOUNTING HOLE LAYOUT



1 FORM C

SCHEMATICS

Notes:
1. Cut-off nib must be removed after relay soldering and board cleaning.
2. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore, when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning (water temperature is less than 50°C).

ENGINEERING DATA

Item	Specifications			
Contact Arrangement	SPDT			
Contact Ratings			Rating	UL Rating
Contact Materials	Contact Materials		28V DC or 120V AC (Resistive)	28V DC or 120V AC (Resistive)
	No suffix	Silver	3A	3A
	—K	Silver-Cadmium Oxide	3A	3A
	—M	Gold-Plated Silver	3A	1A
	—W	Special Alloy	6A	8.5A (0.8 pF @ 120V AC)
Initial Contact Resistance	100mΩ max. (at 6V DC 0.5A for No mark or -M, 6V DC 1A for -K or -W)			
Rated Coil Voltage	5, 6, 9, 12, 24V DC			
Coil Power Dissipation	Standard: 0.36W approx. at rated voltage UL Type: 0.50W approx. at rated voltage			
Coil Temperature Rise	Standard: 30°C max. at rated voltage UL Type: 40°C max. at rated voltage			
Insulation Resistance	100MΩ min. at 500V DC			
Dielectric Withstanding Voltage	500V AC tor 1 minute			
Operate Time	20 ms max. at rated voltage			
Release Time	10 ms max.			
Life Expectancy — Mechanical	10 x 10⁶ ops. min.			
Electrical	100 x 10³ ops. min. at rated load			
Vibration	10 to 50Hz (Dual amplitude: 1.5mm)			
Shock	10G (11 ms)			
Temperature Range	Standard, −30°C ~ +65°C — UL Type, −30°C ~ +55°C			
Weight	15 gr. approx.			

SELECTION TABLES

FBR111 Type	Contacts		Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	Designation	Price
	Arrangement	Materials*					
Standard	SPDT	No Suffix	5	70	Less Than 80% of Rated Voltage	FBR111CD005	$1.70
		—K	6	100		FBR111CD006	1.70
		—M	9	225		FBR111CD009	.1.70
		—W	12	400		FBR111CD012	1.70
			24	1600		FBR111CD024	1.84
UL Type	SPDT	No Suffix	5	50	Less Than 75% of Rated Voltage	FBR111UD005	$1.84
		—K	6	72		FBR111UD006	1.84
		—M	9	160		FBR111UD009	1.84
		—W	12	290		FBR111UD012	1.84
			24	1150		FBR111UD024	1.96

FBR111N Type	Contacts		Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	Designation	Price
	Arrangement	Materials*					
Standard	SPDT	No Suffix	5	70	Less Than 80% of Rated Voltage	FBR111NCD005	$2.04
		—K	6	100		FBR111NCD006	2.04
		—M	9	225		FBR111NCD009	2.04
		—W	12	400		FBR111NCD012	2.04
			24	1600		FBR111NCD024	2.18
UL Type	SPDT	No Suffix	5	50	Less Than 80% or Rated Voltage	FBR111NUD005	$2.18
		—K	6	72		FBR111NUD006	2.18
		—M	9	160		FBR111NUD009	2.18
		—W	12	290		FBR111NUD012	2.18
			24	1150		FBR111NUD024	2.32

Note 1. 48V rated voltage relays are available on special order.
2. Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
* Add $0.14 to price for —K, $0.28 for —M, $0.14 for —W.
For CSA certified relays, —CSA suffix must be added to part number of UL type. Price is same as UL type.

FUJITSU

RELAYS

SMALL CONTROL RELAYS FOR P.C. BOARDS

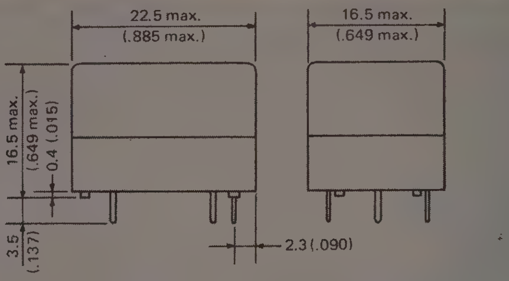
FBR160 SERIES

Fujitsu FBR160 series small control relays are PC board mounted and have excellent cost performance.

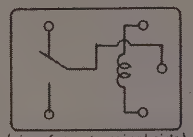
FEATURES

- **Same terminal array as FBR100**
  These relays have the same foot print as Fujitsu's conventional FBR100 series.
- **Lower profile**
  Since their profile is 7 mm lower than that of the FBR100 series relays, they can be used in smaller equipment.
- **Flux-prevention structure**
  The contacts are located on the top of the relay to protect them from solder flux from the terminals.
- **Meets major safety standards**
  The relays structure is designed to meet the Japan Electric Appliance Control Law (150V or less) and UL standards (114).
- **Choices of contact materials**
  Two different kinds of contact materials can be specified according to the load.

DIMENSIONS

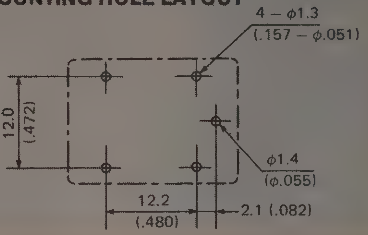


SCHEMATICS



(view from terminal side)

MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT
Contact Material	See Selection Table
Initial Contact Resistance	100 mΩ max. Silver contacts: Measured at 6 VDC, 0.5A Other contacts: Measured at 6 VDC, 1.0A
Insulation Resistance	100 mΩ min. (at 500 VDC)
Withstanding Voltage	Between open contacts: 500 VAC for 1 minute Between contact and coil: 1,500 VAC for 1 minute
Vibration	10 to 55 Hz (dual amplitude: 1.5 mm)
Shock	Operation malfunction: Less than 0.1 ms at 10G (11 ms) Durability: 100G (11 ms)
Operate Time	10 ms max. (at rated voltage, bounce time not included)
Release Time	5 ms max. (after rated voltage, bounce time not included)
Life Expectancy	Mechanical: 10 x 10^6 ops. min. (maximum switching frequency: 18 x 10^3/hour) Electrical: 100 x 10^3 ops. min. (at rated contact load, maximum switching frequency: 18 x 10^2/hour)
Ambient Temperature	−30°C to +60°C
Ambient Humidity	45% to 85% RH
Weight	11 gr. (approx.)

SELECTION TABLE

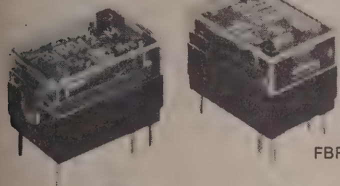
FBR161 Type	Contacts		Rated Voltage in VDC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
	Arrangement	Materials*					
Standard	SPDT	No Suffix: Silver —K: Silver Cad Oxide	5	70	Less than 80% of rated voltage	FBR161ED005	$1.70
			6	100		FBR161E0006	1.70
			9	225		FBR161ED009	1.70
			12	400		FBR161ED012	1.70
			24	1,600		FBR161ED024	1.84

* Add $0.14 to price for —K contacts.

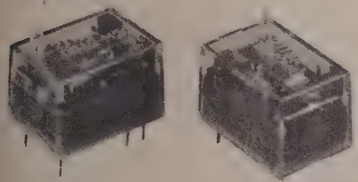
ULTRA-MINIATURE RELAYS FOR P.C. BOARDS

FBR211 AND FBR211N SERIES

SPDT 1A-28V DC, 0.5A-120V AC



FBR211



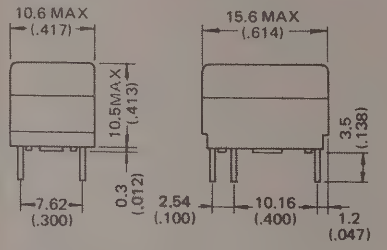
FBR211N

The FBR211 and FBR211N Series of ultra-miniature relays allow high component densities for savings in both equipment size and cost for the printed circuit board. The FBR-211N Series is suitable for immersion cleaning in freon and aqueous systems.

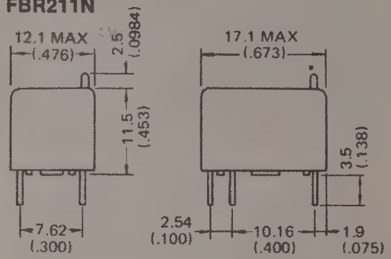
These highly sensitive relays with gold-clad SPDT contact arrangements are ingeniously designed so as to offer flux-contamination-immunity and load handling capabilities of 1A at 28V DC or 0.5A at 120V AC under a resistive load. The 0.1″ grid spacing of terminals makes these relays ideally suited for printed circuit board applications requiring high density mounting and for use in audio and wireless communications, office and vending machines, automobiles and various control applications.

DIMENSIONS Unit: mm (inch)

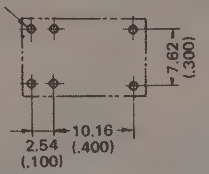
FBR211



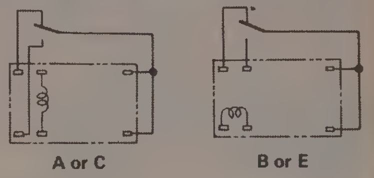
FBR211N



FBR211, FBR211N MOUNTING HOLE LAYOUT



SCHEMATICS (BOTTOM VIEWS)



Notes:
1. For low level or dry circuit switching, use of gold thick-overlay silver-palladium alloy contact relays are recommended.
2. *Cut off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay board, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

ENGINEERING DATA

Item	Specifications	
	Standard Model	High Sensitivity Model
Contact Arrangement	SPDT	
Contact Ratings	1A at 28V DC, 0.5A at 120V AC (resistive)	
Initial Contact Resistance	100mΩ max. at 6V DC, 0.5A	
Contact Materials	Standard: Gold overlay silver (—M) — Low Level: Gold overlay silver-palladium alloy (—P)	
Rated Coil Voltage	1.5, 3, 5, 6, 9, 12, 24V DC	
Coil Power Dissipation	0.45W at rated voltage	0.20W at rated voltage
Coil Temperature Rise	45°C approx. at rated voltage	25°C approx. at rated voltage
Insulation Resistance	100MΩ min. at 500V DC (at 20°C 65% RH)	
Dielectric Withstanding Voltage	500V AC for 1 minute	
Operate Time	5 ms approx. (at rated voltage, 20°C)	
Release Time	5 ms approx.	
Life Expectancy — Mechanical	5 x 16⁶ ops. min.	
Electrical	300 x 10³ ops. min. at 1A 28V DC, resistive 100 x 10³ ops. min. at 0.5A 120V AC, resistive	
Vibration	10 to 40Hz (Dual amplitude: 1.5mm)	
Shock	10G (11 ms)	6G (11 ms)
Temperature Range	—25°C to +55°C	—25°C to +75°C
Weight	4 gr. approx.	

SELECTION TABLE

Type	Contact		Schematics	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-up Voltage at 20°C	FBR211		FBR211N	
	Arrangement	Materials					Designation	Price* —M Type	Designation	Price* —M Type
Standard	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	A	1.5	5	Less Than 70% of Rated Voltage	FBR211AD001—M or P	$1.82	FBR211NAD001—M20 or P20	$2.30
				3	20		FBR211AD003—M or P	1.82	FBR211NAD003—M20 or P20	2.30
				5	56		FBR211AD005—M or P	1.82	FBR211NAD005—M20 or P20	2.30
				6	80		FBR211AD006—M or P	1.82	FBR211NAD006—M20 or P20	2.30
				9	180		FBR211AD009—M or P	1.82	FBR211NAD009—M20 or P20	2.30
				12	320		FBR211AD012—M or P	1.82	FBR211NAD012—M20 or P20	2.30
				24	1280		FBR211AD024—M or P	1.98	FBR211NAD024—M20 or P20	2.46
Standard	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	B	1.5	5	Less Than 70% of Rated Voltage	FBR211BD001—M or P	$1.82	FBR211NBD001—M20 or P20	$2.30
				3	20		FBR211BD003—M or P	1.82	FBR211NBD003—M20 or P20	2.30
				5	56		FBR211BD005—M or P	1.82	FBR211NBD005—M20 or P20	2.30
				6	80		FBR211BD006—M or P	1.82	FBR211NBD006—M20 or P20	2.30
				9	180		FBR211BD009—M or P	1.82	FBR211NBD009—M20 or P20	2.30
				12	320		FBR211BD012—M or P	1.82	FBR211NBD012—M20 or P20	2.30
				24	1280		FBR211BD024—M or P	1.98	FBR211NBD024—M20 or P20	2.46
High Sensitivity	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	C	1.5	12	Less Than 70% of Rated Voltage	FBR211CD001—M or P	$1.96	FBR211NCD001—M20 or P20	$2.44
				3	45		FBR211CD003—M or P	1.96	FBR211NCD003—M20 or P20	2.44
				5	120		FBR211CD005—M or P	1.96	FBR211NCD005—M20 or P20	2.44
				6	180		FBR211CD006—M or P	1.96	FBR211NCD006—M20 or P20	2.44
				9	400		FBR211CD009—M or P	1.96	FBR211NCD009—M20 or P20	2.44
				12	700		FBR211CD012—M or P	1.96	FBR211NCD012—M20 or P20	2.44
				24	2800		FBR211CD024—M or P	2.12	FBR211NCD024—M20 or P20	2.60
High Sensitivity	SPDT	Gold Overlay Silver (M) or Gold Overlay Silver-Palladium Alloy (P)*	E	1.5	12	Less Than 70% of Rated Voltage	FBR211ED001—M or P	$1.96	FBR211NED001—M20 or P20	$2.44
				3	45		FBR211ED003—M or P	1.96	FBR211NED003—M20 or P20	2.44
				5	120		FBR211ED005—M or P	1.96	FBR211NED005—M20 or P20	2.44
				6	180		FBR211ED006—M or P	1.96	FBR211NED006—M20 or P20	2.44
				9	400		FBR211ED009—M or P	1.96	FBR211NED009—M20 or P20	2.44
				12	700		FBR211ED012—M or P	1.96	FBR211NED012—M20 or P20	2.44
				24	2800		FBR211ED024—M or P	2.12	FBR211NED024—M20 or P20	2.60

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
* Add $0.32 to price or —P contact material.

FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex 206196, TWX 910-651-2259

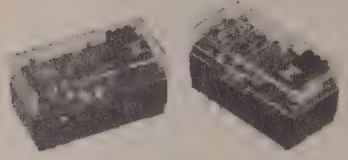
FUJITSU

RELAYS

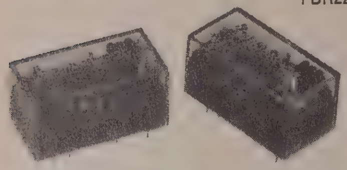
ULTRA-MINIATURE RELAYS FOR P.C. BOARDS

FBR221 AND FBR221N SERIES

DPDT 1A-28V DC, 0.5A-120V AC



FBR221



FBR221N

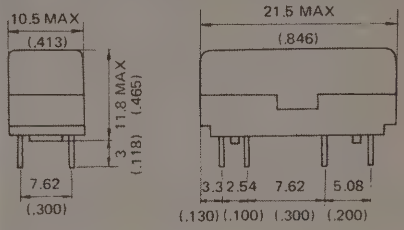
The FBR221 and FBR221N Series of ultra-miniature relays are designed to provide high component densities for savings in both equipment size and cost.

These highly sensitive relays with gold-clad DPDT contact arrangements can switch loads up to 1A at 28V DC or 0.5A at 120V AC.

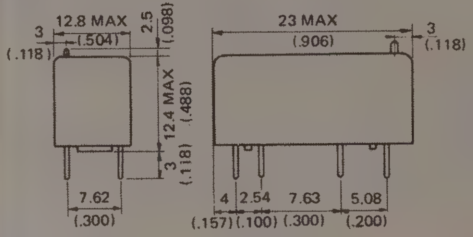
The .1″ grid spacing of terminals makes these relays ideally suited for printed circuit board applications requiring high density mounting—and for use in audio and wireless communications, office machines, various control applications and automobiles.

DIMENSIONS Unit: mm (inch)

FBR221



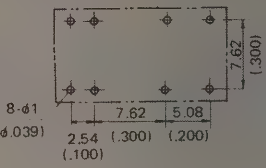
FRB221N



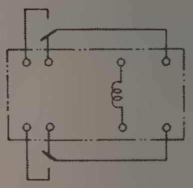
Notes:
1. For low level or dry circuit switching, use of gold thick-overlay silver-palladium alloy contact relays is recommended.
2. Cut-off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

FBR221, FRB221N

MOUNTING HOLE LAYOUT



SCHEMATIC



(BOTTOM VIEW)

ENGINEERING DATA

Item	Specifications
Contact Arrangement	DPDT
Contact Rating	1A at 28V DC, 0.5A at 120V AC (resistive)
Initial Contact Resistance	100mΩ max. at 6V DC, 0.1A initial
Contact Materials	Standard: Gold overlay silver — Low Level Type: Gold overlay silver-palladium alloy
Rated Coil Voltage	3, 5, 6, 9, 12, 24V DC
Coil Power Dissipation	Typical 0.5W at rated coil voltage at 20°C
Coil Temperature Rise	50°C approx. at rated voltage at 20°C
Insulation Resistance	100MΩ min. at 500V DC (at 20°C 65% RH)
Dielectric Withstanding Voltage	500V RMS (60Hz) for 1 minute
Operate Time	10 ms max. at rated voltage at 20°C
Release Time	5 ms max.
Life Expectancy — Mechanical	5 x 10⁶ ops. min.
Electrical	300 x 10³ ops. min. at 28V DC, 1A, resistive 100 x 10³ ops. min. at 120V AC, 0.5A, resistive
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Temperature Range	−25°C to +50°C
Weight	5 gr. approx.

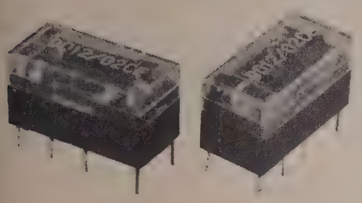
SELECTION TABLE

Type	Contact Arrangements	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	FBR221		FBR221N	
					Designation	Price	Designation	Price
Standard	DPDT (Gold Overlay Silver)	3	18	Less Than 75% of Rated Voltage	FBR221D003	$3.06	FBR221ND003—20	$3.54
		5	50		FBR221D005	3.06	FBR221ND005—20	3.54
		6	72		FBR221D006	3.06	FBR221ND006—20	3.54
		9	162		FBR221D009	3.06	FBR221ND009—20	3.54
		12	290		FBR221D012	3.06	FBR221ND012—20	3.54
		24	1150		FBR221D024	3.22	FBR221ND024—20	3.70
Low Level Load	DPDT (Gold Overlay Silver-Palladium Alloy)	3	18	Less Than 75% of Rated Voltage	FBR221D003—P	$3.76	FBR221ND003—P20	$4.24
		5	50		FBR221D005—P	3.76	FBR221ND005—P20	4.24
		6	72		FBR221D006—P	3.76	FBR221ND006—P20	4.24
		9	162		FBR221D009—P	3.76	FBR221ND009—P20	4.24
		12	290		FBR221D012—P	3.76	FBR221ND012—P20	4.24
		24	1150		FBR221D024—P	3.92	FBR221ND024—P20	4.40

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.

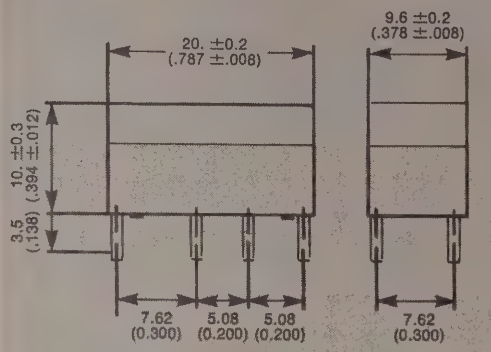
LOW PROFILE RELAYS FOR P.C. BOARDS

FBR244 AND FBR244N SERIES

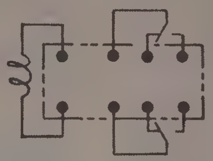


FBR244 and FBR244N Series Relays are low profile, P.C. board relays with 2 Form C (DPDT) contact arrangements in D.I.P.-compatible plastic housing and have a 2.54mm pinout grid spacing to provide 16-pin-DIP-socket compatibility. Watertight terminal sealing prevents relay from contamination by soldering flux and N type allows automatic wave soldering and board washing without relay damage. Single or bifurcated contacts switch 1A at 28V DC or 0.5A at 120V AC and have a rated-load life-time of 5x10^5 operations. These relays are suitable for telecommunication equipment, audio equipment and business machines.

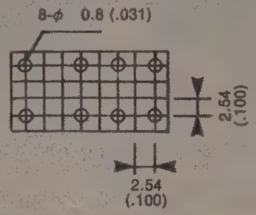
DIMENSIONS Unit: mm (inch)



SCHEMATICS



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specifications
Contact Arrangement	2 Form C
Contact Material	Gold overlay silver Gold overlay silver-palladium alloy
Contact Rating	1A at 28V DC (resistive) 0.5A at 120V AC (resistive)
Initial Contact Resistance	100mΩ max. at 6V DC 0.1A
Coil Power Dissipation	Typical 0.5W at rated coil voltage
Coil Temperature Rise	50°C approx. at rated voltage 20°C
Insulation Resistance	100MΩ min. at 500V DC
Dielectric Withstanding Voltage	500V AC for 1 minute
Vibration	10 to 55 Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Operate Time	10 ms max. at rated coil voltage
Release Time	5 ms max.
Life Expectancy — Mechanical	10^7 ops. min.
Electrical	5 x 10^5 ops. min. at 1A 28V DC (resistive) — 0.3A 120V AC (resistive) 10^5 ops. min. at 0.5A 120V AC (resistive)
Ambient Temperature Range	−30°C to +50°C
Weight	4.5 gr approx.

SELECTION TABLE

Contact Materials*	Rated Voltage in V CD	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	FBR244		FBR244N	
				Designation	Price	Designation	Price
S: Single Gold overlay silver P: Single Gold overlay silver-palladium alloy T: Bifurcated Gold overlay silver E: Bifurcated Gold overlay silver-palladium alloy	3	18	Less Than 75% of Rated Voltage	FBR244D003/02CS	$2.66	FBR244ND003/02CS	$3.14
	5	50		FBR244D005/02CS	2.66	FBR244ND005/02CS	3.14
	6	72		FBR244D006/02CS	2.66	FBR244ND006/02CS	3.14
	9	162		FBR244D009/02CS	2.66	FBR244ND009/02CS	3.14
	12	290		FBR244D012/02CS	2.66	FBR244ND012/02CS	3.14
	24	1150		FBR244D024/02CS	2.80	FBR244ND024/02CS	3.28

* Substitute S with P, T or E for alternate contact materials and add $0.70 to price for P, $0.32 for T or $1.00 for E.
For 48V relays add $0.60 to the prices of the 24V relays.

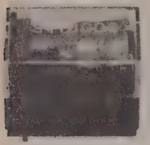
FUJITSU

RELAYS

MINIATURE RELAYS FOR P.C. BOARDS

FBR311 (SPDT) AND FBR321 (DPDT) SERIES

3A-28V DC, 3A-120V AC


FBR311

FBR321

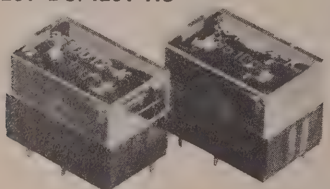
The FBR311 (SPDT) and FBR321 (DPDT) Series miniature relays were designed to provide 3 amps ratings contacts, accommodated in truly compact packages for P.C. boards.

These sensitive miniature relays, featuring high density mounting, flux-contamination immunity, versatile switching performance from signal level to handling 3 amps, are ideally suited for such applications as audio equipment, office machines, vending machines and automotive or other control application. These relays are UL Recognized (E63615) and CSA Certified (add —CSA suffix to P/N).

MINIATURE RELAYS FOR P.C. BOARDS

FBR351 SERIES

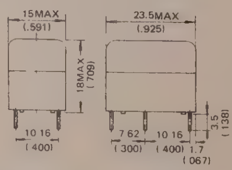
SPDT 3A-28V DC/120V AC, 6A-28V DC/120V AC


FBR351

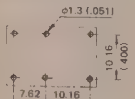
FBR351 Series miniature relays are 1 Form C compact relays which can be used for a wide range of current switching from low levels to heavy loads. Two types are available: gold overlay contacts with contact ratings of 3A, 28V DC or 120V AC, and silver cadmium oxide contacts in 6A, 28V DC or 120V AC. These relays can be easily mounted on a PC board and use 3 pitch (7.62mm) pin arrangements. What's more, FBR351 Series relays endure 6KV at 40μ second in lightening. They are ideal for use in audio equipment, business machines, game machines and automotive applications.

DIMENSIONS Unit: mm (inch)

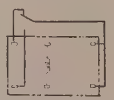
FBR351



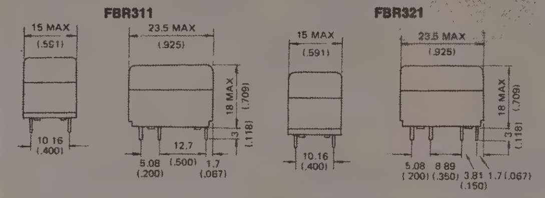
MOUNTING HOLE LAYOUT



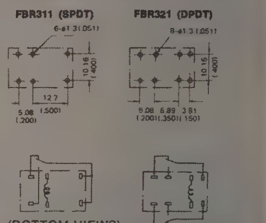
SCHEMATIC


(BOTTOM VIEW)

DIMENSIONS Unit: mm (inch)



SCHEMATICS



(BOTTOM VIEWS)

ENGINEERING DATA FBR311, 321

Item	Specifications
Contact Arrangement Contact Rating Initial Contact Resistance Contact Material	SPDT (FBR311) DPDT (FBR321) 3A at 28V DC, resistive — 3A at 120V AC, (resistive) 100mΩ max. at 6V DC, 0.5A Gold overlay silver
Rated Coil Voltage Coil Power Dissipation Coil Temperature Rise Insulation Resistance Dielectric Withstanding Voltage	5, 6, 9, 12, 24V DC 0.45W approx. at rated voltage 35°C approx. at rated voltage 100MΩ min. at 500V DC (initial) 500V AC for 1 minute
Operate Time Release Time	20 ms max. at rated voltage 10 ms max.
Life Expectancy — Mechanical Electrical	10 x 10^6 ops. min., 100 x 10^3 ops. min. at rated load
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	10G (11ms)
Temperature Range	−30°C to +50°C
Weight	12 gr. approx.

SELECTION TABLE

Contact Arrangement	Rated Voltage in V DC	Coil Resistance in Ω ±15% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
SPDT	5	58	Less Than 80% of Rated Voltage	FBR311D005	$2.12
	6	85		FBR311D006	2.12
	9	180		FBR311D009	2.12
	12	300		FBR311D012	2.12
	24	1250		FBR311D024	2.26
DPDT	5	42	Less Than 80% of Rated Voltage	FBR321D005	$3.36
	6	60		FBR321D006	3.36
	9	135		FBR321D009	3.36
	12	230		FBR321D012	3.36
	24	960		FBR321D024	3.50

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
For 48V relays add $0.28 to prices of 24V relays.

ENGINEERING DATA FBR351

Item	Specifications	
	Standard	High-power Type
Contact Arrangement Contact Ratings Contact Materials Initial Contact Resistance	1 Form C (SPDT) 3A at 28V DC or 120V AC (resistive) Gold overlay 100mΩ max. at 6V DC, 0.5A	6A at 28V DC or 120V AC (resistive) Silver-cadmium oxide 100mΩ max. at 6V DC, 1A
Rated Coil Voltage Coil Power Dissipation Coil Temperature Rise	5, 6, 9, 12, 24V DC 0.45W approx. at rated voltage 35°C approx. at rated voltage	
Insulation Resistance Dielectric Withstanding Voltage Lightening	100MΩ min. at 500V DC Between open contacts: 750V AC for 1 minute Between coil and contact: 2000V AC for 1 minute 6KV at 1 x 40 μs	
Operate Time Release Time	8 ms approx. at rated voltage 2.5 ms approx.	
Life Expectancy — Mechanical Electrical	10 x 16^6 ops. min. 200 x 10^3 ops. min. at 28V DC, 3A 100 x 10^3 ops. min. at 120V AC, 3A	100 x 10^3 ops. min. at 28V DC, 6A 50 x 10^3 ops. min. at 120V AC, 6A
Vibration	10∼50Hz (Dual amplitude: 1.5mm)	
Shock	10G (11 ms)	
Temperature Range	−40°C∼+70°C at 2A carrying current −40°C∼+50°C at 5A carrying current (without freezing) −40 C∼+40°C at 6A carrying current	
Weight	12 gr. approx.	

SELECTION TABLE

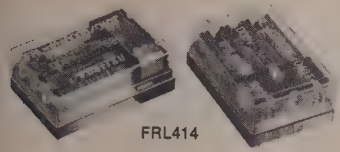
Type	Contact Rating	Contact Materials	Rated Voltage in V DC	Coil Resistance in Ω ±10% at 20°C	Pick-Up Voltage at 20°C	Designation	Price
Standard	3A at 28V DC or 120V AC, resistive	Gold Overlay	5	58	Less Than 80% of Rated Voltage	FBR351D005	$2.32
			6	85		FBR351D006	2.32
			9	180		FBR351D009	2.32
			12	300		FBR351D012	2.32
			24	1250		FBR351D024	2.46
High-Power Type	6A at 28V DC or 120V AC, resistive	Silver-Cadmium Oxide	5	58	Less Than 80% of Rated Voltage	FBR351D005—K	$2.46
			6	85		FBR351D006—K	2.46
			9	180		FBR351D009—K	2.46
			12	300		FBR351D012—K	2.46
			24	1250		FBR351D024—K	2.60

Note: Each product bears its own designation on the top of the cover, but initial code 'FBR' is omitted.
For 48V relays add $0.28 to prices of 24V relays.

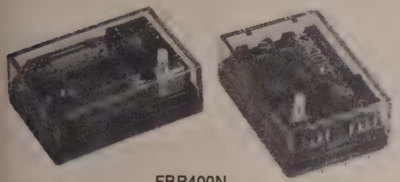
FLAT PACKAGE RELAYS

FRL-414 AND FBR400N SERIES

4PDT, DPDT 1A-30V DC, 1A-120V AC



FRL414



FBR400N

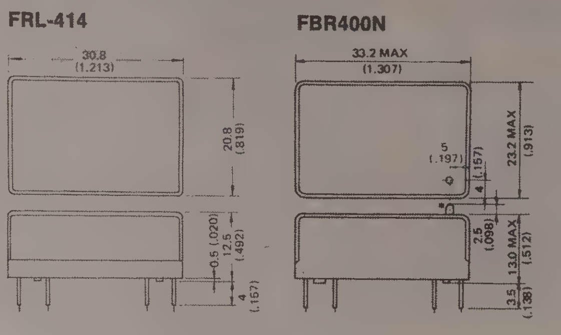
The Fujitsu FRL-414 and FBR400N (immersion cleanable) Series Flat Package Relays have been designed for P.C. board mounting and are ingeniously constructed so as to offer the advantages of flux-contamination-immunity.

The low power consumption relays are available in both DPDT and 4PDT contact arrangements and in coil voltage ratings to 48V DC. The wide selection is useful for numerous demanding applications, including communications, data processing and controls.

Bifurcated contacts assure high reliability. These relays are capable of handling resistive loads of up to 1A at 30V DC or 120V AC.

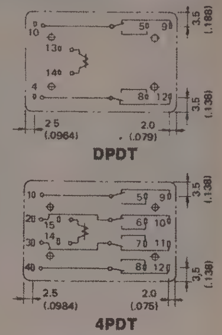
A low level load version with gold overlay silver-palladium alloy contacts is also available. Electrical life expectancy is more than three million operations at 1A-50V DC resistive load.

DIMENSIONS Unit: mm (inch)

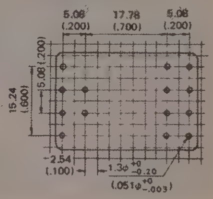


Notes:
1. For low level or dry circuit switching, use of gold overlay silver-palladium alloy contact relays is recommended.
2. *Cut-off nib must be removed after relay soldering and board cleaning.
3. Although the plastic cover is bonded to the relay base, it is not hermetically sealed. Therefore when the board on which the relay is soldered is cleaned by immersion, cleaning time must not exceed 2 minutes. Please use alcohol, freon or water for cleaning.

FRL-414, FBR400N
SCHEMATICS



MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Characteristics
Contact Arrangement Contact Rating Initial Contact Resistance Contact Materials	DPDT and 4PDT with bifurcated contacts 1A at 120V AC (resistive) — 1A at 30V DC (resistive) 100mΩ max. at 3V DC, 0.5A initial Standard: Gold-overlay silver — Low-level Load: Gold-overlay silver-palladium alloy
Rated Coil Voltage Coil Power Dissipation Coil Temperature Rise	5, 6, 12, 24, 48V DC DPDT: 0.45W — 4PDT: 0.60W at rated voltage at 20°C DPDT: 30°C approx. — 4PDT: 40°C approx. at rated voltage at 20°C
Insulation Resistance Dielectric Withstanding Voltage	100MΩ min. at 500V DC (at 20°C 65% RH) 500V rms (60 Hz) for 1 minute
Operate Time Release Time	15 ms max. at rated coil voltage at 20°C 5 ms max.
Life Expectancy — Mechanical Electrical	30 x 10⁶ ops. min. 3 x 10⁶ ops. min. at 30V DC, 1A (resistive) 100 x 10³ ops. min. at 120V AC, 1A (resistive)
Shock	10G
Temperature Range	−30°C to +50°C (without freezing)
Weight	15 gr. approx.

SELECTION TABLES

Load	Contact		Rated Voltage in V	Pick-Up Voltage at 20°C	Coil Resistance in Ω±15%	FRL-414		FBR400N	
	Materials	Arrangements				Designation	Price	Designation	Price
Standard	Gold Overlay Silver	DPDT	5 6 12 24 48	Less Than 80% of Rated Voltage	56 78 320 1250 4000	FRL-414D005/02CT FRL-414D006/02CT FRL-414D012/02CT FRL-414D024/02CT FRL-414D048/02CT	$4.44 4.44 4.44 4.44 5.04	FBR422ND005—20 FBR422ND006—20 FBR422ND012—20 FBR422ND024—20 FBR422ND048—20	$5.04 5.04 5.04 5.04 5.64
Standard	Gold Overloy Silver	4PDT	5 6 12 24 48	Less Than 80% of Rated Voltage	42 58 220 960 2800	FRL-414D005/04CT FRL-414D006/04CT FRL-414D012/04CT FRL-414D024/04CT FRL-414D048/04CT	$4.84 4.84 4.84 4.84 5.44	FBR442ND005—20 FBR442ND006—20 FBR442ND012—20 FBR442ND024—20 FBR442ND048—20	$5.44 5.44 5.44 5.44 6.04
Low-Level Load	Gold Overlay Silver-Palladium Alloy	DPDT	5 6 12 24 48	Less Than 80% of Rated Voltage	56 78 320 1250 4000	FRL-414D005/02CE FRL-414D006/02CE FRL-414D012/02CE FRL-414D024/02CE FRL-414D048/02CE	$4.84 4.84 4.84 4.84 5.44	FBR422ND005—P20 FBR422ND006—P20 FBR422ND012—P20 FBR422ND024—P20 FBR422ND048—P20	$5.44 5.44 5.44 5.44 6.04
Low-Level Load	Gold Overlay Silver-Palladium Alloy	4PDT	5 6 12 24 48	Less Than 80% of Rated Voltage	42 58 220 960 2800	FRL-414D005/04CE FRL-414D006/04CE FRL-414D012/04CE FRL-414D024/04CE FRL-414D048/04CE	$6.16 6.16 6.16 6.16 6.76	FBR442ND005—P20 FBR442ND006—P20 FBR442ND012—P20 FBR442ND024—P20 FBR442ND048—P20	$6.76 6.76 6.76 6.76 7.36

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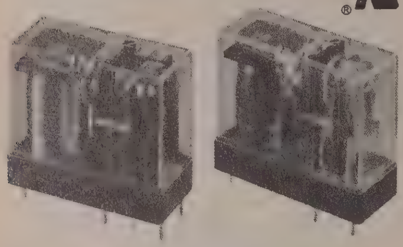
FUJITSU

RELAYS

MINIATURE HIGH-POWER RELAYS

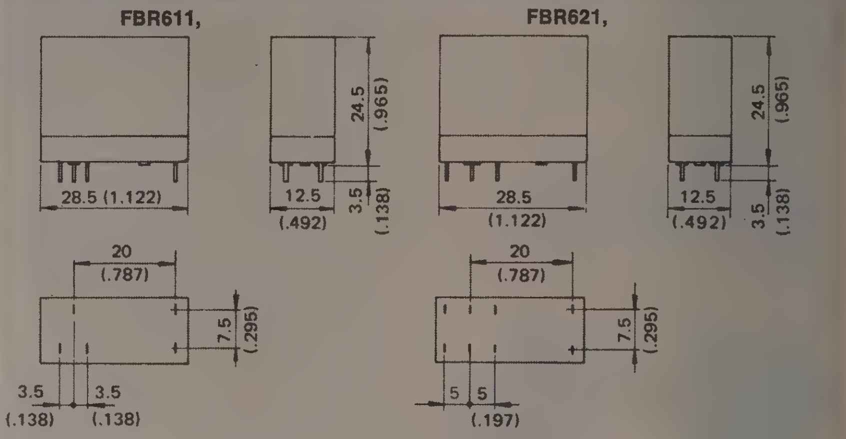
FBR600 SERIES



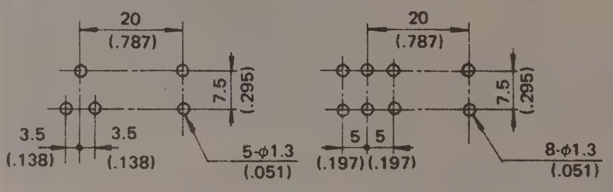
The FBR600 Series are miniature high-power relays with a switching capability of 10A, 30V DC or 240V AC for 1 Form C contact; and 5A, 30V DC or 240V AC for 2 Form C contacts. These relays, conforming to VDE, UL and CSA standards, are designed for mounting on printed circuit boards. Dielectric withstanding voltage is 500V AC for 1 minute and creeping distance is 8mm. These FBR600 Series relays are ideal for use in audio equipment, TV, vending machines, control machines, etc.

UL recognized (E63615) for industrial control equipment per UL508.

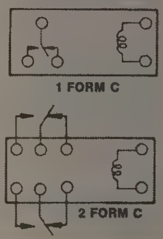
DIMENSIONS Unit: mm (inch)



MOUNTING HOLE LAYOUT



SCHEMATICS



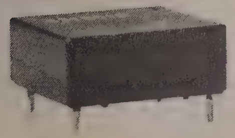
ENGINEERING DATA

Item	Specifications
Contact Arrangement	FBR611, 1 Form C — FBR621, 2 Form C
Contact Ratings	FBR611, 10A at 30V DC or 240V AC — FBR621, 5A at 30V DC or 240V AC
Carrying Current	FBR611, 10A — FBR621, 5A
Contact Material	Silver-alloy
Initial Contact Resistance	100mΩ max. at 6V DC, 1A
Rated Coil Voltage	5, 6, 9, 12, 18, 24, 48, 60V DC
Coil Power Dissipation	FBR611/621, 0.5W at 20°C
Coil Temperature Rise	FBR611/621, 35°C at rated voltage at 20°C
Insulation Resistance	1000Ω min. at 500V DC (initial) at 20°C, 65% RH
Dielectric Withstanding Voltage	
Between Coil and Contact	5000V AC for 1 minute at 20°C, 65% RH
Between Open Contacts	1000V AC for 1 minute at 20°C, 65% RH
Between Adjacent Contacts	FBR621, 3000V AC for 1 minute at 20°C, 65% RH
Lightening (1 x 40μ sec)	
Between Coil and Contact	10,000V min
Between Adjacent Contacts	FBR621, 6000V min.
Operate Time	8 ms approx. at rated voltage at 20°C
Release Time	2.5 ms approx. at 20°C
Life Expectancy — Mechanical	20 x 10⁶ ops. min.
Electrical	100 x 10³ ops. min. at rated voltage
Vibration	10∼55 Hz (Dual amplitude: 1.5mm)
Shock	10G (11 ms)
Temperature Range	FBR611/621, −40°C∼+70°C
Weight	16 gr. approx.

SELECTION TABLE

Contact Material	Rated Voltage in V DC	Coil Resistance in Ω at 20°C	Pick-Up Voltage at 20°C	Open Voltage at 20°C	FBR611		FBR621	
					Designation	Price	Designation	Price
Silver-Alloy	5	50	Less Than 70% of Rated Voltage	More Than 10% of Rated Voltage (reference)	FBR611D005	$3.74	FBR621D005	$4.00
	6	72			FBR611D006	3.74	FBR621D006	4.00
	9	160			FBR611D009	3.74	FBR621D009	4.00
	12	285			FBR611D012	3.74	FBR621D012	4.00
	18	640			FBR611D018	3.74	FBR621D018	4.00
	24	1150			FBR611D024	3.86	FBR621D024	4.12
	48	4600			FBR611D048	4.56	FBR621D048	4.82
	60	7200			FBR611D060	4.96	FBR621D060	5.24

LOW PROFILE RELAYS FOR P.C. BOARDS
FBR630 SERIES



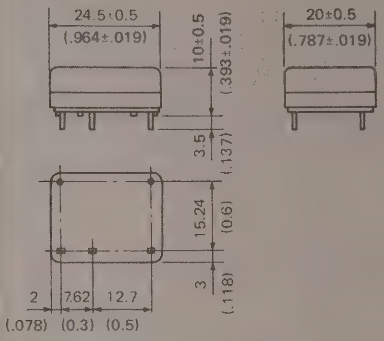
Fujitsu's compact FBR630-series relays are only 10 mm in height, but they provide a remarkable contact rating of 10A.

Compactness and high capacity make these low-profile power relays ideally suited to mounting on PC boards.

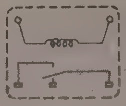
FEATURES

- Low profile — only 10 mm high
- 5 kV minimum lightning surge (between coil and contact)
- 2.5 kV minimum dielectric withstanding voltage (between coil and contact)
- Sealed terminals to protect against flux
- Input/output isolated terminal arrangement for easy pattern design
- Wide operating temperature range— −30°C to +70°C
- Maximum contact rating: 10A (30 VDC/120 VAC)
- High-reliability design meeting various safety standards:
  - Japan Electric Appliance Control Law UL508 Standard
  - CSA-Class 3211 Standard
  - FCC 68-302 Standard

DIMENSIONS

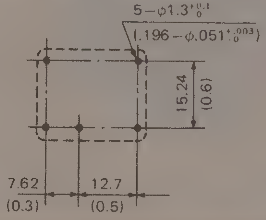


SCHEMATICS

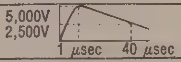


Unit: mm (inch) (BOTTOM VIEW)

MOUNTING HOLE LAYOUT



ENGINEERING DATA

Item	Specification
Contact Arrangement	SPDT (1 Form C)
Contact Rating	10A 30 VDC/120 VAC, 8A 240 VAC
Contact Configuration	Single
Contact Material	Silver alloy
Initial Contact Resistance	100 mΩ max. at 6 VDC, 1A
Insulation Resistance	100 MΩ min. at 500 VDC
Dielectric Withstanding Voltage	Between open contacts: 1,000 VAC for 1 minute Between coil and contact: 2,500 VAC for 1 minute
Lightning	5,000 V/1 μs/40 μs (Between coil and contact) 
Vibration	10 to 55 Hz (Dual amplitude: 1.5 mm)
Shock	Operating malfunction: 10G (11 ms) Durability: 100G (11 ms)
Operate Time	15 ms max. (excluding bounce time)
Release Time	5 ms max. (excluding bounce time)
Life Expectancy	Mechanical: 10 x 10^6 ops/min. Electrical: 100 x 10^3 ops/min. at rated contact load
Maximum Switching Frequency	Mechanical: 18,000 ops//hr Electrical: 1,800 ops//hr (at rated contact load)
Operating Temperature	−30°C to +70°C
Operating Humidity	45% to 85% RH
Weight	Approx. 10 g

Remarks: The table shows characteristic values at 20°C.

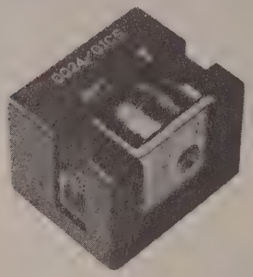
SELECTION TABLE

Rated Coil Voltage	VOLTAGE Specifications	Coil Resistance (±10%)	Coil Current (at Rated Voltage)	Pick-up Voltage	Drop-out Voltage (Reference Value)	Maximum Voltage Allowance	Rated Power Consumption	Coil Temperature Rise	Designation	Price
DC 5V	D005	50Ω	100 mA	Less than 75% of rated voltage	More than 10% of rated voltage	Refer to reference data	Approx. 500 mW (at rated voltage)	Approx. 35 deg. (at rated voltage)	FBR631D005	$2.50
DC 6V	D006	72Ω	83 mA						FBR631D006	2.50
DC 9V	D009	160Ω	56 mA						FBR631D009	2.50
DC 12V	D012	288Ω	42 mA						FBR631D012	2.50
DC 18V	D018	650Ω	28 mA						FBR631D018	2.50
DC 24V	D024	1,150Ω	21 mA						FBR631D024	2.66
DC 48V	D048	4,600Ω	10 mA						FBR631D048	3.34

FUJITSU

RELAYS

P.C. BOARD RELAYS FOR AUTOMOTIVE APPLICATIONS
FRL270 SERIES



Fujitsu FRL270 series power relays are for PC board mounting and are designed especially for automotive applications.

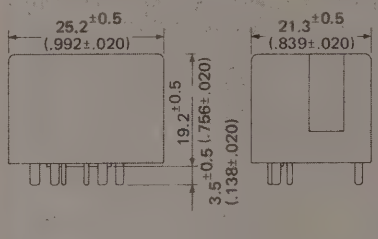
FEATURES

- **Maximum current: 30A**
  The relays are designed for high ambient and storage temperatures to ensure the contacts will endure continuous current of up to 30A.
- **Rigid, shock-resistant construction**
- **1 mm-gap contacts**
  1 mm-gap contacts are also available for controlling 24V motors in trucks and other large vehicles.
- **Welding resistant contact materials**
  Three types of welding resistant contact materials are available as standard.
- Choice of wide terminal model (−01 and −11 suffix) for maximum heat/power transfer or standard terminal model (no suffix or −10) for conventional hole/conductor sizes, at no extra charge.
- Available with case as shown (no suffix and −01) or without case (−10 and −11 suffix).

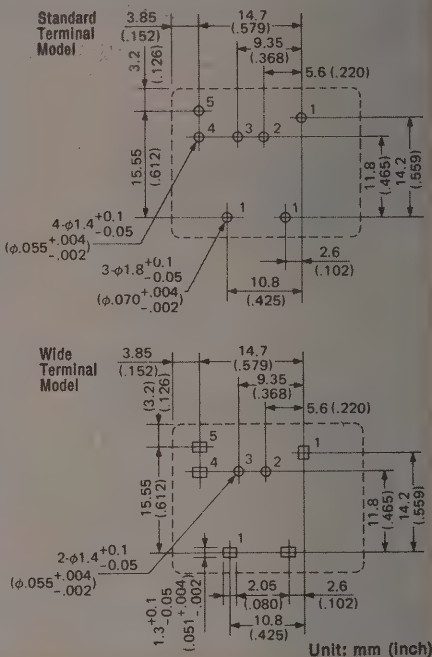
Main Uses

- **Engine control**
  Electronic fuel injection units
- **Lamp control**
  Flasher control units
  Headlight control units
- **Motor, solenoid, and heater controls**
  Windshield wiper control units for trucks
  Automatic door-lock control units
  Defogger control units
  Other various control units

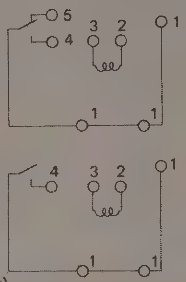
DIMENSIONS



MOUNTING HOLE LAYOUT



SCHEMATICS (BOTTOM VIEWS)



Unit: mm (inch)

ENGINEERING DATA

Item	Specifications
Contact Arrangement	SPDT (1 Form C) or SPST (1 Form A)
Contact Material	Silver-copper alloy (S) Silver-cadmium oxide (K) Silver-tin oxide (Y)
Contact Gap	01 type (Standard gap) 51 type (1 mm gap)
Contact Rating	N.O. contact: 12 VDC, 15A or 24 VDC, 10A N.C. contact: 12 VDC, 10A or 24 VDC, 7A (resistive load)
Rated Current	15A (Continuous)
Maximum Current	30A (Overload current when motor locks)
Voltage Drop Across Contacts	Initial: 0.3V max. After life testing: 0.5V max. (after several operations at rated current)
Coil Power	Standard coil. 1.7W approx. Low-power coil: 0.6W approx. (with rated voltage applied at 20°C)
Coil Temperature Rise	Standard coil: 75 deg. approx. Low-power coil: 35 deg. approx. (with rated voltage applied at 20°C)
Insulation Resistance	100 MΩ min. (at 500 VDC)
Withstanding Voltage	500 VAC for 1 minute
Vibration	Operation error: With 1.5 mm vibration applied at full amplitude at 10 ∼ 55 Hz, contact chatter lasts less than 1 ms.
Shock	Operation error: 10G (11 ms sine half-wave) Durability: 100G (11 ms sine half-wave)
Operate Time	10 ms max. (Standard coil with 01-type contact gap)
Release Time	5 ms max. (01-type contact gap) 8 ms max. (51-type contact gap)
Life Expectancy	Mechanical: 100 x 10^6 operations or more Electrical: 250 x 10^3 operations or more (Silver-copper alloy under the rated contact load)
Ambient Temperature	−30°C ∼ +80°C
Storage Temperature	−40°C ∼ +100°C
Weight	20 g approx.

SELECTION TABLE

Type of Coil (Spec. Code)	Rated Voltage (Spec. Code)	Contact Gap (Spec. Code)	Coil Resistance (±10%)	Rated Power Consumption	Pick-Up Voltage	Drop-Out Voltage	All case/terminal suffix codes: none, −01, −10 or −11	
							Designation	Price
Standard (D)	12 VDC (012)	Standard (01)	85	1.7W approx.	Less than 6.5 VDC	More than 1.0 VDC	FRL274 D12/01AS (or CS)	$2.56 (or $2.66)
		1 mm (51)	85	1.7W approx.	Less than 6.5 VDC	More than 1.0 VDC	FRL274 D12/51AS (or CS)	$2.56 (or $2.66)
Low Power (H)		Standard (01)	240	0.6W approx.	Less than 8.4 VDC	More than 0.8 VDC	FRL274 H12/01AS (or CS)	$2.56 (or $2.66)
Standard (D)	24 VDC (024)	Standard (01)	340	1.7W approx.	Less than 13.0 VDC	More than 2.0 VDC	FRL274 D24/01AS (or CS)	$2.56 (or $2.66)
		1 mm (51)	340	1.7W approx.	Less than 13.0 VDC	More than 2.0 VDC	FRL274 D24/51AS (or CS)	$2.56 (or $2.66)
Low Power (H)		Standard (01)	960	0.6W approx.	Less than 16.8 VDC	More than 1.6 VDC	FRL274 H24/01AS (or CS)	$2.56 (or $2.66)

Notes: 1. Values listed in the table are measured at 20°C.
2. For silver cadmium oxide contacts (code "K") add $0.10.
3. For silver-tin oxide contact (code "Y") add $0.18.

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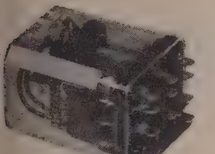
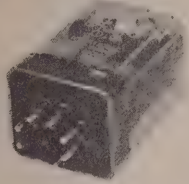
HEAVY DUTY GENERAL PURPOSE RELAYS

FRL-250 AND FRL-256 SERIES

SPDT, DPDT, 3PDT 10A-30V DC, 10A-240V AC


FRL-250

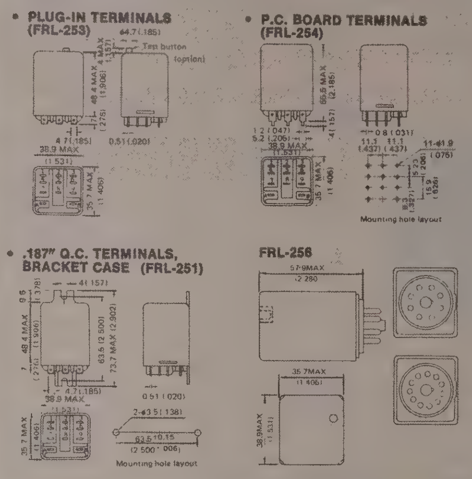

FRL-256

The FRL-250 Series Relays have been designed with particular attention to reliability, cost performance and versatility of application. These heavy duty general purpose relays provide SPDT, DPDT or 3PDT contacts with switching ability of 10A at 30V DC or 240V AC. The FRL-250 Series Relays provide various mounting styles such as plug-in, bracket case, tapped core, stud or P.C. board, and their terminals are convenient quick-connect/solder or P.C. board. The optional features are with or without test button for manual circuit checking and indicator lamp to indicate whether power is reaching relay.

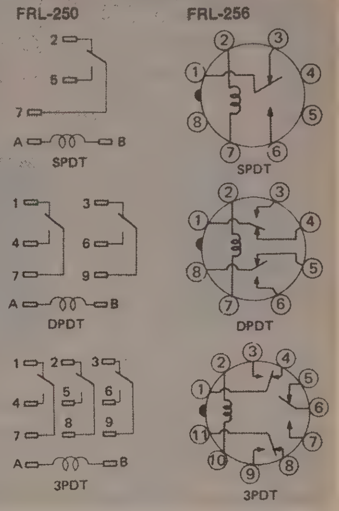
These relays are particularly desirable for use in automation control, communication circuit and many other applications where high power switching and rugged construction are required.

The FRL-250 Series relays are UL recognized (File No. E63614) and C.S.A. certified (File No. LR40304).

DIMENSIONS Unit: mm (inch)



SCHEMATICS



ENGINEERING DATA

Item	Specifications
Contact Arrangement Contact Rating Initial Contact Resistance Contact Material	SPDT, DPDT, 3PDT 10A at 30V DC (resistive) — 10A at 240V AC (resistive) ⅓ HP at 120V AC, ½ HP at 240V AC 100mΩ max. at 6V DC, 1A Gold flashed silver-cadmium oxide
Rated Coil Voltage Coil Power Dissipation Coil Temperature Rise	6, 12, 24, 48, 110V DC — 12, 24, 48, 120, 240V AC DC: 1.2W, AC: 3PDT — 2.7VA, DPDT, SPDT — 2VA at rated voltage, 60 Hz DC: 40°C max., AC: 60° max.
Insulation Resistance Dielectric Withstanding Voltage	100MΩ min. at 500V DC 2000V AC for 1 minute (1000V AC between open contacts)
Operate Time Release Time	30 ms max. at rated coil voltage 30 ms max.
Life Expectancy — Mechanical Electrical	10×10^6 ops. min. 100×10^3 ops. min. at rated load
Vibration	600 to 1500 rpm (Dual amplitude: 1mm)
Shock	10G (11 ms)
Temperature Range	DC: —45°C to +70°C/AC: 3PDT: —45°C to +45C°/DPDT, SPDT: —45°C to +55°C
Weight	80 gr. approx.

SELECTION TABLES

DC RELAYS

Contacts	Coil Rated V DC	Coil Resistance Ohms	Coil Power Watts	Fujitsu Number QC/Solder Bracket Case*	Price	Fujitsu Number Plug-In	Price	Fujitsu Number PC Board	Price	Fujitsu Number Plug-In	Price
SPDT	6	32	1.2	FRL-251D006/01CS-OC	$6.32	FRL-253D006/01CS	$6.32	FRL-254D006/01CS	$6.32	FRL-256D006/01CS	$7.80
	12	120	1.2	FRL-251D012/01CS-OC	6.32	FRL-253D012/01CS	6.32	FRL-254D012/01CS	6.32	FRL-256D012/01CS	7.80
	24	470	1.2	FRL-251D024/01CS-OC	6.32	FRL-253D024/01CS	6.32	FRL-254D024/01CS	6.32	FRL-256D024/01CS	7.80
	48	1800	1.2	FRL-251D048/01CS-OC	6.32	FRL-253D048/01CS	6.32	FRL-254D048/01CS	6.32	FRL-256D048/01CS	7.80
	110	10000	1.2	FRL-251D110/01CS-OC	6.82	FRL-253D110/01CS	6.82	FRL-254D110/01CS	6.82	FRL-256D110/01CS	8.52
DPDT	6	32	1.2	FRL-251D006/02CS-OC	$6.86	FRL-253D006/02CS	$6.86	FRL-254D006/02CS	$6.86	FRL-256D006/02CS	$8.74
	12	120	1.2	FRL-251D012/02CS-OC	6.86	FRL-253D012/02CS	6.86	FRL-254D012/02CS	6.86	FRL-256D012/02CS	8.74
	24	470	1.2	FRL-251D024/02CS-OC	6.86	FRL-253D024/02CS	6.86	FRL-254D024/02CS	6.86	FRL-256D024/02CS	8.74
	48	1800	1.2	FRL-251D048/02CS-OC	6.86	FRL-253D048/02CS	6.86	FRL-254D048/02CS	6.86	FRL-256D048/02CS	8.74
	110	10000	1.2	FRL-251D110/02CS-OC	7.36	FRL-253D110/02CS	7.36	FRL-254D110/02CS	7.36	FRL-256D110/02CS	9.46
3PDT	6	32	1.2	FRL-251D006/03CS-OC	$8.00	FRL-253D006/03CS	$8.00	FRL-254D006/03CS	$8.00	FRL-256D006/03CS	$10.88
	12	120	1.2	FRL-251D012/03CS-OC	8.00	FRL-253D012/03CS	8.00	FRL-254D012/03CS	8.00	FRL-256D012/03CS	10.88
	24	470	1.2	FRL-251D024/03CS-OC	8.00	FRL-253D024/03CS	8.00	FRL-254D024/03CS	8.00	FRL-256D024/03CS	10.88
	48	1800	1.2	FRL-251D048/03CS-OC	8.00	FRL-253D048/03CS	8.00	FRL-254D048/03CS	8.00	FRL-256D048/03CS	10.88
	110	10000	1.2	FRL-251D110/03CS-OC	8.50	FRL-253D110/03CS	8.50	FRL-254D110/03CS	8.50	FRL-256D110/03CS	11.60

AC RELAYS

Contacts	Coil Rated V AC	Coil Current mA	Coil Power VA	Fujitsu Number QC/Solder Bracket Case*	Price	Fujitsu Number Plug-In	Price	Fujitsu Number PC Board	Price	Fujitsu Number Plug-In	Price
SPDT	12	168	2.0	FRL-251A012/01CS-OC	$6.32	FRL-253A012/01CS	$6.32	FRL-254A012/01CS	$6.32	FRL-256A012/01CS	$7.80
	24	84	2.0	FRL-251A024/01CS-OC	6.32	FRL-253A024/01CS	6.32	FRL-254A024/01CS	6.32	FRL-256A024/01CS	7.80
	48	42	2.0	FRL-251A048/01CS-OC	6.32	FRL-253A048/01CS	6.32	FRL-254A048/01CS	6.32	FRL-256A048/01CS	7.80
	120	18	2.0	FRL-251A120/01CS-OC	6.86	FRL-253A120/01CS	6.82	FRL-254A120/01CS	6.82	FRL-256A120/01CS	8.52
	240	9	2.0	FRL-251A240/01CS-OC	7.12	FRL-253A240/01CS	7.12	FRL-254A240/01CS	7.12	FRL-256A240/01CS	9.32
DPDT	12	168	2.0	FRL-251A012/02CS-OC	$6.86	FRL-253A012/02CS	$6.86	FRL-254A012/02CS	$6.86	FRL-256A012/02CS	$ 8.74
	24	84	2.0	FRL-251A024/02CS-OC	6.86	FRL-253A024/02CS	6.86	FRL-254A024/02CS	6.86	FRL-256A024/02CS	8.74
	48	42	2.0	FRL-251A048/02CS-OC	6.86	FRL-253A048/02CS	6.86	FRL-254A048/02CS	6.86	FRL-256A048/02CS	8.74
	120	18	2.0	FRL-251A120/02CS-OC	7.36	FRL-253A120/02CS	7.36	FRL-254A120/02CS	7.36	FRL-256A120/02CS	9.46
	240	9	2.0	FRL-251A240/02CS-OC	7.66	FRL-253A240/02CS	7.66	FRL-254A240/02CS	7.66	FRL-256A240/02CS	10.26
3PDT	12	230	2.7	FRL-251A012/03CS-OC	$8.00	FRL-253A012/03CS	$8.00	FRL-254A012/03CS	$8.00	FRL-256A012/03CS	$10.88
	24	115	2.7	FRL-251A024/03CS-OC	8.00	FRL-253A024/03CS	8.00	FRL-254A024/03CS	8.00	FRL-256A024/03CS	10.88
	48	57	2.7	FRL-251A048/03CS-OC	8.00	FRL-253A048/03CS	8.00	FRL-254A048/03CS	8.00	FRL-256A048/03CS	10.88
	120	24	2.7	FRL-251A120/03CS-OC	8.50	FRL-253A120/03CS	8.50	FRL-254A120/03CS	8.50	FRL-256A120/03CS	11.60
	240	12	2.7	FRL-251A240/03CS-OC	8.80	FRL-253A240/03CS	8.80	FRL-254A240/03CS	8.80	FRL-256A240/03CS	12.40

* To order No. 6-32 tapped core mounting style, change suffix, **-OC** to **-OA-01** and add **$0.90** to price shown; to order No. 6-32 stud mounting style, change suffix **-OC** to **-OB-01** and add **$0.80** to price shown.

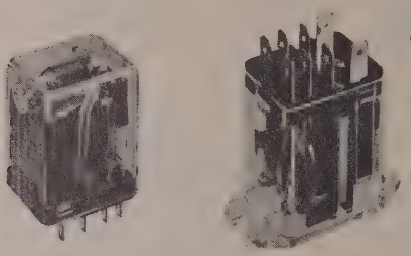
FUJITSU

RELAYS

GENERAL PURPOSE RELAYS

FRL-260 SERIES

4PDT-3A, 3PDT-5A, DPDT-10A, SPDT-15A



The FRL-260 series relays with proven performance and top quality have been designed with emphasis on reliability, safety, cost performance and applicability to a wide range of uses.

These relays provide SPDT to 4PDT contacts, which are offered for contact ratings from 1 amp to 15 amps at 30V DC or 240V AC, resistive. Moreover, they are also available with 4 transfer bifurcated contacts that enable them to meet signal level or other light loads.

The FRL-260 series relays are available in both DC- and AC-rated coils, and with a selection of mountings, such as solder, plug-in, P.C. boards and quick connect terminals.

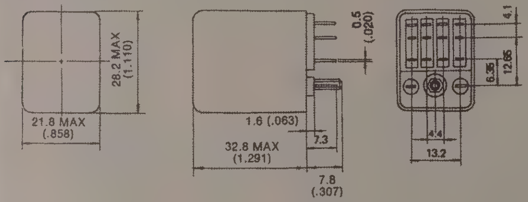
The FRL-260 series is UL recognized (File No. E63614/E63615) and C.S.A. certified.

ENGINEERING DATA

Item	Specifications
Contact Ratings (Resistive Load).	As per SELECTION TABLE
Initial Contact Resistance	General (S, K, V Contact): 100mΩ max. (at 6V DC, 1A) Low Level (T, L Contact): 50mΩ max. (at 6V DC, 0.1A)
Operate Time Release Time	25 ms max. (at rated coil voltage) 25 ms max.
Coil Power Dissipation	DC: 0.9W (at rated coil voltage) AC: 1.2 VA (120V max.) at rated coil voltage of 60 Hz 1.4 VA (200V min.) at rated coil voltage of 60 Hz
Coil Temperature Rise	DC: 50° max. AC: 60°C max.
Life Expectancy — Mechanical	50 x 10^6 ops. min.
Electrical	(at rated load) Medium Load SPDT: 500 x 10^3 ops. min. DPDT: 500 x 10^3 ops. min. 3PDT: 500 x 10^3 ops. min. 4PDT: 200 x 10^3 ops. min. 4PST: 100 x 10^3 ops. min. Heavy Load SPDT: 200 x 10^3 ops. min. SPST: 200 x 10^3 ops. min. DPDT: 500 x 10^3 ops. min.
Insulation Resistance	100MΩ min. (at 500V DC)
Dielectric Withstanding Voltage	1500V AC (1000V AC between open contacts) for 1 minute
Vibration	50 Hz (Dual Amplitude: 0.5mm)
Shock	10G (11 ms)
Temperature Range	−30°C to +55°C
Weight	35 gr. approx.

DIMENSIONS Unit: mm

04CL: DIMENSION AND CONSTRUCTION
04CS: DIMENSION AND CONSTRUCTION
04CT: DIMENSION AND CONSTRUCTION
04CV: DIMENSION AND CONSTRUCTION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21.8 MAX
(.858)
0.5
(.020)
1.6 (.063)
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(.307)
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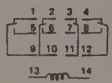
4.4
13.2

SCHEMATIC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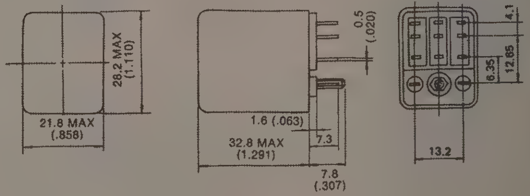
13 14

(Bottom view)

03CS: DIMENSION AND CONSTRUCTION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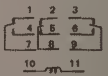
SCHEMATIC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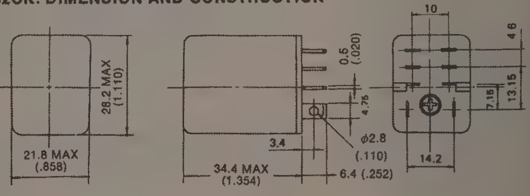
(Bottom view)

02CK: DIMENSION AND CONSTRUCTION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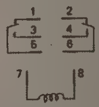
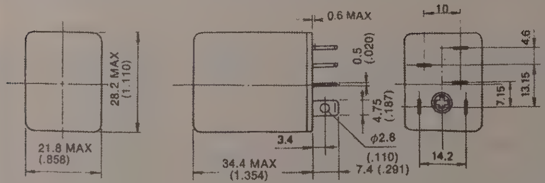
SCHEMATIC



(Bottom view)

01CK: DIMENSION AND CONSTRUCTION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(.110)
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(1.354)
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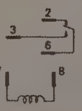
14.2



SCHEMATIC
(Bottom view)

FRL260 SERIES RELAYS SELECTION TABLE — DC COIL

Contact Arrangement and Material	Contact Ratings		Rated Voltage V DC 50/60 Hz	Coil Resistance ±15% Ohms @ 20°C	Pick-Up Voltage @ 20°C	Fujitsu Part Numbers (Plug-In)*	Price
	Resistive	Horsepower					
SPDT AgCdO	15A @ 30V DC or 150V AC 10A @ 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	40	4.5	FRL263D006/01CK	$4.66
			12	160	9	FRL263D012/01CK	4.66
			24	650	18	FRL263D024/01CK	4.66
			48	2600	36	FRL263D048/01CK	4.66
			110	13300	82.5	FRL263D110/01CK	5.80
DPDT AgCdO	10A @ 30V DC or 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	40	4.5	FRL263D006/02CK	$4.84
			12	160	9	FRL263D012/02CK	4.84
			24	650	18	FRL263D024/02CK	4.84
			48	2600	36	FRL263D048/02CK	4.84
			110	13300	82.5	FRL263D110/02CK	5.98
3PDT AgCdO	5A @ 30V DC or 240V AC	1/6 HP @ 120V AC	6	40	4.5	FRL263D006/03CS	$4.84
			12	160	9	FRL263D012/03CS	4.84
			24	650	18	FRL263D024/03CS	4.84
			48	2600	36	FRL263D048/03CS	4.84
			110	13300	82.5	FRL263D110/03CS	5.98
4PDT Ag + Au Clad	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CL	$5.18
			12	160	9	FRL263D012/04CL	5.18
			24	650	18	FRL263D024/04CL	5.18
			48	2600	36	FRL263D048/04CL	5.18
			110	13300	82.5	FRL263D110/04CL	6.32
4PDT Ag	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CS	$4.84
			12	160	9	FRL263D012/04CS	4.84
			24	650	18	FRL263D024/04CS	4.84
			48	2600	36	FRL263D048/04CS	4.84
			110	13300	82.5	FRL263D110/04CS	5.98
4PDT (Bifurcated) Ag + Au Clad	1A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	40	4.5	FRL263D006/04CT	$5.64
			12	160	9	FRL263D012/04CT	5.64
			24	650	18	FRL263D024/04CT	5.64
			48	2600	36	FRL263D048/04CT	5.64
			110	13300	82.5	FRL263D110/04CT	6.78
4PDT AgCdO	5A @ 30V AC or 240V AC	1/6 HP @ 120V AC	6	40	4.5	FRL263D006/04CV	$5.18
			12	160	9	FRL263D012/04CV	5.18
			24	650	18	FRL263D024/04CV	5.18
			48	2600	36	FRL263D048/04CV	5.18
			110	13300	82.5	FRL263D110/04CV	6.32

or CSA Certified Relays, —CSA suffix must be added to part number. Price is same.
For PCB type terminals change prefix to FRL264

FRL260 SERIES RELAYS SELECTION TABLE — AC COIL

Contact Arrangement and Material	Contact Ratings		Rated Voltage V AC 50/60 Hz	Coil Resistance ±15% Ohms @ 20°C	Pick-Up Voltage @ 20°C	Fujitsu Part Numbers (Plug-In)*	Price
	Resistive	Horsepower					
SPDT AgCdO	15A @ 30V DC or 150V AC 10A @ 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	9.5	4.8	FRL263A006/01CK	$4.66
			12	40	9.6	FRL263A012/01CK	4.66
			24	165	19.2	FRL263A024/01CK	4.66
			48	630	38.4	FRL263A048/01CK	4.66
			120	4400	96.0	FRL263A120/01CK	5.00
			240	13000	192.0	FRL263A240/01CK	6.66
DPDT AgCdO	10A @ 30V DC or 240V AC	1/3 HP @ 120V AC 1/2 HP @ 240V AC	6	9.5	4.8	FRL263A006/02CK	$4.84
			12	40	9.6	FRL263A012/02CK	4.84
			24	165	19.2	FRL263A024/02CK	4.84
			48	630	38.4	FRL263A048/02CK	4.84
			120	4400	96.0	FRL263A120/02CK	5.18
			240	13000	192.0	FRL263A240/02CK	6.84
3PDT AgCdO	5A @ 30V DC or 240V AC	1/6 HP @ 120V AC	6	9.5	4.8	FRL263A006/03CS	$4.84
			12	40	9.6	FRL263A012/03CS	4.84
			24	165	19.2	FRL263A024/03CS	4.84
			48	630	38.4	FRL263A048/03CS	4.84
			120	4400	96.0	FRL263A120/03CS	5.18
			240	13000	192.0	FRL263A240/03CS	6.84
4PDT Ag + Au Clad	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CL	$5.18
			12	40	9.6	FRL263A012/04CL	5.18
			24	165	19.2	FRL263A024/04CL	5.18
			48	630	38.4	FRL263A048/04CL	5.18
			120	4400	96.0	FRL263A120/04CL	5.52
			240	13000	192.0	FRL263A240/04CL	7.18
4PDT Ag	3A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CS	$4.84
			12	40	9.6	FRL263A012/04CS	4.84
			24	165	19.2	FRL263A024/04CS	4.84
			48	630	38.4	FRL263A048/04CS	4.84
			120	4400	96.0	FRL263A120/04CS	5.18
			240	13000	192.0	FRL263A240/04CS	6.84
4PDT (Bifurcated) Ag + Au Clad	1A @ 30V AC or 120V AC	1/10 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CT	$5.64
			12	40	9.6	FRL263A012/04CT	5.64
			24	165	19.2	FRL263A024/04CT	5.64
			48	630	38.4	FRL263A048/04CT	5.64
			120	4400	96.0	FRL263A120/04CT	5.98
			240	13000	192.0	FRL263A240/04CT	7.64
4PDT AgCdO	5A @ 30V AC or 240V AC	1/6 HP @ 120V AC	6	9.5	4.8	FRL263A006/04CV	$5.18
			12	40	9.6	FRL263A012/04CV	5.18
			24	165	19.2	FRL263A024/04CV	5.18
			48	630	38.4	FRL263A048/04CV	5.18
			120	4400	96.0	FRL263A120/04CV	5.52
			240	13000	192.0	FRL263A240/04CV	7.18

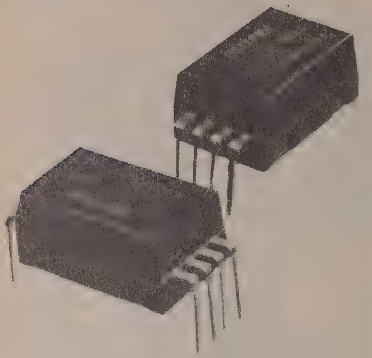
or CSA Certified Relays, —CSA suffix must be added to part number. Price is same.
For PCB type terminals change prefix to FRL264

FUJITSU

RELAYS

MICRO REED RELAYS FOR P.C. BOARDS

FRL-648 SERIES



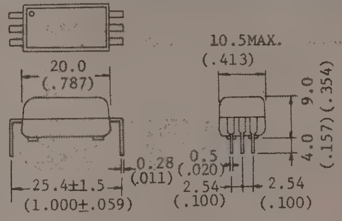
The FRL-648 Series Micro Reed Relays offer a wide selection and outstanding performance to meet those demanding on-board switching requirements and high density packaging applications.

These relays, available in 1 Form A/B and 2 Form A/B, feature a standard contact rating of 50VA/10W for S type/K type, compact size with a mounting height of only 9mm (.354″), epoxy-molded construction for immersion cleaning safety, low power consumption, and the option of magnetic shielding for isolation from the effects of adjacent relays.

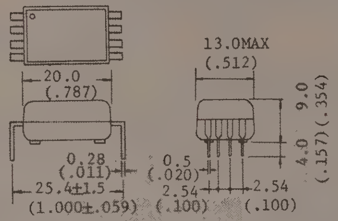
These relays are ideally used for various applications for audio equipment, data processing systems, communications, measuring and control equipment.

Fujitsu field proven dry reed switches are employed as the switching element in the relays in order to offer an excellent low resistance contact and low noise characteristics.

DIMENSIONS Unit: mm (inch)

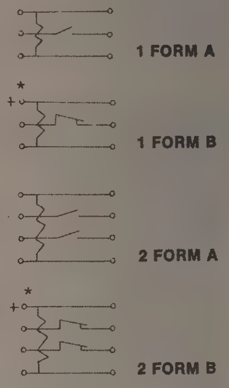


1 FORM A OR 1 FORM B



2 FORM A OR FORM B

SCHEMATICS (TOP VIEW)



* : dotted mark
Positive voltage should be applied at the terminal signed with (+) for correct operation.

ENGINEERING DATA

Item	Characteristics
Contact Arrangement	1 Form A/B, 2 Form A/B
Contact Rating	Type K: 50VA max. (100V AC, 0.5A max.) 30W max. (100V DC, 0.7A max.) Type S: 10W max. (100V DC, 0.5A max.)
Initial Contact Resistance	150mΩ max. at rated voltage
Contact Materials	Rhodium
Rated Coil Voltage	5, 6, 12, 24V DC
Coil Temperature Rise	20°C max.
Insulation Resistance	100MΩ min. at 100V DC
Dielectric Withstanding Voltage	500V DC (200V DC between open contacts)
Operate Time	1.0 ms max. including bounce time
Release Time	Form A: 0.1 ms max. including bounce time Form B: 1.0 ms max. including bounce time
Life Expectancy	K type 1 x 10^6 min at rated load S type: 5 x 10^6 min. at rated load
Vibration	10 to 55Hz (Dual amplitude: 1.5mm)
Shock	30G
Temperature Range	Form A: −10°C to +70°C Form B: −10°C to +50°C
Weight	6 gr. approx.

SELECTION TABLE

Type	Contact		Rated Voltage in V DC	Pick-Up Voltage in V DC at 20°C	Coil Resistance in Ohm ±15% at 20°C	Coil Power Dissipation in mW	Designation	Price
	Materials	Arrangements						
Standard	Rhodium	1 Form A (Make)	5	3.8	550	45	FRL-648D05/1AS	$1.82
			6	4.5	550	65	FRL-648D06/1AS	1.82
			12	9.0	1050	140	FRL-648D12/1AS	1.82
			24	18.0	2800	200	FRL-648D24/1AS	2.12
Standard	Rhodium	1 Form B (Break)	5	3.8	300	85	FRL-648D05/1BS	$3.48
			6	4.5	300	120	FRL-648D06/1BS	3.48
			12	9.0	1300	110	FRL-648D12/1BS	3.48
			24	18.0	3800	150	FRL-648D24/1BS	3.78
Standard	Rhodium	2 Form A (Make)	5	3.8	210	120	FRL-648D05/2AS	$2.42
			6	4.5	210	170	FRL-648D06/2AS	2.42
			12	9.0	800	180	FRL-648D12/2AS	2.42
			24	18.2	2600	220	FRL-648D24/2AS	2.72
Standard	Rhodium	2 Form B (Break)	5	3.8	80	300	FRL-648D05/2BS	$4.10
			6	4.5	105	340	FRL-648D06/2BS	4.10
			12	9.0	460	310	FRL-648D12/2BS	4.10
			24	18.0	1500	380	FRL-648D24/2BS	4.40
Heavy Load	Rhodium	1 Form A (Make)	5	3.8	550	45	FRL-648D05/1AK	$1.96
			6	4.5	550	65	FRL-648D06/1AK	1.96
			12	9.0	1050	140	FRL-648D12/1AK	1.96
			24	18.0	2800	200	FRL-648D24/1AK	2.28
Heavy Load	Rhodium	1 Form B (Break)	5	3.8	300	85	FRL-648D05/1BK	$3.64
			6	4.5	300	120	FRL-648D06/1BK	3.64
			12	9.0	1300	110	FRL-648D12/1BK	3.64
			24	18.0	3800	150	FRL-648D24/1BK	3.94
Heavy Load	Rhodium	2 Form A (Make)	5	3.8	210	120	FRL-648D05/2AK	$2.58
			6	4.5	210	170	FRL-648D06/2AK	2.58
			12	9.0	800	180	FRL-648D12/2AK	2.58
			24	18.0	2600	220	FRL-648D24/2AK	2.88
Heavy Load	Rhodium	2 Form B (Break)	5	3.8	80	300	FRL-648D05/2BK	$4.24
			6	4.5	105	340	FRL-648D06/2BK	4.24
			12	9.0	460	310	FRL-648D12/2BK	4.24
			24	18.0	1500	380	FRL-648D24/2BK	4.54

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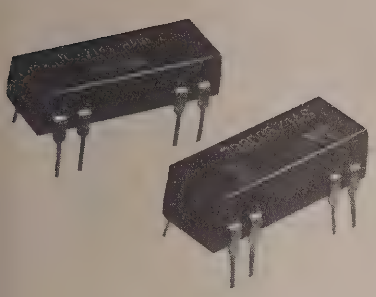
D.I.P. REED RELAYS
RL-730 SERIES



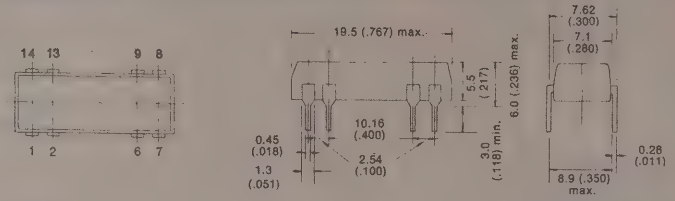
he FRL-730 Series D.I.P. Reed Relays are vailable in 1 Form A contact with contact ating capability of up to 10VA.

These relays can be mounted in the standrd 14-pin dual-in-line package with epoxyolded construction for safe immersion leaning. Models with diode and/or electrotatic shield are available.

These FRL-730 D.I.P. reed relays are ideal or use in data processing systems and comunications, measuring and control equipent.

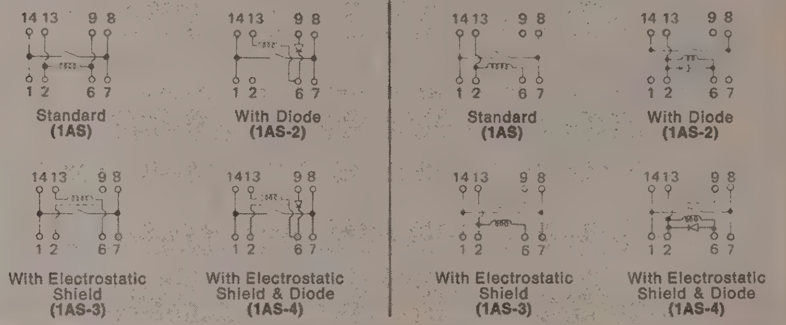
DIMENSIONS

Unit: mm (inch)



SCHEMATICS (TOP VIEW)

FRL-734 TYPE FRL-738 TYPE



Standard (1AS) · With Diode (1AS-2) · Standard (1AS) · With Diode (1AS-2)

With Electrostatic Shield (1AS-3) · With Electrostatic Shield & Diode (1AS-4) · With Electrostatic Shield (1AS-3) · With Electrostatic Shield & Diode (1AS-4)

ENGINEERING DATA

Item	Characteristics
Contact Arrangement	1 Form A
Contact Rating	10 VA max. (100V DC or peak AC max., 0.5A max.) 2.0A max. carry only
Initial Contact Resistance	150mΩ max.
Contact Material	Rhodium
Rated Coil Voltage	5, 6, 12V DC
Coil Temperature Rise	20°C max.
Insulation Resistance	$10^{10}\Omega$ min. at 100V DC, +20°C, 40% RH
Dielectric Withstanding Voltage	250V DC min. across open contacts 500V DC min. (between other mutually insulated terminals)
Operate Time	1.0 ms max. including bounce time
Release Time	0.1 ms max.
Life Expectancy	1 x 10^6 min. at rated load (resistive)
Vibration	10 to 55 Hz (Dual amplitude: 1.5mm)
Shock	50G
Temperature Range	−10°C to +70°C
Weight	4 gr. approx.

SELECTION TABLE

Contact Arrangement	Rated Coil Voltage in V DC	Coil Resistance at 20°C in Ω ±15%	Must Operate Voltage at 20°C in V DC	FRL-734 Type		FRL-738 Type	
				Designation	Price	Designation	Price
1A Standard	5	380	3.8	FRL-734D05/1AS	$3.12	FRL-738D05/1AS	$3.12
	6	380	4.5	FRL-734D06/1AS	3.12	FRL-738D06/1AS	3.12
	12	530	9.0	FRL-734D12/1AS	3.42	FRL-738D12/1AS	3.42
1A With Diode	5	380	3.8	FRL-734D05/1AS-2	$3.90	FRL-738D05/1AS-2	$3.90
	6	380	4.5	FRL-734D06/1AS-2	3.90	FRL-738D06/1AS-2	3.90
	12	530	9.0	FRL-734D12/1AS-2	4.22	FRL-738D12/1AS-2	4.22
1A With Electrostatic Shield	5	380	3.8	FRL-734D05/1AS-3	$3.42	FRL-738D05/1AS-3	$3.42
	6	380	4.5	FRL-734D06/1AS-3	3.42	FRL-738D06/1AS-3	3.42
	12	530	9.0	FRL-734D12/1AS-3	3.72	FRL-738D12/1AS-3	3.72
1A With Electrostatic Shield & Diode	5	380	3.8	FRL-734D05/1AS-4	$4.22	FRL-738D05/1AS-4	$4.22
	6	380	4.5	FRL-734D06/1AS-4	4.22	FRL-738D06/1AS-4	4.22
	12	530	9.0	FRL-734D12/1AS-4	4.52	FRL-738D12/1AS-4	4.52

FUJITSU

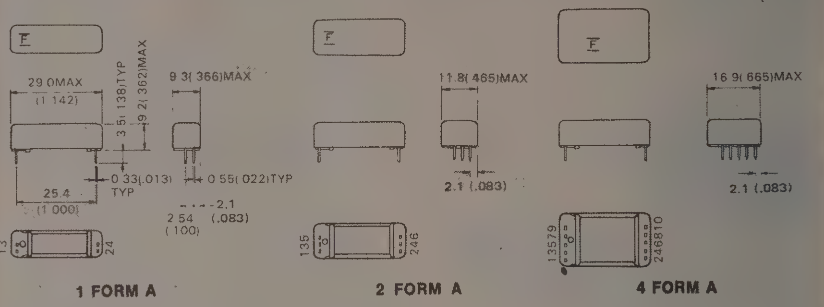
RELAYS

MICRO REED RELAYS FOR P.C. BOARDS

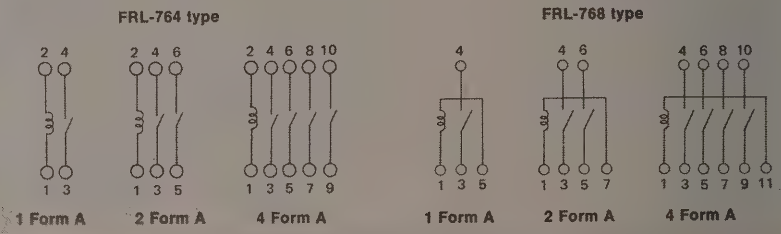
FRL-764 and 768 SERIES

FRL-764 and 768 Series Micro Reed Relays offer excellent operating characteristics such as fast operating time, high reliability and long life. Available in a choice of contact arrangements (1 Form A, 2 Form A and 4 Form A) and contact rating capabilities (10W for standard type and 30W DC, 50VA AC for heavy load type), they are potted by polyurethane resin. These low-profile relays are compatible with 1 x .1 inch grid spacing for P.C. board mounting. These micro reed relays are ideal for use in telecommunications, audio equipment, process control systems and vending machines.

DIMENSIONS Unit: mm (inch)



SCHEMATICS



ENGINEERING DATA

Item	Characteristics
Contact Arrangement Contact Rating Power Voltage Current Initial Contact Resistance Contact Material	1 Form A, 2 Form A, 4 Form A Standard: 10W max. (resistive) — Heavy Load Type: 30W DC, 50VA AC max. (resistive) Standard: 100V DC max. (resistive) — Heavy Load Type: 100V DC/100V AC max. (resistive) Standard: 0.5A DC switched max. (resistive) — Heavy Load Type: 0.5A AC switched max. 2.0A carry only max. (resistive) 150mΩ max. Rhodium
Rated Coil Voltage Coil Temperature Rise	5, 6, 12, 24V DC 30°C max.
Insulation Resistance Dielectric Withstanding Voltage	$10^{10}\Omega$ min. at 100V DC at 20°C, 40% RH 200V DC min. across open contacts 500V DC min. between other mutually insulated terminals
Operate Time Release Time	1.0 ms max. including bounce 0.1 ms max.
Life Expectancy	K type: 1 x 10^6 min. at rated load S type: 5 x 10^6 min. at rated load
Vibration	10∼55 Hz (Dual amplitude: 1.5mm)
Shock	30G, 11 ms half-sinewave
Temperature Range	−10°C∼+70°C
Weight	8.5 gr. approx. (2 Form A)

SELECTION TABLES

Type	Contact Arrangement	Coil Rated Voltage in V DC	Must Operate Voltage in V DC at 20°C	Coil Resistance in Ω ±15% at 20°C	Coil Power Dissipation in mW	Designation FRL-764	Price	Designation FRL-768	Price
Standard	1 Form A	5	3.8	310	80	FRL-764D05/1AS	$2.88	FRL-768D05/1AS	$2.88
		6	4.5	310	116	FRL-764D06/1AS	2.88	FRL-768D06/1AS	2.88
		12	9.0	1500	96	FRL-764D12/1AS	2.88	FRL-768D12/1AS	2.88
		24	18.0	4400	131	FRL-764D24/1AS	3.18	FRL-768D24/1AS	3.18
Standard	2 Form A	5	3.8	150	167	FRL-764D05/2AS	$3.64	FRL-768D05/2AS	$3.64
		6	4.5	150	240	FRL-764D06/2AS	3.64	FRL-768D06/2AS	3.64
		12	9.0	730	198	FRL-764D12/2AS	3.64	FRL-768D12/2AS	3.64
		24	18.0	2500	231	FRL-764D24/2AS	3.94	FRL-768D24/2AS	3.94
Standard	4 Form A	5	3.8	60	417	FRL-764D05/4AS	$6.00	FRL-768D05/4AS	$6.00
		6	4.5	90	400	FRL-764D06/4AS	6.00	FRL-768D06/4AS	6.00
		12	9.0	330	436	FRL-764D12/4AS	6.00	FRL-768D12/4AS	6.00
		24	18.0	1300	443	FRL-764D24/4AS	6.30	FRL-768D24/4AS	6.30
Heavy Load	1 Form A	5	3.8	310	80	FRL-764D05/1AK	$3.04	FRL-768D05/1AK	$3.04
		6	4.5	310	116	FRL-764D06/1AK	3.04	FRL-768D06/1AK	3.04
		12	9.0	1500	96	FRL-764D12/1AK	3.04	FRL-768D12/1AK	3.04
		24	18.0	4400	131	FRL-764D24/1AK	3.34	FRL-768D24/1AK	3.34
Heavy Load	2 Form A	5	3.8	150	167	FRL-764D05/2AK	$3.94	FRL-768D05/2AK	$3.94
		6	4.5	150	240	FRL-764D06/2AK	3.94	FRL-768D06/2AK	3.94
		12	9.0	730	198	FRL-764D12/2AK	3.94	FRL-768D12/2AK	3.94
		24	18.0	2500	231	FRL-764D24/2AK	4.24	FRL-768D24/2AK	4.24
Heavy Load	4 Form A	5	3.8	60	417	FRL-764D05/4AK	$6.60	FRL-768D05/4AK	$6.60
		6	4.5	90	400	FRL-764D06/4AK	6.60	FRL-768D06/4AK	6.60
		12	9.0	330	436	FRL-764D12/4AK	6.60	FRL-768D12/4AK	6.60
		24	18.0	1300	443	FRL-764D24/4AK	6.90	FRL-768D24/4AK	6.90

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FUJITSU

RELAYS

MERCURY WETTED CONTACT RELAYS

FMR-800 SERIES

Fujitsu FMR-800 Series mercury wetted contact relays are compact for P.C. board mounting.

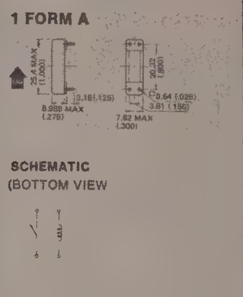
Highly stable, they can be used for a wide range of current switching from very low levels to heavy loads. Conventional flux cleaning can be used after P.C. board mounting as these relays are potted with polyurethane resin. The mercury switching gives these relays a bounce-free contact and an extremely long operating life. Therefore, Fujitsu mercury wetted contact relays are ideal for use in measuring equipment, communications systems, computer systems, automatic control systems etc.

FEATURES

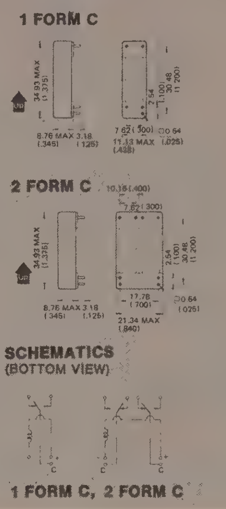
- Extremely long life expectancy (10 x 10^9 operations)
- Short operate/release time (2 ms) and no contact bounce
- Stable, low contact resistance
- Available for wide current range switching from low level signals to 2 amps
- Contacts are independent from atmospheric conditions

DIMENSIONS

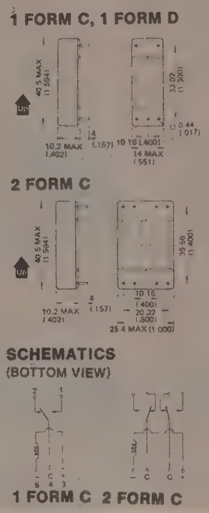
820 SERIES



830 SERIES



870 SERIES



SELECTION TABLE

Series	Contact Arrangement	Rated Voltage in V DC	Coil Resistance in Ω at 20°C	Coil Power Dissipation in mW	Operate in V DC at 20°C	Release in V DC at 20°C	Designation	Price
820 Series	1 Form A	5	350	72	4.0	0.5	FMR-824D05/1AS	$ 8.86
		6	350	103	4.8	0.6	FMR-824D06/1AS	8.86
		12	950	152	9.6	1.2	FMR-824D12/1AS	8.86
		24	2742	210	19.2	2.4	FMR-824D24/1AS	9.46
830 Series	1 Form C	5	117	214	2.9	0.52	FMR-834D05/1CS	$14.36
		6	196	184	3.5	0.66	FMR-834D06/1CS	14.36
		12	720	200	7.0	1.3	FMR-834D12/1CS	14.36
		24	2730	211	14.0	2.6	FMR-834D24/1CS	15.16
		48	10,000	231	28.0	5.2	FMR-834D48/1CS	15.94
830 Series	2 Form C	5	56	447	2.9	0.52	FMR-834D05/2CS	$23.90
		6	90	400	3.5	0.66	FMR-834D06/2CS	23.90
		12	392	368	7.0	1.3	FMR-834D12/2CS	23.90
		24	1440	400	14.0	2.6	FMR-834D24/2CS	24.72
		48	5460	422	28.0	5.2	FMR-834D48/2CS	25.52
830 Series	2 Form C (with C.O.T.)	5	56	447	2.9	0.52	FMR-834D05/2CT	$25.52
		6	90	400	3.5	0.66	FMR-834D06/2CT	25.52
		12	392	368	7.0	1.3	FMR-834D12/2CT	25.52
		24	1440	400	14.0	2.6	FMR-834D24/2CT	26.30
		48	5460	422	28.0	5.2	FMR-834D48/2CT	27.12
870 Series*	1 Form C	5	125	200	2.9	0.61	FMR-874D05/1CS	$13.88
		6	125	290	3.5	0.75	FMR-874D06/1CS	13.88
		12	685	210	7.1	1.5	FMR-874D12/1CS	13.88
		24	2650	220	14.0	3.0	FMR-874D24/1CS	14.68
870 Series*	1 Form D	5	125	200	2.9	0.61	FMR-874D05/1DS	$13.88
		6	125	290	3.5	0.75	FMR-874D06/1DS	13.88
		12	685	210	7.1	1.5	FMR-874D12/1DS	13.88
		24	2650	220	14.0	3.0	FMR-874D24/1DS	14.68
870 Series*	2 Form C	5	55	455	2.6	0.55	FMR-874D05/2CS	$23.12
		6	55	655	3.4	0.7	FMR-874D06/2CS	23.12
		12	370	390	6.7	1.4	FMR-874D12/2CS	23.12
		24	1370	421	13.0	2.7	FMR-874D24/2CS	24.40
870 Series*	2 Form C (with C.O.T.)	5	55	455	2.6	0.55	FMR-874D05/2CT	$24.72
		6	55	655	3.4	0.7	FMR-874D06/2CT	24.72
		12	370	390	6.7	1.4	FMR-874D12/2CT	24.72
		24	1370	421	13.0	2.7	FMR-874D24/2CT	26.00

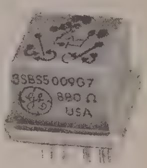
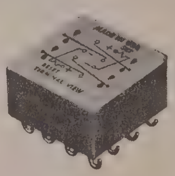
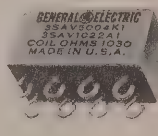
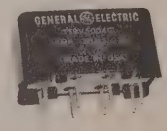
* FMR-878 Series is available with .093 inch grid spacing instead of .100 inch grid. Price is same as FMR-874 Series.

ENGINEERING DATA

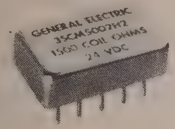
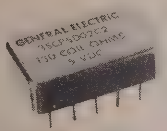
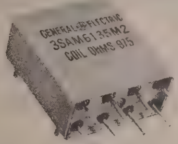
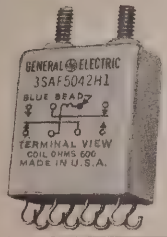
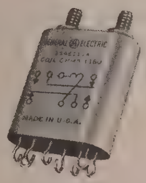
	FMR-820	FMR-830			FMR-870			
Contact Arrangements	1 Form A	1 Form C	2 Form C	2 Form C (with C.O.T.)	1 Form C	1 Form D	2 Form C	2 Form C (with C.O.T.)
Contact Ratings — Switching Carry Current	50 VA max. 1A max. 350V DC max. 2A max.	100 VA max. 2A max., 500V DC max. 5A max.						
Initial Contact Resistance	50 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.	30 mΩ max.
Operate Time	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.
Release Time	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.	2.0 ms max.
Insulation Resistance	1000 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	100 MΩ min. (500V DC)	1000 MΩ min. (500V DC)	1000 MΩ min. (500V DC)
Dielectric Withstanding Voltage	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.	1000V AC min.
C.O.T. (Common Open Type)	——	——	——	50 µs min. (100 Hz, 50% duty)	——	——	——	50 µs min. (100 Hz, 50% duty)
Operating Temptrature Range	−38°C to +90°C (include coil temperature rise)							
Vibration	10 Hz to 55 Hz (Dual amplitude: 1.5mm)							
Shock	30G							

FUJITSU AMERICA, INC. / COMPONENT DIV. / 918 Sherwood Drive, Lake Bluff, IL 60044 / (312) 295-2610, Telex 206196, TWX 910-651-2259

SEALED RELAY Selection Guide

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE		SIZE NO MOUNT L"×W"×H" & WEIGHT (OZ.)	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE	CATALOG GEA 6628 PAGE NO.
			CURRENT LEVELS AT 28 VDC AT 115 VAC*	OPERATIONS							
3SBS Transistor Size Relay		2PDT	1A DC Res .2A DC Ind Low Level	10^5 10^6	Size .37 × .37 × .275 Weight 0.09	120 mW	39016/9 39016/15 39016/20	100G @ 11ms	30G 55-3000 Hz	−65C +125C	6-7
3SBC ¼ Size Two Pole 150 Grid Hybrid		2PDT 1PDT 1A, 1B	2A DC Res .5A DC Ind .5-AC Low Level	10^5 10^6	Size .61 × .31 × .32 Weight 0.13	135 mW	39016/13 39016/37 39016/38	100G @ 11 ms	30G 55-3000 Hz	−65C +125C	8-9 10-11
3SBH ¼ Size Four Pole 150 Grid		4PDT	2A DC Res .5A DC Ind .5A-AC Low Level	10^5 10^6	Size .61 × .61 × .32 Weight 0.24	250 mW	39016/14	100G @ 11 ms	30G 3000 Hz	−65C +125C	12-13
3SBM ¼ Size 150 Grid Latching Hybrid		4PDT	2A DC Res .5A DC Ind .5A-DC Low Level	10^5 10^6	Size .61 × .61 × .32 Weight 0.28	100mW Single Coil or 180mW Dual Coil	39016/31 39016/35 39016/36	150G @ 11 ms	30G 3000 Hz	−65C +125C	14-15 16-17
3SAV Half-Size Sensitive R.F.		2PDT	2A DC Res .5A DC Ind .75 A-AC Low Level	10^5 10^6	Size .80 × .40 × .40 Weight 0.30	100mW to 260mW	39016/6 39016/22 39016/33 39016/44	100G @ 11ms	30G 3000 Hz	−65C +125C	18-19 22-23 24-25
3SBV Industrial Half-Size		2PDT	2A DC Res .5A-AC Low Level	10^5 10^6	Size .88 × .48 × .49 Weight 0.30	285 mW				−45C +71C	20
3SCV Long Life Half-Size		2PDT	2A DC Res .5A DC Ind .5A-AC Low Level	10^5 100×10^6	Size .80 × .40 × .40 Weight .30	340mW				−55C +125C	21
3SAH Four Pole Grid		4PDT	2A DC Res .5A DC Ind 1A-AC Low Level	4×10^5 at 1A DC at 0.5A ac 2×10^5 at 2A dc at 1A DC 2×10^6	Size 1.01 × .61 × .81 Weight 1.0	400 mW	39016/39	50G @ 11ms	30G 55-3000 Hz	−65C +125C	26-27

*Single-phase load, case not grounded

RELAY TYPE	PICTURE	CONTACT ARRANGEMENT	CONTACT LIFE		SIZE NO MOUNT L"×W"×H" & WEIGHT (OZ.)	OPERATE SENSITIVITY (MILLIWATTS)	APPLICABLE MIL SPEC MIL-R-	SHOCK	VIBRATION	TEMPERATURE RANGE	DCP OR CATALOG PAGE NO.
			CURRENT LEVELS AT 28 VDC AT 115 VAC*	OPERATIONS							
3SCM DeciGrid® Mag-Latch 1/10 Size	 GENERAL ELECTRIC 3SCM5007H2 1500 COIL OHMS 24 VDC	2PDT	0.5A DC Res Low Level	10^5 5×10^5	Size .350 × .575 × .17 Weight 2. Grams	105 mW	39016/47	100G @ 6ms	50G-3000 Hz	−65C +125C	DCP 1358
3SCP DeciGrid® Mono-stable 1/10 Size	 GENERAL ELECTRIC 3SCP5002C2 150 COIL OHMS 5 VDC	2PDT	0.5A DC Res Low Level	10^5 5×10^5	Size .350 × .575 × .17 Weight 2. Grams	68 mW	39016/48	100G @ 6ms	50G-3000 Hz	−65C +125C	DCP 1359
3SAM Mag-Latch Grid-Space	 GENERAL ELECTRIC 3SAM6135M2 COIL OHMS 915	2PDT	2A DC Res .5A DC Ind 1A-AC Low Level	10^5 at 2A DC at 1A AC 10^6	Size .80 × .40 × .90 Weight 0.60	50mW Single Coil 75mW Dual Coil	39016/32	150G @ 11ms	30G 3000 Hz	−65C +125C	28-29
3SAF Grid Spaced Micro Crystal Can	 GENERAL ELECTRIC 3SAF5042H1 BLUE BEAD TERMINAL VIEW COIL OHMS 600 MADE IN U.S.A.	2PDT	2A DC Res 1A DC Ind 1A-AC Low Level	10^5 at 2A DC 10^6	Size .80 × .40 · .90 Weight 0.50	300 mW	5757/10	100G @ 11 ms	30G 55-2000 Hz	−65C +125C	30-31
3SAE Crystal Can "S" Header		2PDT	2A DC Res 1A DC Ind 1A-AC Low Level	10^5 at 2A DC at 2A AC 10^6	Size .797 × .359 × .875 Weight 0.45	330mW	5757/10	100G @ 11ms	20G 55-2000 Hz	−65C +125C	32-33
3SCA Miniature Industrial Relays		2PDT 4PDT 6NO	5A DC Res 2A DC Ind 5A-AC Low Level	10^5 at 5A DC 10^6	1.67 × 1.48 × 2.1 Weight 4.5	600mW				0C +71C	34-35 and DCP 1003
3SBW RF Relay		1PDT	15 Watts RF	$2 \cdot 10^5$ at RF	1.150 × .950 × .840 Weight 1.0	250mW			10G 500 Hz	−65C +85C	36-37

***Single-phase load, case not grounded**

For additional publications and product information contact:
GENICOM Corporation, GENICOM Relays
Waynesboro, VA 22980, 1-703-949-1471

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The New Company You've Been Doing Business with for Years.

GORDOS
ARKANSAS

AC SOLID STATE RELAYS
(photo isolation — Back-to-Back SCR)

G SERIES

BACK-TO-BACK SCR
AC SOLID STATE RELAYS

- Back-to-back (dual) SCR output for switching highly inductive AC loads
- Superior turn-on immunity and positive turn-off ability at high dv/dt
- Optical coupling
- Zero-voltage turn-on
- 10 to 45 Arms current ratings
- Output RC network
- 3-32 VDC and 90-280 VAC input ratings
- 24 to 480 VAC line voltages
- UL recognized. CSA certified
- Some models optionally available in compliance with VDE specs 0730, 0730 part 2P, 0806, and IEC Specs 380 and 435. (Consult factory for details)

POWER CIRCUIT OUTPUT SPECIFICATIONS

Maximum Line Voltage Code Number	120	240	280	480
Maximum Line Voltage	140	250	280	480
Minimum Line Voltage	24	24	24	48
Nominal Line Voltage	120	240	240	440
Maximum AC Leakage (mArms At Rated Voltage)				
10 A relays	9	9	9	15
25 A & &45 A relays	15	15	15	—
Line Frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
Minimum Blocking Voltage	250 V	500 V	600 V	800 V
Zero Crossing(2)	5°	5°	5°	5°

(1) Output circuit includes RC Snubber Network
(2) Measured utilizing a resistive load

Maximum Load Current Code Number	10	25	45
Maximum Load Current (Arms)	10	25	45
Maximum 1-Cycle Surge (A Peak) Non-Repetitive 60/50 Hz	110/100	250/230	650/600
Maximum 1-Second Surge (A Peak) Non-Repetitive	40	67	134
Maximum On-State Voltage (Volts)	1.6	1.6	1.6
Off-State dv/dt (V/μS)	200	200	200
Minimum Power Factor Load	.4	.4	.4
I^2T-Amps^{2}Sec (8.33/10 mS)	50	260	1750
Rθ_{jc} (°C/Watt)	1.3	1.2	0.67
Dissipation (Watts/Amp)	1.6	1.3	0.9

Note: Consult factory for temperature derating.

CONTROL CIRCUIT INPUT SPECIFICATIONS

Control Voltage Code Number	A	D	R
Nominal Input Rating	90-280 VAC	3-32 VDC	3-32 VDC
Must Operate	90 VAC	3 VDC	3 VDC
Must Release	10 VAC	1.0 VDC	1.0 VDC
Max. Allowable Voltage	280 VAC	32 VDC	32 VDC
Nominal Input Current	10 mArms	1 mA/V	10 mA max. (Regulated)
Maximum Turn-On Time at 60/50 Hz	34/40 mS	8.33/10 mS	8.33/10 mS
Maximum Turn-Off Time at 60/50 Hz	34/40 mS	8.33/10 mS	8.33/10 mS

KEY TO PART NUMBERS

G 240 D 10

MAXIMUM LINE VOLTAGE CODE NUMBER
CONTROL VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER

For available standard part numbers, see the chart on the opposite page.

GORDOS ARKANSAS

AC SOLID STATE RELAYS
(photo isolation — Back-to-Back SCR)

G SERIES

APPLICATION GRID

PART ORDERING INSTRUCTIONS:

1. Use the grid below to select your Control Voltage.
2. Then determine the Maximum Line Voltage and Maximum Load Current required.
3. When you have identified your Part Number on the grid, refer to the Part Number Key and charts at the left for complete Part Specifications.

GENERAL SPECIFICATIONS

(Apply to all part numbers)

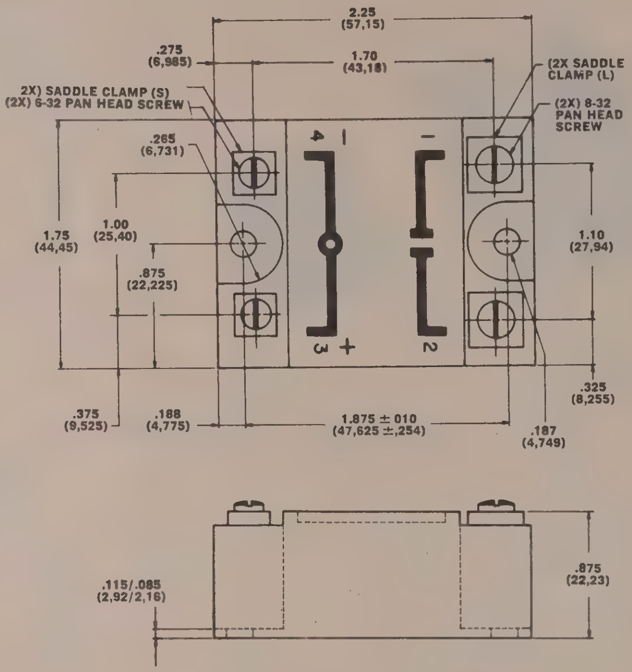
Input to Output Isolation (and Input to Base) Dielectric Strength (min.) 2500 VAC

Insulation Resistance (min.): 10^{10} Ohms

Coupling Capacitance (typical): 8 pF

Operating Temperature Range: −40 to 80°C

Storage Temperature Range: −40 to 100°C


2.25 (57,15)
1.70 (43,18)
.275 (6,985)
(2X SADDLE CLAMP (L)
2X) SADDLE CLAMP (S) (2X) 6-32 PAN HEAD SCREW
(2X) 8-32 PAN HEAD SCREW
.265 (6,731)
4
1
1.75 (44,45)
1.00 (25,40)
1.10 (27,94)
.875 (22,225)
3
+
2
.325 (8,255)
.375 (9,525)
.188 (4,775)
1.875 ± 010 (47,625 ±,254)
.187 (4,749)
.875 (22,23)
.115/.085 (2,92/2,16)

Control Voltage	Maximum Load Current (Arms)	90-280 VAC	3-32 VDC	3-32 VDC Regulated
120 VAC Line Voltage	10	G120A10	G120D10	G120R10
	25	G120A25	G120D25	G120R25
	45	G120A45	G120D45	G120R45
240 VAC Line Voltage	10	G240A10	G240D10	G240R10
	25	G240A25	G240D25	G240R25
	45	G240A45	G240D45	G240R45
280 VAC Line Voltage	10	G280A10	G280D10	G280R10
	25	G280A25	G280D25	G280R25
	45	G280A45	G280D45	G280R45
480 VAC Line Voltage	10	G480A10	G480D10	G480R10

DIMENSIONS: INCHES (MILLIMETERS)

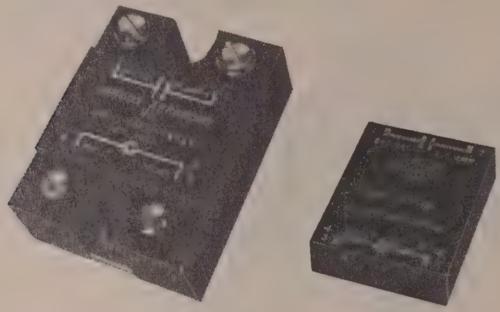
TOLERANCE: ±.02 ±,50

GORDOS ARKANSAS

AC SOLID STATE RELAYS
(photo isolation — triac)

GA SERIES

GENERAL PURPOSE



The Gordos GA Series of SSRs has been specifically designed and marketed to meet your commercial requirements.

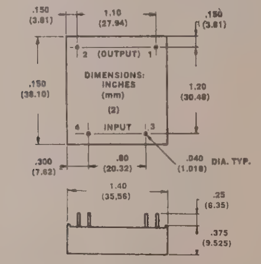
Whether your application is gas pumps or copiers, computer peripherals or process controllers, study the GA specs carefully. Then let Gordos handle your high-volume needs from this versatile, in-stock line.

GA Series relays get a minimum of 200% testing — multiple component and functional tests that make Gordos the reliability standard in SSRs.

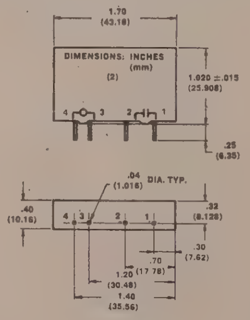
HEAT SINKING/DERATING OF SOLID STATE RELAYS

The voltage drop across the thyristor, when the relay is in its conducting state, causes heat to be generated. This condition is one of the operating characteristics inherent with semiconductor components. To insure the junction temperature of the SSR remains within its design parameters, it may be necessary to heat sink the relay and/or derate the amperage rating. Please consult temperature derating charts for relays with baseplates; use derating factor for PC mounted relays.

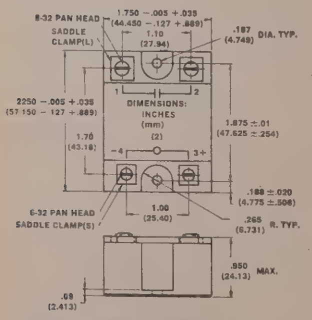
OUTLINE DIMENSIONS


.150
(3.81)
1.10
(27.94)
.150
(3.81)
2 (OUTPUT) 1
DIMENSIONS:
INCHES
(mm)
(2)
.150
(38.10)
1.20
(30.48)
4 INPUT 3
.300
(7.62)
.80
(20.32)
.040
(1.016)
DIA. TYP.
1.40
(35,56)
.25
(6.35)
.375
(9.525)

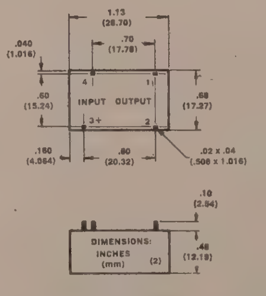
FLAT-PACK


1.70
(43.18)
DIMENSIONS: INCHES
(mm)
(2)
1.020 ±.015
(25.908)
4 3 2 1
.25
(6.35)
.04
(1.016)
DIA. TYP.
.40
(10.16)
.32
(8.128)
4 3 2 1
.30
(7.62)
.70
(17 78)
1.20
(30.48)
1.40
(35.56)

SINGLE-IN-LINE


8-32 PAN HEAD
SADDLE
CLAMP(L)
1.750 −.005 +.035
(44.450 −.127 +.889)
1.10
(27.94)
.187
(4.749)
DIA. TYP.
1 2
2250 −.005 +.035
(57 150 − 127 +.889)
DIMENSIONS:
INCHES
(mm)
(2)
1.70
(43.18)
−4 3+
1.875 ±.01
(47.625 ±.254)
.188 ±.020
(4.775 ±.508)
6-32 PAN HEAD
SADDLE CLAMP(S)
1.00
(25.40)
.265
(6.731)
R. TYP.
.950
(24.13)
MAX.
.09
(2.413)

PANEL MOUNT

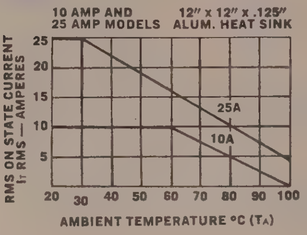

1.13
(28.70)
.70
(17.78)
.040
(1.016)
4 1
.60
(15.24)
INPUT OUTPUT
.68
(17.27)
3+ 2
.160
(4.064)
.80
(20.32)
.02 x .04
(.508 x 1.016)
.10
(2.54)
DIMENSIONS:
INCHES
(mm)
(2)
.48
(12.19)

PC MOUNT

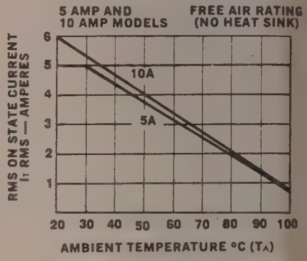
TEMPERATURE DERATING CHARTS

Ratings are based on proper mounting to a heat sink using a thermal compound.

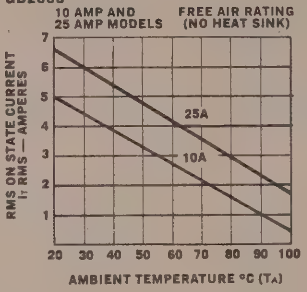
GB2000



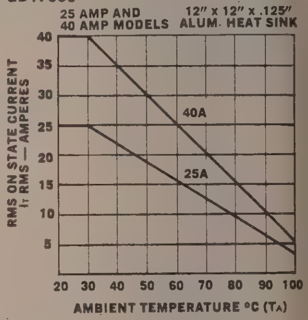
GB17000



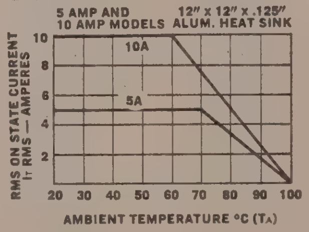
GB2000



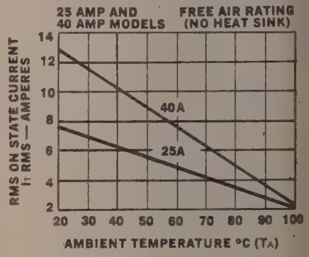
GB17000



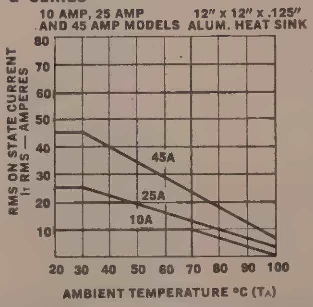
GB17000



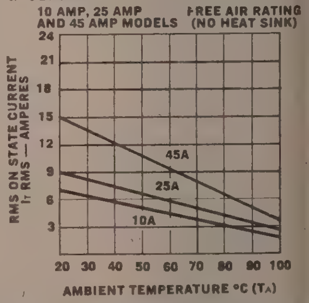
GB17000



G SERIES



G SERIES



GORDOS ARKANSAS

AC SOLID STATE RELAYS
(photo isolation — triac)

GA SERIES

GENERAL PURPOSE

APPLICATION GRID

PART ORDERING INSTRUCTIONS:

1. Use the grid below to select your Control Voltage.
2. Then determine the Maximum Line Voltage and Maximum Load Current required.
3. When you have identified your Part Number on the grid, refer to the Part Number Key and charts at the left for complete Part Specifications.

KEY TO PART NUMBERS

GA 1 - 2 B 02

PACKAGE STYLE CODE NUMBER

MAXIMUM LINE VOLTAGE CODE NUMBER

MAXIMUM LOAD CURRENT CODE NUMBER

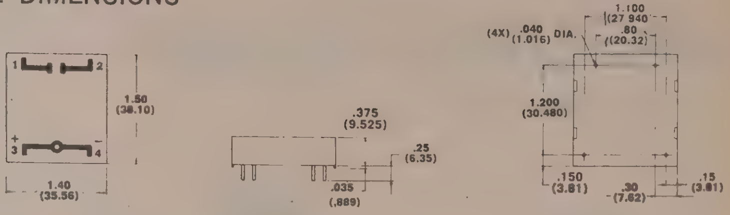
CONTROL VOLTAGE CODE NUMBER

DIMENSIONS: INCHES (MILLIMETERS)

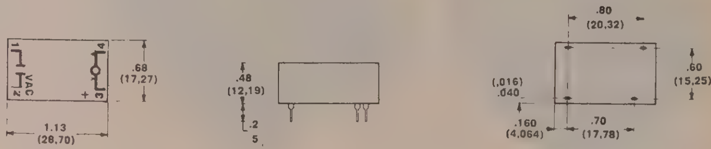
TOLERANCE: ±.02 ±,50

OUTLINE DIMENSIONS

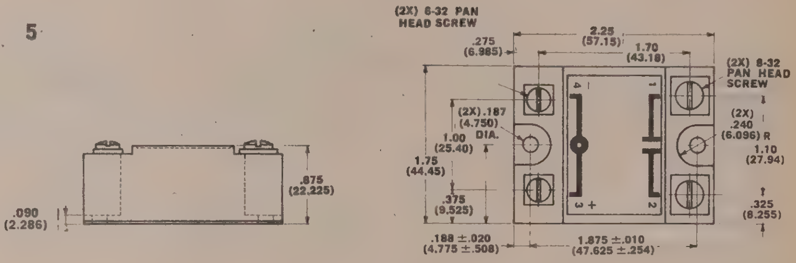
1


1
2
3
4
+
1.50 (38.10)
1.40 (35.56)
.375 (9.525)
.25 (6.35)
.035 (,889)
(4X) .040 (1.016) DIA.
1.100 (27 940)
.80 (20.32)
1.200 (30.480)
.150 (3.81)
.30 (7.62)
.15 (3.81)

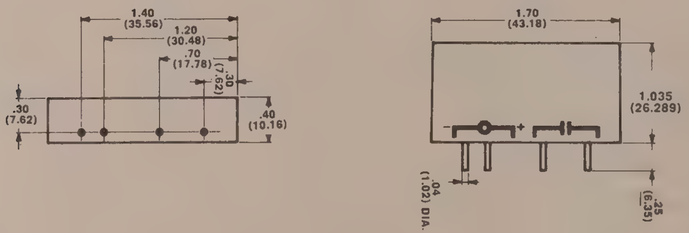
4


1
VAC
2
4
3
+
.68 (17,27)
1.13 (28,70)
.48 (12,19)
.2
5
.80 (20,32)
(,016) .040
.60 (15,25)
.160 (4,064)
.70 (17,78)

5


.090 (2.286)
.875 (22,225)
(2X) 6-32 PAN HEAD SCREW
2.25 (57.15)
.275 (6.985)
1.70 (43.18)
(2X) 8-32 PAN HEAD SCREW
(2X) .187 (4.750) DIA.
1.00 (25.40)
1.75 (44.45)
.375 (9.525)
(2X) .240 (6.096) R
1.10 (27.94)
.325 (8.255)
.188 ±.020 (4.775 ±.508)
1.875 ±.010 (47.625 ±.254)
4
1
3 +
2

8


1.40 (35.56)
1.20 (30.48)
.70 (17.78)
.30 (7.62)
.30 (7.62)
.40 (10.16)
1.70 (43.18)
1.035 (26.289)
.04 (1.02) DIA.
.25 (6.35)
+

Package Style →	Maximum Load Current (Arms) Output	1	4	5		8
Control Voltage →		3.5 to 15 VDC	3.8 to 8 VDC	3 to 32 VDC	90 to 250 VAC	3.5 to 15 VDC
140 VAC Maximum Line Voltage	1.5					
	2.5	GA1-2B02	GA4-2C02			GA8-2B02
	5.0					
	10.0			GA5-2D10	GA5-2A10	
	25.0			GA5-2D25	GA5-2A25	
250 VAC Maximum Line Voltage	1.5					
	2.5	GA1-4B02	GA4-4C02			GA8-4B02
	5.0					
	10.0			GA5-4D10	GA5-4A10	
	25.0			GA5-4D25	GA5-4A25	
280 VAC Maximum Line Voltage	1.5					
	2.5	GA1-6B02				GA8-6B02
	5.0					
	10.0			GA5-6D10	GA5-6A10	
	25.0			GA5-6D25	GA5-6A25	

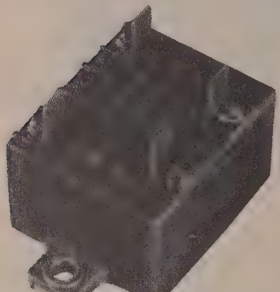
GORDOS ARKANSAS

AC SOLID STATE RELAYS
(reed isolation — triac)

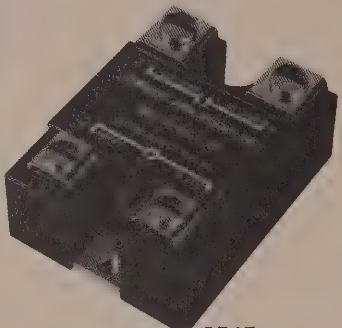
GB SERIES REEDAC®

AC SOLID STATE RELAYS

- Inductive load switching up to 0.1 power factor
- Reed coupling
- Random turn-on
- 10 to 40 Arms current ratings
- Output RC network
- 5, 12, or 24 VDC nominal input ratings
- 24 to 280 VAC line voltages
- UL recognized — CSA certified
- Some models optionally available in compliance with VDE specs 0730, 0730 part 2P, 0806, and IEC Specs 380 and 435.



GB2



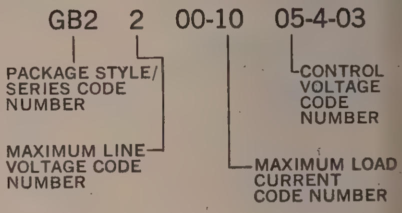
GB17

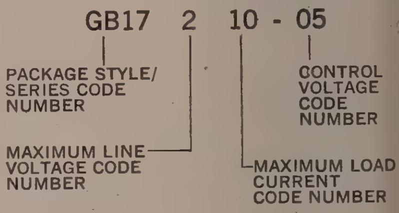
POWER CIRCUIT OUTPUT SPECIFICATIONS[2]

Maximum Line Voltage Code Number	2	4	6
Maximum Line Voltage (VAC)	140	250	280
Minimum Line Voltage (VAC)	24	24	24
Nominal Line Voltage (VAC)	120	240	240
Maximum AC Leakage (mArms At Rated Voltage)	5.0	10.0	10.0
Line Frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
Minimum Blocking Voltage	200 V	400 V	600 V

Maximum Load Current Code Number	10	25	40[3]
Maximum Load Current (Arms)	10	25	40
Maximum 1-Cycle Surge (A Peak) Non-Repetitive 60/50 Hz	100/90	250/230	350/320
Maximum 1-Second Surge (A Peak) Non-Repetitive	40	60	90
Maximum On-State Voltage (Volts)	1.8	1.6	1.6
Off-State dv/dt (V/μS)	200	200	200
Minimum Power Factor Load	.1	.1	.1
I^2T-Amps^{2}Sec (8.33/10 mS)	42	260	510

Note: Consult factory for temperature derating.


GB2 2 00-10 05-4-03
PACKAGE STYLE/ SERIES CODE NUMBER
MAXIMUM LINE VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER
CONTROL VOLTAGE CODE NUMBER


GB17 2 10 - 05
PACKAGE STYLE/ SERIES CODE NUMBER
MAXIMUM LINE VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER
CONTROL VOLTAGE CODE NUMBER

For available standard part numbers, see the chart on the opposite page.

CONTROL CIRCUIT INPUT SPECIFICATIONS

Control Voltage Code Number	05	12[1]	24[1]
Nominal Input Rating (VDC)	5	12	24
Must Operate (VDC)	4.0	9.0	18.0
Must Release (VDC)	0.5	1.0	2.0
Maximum Allowable Voltage	7.5	18.0	36.0
Nominal Input Current	14 mA	14 mA	13 mA

[1] GB2000 only [2] Output circuit includes RC Snubber Network [3] GB17000 only

®Reedac is a registered trademark of the Gordos Corporation for reed-coupled AC-switching SSRs.

GORDOS ARKANSAS

AC SOLID STATE RELAYS
(reed isolation — triac)

GB SERIES REEDAC®

AC SOLID STATE RELAYS

APPLICATION GRID

PART ORDERING INSTRUCTIONS:

1. Use the grid below to select your Control Voltage.
2. Then determine the Maximum Line Voltage and Maximum Load Current required.
3. When you have identified your Part Number on the grid, refer to the Part Number Key and charts at the left for complete Part Specifications.

GENERAL SPECIFICATIONS

(Apply to all part numbers)

Input to Output Isolation (and Input to Base) Dielectric Strength (min.) 2500 VAC

Insulation Resistance (min.): 10^{10} Ohms

Coupling Capacitance (typical): 8 pF

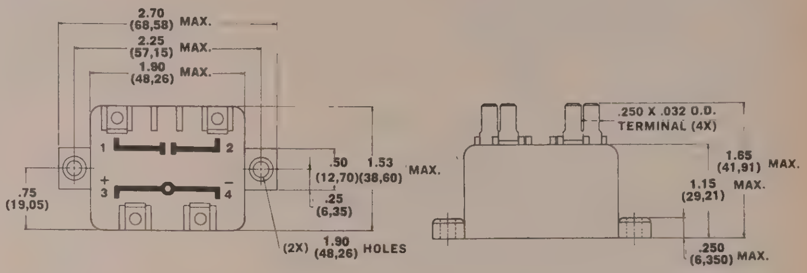
Maximum Turn-On Time at 60/50 Hz: 1.5 mS (Not frequency dependent)

Maximum Turn-Off Time at 60/50 Hz: 8.33/10 mS

Operating Temperature Range: −40 to 80°C

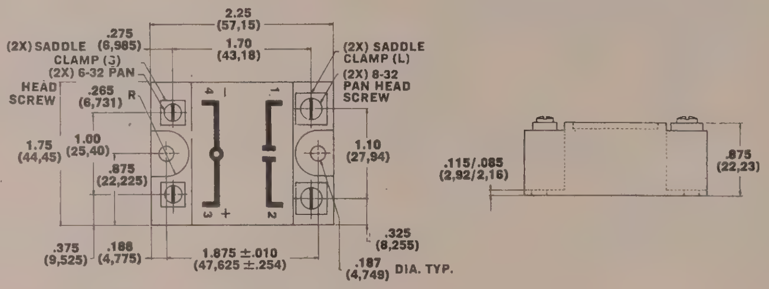
Storage Temperature Range: −40 to 100°C

GB-2



2.70 (68,58) MAX.
2.25 (57,15) MAX.
1.90 (48,26) MAX.
1
2
+
3
−
4
.75 (19,05)
.50 (12,70)
1.53 (38,60) MAX.
.25 (6,35)
(2X) 1.90 (48,26) HOLES
.250 X .032 O.D. TERMINAL (4X)
1.65 (41,91) MAX.
1.15 (29,21) MAX.
.250 (6,350) MAX.

GB-17



2.25 (57,15)
1.70 (43,18)
.275 (6,985)
(2X) SADDLE CLAMP (3)
(2X) 6-32 PAN HEAD SCREW
.265 (6,731) R
(2X) SADDLE CLAMP (L)
(2X) 8-32 PAN HEAD SCREW
1.75 (44,45)
1.00 (25,40)
.875 (22,225)
1.10 (27,94)
4
1
3 +
2
.375 (9,525)
.188 (4,775)
1.875 ±.010 (47,625 ±.254)
.325 (8,255)
.187 (4,749) DIA. TYP.
.115/.085 (2,92/2,16)
.875 (22,23)

DIMENSIONS: INCHES (MILLIMETERS)

TOLERANCE: ±.02 ±,50

Package Style →	Maximum Load Current (Arms) ↓	GB2			GB17
Control Voltage →		5 VDC	12 VDC	24 VDC	5 VDC
140 VAC Maximum Line Volatge	5				
	10	GB2200-1005-4-03	GB2200-1012-4-03	GB2200-1024-4-03	GB17210-05
	25	GB2200-2505-4-03	GB2200-2512-4-03	GB2200-2524-4-03	GB17225-05
250 VAC Maximum Line Voltage	5				
	10	GB2400-1005-4-03	GB2400-1012-4-03	GB2400-1024-4-03	GB17410-05
	25	GB2400-2505-4-03	GB2400-2512-4-03	GB2400-2524-4-03	GB17425-05
280 VAC Maximum Line Voltage	5				
	10	GB2600-1005-4-03	GB2600-1012-4-03	GB2600-1024-4-03	GB17610-05
	25	GB2600-2505-4-03	GB2600-2512-4-03	GB2600-2524-4-03	GB17625-05

® REEDAC is a registered trademark of Gordos Arkansas, Inc.

GORDOS ARKANSAS

VDE AC SOLID STATE RELAYS
(Triac Output)

GB SERIES

VDE MODELS

- Panel or PC mount
- Optical coupling or reed coupling
- Zero-voltage turn-on or random turn-on
- 3.5 to 40 Arms current ratings
- Output RC network
- 3 to 32 VDC control ratings
- 24 to 280 VAC line voltages
- Minimum creepage and clearance distances:
  Input to output: 8mm
  Input or output to ground 4mm
- All models in compliance with VDE specifications 0730, 0730 part 2P, 0806 and IEC specifications 380 and 435
- 3750 Vrms isolation
- Suitable for Safey Extra Low Voltage (SELV) operation
- UL recognized — CSA certified

POWER CIRCUIT OUTPUT SPECIFICATIONS

Maximum Line Voltage Code Number	**2**	**4**	**6**
Maximum Line Voltage	140 VAC	250 VAC	280 VAC
Minimum Line Voltage	24 VAC	24 VAC	24 VAC
Nominal Line Voltage	120 VAC	240 VAC	240 VAC
Maximum AC Leakage (At Rated Voltage)	5.0 mArms	10.0 mArms	10.0 mArms
Line Frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
Minimum Blocking Voltage	200V	400V	600V
Zero Crossing (GB11, GB15, GB18 only)	9°	5°	5°

Note: Maximum voltage and current ratings are achieved under ideal conditions of mounting.

	GB11, GB18 Package	**GB2, GB15, GB17 Package**		**GB15, GB17 Package**
Maximum Load Current Code Number	30	10	25	40
Maximum Load Current (Arms)	3.5	10	25	40
Maximum 1-Cycle Surge (A peak) Non-Repetitive 60/50 Hz	100/90	100/90	250/230	350/320
Maximum 1-Second Surge (A peak) Non-Repetitive	12	40	60	90
Maximum On-State Voltage (V peak)	1.8	1.8	1.6	1.6
Off-State dv/dt (V/μs)	200	200	200	200
Minimum Power Factor Load (Reedac/SSR)	NA/.4	.1/.4	.1/.4	.1/.4
I^2T-Amps^2 Sec (8.33/10 ms)	12	42	260	510

CONTROL CIRCUIT INPUT SPECIFICATIONS

Package Style	**GB2, GB17 (REEDAC)**	**GB2 (Only)**		**GB15 (All Solid State)**	**GB11, GB18 (All Solid State)**
Control Voltage Code Number	**05**	**12**	**24**	**3**	**NA**
Nominal Input Rating (VDC)	5	12	24	3 to 32	4 to 16
Must Operate (VDC)	4.0	9.0	18.0	3.0	4.0
Must Release (VDC)	0.5	1.0	2.0	1.0	0.8
Maximum Allowable Voltage (VDC)	7.5	18.0	36.0	32.0	16.0
Nominal Input Current	14 mA	14 mA	13 mA	1.0 mA per volt	2.0 mA per volt

PART NUMBERING KEY FOR GB2 SERIES

GB2 200-10 05-4-03 V

PACKAGE/STYLE SERIES CODE NUMBER
MAXIMUM LINE VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER
CONTROL VOLTAGE CODE NUMBER
INDICATES VDE/IEC SPEC COMPLIANCE

PART NUMBERING KEY FOR GB15, GB17 SERIES

GB15 2 10-3 V

PACKAGE STYLE/ SERIES CODE NUMBER
MAXIMUM LINE VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER
CONTROL VOLTAGE CODE NUMBER
INDICATES VDE/IEC SPEC COMPLIANCE

PART NUMBERING KEY FOR GB11, GB18 SERIES

GB11 4 30 V

PACKAGE STYLE/ SERIES CODE NUMBER
MAXIMUM LINE VOLTAGE CODE NUMBER
MAXIMUM LOAD CURRENT CODE NUMBER
INDICATES VDE/IEC SPEC COMPLIANCE

For available standard part numbers, see the chart on the opposite page.

GORDOS ARKANSAS

VDE AC SOLID STATE RELAYS
(Triac Output)

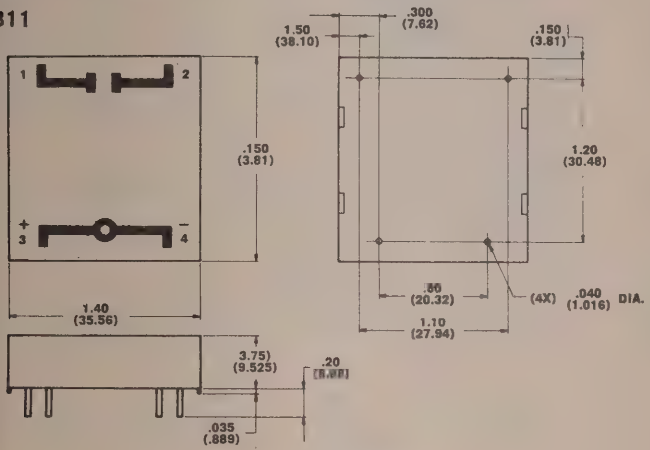
GENERAL SPECIFICATIONS

Package Style	**GB11, GB15, GB18**	**GB2, GB17**
Maximum Turn-On Time at 60/50 Hz	8.33/10 mS	1.5mS (not frequency dependent)
Maximum Turn-Off Time at 60/50 Hz	8.33/10 mS	8.33/10 mS
Input to Output Isolation	3750 VAC	3750 VAC
Input/Output to Base Isolation	2500 VAC	2500 VAC
Operating Temperature Range	0 to 70°C	0 to 70°C
Storage Temperature Range	−20 to 100°C	−20 to 100°C

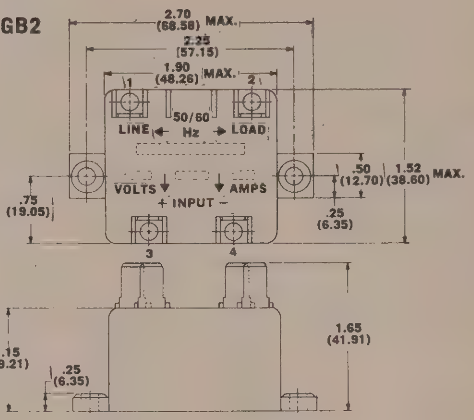
DIMENSIONS: INCHES (MILLIMETERS)

TOLERANCE: ±.02 ±,50

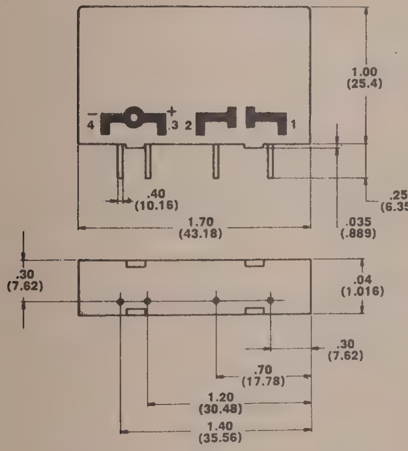
GB11


1.50 (38.10)
.300 (7.62)
.150 (3.81)
1
2
+ 3
− 4
.150 (3.81)
1.20 (30.48)
.80 (20.32)
(4X) .040 (1.016) DIA.
1.10 (27.94)
1.40 (35.56)
3.75) (9.525)
.20
.035 (.889)

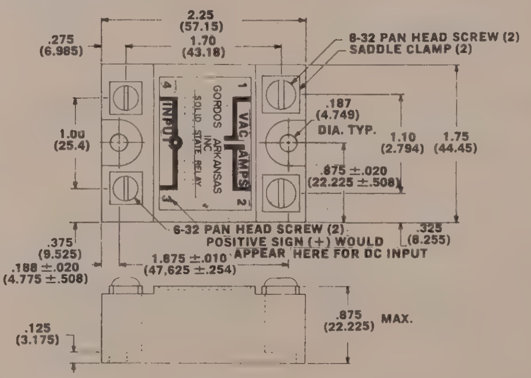
GB2


2.70 (68.58) MAX.
2.25 (57.15)
1.90 (48.26) MAX.
1
2
50/60 Hz
LINE
LOAD
VOLTS
AMPS
+ INPUT −
3
4
.75 (19.05)
.50 (12.70)
1.52 (38.60) MAX.
.25 (6.35)
1.15 (29.21)
.25 (6.35)
1.65 (41.91)

GB18


1.00 (25.4)
− 4
+ 3
2
1
.40 (10.16)
1.70 (43.18)
.25 (6.35)
.035 (.889)
.30 (7.62)
.04 (1.016)
.30 (7.62)
.70 (17.78)
1.20 (30.48)
1.40 (35.56)

GB15 and GB17


2.25 (57.15)
.275 (6.985)
1.70 (43.18)
8-32 PAN HEAD SCREW (2)
SADDLE CLAMP (2)
4
1
INPUT
GORDOS ARKANSAS INC
SOLID STATE RELAY
VAC
AMPS
3
2
1.00 (25.4)
.187 (4.749) DIA. TYP.
1.10 (2.794)
1.75 (44.45)
.875 ±.020 (22.225 ±.508)
6-32 PAN HEAD SCREW (2)
POSITIVE SIGN (+) WOULD APPEAR HERE FOR DC INPUT
.325 (8.255)
.375 (9.525)
.188 ±.020 (4.775 ±.508)
1.875 ±.010 (47,625 ±.254)
.125 (3.175)
.875 (22.225) MAX.

Package Style →	Maximum Load Current (Arms) ↓	Reed Coupled Random Turn-On *GB-2			Optically Coupled Zero-Voltage Turn-On		Reed Coupled Random Turn-On	Optically Coupled Zero-Voltage Turn-On
Control Voltage →		5 VDC	12 VDC	24 VDC	GB11 4 to 16 VDC	*GB15 3 to 32 VDC	GB17* 5 VDC	GB18 4 to 16 VDC
140 VAC Maximum Line Voltage	3.5				GB11230V			GB18230V
	10	GB2200-1005-4-03V	GB2200-1012-4-03V	GB2200-1024-4-03V		GB15210-3V	GB17210-05V	
	25	GB2200-2505-4-03V	GB2200-2512-4-03V	GB2200-2524-4-03V		GB15225-3V	GB17225-05V	
	40					GB15240-3V	GB17240-05V	
250 VAC Maximum Line Voltage	3.5				GB11430V			GB18430V
	10	GB2400-1005-4-03V	GB2400-1012-4-03V	GB2400-1024-4-03V		GB15410-3V	GB17410-05V	
	25	GB2400-2505-4-03V	GB2400-2512-4-03V	GB2400-2524-4-03V		GB15425-3V	GB17425-05V	
	40					GB15440-3V	GB17440-05V	
280 VAC Maximum Line Voltage	3.5				GB11630V			GB18630V
	10	GB2600-1005-4-03V	GB2600-1012-4-03V	GB2600-1024-4-03V		GB15610-3V	GB17610-05V	
	25	GB2600-2505-4-03V	GB2600-2512-4-03V	GB2600-2524-4-03V		GB15625-3V	GB17625-05V	
	40					GB15640-3V	GB17640-05V	

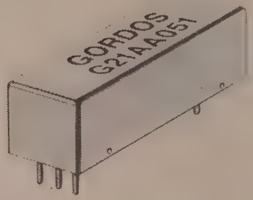
* Note: Base plate must be grounded

GORDOS CORPORATION

MINIATURE OPEN FRAME
DRY AND MERCURY WETTED REED RELAYS

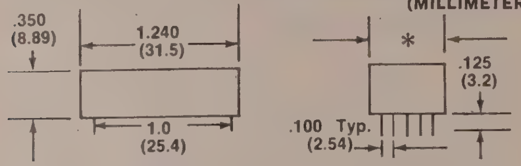
G2 SERIES

REED RELAYS
Miniature Open Frame Reed Relay



OUTLINE DIMENSIONS

DIMENSIONS: INCHES
(MILLIMETERS)

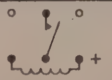
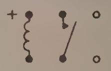
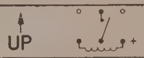
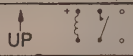
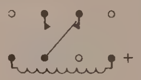
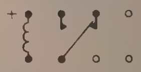
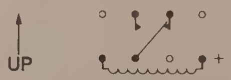
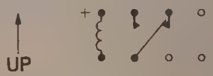
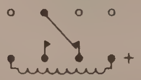
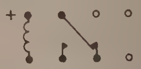
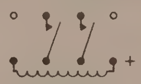
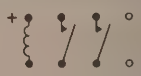
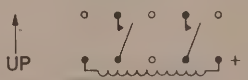
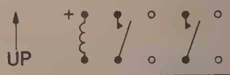
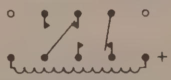
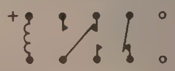
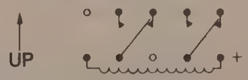
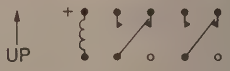
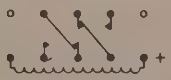
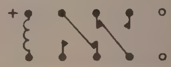


Switching Ratings	Standard Form A or B	High Voltage Form A	Standard Form C	Form A and C Mercury Wet
Current (Amperes, DC Max.)	.500	.500	.250	1.0
Voltage (Volts, DC Max.)	200	1000	28	500
Breakdown (AC RMS Volts)	350	1200	200	1500
Power (Watts)	10	10	3	50
Operating Time (Milliseconds Typical Including Bounce)	1.0	1.0	1.5 (N/C)	2.00
Release Time (Milliseconds Typical)	.50	.50	1.0 (N/O)	1.50
Initial Contact Resistance (Ohms Max. at Rated Coil Voltage)	.200	.200	.200	.070

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	4.0	0.5
12	9.6	1.2
24	19.2	2.4

REED RELAY SELECTION CHART (Add "D" for Diode)

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance (Ohms) ±10%	Part Number		Schematic (Pin View)		Width*
			End Termination	Side Termination	End Termination	Side Termination	
1A	5 12 24	225 1400 4340	G21AA051 G21AA121 G21AA241	G21AA052 G21AA122 G21AA242			.375 (9.5)
1A HIGH VOLTAGE	5 12 24	225 1400 4340	G21AE051 G21AE121 G21AE241	G21AE052 G21AE122 G21AE242			
1A MERCURY	5 12 24	140 800 3200	G21AH051 G21AH121 G21AH241	G21AH052 G21AH122 G21AH242			
1C	5 12 24	105 730 2500	G21CC051 G21CC121 G21CC241	G21CC052 G21CC122 G21CC242			.475 (12.1)
1C MERCURY	5 12 24	65 400 1600	G21CH051 G21CH121 G21CH241	G21CH052 G21CH122 G21CH242			.475 (12.1)
1C	5 12 24	105 730 2500	G21CX051 G21CX121 G21CX241	G21CX052 G21CX122 G21CX242			.475 (12.1)
2A	5 12 24	105 730 2500	G22AA051 G22AA121 G22AA241	G22AA052 G22AA122 G22AA242			.475 (12.1)
2A HIGH VOLTAGE	5 12 24	105 730 2500	G22AE051 G22AE121 G22AE241	G22AE052 G22AE122 G22AE242			
2A MERCURY	5 12 24	36 225 900	G22AH051 G22AH121 G22AH241	G22AH052 G22AH122 G22AH242			.575 (14.6)
2C	5 12 24	82 570 1540	G22CC051 G22CC121 G22CC241	G22CC052 G22CC122 G22CC242			.575 (14.6)
2C MERCURY	5 12 24	36 225 900	G22CH051 G22CH121 G22CH241	G22CH052 G22CH122 G22CH242			.575 (14.6)
2C	5 12 24	82 570 1540	G22CX051 G22CX121 G22CX241	G22CX052 G22CX122 G22CX242			.575 (14.6)

NOTES:
1. To specify diode, add "D" after part number.
2. Magnetic shielding is standard.
3. Consult factory for electrostatic shielding.
4. Orientation arrow appears on all mercury wetted models. These These relays must be mounted ±30° from vertical.
5. Excessive voltage (maximum of 7.0 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 30.0 VDC for 24 VDC model) may cause contact reclosure on form B models.

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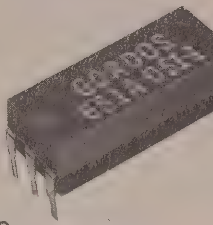
GORDOS CORPORATION

REED RELAYS
.150" x 1.000" PCB grid pattern

65 SERIES

MOLDED EPOXY REED RELAY
.150" x 1.000" PCB GRID PATTERN

- Dry reed, high-voltage, and mercury wetted versions available
- Designed to meet various packaging requirements
- Logic-compatible
- Environmental immunity assured



CONTACT RATINGS

Type	Maximum Switching D.C.		Maximum Current (Amps)		Maximum[1] Initial Contact Resistance (Ohms)	Minimum Breakdown Voltage VAC		Insulation Resistance (Typical)[3] (Ohms)
	Watts	Volts	Switch	Carry		Across Contacts	Contacts Coil	
1A	10	200	.5	1.5	.200	300	1000	10^{10}
1A High Voltage	10	200	.5	1.5	.200	1000	1000	10^{10}
1A Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}
1C	3	28	.250	1.0	.200	250	1000	10^{10}
1C Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}

NOTES: [1] Measured at nominal coil voltage applied (Except Series 65, Form B)
[2] Derate to .050A at 500 volts
[3] Measured at 25°C and 50% relative humidity using 100 VDC

OPERATING CHARACTERISTICS

Series	Operate Time (Typical)				Release Time (Typical) Coil Unsuppressed		Storage Temperature Range
			Form C				
	Form A	Form B	N/O	N/C	Form A	Form B	
Standard Dry Contacts							
65	.5	.35	1.5	1.0	.05	.5	−40°C to 85°C
Mercury-Wetted Contacts							
65	1.8		1.8	1.0			−30°C to 85°C

NOTES: 1. All times measured in milliseconds at nominal coil voltage at a test frequency of 15 Hz.
2. Consult factory for electrostatic and/or magnetic shield requirements.

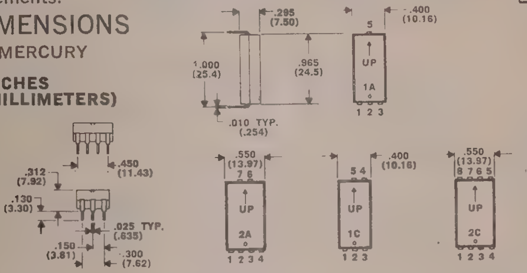
MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	3.8	0.5
12	9.0	1.2
24	18.0	2.4

OUTLINE DIMENSIONS

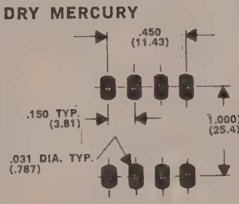
65 Series — DRY/MERCURY

DIMENSIONS: INCHES (MILLIMETERS)

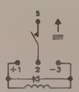
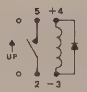
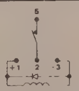
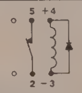
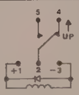
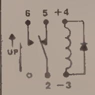
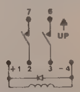
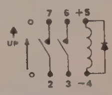
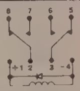


P.C. PAD LAYOUTS

65 SERIES



REED RELAY SELECTION CHART (To specify diode add "D" after part number. All schematics show location of diode)

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Part Number		Schematics (Top View)	
			End Termination	Side Termination	End Termination	Side Termination
1A	5 12 24	150 575 2150	651A051-1 651A121-1 651A241-1	651A052-1 651A122-1 651A242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
1A HIGH VOLTAGE	5 12 24	150 575 2150	651A051-4 651A121-4 651A241-4	651A052-4 651A122-4 651A242-4		
1A MERCURY	5 12 24	70 320 1600	651A051-5 651A121-5 651A241-5	651A052-5 651A122-5 651A242-5		
1B (See Note 1)	5 12 24	80 320 1500	651B051-1 651B121-1 651B241-1	651B052-1 651B122-1 651B242-1		
1C	5 12 24	100 450 1750	651C051-1 651C121-1 651C241-1	651C052-1 651C122-1 651C242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
1C MERCURY	5 12 24	70 320 1600	651C051-5 651C121-5 651C241-5	651C052-5 651C122-5 651C242-5		
2A	5 12 24	80 320 1500	652A051-1 652A121-1 652A241-1	652A052-1 652A122-1 652A242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
2A HIGH VOLTAGE	5 12 24	80 320 1500	652A051-4 652A121-4 652A241-4	652A052-4 652A122-4 652A242-4		
2A MERCURY	5 12 24	40 170 725	652A051-5 652A121-5 652A241-5	652A052-5 652A122-5 652A242-5		
2C	5 12 24	60 280 1000	652C051-1 652C121-1 652C241-1			

NOTES: 1. Excessive voltage (maximum of 7.5 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 32.0 VDC for 24 VDC model) may cause reclosure on form B models.
2. To specify diode add "D" after model number.
3. For operation above 40°C ambient temperature, consult Gordos Corporation.
4. Mercury wetted models must be mounted ±30° from vertical.

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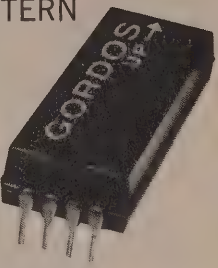
GORDOS CORPORATION

REED RELAYS
.100" x 1.000" PCB grid pattern

66 SERIES

MOLDED EPOXY REED RELAY .100" x 1.000" PCB GRID PATTERN

- Dry reed, high-voltage, and mercury wetted versions available
- Designed to meet various packaging requirements
- Logic-compatible
- Environmental immunity assured



OPERATING CHARACTERISTICS

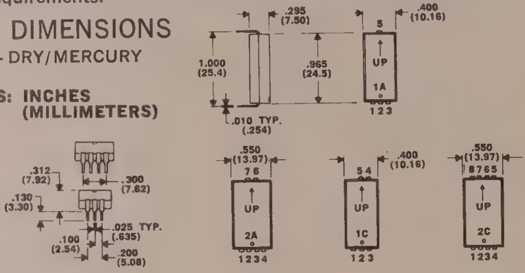
Series	Operate Time (Typical)				Release Time (Typical) Coil Unsuppressed		Storage Temperature Range
	Form A	Form B	Form C N/O	Form C N/C	Form A	Form B	
Standard Dry Contacts							
66	.5	.35	1.5	1.0	.05	.5	−40°C to 85°C
Mercury-Wetted Contacts							
66	1.8		1.8	1.0			−30°C to 85°C

NOTES: 1. All times measured in milliseconds at nominal coil voltage at a test frequency of 15 Hz.
2. Consult factory for electrostatic and/or magnetic shield requirements.

OUTLINE DIMENSIONS

66 SERIES — DRY/MERCURY

DIMENSIONS: INCHES (MILLIMETERS)



CONTACT RATINGS

Type	Maximum Switching D.C.		Maximum Current (Amps)		Maximum[1] Initial Contact Resistance (Ohms)	Minimum Breakdown Voltage VAC		Insulation Resistance (Typical)[3] (Ohms)
	Watts	Volts	Switch	Carry		Across Contacts	Contacts Coil	
1A	10	200	.5	1.5	.200	300	1000	10^{10}
1A High Voltage	10	200	.5	1.5	.200	1000	1000	10^{10}
1A Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}
1C	3	28	.250	1.0	.200	250	1000	10^{10}
1C Mercury	50	500	1.0[2]	2.0	.070	1000	1000	10^{10}

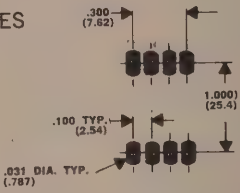
NOTES: [1] Measured at nominal coil voltage applied (Except Series 66, Form B)
[2] Derate to .050A at 500 volts
[3] Measured at 25°C and 50% relative humidity using 100 VDC

MUST OPERATE/RELEASE CHARACTERISTICS

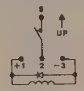
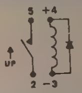
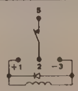
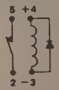
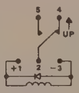
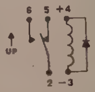
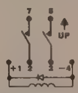
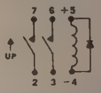
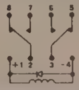
Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	3.8	0.5
12	9.0	1.2
24	18.0	2.4

P.C. PAD LAYOUTS

66 SERIES



REED RELAY SELECTION CHART (To specify diode add "D" after part number. All schematics show location of diode)

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Part Number		Schematics (Top View)	
			End Termination	Side Termination	End Termination	Side Termination
1A	5 12 24	150 575 2150	661A051-1 661A121-1 661A241-1	661A052-1 661A122-1 661A242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
1A HIGH VOLTAGE	5 12 24	150 575 2150	661A051-4 661A121-4 661A241-4	661A052-4 661A122-4 661A242-4		
1A MERCURY	5 12 24	70 320 1600	661A051-5 661A121-5 661A241-5	661A052-5 661A122-5 661A242-5		
1B (See Note 1)	5 12 24	80 320 1500	661B051-1 661B121-1 661B241-1	661B052-1 661B122-1 661B242-1		
1C	5 12 24	100 450 1750	661C051-1 661C121-1 661C241-1	661C052-1 661C122-1 661C242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
1C MERCURY	5 12 24	70 320 1600	661C051-5 661C121-5 661C241-5	661C052-5 661C122-5 661C242-5		
2A	5 12 24	80 320 1500	662A051-1 662A121-1 662A241-1	662A052-1 662A122-1 662A242-1	 Orientation arrow for mercury wetted models	 Orientation arrow for mercury wetted models
2A HIGH VOLTAGE	5 12 24	80 320 1500	662A051-4 662A121-4 662A241-4	662A052-4 662A122-4 662A242-4		
2A MERCURY	5 12 24	40 170 725	662A051-5 662A121-5 662A241-5	662A052-5 662A122-5 662A242-5		
2C	5 12 24	60 280 1000	662C051-1 662C121-1 662C241-1			

NOTES: 1. Excessive voltage (maximum of 7.5 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 32.0 VDC for 24 VDC model) may cause reclosure on form B models.
2. To specify diode add "D" after model number.
3. For operation above 40°C ambient temperature, consult Gordos Corporation.
4. Mercury wetted models must be mounted ±30° from vertical.

GORDOS CORPORATION/250 GLENWOOD AVE., BLOOMFIELD, NJ 07003 USA/TELEPHONE (201) 743-6800/TWX: 710-994-4787

GORDOS CORPORATION

DRY REED RELAY

47 SERIES

MINI-SIP

Reed Relays Designed for ATE Applications

GORDOS
4705S

- Transfer Molded Construction
- 35% Less Board Space Than Standard DIP Package
- Power Consumption < 50 Milliwatts
- Operate Times < 300 Microseconds
- Capacitance < 0.5 pF
- Insulation Resistance > $10^{12}\Omega$ @ 40°C. 95% RH
- Initial Contact Resistance < 100 Milliohms
- Load vs. Life Performance

Contact Load		Minimum Operations
25 mV	10 mA	30 Million
5V	100 mA	50 Million
10V	4 mA	30 Million
16V	10 mA	2.5 Million

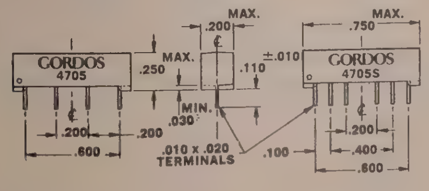
- RF Characteristics
  - Insertion Loss: 0.3 dB Typ. from 10 to 500 MHz
  - Isolation: 30 dB Typ. from 10 to 300 MHz
  - Characteristic Impedance: 50 Ohms Nominal

SPECIFICATIONS @ 25°C

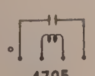
Parameter		4705	4712	4704S	4705S	4721S
Coil Resistance Ohms ±10%		500	1200	150	380	800
Nom. Coil Voltage VDC		5	12	4	5	12
Nom. Coil Power Milliwatts		50	120	106	66	180
Must Operate VDC		4	9.6	3.2	4	9.6
Must Release VDC		0.5	1.2	0.5	0.5	1.2
Initial Contact Res. Milliohms		100	100	100	100	100
Min. Breakdown Voltage AC Vrms	Across Contacts	300	300	300	300	300
	Coil to Contact	1000	1000	1000	1000	1000
	Coil to Shield	—	—	1000	1000	1000
	Contact to Shield	—	—	1000	1000	1000
Capacitance Max. P.F. @ 10 KHz	Across Contacts⁽¹⁾	1.0	1.0	1.0	1.0	1.0
	Coil to Contact⁽²⁾	1.5	1.5	1.5	1.5	1.5
	Contact to Shield⁽²⁾	—	—	1.8	1.8	1.8
Capacitance Max. P.F. @ 10 KHz (Grounded Meas.)	Across Contact	—	—	0.3	0.3	0.3
	Coil to Contact	—	—	0.5	0.5	0.5
Insulation Res. Min. @ 100 VDC	25°C 40% RH	10^{14}	10^{14}	10^{14}	10^{14}	10^{14}
	40°C 95% RH	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}
Operate Time Microseconds (Including Bounce)		300	300	300	300	300
Release Time Microseconds (Diode Suppressed)		50	50	50	50	50
Max. Switching Voltage (DC)		50	50	50	50	50
Max. Switching Current (DC)		.250	.250	.250	.250	.250
Max. Carry Current (DC)		1.5	1.5	1.5	1.5	1.5

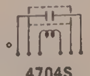
(1) Capacitance (Across Contacts) — Coil and Shield Tied Together and Floating.
(2) Capacitance — Contacts Open.

OUTLINE DIMENSIONS



SCHEMATICS


4705
4712


4704S
4705S
4712S

741 SERIES

GORDOS
741A-1

MOLDED EPOXY

Single In-Line Package

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	380	No	741A-1
			Yes	741A-2
		500	No	741A-9
			Yes	741A-10
	12	500	No	741A-3
			Yes	741A-4
	24	1750	No	741A-7
			Yes	741A-8
1B (See Note 1)	5	150	No	741B-3
			Yes	741B-4
		450	No	741B-9
			Yes	741B-10
	12	450	No	741B-5
			Yes	741B-6
	24	1750	No	741B-7
			Yes	741B-8

NOTES:
1. Excessive voltage (maximum of 7.0 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 30.0 VDC for 24 VDC model) may cause contact reclosure on Form B models.
2. Consult factory for electrostatic and/or magnetic shield requirements

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching² (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance¹ (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
741A	10	100	.250	1.5	.200	250	1000	.8	1.5	10^{10}
741B	10	100	.250	1.5	.200	250	1000	.8	3.8	10^{10}

NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate Time* (Typical)		Release Time (Typical)				Storage Temperature Range
			Coil Unsuppressed		Coil Suppressed		
	Form A	Form B	Form A	Form B	Form A	Form B	
741	.50	.5	.05	.50	.5	.50	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

SCHEMATICS

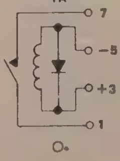


FIG. 1

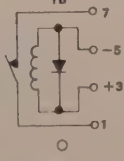
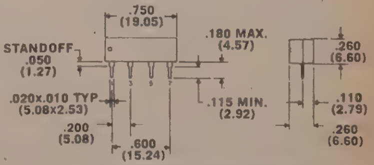


FIG. 2

OUTLINE DIMENSIONS



DIMENSIONS: INCHES
(MILLIMETERS)

GORDOS CORPORATION

76 SERIES

MOLDED EPOXY

GORDOS
761A 05 1

- Low Cost
- Dry Reed, Power and Sensitive Versions
- Designed to meet various packaging requirements
- Popular PCB grid patterns
- Environmental immunity assured
- Logic compatible
- Resistant to board cleaning solvents
- Power series offers tough tungsten contacts capable of handling high inrush inductive and capacitive loads without contact protection in most applications.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Part Number	
			End Termination	Side Termination
1A	5	225	761A051-1	761A052-1
	12	1000	761A121-1	761A122-1
	24	2150	761A241-1	761A242-1
1A Power Series	5	225	761A051-3	761A052-3
	12	575	761A121-3	761A122-3
	24	2150	761A241-3	761A242-3
1A Sensitive Series	5	575	761A05S1-1	761A05S2-1

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	3.8	0.5	7.5
12	9.0	1.2	15.0
24	18.0	2.4	32.0

CONTACT RATINGS

Type	Maximum Switching		Maximum Current		Typical Initial Contact Resistance[1]	Minimum Breakdown Voltage		Insulation Resistance (Typ.)[2]
	Watts	Volts	Switch	Carry		Across Contacts	Contacts Coil	
-1	10	200	0.5	1.5	.200	300	1000	10^{10}
-3	50	200	See Note 3		1.0	300	1000	10^{10}

NOTES:
1. Measured at nominal coil voltage applied
2. Measured at 25°C and 50% relative humidity using 100 VDC
3. Inrush current capability — 5.0 amps

OPERATING CHARACTERISTICS

Form	Operating Time (Typ.)	Release Time (Typ.) (Coil Unsuppressed)
A	.5 msec	.05 msec
B	.35 msec	.5 msec

SCHEMATICS TOP VIEW

1A

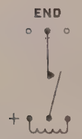


FIG. 1

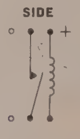
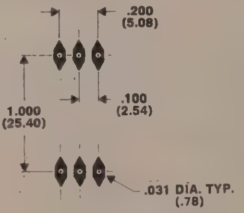
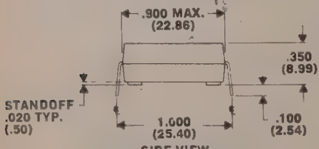


FIG. 2

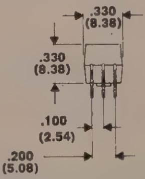
PC PAD LAYOUT



OUTLINE DIMENSIONS

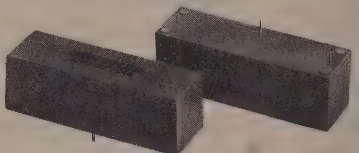


SIDE VIEW
TYPICAL FOR ALL 76-SERIES



KD SERIES

HIGH VOLTAGE REED RELAY
Up To 14kV Dielectric Strength



TYPE 1270 AND 1280

The Reed Relay types 1270 and 1280 are a special high voltage relay with solder and plug-in terminals for pcb-mounting. These relays withstand a test voltage of 25 kV minimum between coil and contact. Hermetical potting with epoxy material in plastic housing prevents both reed switch and coil from mechanical damage.

A modern and cost-saving High Voltage Relay for fast mounting!

RELAY

Nominal voltage VDC	Must operate voltage VDC	Must release voltage VDC	Max. voltage VDC	Coil resistance Ω ±15%	Must operate power mW	Part number designation
5	4	1	7	35	460	33 .... 1270 056
12	10	2	16	200	500	33 .... 1270 126
24	20	4	30	720	575	33 .... 1270/1280 246

CONTACTS FOR 1270 AND 1280

Contact Code	Contact form		Contact material	Switching voltage Vrms	Switching current A	Limiting cont. current* A	Switching Power		Max. contact resistance mΩ**	Dielectric strength V***	Mech. life expectancy
	DIN	ASA					W	VA			
90	1	A	W	5000	3	5	50	—	250	7000	10^9
91	1	A	W	7500	3	5	50	—	250	10000	10^9
92	1	A	W	10000	3	5	50	—	250	14000	10^9

* must not be switched ** typical initial value *** during 1 sec.

ASSEMBLY FOR 1270 AND 1280

Contact arrangement	Min. insulating resistance (Coil/Contact)	Mounting position	Ambient temperature
1 FORM A	1 x 10^9 Ohm	any	−20 .... +70°C

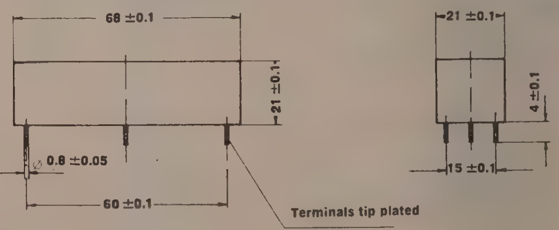
TEST VOLTAGE

Coil/Contact 25,000 Vrms, 1 min.

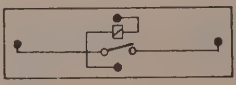
REMARKS

Contact resistance measured at 2V/100 mA with four-wire method. All data for contact rating valid for resistive load only.

OUTLINE DIMENSIONS



SCHEMATICS (pin view)



Note: It is our policy to continue development and therefore specifications are subject to change without notice.

GORDOS CORPORATION/250 GLENWOOD AVE., BLOOMFIELD, NJ 07003 USA/TELEPHONE (201) 743-6800/TWX: 710-994-4787

GORDOS CORPORATION

DIP DRY REED RELAYS

83 SERIES

MOLDED EPOXY DIP (Dual In-Line Package)

- All Gordos molded reed relays are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card number UL94STD (V-O classification).
- Environmental immunity assured
- Logic compatible
- Compatible with automatic insertion equipment

CONTACT RATINGS

Model No.	Maximum Switching[2] (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Contacts	Contacts Coil	Across Contacts	Contacts Coil	
831A	10	100	.250	1.5	.200	250	1000	.8	2	10^{10}
831B	10	100	.250	1.5	.200	250	1000	—	3.8	10^{10}
832A	3	28	.250	1.0	.200	150	1000	.8	2	10^{10}
831C	3	28	.250	1.0	.200	250	1000	1.5	3	10^{9}
835C	4	100	.110	1.0	.250	250	1000	.8	2	10^{9}
836C	4	100	.110	1.0	.250	250	1000	.8	2	10^{9}

NOTES: (1)Measured with nominal coil voltage applied (Except Form B)
(2)Higher voltages and/or current may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

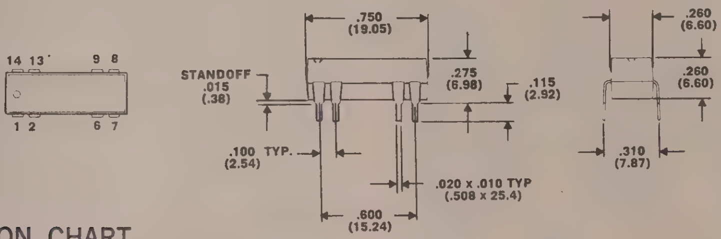
Series	Operate Time* (Typical)				Release Time (Typical)				Storage Temperature Range
					Coil Unsuppressed		Coil Suppressed		
	Form A	Form B	Form C N/O	Form C N/C	Form A	Form B	Form A	Form B	
83	.50	.5	1.0	1.5	.05	.50	.5	.50	−40°C to 85°C

* Operate and Release Times (including bounce) in milliseconds.

MUST OPERATE/RELEASE CHARACTERISTICS

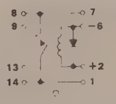
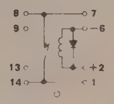
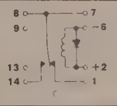
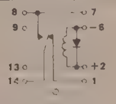
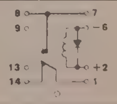
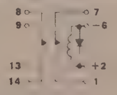
Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C
5	4.0	0.5
12	9.6	1.2
24	19.2	2.4

OUTLINE DIMENSIONS



DIMENSIONS: INCHES (MILLIMETERS)

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance (Ohms) ±10% @ 25°C	Clamp Diode	Part Number	Schematics (Top View)
1A	5	380	No Yes	831A-1 831A-2	
		500	No Yes	831A-3 831A-4	
	12	500	No Yes	831A-5 831A-6	
	24	1750	No Yes	831A-7 831A-8	
1B (See Note 1)	5	150	No Yes	831B-1 831B-2	
		450	No Yes	831B-3 831B-4	
	12	450	No Yes	831B-5 831B-6	
	24	1750	No Yes	831B-7 831B-8	
1C	5	150	No Yes	831C-1 831C-2	
	12	450	No Yes	831C-3 831C-4	
	24	1750	No Yes	831C-5 831C-6	
1C	5	150	No Yes	835C-1 835C-2	
	12	450	No Yes	835C-3 835C-4	
	24	1750	No Yes	835C-5 835C-6	
1C	5	200	No Yes	836C-1 836C-2	
	12	500	No Yes	836C-3 836C-4	
	24	2200	No Yes	836C-5 836C-6	
2A	5	150	No Yes	832A-1 832A-2	
	12	450	No Yes	832A-3 832A-4	
	24	1750	No Yes	832A-5 832A-6	

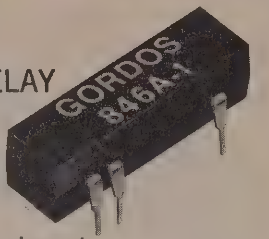
NOTES: 1. Excessive voltage (maximum of 7.0 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 30.0 VDC for 24 VDC model), may cause contact reclosure on Form B models.
2. Consult factory for electrostatic shield and/or magnetic shield requirements.

GORDOS CORPORATION

HIGH VOLTAGE AND MERCURY DIP REED RELAYS

846 SERIES

HIGH VOLTAGE REED RELAY MOLDED EPOXY DIP



- High-Voltage Form A
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-O classification

High-voltage 6-pin DIP reed relays with Form A contacts for applications where high-voltage isolation is required and space is at a premium.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	150	No	846A-1
			Yes	846A-2
	12	575	No	846A-3
			Yes	846A-4
	24	1750	No	846A-5
			Yes	846A-6

NOTES: Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching (DC)		Maximum Current[2] (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
846A	10	800	.5	2	.200	1200	1500	.8	2	10^{10}

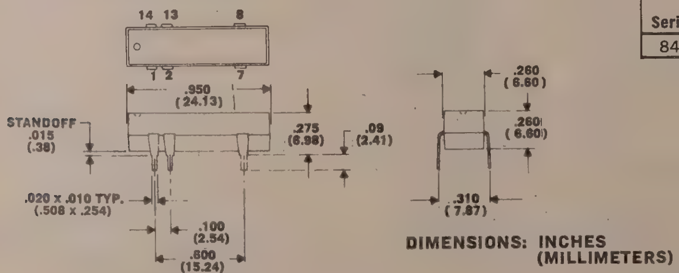
NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Derate to .006A at 800V

OPERATING CHARACTERISTICS

Series	Operate Time* (Typical) Form A	Release Time (Typical)		Storage Temperature Range
		Coil Unsuppressed Form A	Coil Suppressed Form A	
846	.50	.05	.5	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

OUTLINE DIMENSIONS



846 SERIES AND 847 SERIES

847 SERIES

MERCURY WETTED REED RELAY MOLDED SILICONE DIP

GORDOS
847A-1

- Mercury-Wetted (Forms A, C) Versions
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-0 classification

Mercury-wetted 6-pin DIP reed relays with Form A or Form C contacts, offering the advantages of speed, no bounce, stability, extremely long life, and small size.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Résistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	150	No	847A-1
			Yes	847A-2
	12	575	No	847A-3
			Yes	847A-4
	24	1750	No	847A-5
			Yes	847A-6
1C	5	70	No	847C-1
			Yes	847C-2
	12	320	No	847C-3
			Yes	847C-4
	24	1600	No	847C-5
			Yes	847C-6

NOTES: Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

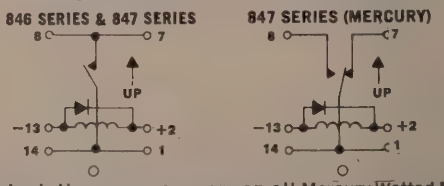
Model No.	Maximum Switching[3] (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
847A	50	500	1.0[2]	2	.050	1000	1500	1.1	2	10^{10}
847C	50	500	1.0[2]	2	.050	1000	1500	1.3	6	10^{8}

NOTES:
1. Measured with nominal coil voltage applied
2. Derate to .002A @ 500 volts
3. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate Time (Typical)			Release Time (Typical)		Storage Temperature Range
	Form A	Form C N/O	Form C N/C	Coil Unsuppressed Form A	Coil Suppressed Form A	
847	2.5	2.00	1.5	2.0	2.0	−30°C to +85°C

SCHEMATICS (TOP VIEW)



NOTE: Orientation arrow appears on all Mercury Wetted Models. These relays must be mounted ±30° from vertical.

GORDOS CORPORATION

DRY REED RELAYS

851 SERIES

DRY REED RELAYS MOLDED EPOXY DIP

- Contact Forms A and B
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled, non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-O classification

Special single-pole 4-pin DIP reed relays with Form A or B contacts for applications requiring high isolation between contacts and coil.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohms (±10%)	Clamp Diode	Part Number
1A	5	380	No	851A-1
			Yes	851A-2
		500	No	851A-5
			Yes	851A-6
	12	500	No	851A-3
			Yes	851A-4
	24	1750	No	851A-7
			Yes	851A-8
1B (See Note 1)	5	150	No	851B-3
			Yes	851B-4
	12	450	No	851B-5
			Yes	851B-6
	24	1750	No	851B-7
			Yes	851B-8

NOTES:
1. Excessive voltage (maximum of 7.5 VDC for 5 VDC model, 15.0 VDC for 12 VDC model, and 32.0 VDC for 24 VDC model) may cause reclosure on form B models.
2. Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

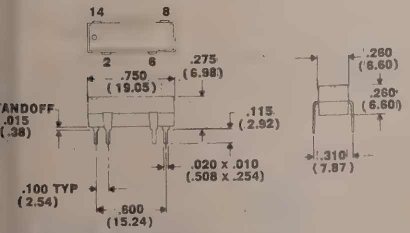
Model No.	Maximum Switching[2] (DC)		Maximum Current (Amps)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ.) (Ohms)
	Watts	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
851A	10	100	.250	1.5	.200	250	2000	.8	2	10^{10}
851B	10	100	.250	1.5	.200	250	2000	.8	3.8	10^{10}

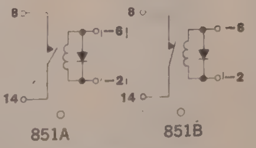
NOTES:
1. Measured with nominal coil voltage applied (Except Form B)
2. Higher voltages and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate Time* (Typical)		Release Time (Typical)				Storage Temperature Range
			Coil Unsuppressed		Coil Suppressed		
	Form A	Form B	Form A	Form B	Form A	Form B	
851	.50	.5	.05	.50	.5	.50	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.





851A 851B

DIMENSIONS: INCHES (MILLIMETERS)

848 SERIES

DRY REED RELAYS MOLDED EPOXY DIP

- Contact Form A
- Environmental Immunity Assured
- Logic-Compatible
- Compatible with Auto-Insertion Equipment
- All Gordos molded devices are molded of glass filled non-burning epoxy with an Underwriters Laboratory certified yellow card, UL94STD, V-O classification

Special Single-pole 4-pin Dip reed relays with Form A contacts for applications requiring high isolation between contacts and coil.

REED RELAY SELECTION CHART

Contact Form	Nominal Coil Voltage (VDC)	Coil Resistance Ohm (±10%)	Clamp Diode	Part Number
1A	5	150	No	848A-1
			Yes	848A-2
	12	575	No	848A-3
			Yes	848A-4
	24	1750	No	848A-5
			Yes	848A-6

NOTES:
1. Consult factory for electrostatic shield and/or magnetic shield requirements.

MUST OPERATE/RELEASE CHARACTERISTICS

Nominal Coil Voltage (VDC)	Must Operate Voltage (VDC) @ 25°C	Must Release Voltage (VDC) @ 25°C	Maximum Voltage (VDC)
5	4.0	0.5	7.5
12	9.6	1.2	15.0
24	19.2	2.4	32.0

CONTACT RATINGS

Model No.	Maximum Switching[2] (DC)		Maximum Current (Amp)		Typical Initial Contact Resistance[1] (Ohms)	Min. Breakdown Voltage (VAC)		Capacitance (Typical) (pF)		Insulation Resistance (Typ Ohms)
	Watt	Volts	Switch	Carry		Across Conts.	Conts. Coil	Across Conts.	Conts. Coil	
848A	10	100	.250	1.5	.200	250	2000	8	2	10^{10}

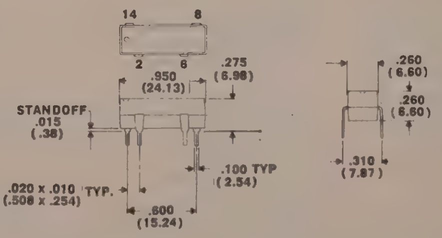
NOTES:
1. Measured with nominal coil voltage applied.
2. Higher voltage and/or currents may be switched with life expectancy reduced. Consult factory for these ratings.

OPERATING CHARACTERISTICS

Series	Operate* Time (Typical) Form A	Release Time (Typical)		Storage Temperature Range
		Coil Unsuppressed Form A	Coil Suppressed Form A	
848	.50	.05	.5	−40°C to +85°C

* Operate and Release Times (including bounce) in milliseconds.

OUTLINE DIMENSIONS



GORDOS CORPORATION/250 GLENWOOD AVE., BLOOMFIELD, NJ 07003 USA/TELEPHONE (201) 743-6800/TWX: 710-994-4787

Distributors

For additional information or to place an order for Gould-Allied's complete line of Industrial Relays, contact your nearest Distributor:

Alabama		
Birmingham	Newark Electronics	205-942-4044
Arizona		
Tempe	Anjon Enterprises	602-894-1332
Tempe	Newark Electronics	602-968-7441
Tucson	Electro Enterprises	602-293-8231
California		
Buena Park	Control Design	415-521-5040
Cerritos	El-Com, Inc	213-404-2961
Hayward	KEA Electronics	415-887-2900
Inglewood	Newark Electronics	213-678-0441
Los Angeles	Master Distributors	213-452-1229
Monrovia	Erik-A Electronics	213-574-1020
Orange	Newark Electronics	714-634-8224
San Carlos	Control Design	415-952-4808
San Diego	El-Com, Inc.	619-578-0900
San Diego	Newark Electronics	714-481-1251
Santa Clara	El-Com, Inc.	408-496-0880
Colorado		
Arvada	Newark Electronics	303-423-7941
Denver	Newark Electronics	303-757-3351
Englewood	Newark Electronics	303-771-6300
Connecticut		
Bloomfield	Newark Electronics	203-243-1731
East Haven	J V Electronics	203-469-2321
Stamford	Bond Electronics	203-348-2663
Florida		
Altamonte Spring	Control Design	305-788-3220
Fort Lauderdale	Newark Electronics	305-587-2372
Fort Lauderdale	Peerless Radio	305-973-4141
Longwood	MRP Micro Electronics, Inc.	305-331-8787
Orlando	Newark Electronics	305-896-8350
Tampa	Newark Electronics	813-879-7700
Georgia		
Fayetteville	Frankland, Inc.	404-461-4026
Norcross	Newark Electronics	404-448-1300
Idaho		
Boise	Newark Electronics	208-342-4311
Pocatello	Kimball Electronics	208-232-2201
Spirit Lake	A-I Electronic Supply	208-623-3111
Illinois		
Alsip	Newark Electronics	312-371-9000
Chicago	Newark Electronics	312-638-4411
Downers Grove	Newark Electronics	312-969-9440
Genoa	Control Design	815-784-6515
Hickory Hills	Newark Electronics	312-430-3232
Hillside	Newark Electronics	312-544-8340
Northbrook	Newark Electronics	312-480-1300
Rockford	Newark Electronics	815-229-0225
Schaumberg	Newark Electronics	312-843-0700
Springfield	Newark Electronics	217-787-9972
Indiana		
Fort Wayne	Graham Electronics	219-423-3422
Fort Wayne	Newark Electronics	219-484-0766
Indianapolis	Control Design	317-788-4559
Indianapolis	Graham Electronics	317-634-8202
Merrillville	Newark Electronics	219-738-2787
Iowa		
Bettendorf	Newark Electronics	319-359-3711
Cedar Rapids	Newark Electronics	319-362-1171
Kansas		
Wichita	RSC, Inc.	316-267-5213
Kentucky		
Louisville	Newark Electronics	502-423-0280
Maryland		
Beltsville	Newark Electronics	301-937-5085
Columbia	Aztech Electronics, Inc.	301-995-1760
Ellicott	Newark Electronics	301-461-2300
Massachusetts		
Braintree	Newark Electronics	617-688-1837
Newton	Greene-Shaw Co., Inc.	617-969-8900
Springfield	Newark Electronics	413-785-5851
Waltham	Newark Electronics	617-894-8050
Woburn	Newark Electronics	617-935-8350
Michigan		
Grand Rapids	Newark Electronics	616-241-6681
Grand Rapids	S F Electronic Supply, Inc.	616-459-0216
Oak Park	Newark Electronics	313-967-0600
Saginaw	Newark Electronics	517-799-0480
Minnesota		
Minneapolis	Control Design	612-721-1628
Minneapolis	Industrial Components, Inc.	612-831-2666
Minneapolis	Newark Electronics	612-331-6350
St. Paul	Newark Electronics	612-631-2683
Missouri		
Blue Springs	Newark Electronics	816-229-3170
St. Louis	Control Design	314-426-3150
St. Louis	Interstate Industrial	314-423-4322
Nebraska		
Omaha	Newark Electronics	402-392-1221
New Jersey		
Bordentown	Newark Electronics	609-298-4450
Edison	Newark Electronics	201-572-2103
Fair Lawn	Relay Specialties	201-797-3313
Fairfield	Newark Electronics	201-882-0300
Kenilworth	Federated Purchaser	201-272-0505
Oakland	Gordon/Horne, Inc.	201-337-5200
New Mexico		
Albuquerque	International Electronics	505-262-2011
New York		
Amherst	Standard Electronics	716-691-3801
Buffalo	Newark Electronics	716-892-4321
Buffalo	Summit Distributing	716-884-3450
Farmingdale	Pride Electronics	516-293-4020
Lynbrook	Newark Electronics	516-887-2100
Rochester	Newark Electronics	716-473-6600
Rome	Rome Electronics	315-337-5400
North Carolina		
Charlotte	Control Design	704-588-4410
Charlotte	Newark Electronics	704-535-5650
Greensboro	Newark Electronics	919-292-7240
Raleigh	Newark Electronics	919-781-7677
Winston-Salem	Kirkman Electronics	919-722-9131
Ohio		
Akron	Akron Electronics	216-762-8818
Akron	Newark Electronics	216-374-9987
Cincinnati	Graham Electronics	513-772-1661
Cincinnati	Newark Electronics	513-771-9700
Cleveland	Newark Electronics	216-361-4700
Columbus	Newark Electronics	614-451-0002
Dayton	Stotts Friedman	513-298-5555
Toledo	Newark Electronics	419-866-0404
Wickliffe	Gateway Megatech	216-944-8565
Youngstown	Newark Electronics	216-793-6134
Oklahoma		
Oklahoma City	Electro Enterprises	404-427-6591
Oregon		
Portland	Carlyle Technical Sales	503-292-2053
Portland	Newark Electronics	503-257-0741
Pennsylvania		
Allentown	Federated Purchaser	215-437-4481
Allentown	Newark Electronics	215-434-7171
Cornwell Heights	Newark Electronics	215-245-7300
Erie	C. J. Wettekin Electr.	814-838-9184
Erie	Newark Electronics	814-453-5726
Johnstown	Bird Electric and Supply	814-535-3574
Malvern	Control Design	215-296-0150
McCandless	Newark Electronics	412-367-2790
McKeesport	Barno Radio	412-751-5966
Philadelphia	Shap Electronics Co., Inc.	215-969-3300
Pittsburgh	Newark Electronics	412-787-7740
Rhode Island		
Warwick	Newark Electronics	401-738-4010
South Carolina		
Greenville	Newark Electronics	803-288-9610
Tennessee		
Knoxville	Newark Electronics	615-588-6493
Memphis	Newark Electronics	901-365-8060
Nashville	Electra Distributing Co.	615-329-3971
Texas		
Dallas	Control Design	214-358-1441
Dallas	International Electronics	214-233-9323
Dallas	Sterling Electronics	214-243-1600
Dallas	Trevino Sales	214-357-5446
El Paso	International Electronics	915-598-3406
El Paso	Midland Specialty	915-533-9555
El Paso	Newark Electronics	915-778-5322
Garland	Newark Electronics	214-494-5911
Houston	Geophysical Supply	713-666-4100
Houston	Newark Electronics	713-782-4800
Houston	Sterling Electronics	713-623-6600
Hurst	Newark Electronics	817-589-1295
Pasadena	Newark Electronics	713-477-0286
Utah		
Salt Lake City	Kimball Electronics	801-328-2075
Salt Lake City	Newark Electronics	801-484-8611
Virginia		
Arlington	Newark Electronics	703-522-0880
Washington		
Bellevue	Newark Electronics	206-641-9800
Seattle	Carlyle Technical Sales	206-575-6750
Wisconsin		
Brookfield	Newark Electronics	414-781-2450
Green Bay	Newark Electronics	414-494-1400
Madison	Newark Electronics	808-221-4738
New Berlin	Control Design	414-784-1015
Canada		
British Columbia		
Vancouver	Future Electronics	604-438-5545
Ontario		
Downsview	Future Electronics	416-663-5563
Markham	Semad Electronics	416-475-3922
Ottawa	Future Electronics	613-820-9471
Ottawa	Semad Electronics	613-722-6571
Quebec		
Dorval	Semad Electronics	514-636-4614
Pointe Claire	Future Electronics	514-694-7710

Gould Inc., Industrial Controls Division
100 Relay Road, Plantsville, CT 06479
Telephone (203) 621-6771
TWX 710-473-0079

GOULD
Electronics

For manufacturers' sales offices, see yellow pages

Allied Control Relays

General Purpose Relays

CRADLE® SERIES T154/163

DC Relays — Current and Voltage Adjusted

AC Relays — Voltage Adjusted

FEATURES

- **T154 Single-Point Contacts**
- **T163 Bifurcated Contacts**
- **Proven Cradle® reliability**
- **100 million mechanical operations**
- **Contact selection to match application**
- **Contact configuration:**
  DC Voltage: up to 8 Form C
  AC Voltage: up to 4 Form C
- **Input voltages:**
  DC Voltage: from 3 VDC to 115 VDC
  AC Voltage: from 6 VAC to 220 VAC 50/60 Hz
- **Sensitivity as low as 20 MW/pole** (DC Voltage only)
- **Low-priced relays**
- **Versatile mounting configurations**
- **High density packaging**
- **UL File E20604 / CSA File 34171**

TYPICAL OPERATING CONDITIONS @ 25°C

ELECTRICAL

Minimum drop-out (DC voltage):
10% of maximum pick-up value (5% for single and double-pole relays)

Dielectric Strength:
1000 VRMS, coil to contacts and between gaps on standard T154 series 500 VRMS, between contact gaps on sensitive, ultrasensitive relays and on all relays with bifurcated contacts

Insulation resistance:
10,000 megohms minimum

Capacitance, DC Voltage:
Closed contacts to frame 3.0 pf
Open contacts to frame 3.0 pf
Between open contacts 3.0 pf (energized or de-energized)

Capacitance, AC Voltage:
Contact to contact 3.0 pf
Coil to contact 3.0 pf
Coil to frame 30 pf

Operate time, DC Voltage:
15 MS max. at nominal voltage

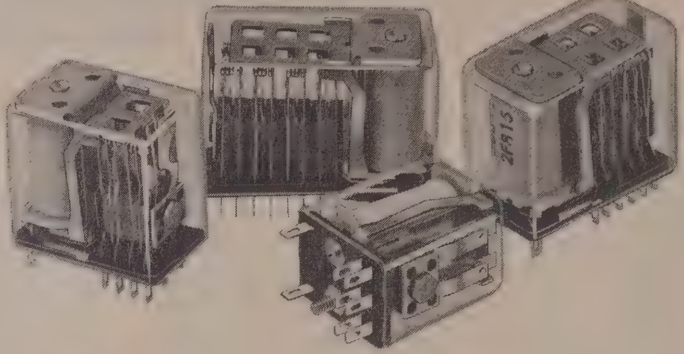
Operate time, AC Voltage: 25 MS

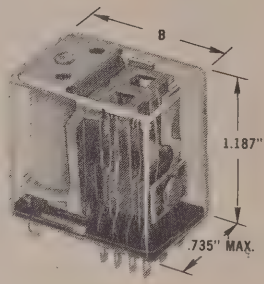
Release time, DC Voltage:
8 MS max. at nominal voltage

Release time, AC Voltage: 25 MS

ENVIRONMENTAL

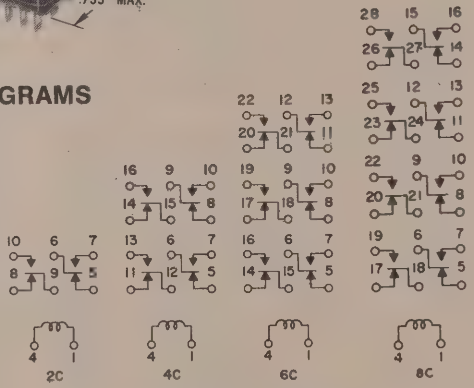
Ambient temperature: −55°C to 71°C




B
1.187"
.735" MAX.

DIMENSION B	
2C	.937
4C	1.172
6C	1.391
8C	1.594

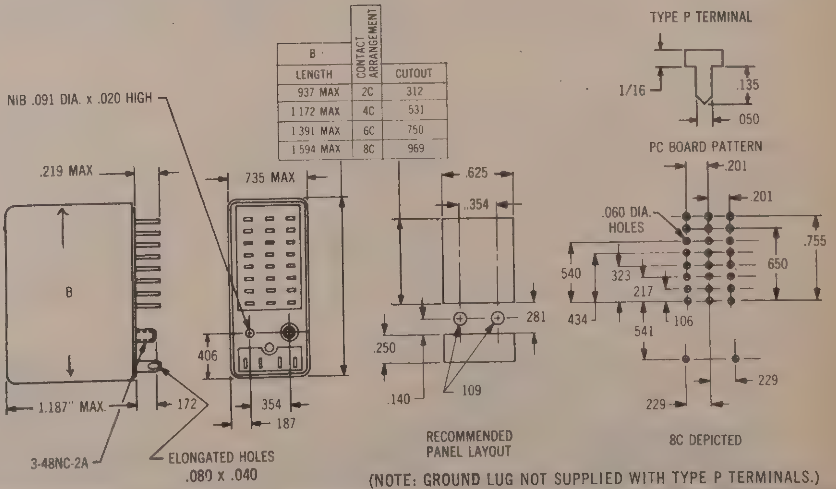
WIRING DIAGRAMS


10 6 7
8 9 5
4 1
13 6 7
11 12 5
16 9 10
14 15 8
4 1
16 6 7
14 15 5
19 9 10
17 18 8
22 12 13
20 21 11
4 1
19 6 7
17 18 5
22 9 10
20 21 8
25 12 13
23 24 11
28 15 16
26 27 14
4 1

2C 2 Pole | 4C 4 Pole | 6C 6 Pole | 8C 8 Pole

Circuit Diagrams — Unenergized

DETAILED DIMENSIONS


NIB .091 DIA. x .020 HIGH
.219 MAX
735 MAX
B
406
1.187" MAX.
172
354
187
3-48NC-2A
ELONGATED HOLES .080 x .040
.625
.354
281
.250
.140
109
TYPE P TERMINAL
1/16
.135
050
PC BOARD PATTERN
.201
.201
.060 DIA. HOLES
.755
650
540
323
217
434
541
106
229
229

B LENGTH	CONTACT ARRANGEMENT	CUTOUT
937 MAX	2C	312
1 172 MAX	4C	531
1 391 MAX	6C	750
1 594 MAX	8C	969

RECOMMENDED PANEL LAYOUT

8C DEPICTED

(NOTE: GROUND LUG NOT SUPPLIED WITH TYPE P TERMINALS.)

Gould Inc., Industrial Controls Division
100 Relay Road, Plantsville, CT 06479
Telephone (203) 621-6771
TWX 710-473-0079

GOULD
Electronics

Allied Control Relays

General Purpose Relays

CRADLE® SERIES T154/163

DC RELAYS

STANDARD DC VOLTAGE ADJUSTMENT

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Pick-up Power	Contact Arrangement [3]	Contact Rating [4]
T154-2C-6VDC	52Ω	6V	4.5V	500mW	2C	2 Amp
T154-2C-12VDC	185Ω	12V	9.0V	500mW	2C	2 Amp
T154-2C-24VDC	700Ω	24V	18.0V	500mW	2C	2 Amp
T154-2C-48VDC	2,500Ω	48V	36.0V	500mW	2C	2 Amp
T154-2C-115VDC	15,000Ω	115V	86.0V	500mW	2C	2 Amp
T154-4C-6VDC	52Ω	6V	4.5V	500mW	4C	2 Amp
T154-4C-12VDC	185Ω	12V	9.0V	500mW	4C	2 Amp
T154-4C-24VDC	700Ω	24V	18.0V	500mW	4C	2 Amp
T154-4C-48VDC	2,500Ω	48V	36.0V	500mW	4C	2 Amp
T154-4C-115VDC	15,000Ω	115V	86.0V	500mW	4C	2 Amp
T154-6C-6VDC	25Ω	6V	4.5V	800mW	6C	2 Amp
T154-6C-12VDC	90Ω	12V	9.0V	800mW	6C	2 Amp
T154-6C-24VDC	430Ω	24V	18.0V	800mW	6C	2 Amp
T154-6C-48VDC	1,550Ω	48V	36.0V	800mW	6C	2 Amp
T154-6C-115VDC	9,000Ω	115V	86.0V	800mW	6C	2 Amp
T154-8C-6VDC	20Ω	6V	4.5V	1.000W	8C	2 Amp
T154-8C-12VDC	75Ω	12V	9.0V	1.000W	8C	2 Amp
T154-8C-24VDC	430Ω	24V	18.0V	1.000W	8C	2 Amp
T154-8C-48VDC	1,275Ω	48V	36.0V	1.000W	8C	2 Amp
T154-8C-115VDC	9,000Ω	115V	86.0V	800mW	8C	2 Amp

SENSITIVE DC VOLTAGE ADJUSTMENT

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Pick-up Power	Contact Arrangement [3]	Contact Rating [4]
TS154-2C-6VDC	185Ω	6V	4.5V	100mW	2C	2 Amp
TS154-2C-12VDC	800Ω	12V	9.0V	100mW	2C	2 Amp
TS154-2C-24VDC	3,200Ω	24V	18.0V	100mW	2C	2 Amp
TS154-2C-48VDC	13,000Ω	48V	36.0V	100mW	2C	2 Amp
TS154-4C-6VDC	110Ω	6V	4.5V	175mW	4C	2 Amp
TS154-4C-12VDC	430Ω	12V	9.0V	175mW	4C	2 Amp
TS154-4C-24VDC	1,800Ω	24V	18.0V	175mW	4C	2 Amp
TS154-4C-48VDC	7,500Ω	48V	36.0V	175mW	4C	2 Amp
TS154-6C-6VDC	75Ω	6V	4.5V	250mW	6C	2 Amp
TS154-6C-12VDC	350Ω	12V	9.0V	250mW	6C	2 Amp
TS154-6C-24VDC	1,275Ω	24V	18.0V	250mW	6C	2 Amp
TS154-6C-48VDC	5,200Ω	48V	36.0V	250mW	6C	2 Amp
TS154-8C-6VDC	52Ω	6V	4.5V	400mW	8C	2 Amp
TS154-8C-12VDC	190Ω	12V	9.0V	400mW	8C	2 Amp
TS154-8C-24VDC	800Ω	24V	18.0V	400mW	8C	2 Amp
TS154-8C-48VDC	3,200Ω	48V	36.0V	400mW	8C	2 Amp

ULTRA-SENSITIVE VOLTAGE ADJUSTMENT

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Pick-up Power	Contact Arrangement [3]	Contact Rating [4]
TSS154-2C-6VDC	500Ω	6V	4.5V	40mW	2C	1 Amp
TSS154-2C-12VDC	2,000Ω	12V	9.0V	40mW	2C	1 Amp
TSS154-2C-24VDC	7,500Ω	24V	18.0V	40mW	2C	1 Amp
TSS154-4C-6VDC	250Ω	6V	4.5V	80mW	4C	1 Amp
TSS154-4C-12VDC	1,000Ω	12V	9.0V	80mW	4C	1 Amp
TSS154-4C-24VDC	3,700Ω	24V	18.0V	80mW	4C	1 Amp

SENSITIVE DC CURRENT ADJUSTMENT

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Pick-up Power	Contact Arrangement [3]	Contact Rating [4]
TS154-2C-8.5Madc	1,000Ω	8.5Madc	8.5Madc	85mW	2C	2 Amp
TS154-2C-5.8Madc	2,500Ω	5.8Madc	5.8Madc	85mW	2C	2 Amp
TS154-2C-4.1Madc	5,000Ω	4.1Madc	4.1Madc	85mW	2C	2 Amp
TS154-2C-3.1Madc	10,000Ω	3.1Madc	3.1Madc	85mW	2C	2 Amp
TS154-2C-2.6Madc	15,000Ω	2.6Madc	2.6Madc	85mW	2C	2 Amp
TS154-4C-13.0Madc	1,000Ω	13.0Madc	13.0Madc	175mW	4C	2 Amp
TS154-4C-8.4Madc	2,500Ω	8.4Madc	8.4Madc	175mW	4C	2 Amp
TS154-4C-6.2Madc	5,000Ω	6.2Madc	6.2Madc	175mW	4C	2 Amp
TS154-4C-4.5Madc	10,000Ω	4.5Madc	4.5Madc	175mW	4C	2 Amp
TS154-4C-3.5Madc	15,000Ω	3.5Madc	3.5Madc	175mW	4C	2 Amp
TS154-6C-16.0Madc	1,000Ω	16.0Madc	16.0Madc	250mW	6C	2 Amp
TS154-6C-10.0Madc	2,500Ω	10.0Madc	10.0Madc	250mW	6C	2 Amp
TS154-6C-7.2Madc	5,000Ω	7.2Madc	7.2Madc	250mW	6C	2 Amp
TS154-6C-5.0Madc	10,000Ω	5.0Madc	5.0Madc	250mW	6C	2 Amp
TS154-6C-4.2Madc	15,000Ω	4.2Madc	4.2Madc	250mW	6C	2 Amp
TS154-8C-20.0Madc	1,000Ω	20.0Madc	20.0Madc	400mW	8C	2 Amp
TS154-8C-13.0Madc	2,500Ω	13.0Madc	13.0Madc	400mW	8C	2 Amp
TS154-8C-9.0Madc	5,000Ω	9.0Madc	9.0Madc	400mW	8C	2 Amp
TS154-8C-6.4Madc	10,000Ω	6.4Madc	6.4Madc	400mW	8C	2 Amp
TS154-8C-5.3Madc	15,000Ω	5.3Madc	5.3Madc	400mW	8C	2 Amp

ULTRA-SENSITIVE CURRENT ADJUSTMENT

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Pick-up Power	Contact Arrangement [3]	Contact Rating [4]
TSS154-2C-6.5Madc	1,000Ω	6.5Madc	6.5Madc	40mW	2C	1 Amp
TSS154-2C-4.1Madc	2,500Ω	4.1Madc	4.1Madc	40mW	2C	1 Amp
TSS154-2C-2.9Madc	5,000Ω	2.9Madc	2.9Madc	40mW	2C	1 Amp
TSS154-2C-2.0Madc	10,000Ω	2.0Madc	2.0Madc	40mW	2C	1 Amp
TSS154-2C-1.7Madc	15,000Ω	1.7Madc	1.7Madc	40mW	2C	1 Amp
TSS154-4C-9.0Madc	1,000Ω	9.0Madc	9.0Madc	80mW	4C	1 Amp
TSS154-4C-5.8Madc	2,500Ω	5.8Madc	5.8Madc	80mW	4C	1 Amp
TSS154-4C-4.1Madc	5,000Ω	4.1Madc	4.1Madc	80mW	4C	1 Amp
TSS154-4C-3.0Madc	10,000Ω	3.0Madc	3.0Madc	80mW	4C	1 Amp
TSS154-4C-2.4Madc	15,000Ω	2.4Madc	2.4Madc	80mW	4C	1 Amp

AC RELAYS

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Contact Arrangement [3]	Contact Rating [4]
T154-2C-6VAC	14Ω	6V	5.0V	2PDT	2 Amp
T154-2C-12VAC	65Ω	12V	9.0V	2PDT	2 Amp
T154-2C-24VAC	280Ω	24V	18.0V	2PDT	2 Amp
T154-2C-48VAC	1,250Ω	48V	36.0V	2PDT	2 Amp
T154-2C-115VAC	6,000Ω	115V	86.0V	2PDT	2 Amp
T154-2C-220VAC	15,000Ω	220V	170.0V	2PDT	2 Amp

Catalog No. [1] [2]	Coil Res.	Input	Pick-up	Contact Arrangement [3]	Contact Rating [4]
T154-4C-6VAC	14Ω	6V	5.0V	4PDT	2 Amp
T154-4C-12VAC	65Ω	12V	9.0V	4PDT	2 Amp
T154-4C-24VAC	280Ω	24V	18.0V	4PDT	2 Amp
T154-4C-48VAC	1,250Ω	48V	36.0V	4PDT	2 Amp
T154-4C-115VAC	6,000Ω	115V	86.0V	4PDT	2 Amp
T154-4C-220VAC	15,000Ω	220V	170.0V	4PDT	2 Amp

NOTES:

1. Single-point contacts shown as standard; for bifurcated contacts, substitute "163" for "154".
2. Solder lug terminals shown as standard; for printed circuit mounts, add "P" after "T", "TS" or "TSS".

Note: Solder Lug terminals not supplied on printed circuit mount relays.

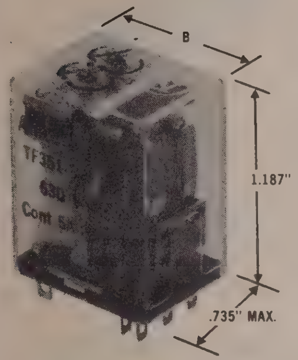
3. Form C contact arrangement shown as standard; for Form A, B or D, substitute appropriate letter.
4. 5-amp and 10-amp contacts are also available for Standard DC and AC single-point-contact relays; if desired, add "F" after "T" for 5-amp; and add "Y" after "T" for 10-amp.

Allied Control Relays

General Purpose Relays (cont'd)

CRADLE® SERIES T351/T362

MAGNETIC LATCH RELAYS



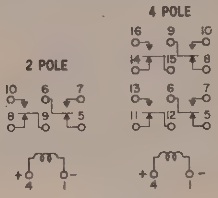
B	.937" for 2C
B	1.172" for 4C

Catalog No. 1 2	Coil Res.	Input	Transfer Voltage	Contact 3 Arrangement	Contact 4 Rating
SINGLE COIL					
T351-2C-12VDC	166Ω	12V	7.0V	2C	2 Amp
T351-2C-24VDC	630Ω	24V	14.5V	2C	2 Amp
T351-4C-12VDC	166Ω	12V	7.0V	4C	2 Amp
T351-4C-24VDC	630Ω	24V	14.5V	4C	2 Amp
DUAL COIL					
T351-2C-2/12VDC	134/134Ω	2/12V	9.2V	2C	2 Amp
T351-2C-2/24VDC	485/485Ω	2/24V	18.0V	2C	2 Amp
T351-4C-2/12VDC	134/134Ω	2/12V	9.2V	4C	2 Amp
T351-4C-2/24VDC	485/485Ω	2/24V	18.0V	4C	2 Amp

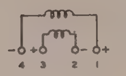
NOTES:

1. Single-point contacts shown as standard; for bifurcated contacts, substitute "362" for "351."
2. Solder lug terminals shown as standard; for printed circuit mounts, add "P" after "T."
3. Form C contact arrangement shown as standard; for Form A, B or D, substitute appropriate letters.
4. 5-amp contacts are also available for single-point-contact relays; if desired, add "F" after "T" for 5-amp, and add "Y" after "T" for 10-amp.

WIRING DIAGRAM
(RESET POSITION SHOWN)



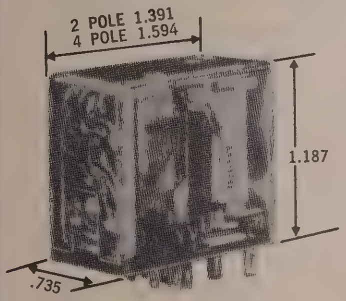
SINGLE WINDING
CIRCUIT DIAGRAMS
TO OPERATE REVERSE POLARITY



DUAL WINDING
CIRCUIT DIAGRAMS
1-4 OPERATE 2-3 RESET

- Consult factory for other voltage coils.

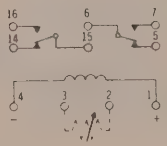
TIMERS, DPDT 5 AMP — Series TD10



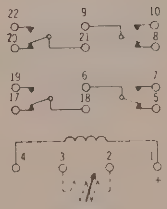
The TD10 utilizes the service proved T154 Cradle® relay with a solid state timing circuit to provide timing from 0.1 to 100 seconds with +2% repeat accuracy.

Available as "time delay to make" or "interval" timing models with optional operating and mounting features.

Catalog Number	Time Range (in seconds)	Input Volt
INTERVAL		
TD10NA-2C-12DNB	0.1 to 10	12VDC
TD10NA-2C-24DNB	0.1 to 10	24VDC
TD10NA-2C-115ANB	0.1 to 10	115VAC 50/60 Hz
TD10NA-2C-12DND	1 to 100	12VDC
TD10NA-2C-24DND	1 to 100	24VDC
TD10NA-2C-115AND	1 to 100	115VAC 50/60 Hz
DELAY TO MAKE		
TD10DA-2C-12DNB	0.1 to 10	12VDC
TD10DA-2C-24DNB	0.1 to 10	24VDC
TD10DA-2C-115ANB	0.1 to 10	115VAC 50/60 Hz
TD10DA-2C-12DND	1 to 100	12VDC
TD10DA-2C-24DND	1 to 100	24VDC
TD10DA-2C-115AND	1 to 100	115VAC 50/60 Hz



2 POLE



4 POLE

TIME DELAY ON MAKE	Before	During	After
INPUT		■	
N.O. CONTACT		← TD → ■	
N.C. CONTACT	■	■	■

INTERVAL	Before	During	After
INPUT		■	
N.O. CONTACT		■	
N.C. CONTACT	■	← TD →	■

Gould Inc., Industrial Controls Division
100 Relay Road, Plantsville, CT 06479
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TWX 710-473-0079

GOULD
Electronics

Allied Control Relays

General Purpose Relays (cont'd)

Industrial Sockets — Class 50
Slimline Design — Self-lifting Wire Clips
Compact Construction — Unbreakable Polycarbonate Body

APPLICATIONS

- Electro-mechanical relays
- Thermal timers
- Solid state and hybrid time delay relays
- Solid state controls for liquid level sensing and other processes

FEATURES

- **UL Recognized File No. 48784. CSA Certified File No. 28098.**
- UL rated for flammability to 94V2 with high-voltage arc track characteristics.
- Screw terminals and captive self-lifting wire clips for reliable and easy wire insertion.*
- Patented design assures positive connection that exceeds UL486 requirements for wire pull-out specifications, including heat and security standards.
- Dielectric strength: 2000V.
- Contrasting all-black bodies and accessories with nickel color terminals that facilitate easy wiring and/or trouble shooting.
- Integral molded barrier construction. Durable polycarbonate body. Back plate ultrasonically welded to body, eliminating need for additional panel insulation.
- Choice of mountings: direct panel or track.
- Track: strong, lightweight aluminum; standard length 3 feet.

* Combination slot/Phillips head screw available on request.

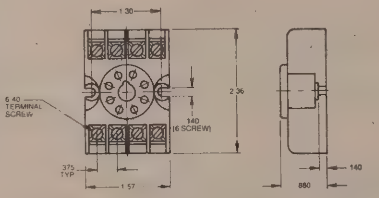
Octal Sockets for Cradle Relay

Catalog No.	Contact Arrangement
H50SL608	8 pin — 2 pole double throw
H50SL611	11 pin — 3 pole double throw

Blade Socket for Midget Power Relay

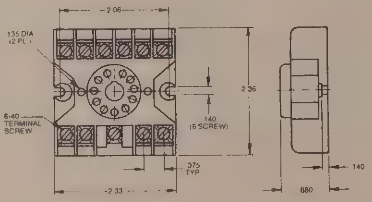
Catalog No.	Contact Arrangement
H50SL708	2 pole double throw
H50SL711	3 pole double throw
H50SL715	4 pole double throw

H50SL608
Industrial 8-pin octal socket. Rating: UL and CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.

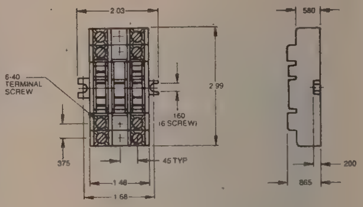

1 30
6 40 TERMINAL SCREW
2 36
140 (6 SCREW)
375 TYP
1 57
140
880

NOTE SL608A is same as Model SL608 except Terminals standard pan head 6-40 screw

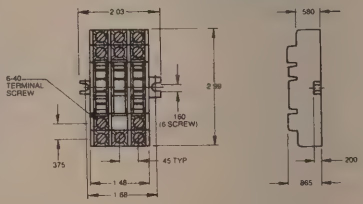
H50SL611
Industrial 11-pin magnol socket. Rating: UL and CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.


2 06
135 DIA (2 PL)
6-40 TERMINAL SCREW
2 36
140 (6 SCREW)
375 TYP
2 33
140
880

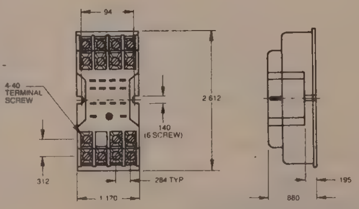
H50SL708
Industrial 8-pin blade type socket. Rating: UL, 15 amperes, 300 VAC; CSA, 10 amperes, 300 VAC. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.


2 03
580
6-40 TERMINAL SCREW
2 99
160 (6 SCREW)
375
45 TYP
1 48
1 68
200
865

H50SL711
Industrial 11-pin blade type socket. Rating: UL, 15 amperes, 300 VAC; CSA, 10 amperes. Wire sizes: up to #12 AWG. Terminals: pan head 6-40 screw.


2 03
580
6-40 TERMINAL SCREW
2 99
160 (6 SCREW)
375
45 TYP
1 48
1 68
200
865

H50SL715
Industrial 14-pin blade type socket. Rating: UL and CSA, 5 amperes, 300 VAC. Wire sizes: up to #14 AWG. Terminals: pan head 4-40 screw.


94
4-40 TERMINAL SCREW
2 612
140 (6 SCREW)
312
284 TYP
1 170
195
880

Gould Inc., Industrial Controls Division
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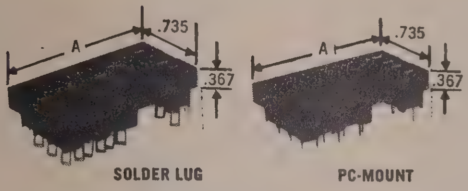
GOULD Electronics

Allied Control Relays

General Purpose Relays (cont'd)

CRADLE® SOCKETS AND HARDWARE



Dimensions			
Poles	**A**	**Poles**	**A**
2-Pole	1.000″	6-Pole	1.430″
4-Pole	1.205″	8-Pole	1.645″

T-Series Cradle® Relay Sockets

Redesigned, improved, and directly interchangeable with other Cradle® type sockets.

FEATURES

- Body molded of glass filled flame retardant Polyester (PBT).

  Can be wave soldered and cleaned with commercial solvents without degradation.

  Meets U.L. 94VO and is fungus resistant.
- Wider contact mating surface.

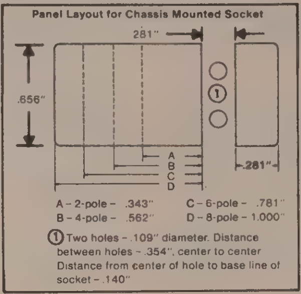
  Provides for higher reliability of relay terminal mating.
- One piece contact/terminal construction of beryllium copper.

  More conductive, greater strength higher spring rate.
- Selectively plated gold over nickel on contact area–60/40 Brite-Tin on terminal area.
- Low insertion and high withdrawal forces of relay to socket.

  Assures maximum retention.
- Captive ground spring.

  Once inserted, not easily dislodged.
- Provision for either end or side retainer/bale.
- U.L. E-20604.
- C.S.A. LR34171.

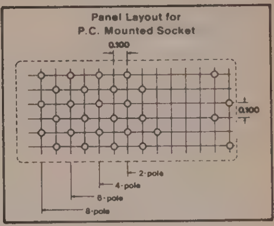
Panel Layout for Chassis Mounted Socket



A – 2-pole – .343″
B – 4-pole – .562″
C – 6-pole – .781″
D – 8-pole – 1.000″

① Two holes – .109″ diameter. Distance between holes – .354″, center to center Distance from center of hole to base line of socket – .140″

Panel Layout for P.C. Mounted Socket



Ordering Information and Available Options

T-Series relay sockets accommodate Gould Cradle® relay models: T154/T163, T351/T362, and TD10 timers, as well as equivalent competitive models. Order sockets with the mounting configuration required by your application and the number of poles required by the relay, using the guidelines below.

CRADLE® SOCKET ORDERING INFORMATION

T- ☐ ☐ ☐ ☐☐
① ② ③ ④

① Number of Poles
  2=2-pole socket
  4=4-pole socket
  6=6-pole socket
  8=8-pole socket

② Type of Terminal
  1=Solder lug/chassis mounted
  3=Standard PC in-line mounting
  5=PC mounting, .100″ × .100″ grid throughout
  7=PC mounting, .100″ × .100″ grid in contact terminal area
  .100″ × .150″ grid in coil terminal area

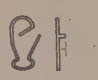
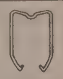
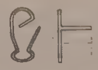
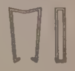
③ Contact Finish*
  1=10 to 12 microinch gold over nickel contact area

④ Socket Assemblies*
  10=Socket only
  11=Socket with ground spring installed
  12=Socket with ground spring installed and retainer
  13=Socket with retainer

Examples:
T-21110: 2-pole, solder/lug chassis mount, standard gold contact plating, socket only.
T-43112: 4-pole, PC in-line mounting, standard gold contact plating, with ground spring and standard retainer.

* Consult factory for additional variations

Accessories

Part Name	Part No.	Diagram	Retainer-Part No.	Diagram
Ground Spring for Solder Lug/Chassis	T-00101		T-00102 2-pole	 to be inserted into recesses on narrow sides of sockets
			T-00104 4-pole	
			T-00106 6-pole	
Ground Spring for all P.C. mounted sockets	T-00105		T-00108 8-pole Flat Retainer	

All dimensions in inches unless otherwise noted General tolerance ±.015

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GOULD
Electronics

For manufacturers' sales offices, see yellow pages

Allied Control Relays

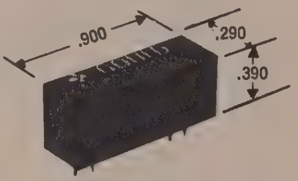
Low Profile Relays

SERIES SR SIP RELAYS

FEATURES:

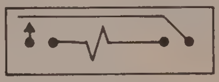
- Superior switching – 2 ampere Bifurcated contacts, handles (6) times the inductive load of a standard size Form "A" contact Reed Relay.
- Small space – ¼ in² PCB space with .390″ max. height.
- Easy mounting, symmetrical, eliminates installation errors. Mounts in PCB or on strip or in DIP sockets.
- Fast response – 2 ms typical at rated pull in voltage, 1 ms release.
- 420-SEO Valox Housing meets UL 94V-0 flammability requirement.
- Housing resists fluorocarbon, aqueous detergent and chlorinated commercial solvents.

NEW! SERIES SR– SINGLE-IN-LINE

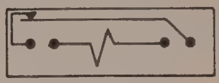


Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPST-NO[1]						
SR-1A-3VDC	38Ω	3V	2.3V	0.13V	125mW	2 Amp
SR-1A-5VDC	95Ω	5V	3.7V	0.19V	125mW	2 Amp
SR-1A-6VDC	150Ω	6V	4.5V	0.23V	125mW	2 Amp
SR-1A-9VDC	380Ω	9V	6.8V	0.34V	125mW	2 Amp
SR-1A-12VDC	600Ω	12V	9.0V	0.45V	125mW	2 Amp
SR-1A-18VDC	1,500Ω	18V	13.5V	0.70V	125mW	2 Amp
SR-1A-24VDC	2,400Ω	24V	18.0V	0.90V	125mW	2 Amp
SR-1A-48VDC	6,000Ω	48V	36.0V	1.80V	125mW	2 Amp

NOTE:
1. For SPST-NC, substitute "1B" for "1A." For example SR-1B-3VDC.

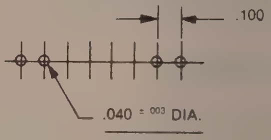


1 FORM A CONTACTS



1 FORM B CONTACTS

PC LAYOUT GRID

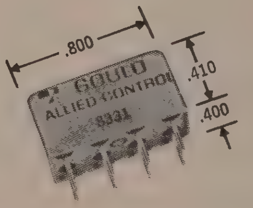


ORDER DATA
EXAMPLE: SR-1A-12 VDC

MILITARY TYPE RELAY-MODEL ST

DC 2 Pole Double Throw (2 Amperes)

PART NUMBER ST 6A1-26.5VDC



FEATURES:

- Reliability By Design.
- Complete Welded Construction.
- Bifurcated Contacts.
- High Contact Force.
- Balanced Armature.
- Low Profile, High Density Package.
- Mounting Versatility.
- 2 Form C Contact Configuration.

Contact Rating†: (at nominal coil voltage)
Contact Bounce — 5 MS Maximum
Non-inductive —
2 ampere at 28 volts d-c, 0.3 ampere at 115 volts a-c 60 to 400 cps.
Inductive: 0.75 ampere at 28 volts d-c.

Initial Contact Resistance:
0.100 ohms maximum

Contact Arrangement:
Double pole double throw

Ambient Temperature:
−55°C to +85°C

Dielectric Strength:
1000 volts rms at sea level
500 volts rms between open contacts and between coil terminals and case,
350 volts rms at 80,000 feet

Coil Data Operating Conditions at 25°C

Nominal Voltage VDC	Pick-Up VDC Max.	Drop-Out VDC Min.	Coil Resistance Ohms ±20%
26.5	16	0.5	770

Vibration:
5 to 28 cps at .5 inch double amplitude
28 to 2000 cps at a constant 20g

Shock:
50g operational

Operate Time: (at +25 C)
4 milliseconds maximum at nominal coil voltage

Release Time: (at +25 C)
4 milliseconds maximum at nominal coil voltage

Enclosure:
Hermetically sealed by welding

Terminals:
Plug-in, printed circuit, and hook type

Weight:
0.3 ounce maximum

† AC ratings are for single phase case grounded

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Low Profile Relays

SERIES MPC MINIATURE RELAYS

Series MPC – Miniature PC, Standard
Series MPCS – Miniature PC, Sensitive
Series MPCL – Miniature PC, Latching

FEATURES:

LOW PROFILE – miniature dc operated relay offers space savings comparable to reed relay

LONG LIFE – patented hingeless armature construction insures long mechanical life

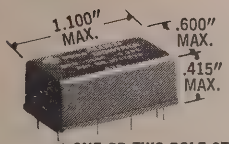
POWER SWITCHING – using standard gold plated silver contact material, MPC Relay has power handling capability of 50 watts per pole

HIGH RELIABILITY – interlocking housing to base minimizes contaminants affecting performance

MULTI-POLE CONTACTS – one form C to four form C available in two basic case sizes

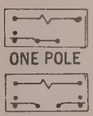
SENSITIVE VERSION – operates from TTL – Driver circuits, available in one form C and two form C within same package size

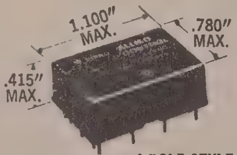
SERIES MPC – STANDARD VERSION



ONE OR TWO POLE STYLE

TOP VIEW



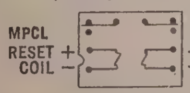


4-POLE STYLE

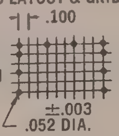
Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPDT						
MPC-1C-5VDC	35Ω	5V	3.7V	0.37V	400 mW	2 Amp
MPC-1C-6VDC	50Ω	6V	4.5V	0.45V	400 mW	2 Amp
MPC-1C-12VDC	200Ω	12V	9.0V	0.9V	400 mW	2 Amp
MPC-1C-20VDC	550Ω	20V	15.0V	1.5V	400 mW	2 Amp
MPC-1C-24VDC	800Ω	24V	18.0V	1.8V	400 mW	2 Amp
MPC-1C-48VDC	3,200Ω	48V	36.0V	3.6V	400 mW	2 Amp
DPDT						
MPC-2C-5VDC	35Ω	5V	3.7V	0.37V	400 mW	2 Amp
MPC-2C-6VDC	50Ω	6V	4.5V	0.45V	400 mW	2 Amp
MPC-2C-12VDC	200Ω	12V	9.0V	0.9V	400 mW	2 Amp
MPC-2C-20VDC	550Ω	20V	15.0V	1.5V	400 mW	2 Amp
MPC-2C-24VDC	800Ω	24V	18.0V	1.8V	400 mW	2 Amp
MPC-2C-48VDC	3,200Ω	48V	36.0V	3.6V	400 mW	2 Amp
4PDT[1]						
MPC-4C-5VDC	26Ω	5V	3.7V	0.37V	550 mW	2 Amp
MPC-4C-6VDC	38Ω	6V	4.5V	0.45V	550 mW	2 Amp
MPC-4C-12VDC	150Ω	12V	9.0V	0.9V	550 mW	2 Amp
MPC-4C-20VDC	400Ω	20V	15.0V	1.5V	550 mW	2 Amp
MPC-4C-24VDC	600Ω	24V	18.0V	1.8V	550 mW	2 Amp
MPC-4C-48VDC	2,400Ω	48V	36.0V	3.6V	550 mW	2 Amp

NOTE:
1. For a 3PDT substitute "3C" for "4C."

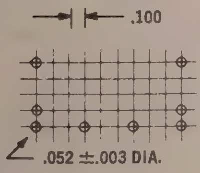
BOTTOM VIEW
(RESET POSITION SHOWN)
(2 POLE)



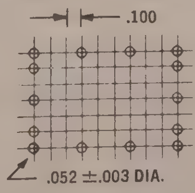
PC LAYOUT & GRID



MPC TWO POLE RELAY



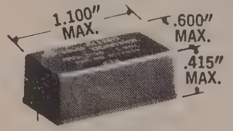
MPC FOUR POLE RELAY



Note: Consult factory for dual source footprint layout.

SERIES MPCS – SENSITIVE VERSION

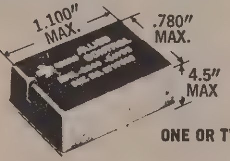
Operates from TTL – Driver Circuits



Catalog No.	Coil Res.	Input	Pull-in	Drop-out	Pick-up Power	Contact Rating
SPDT						
MPCS-1C-5VDC	80Ω	5V	46 mA	5 mA	160 mW	2 Amp
MPCS-1C-6VDC	125Ω	6V	4.5V	0.45V	160 mW	2 Amp
MPCS-1C-12VDC	500Ω	12V	9.0V	0.9V	160 mW	2 Amp
MPCS-1C-24VDC	2,000Ω	24V	18.0V	1.8V	160 mW	2 Amp
MPCS-1C-48VDC	8,000Ω	48V	36.0V	3.6V	160 mW	2 Amp
DPDT						
MPCS-2C-5VDC	80Ω	5V	46 mA	5 mA	160 mW	2 Amp
MPCS-2C-6VDC	125Ω	6V	4.5V	0.45V	160 mW	2 Amp
MPCS-2C-12VDC	500Ω	12V	9.0V	0.9V	160 mW	2 Amp
MPCS-2C-24VDC	2,000Ω	24V	18.0V	1.8V	160 mW	2 Amp
MPCS-2C-48VDC	8,000Ω	48V	36.0V	3.6V	160 mW	2 Amp

For sealed version precede catalog number with an "S." For example SMPC-2C-12VDC.

SERIES MPCL – LATCHING VERSION



ONE OR TWO POLE STYLE

Two completely isolated coils; minimum pulse width: 10 ms.

Catalog No.	Coil Res.	Input	Latch or Reset Voltage	Power	Contact Rating
SPST					
MPCL-1A-5VDC	15.8Ω	5V	3.7V	800mW	2 Amp
MPCL-1A-6VDC	25.0Ω	6V	4.5V	800mW	2 Amp
MPCL-1A-12VDC	100.0Ω	12V	9.0V	800mW	2 Amp
MPCL-1A-24VDC	400.0Ω	24V	18.0V	800mW	2 Amp
MPCL-1A-48VDC	1,600.0Ω	48V	36.0V	800mW	2 Amp
DPDT					
MPCL-2A-5VDC	15.8Ω	5V	3.7V	800mW	2 Amp
MPCL-2A-6VDC	25.0Ω	6V	4.5V	800mW	2 Amp
MPCL-2A-12VDC	100.0Ω	12V	9.0V	800mW	2 Amp
MPCL-2A-24VDC	400.0Ω	24V	18.0V	800mW	2 Amp
MPCL-2A-48VDC	1,600.0Ω	48V	36.0V	800mW	2 Amp

For sealed version precede catalog number with an "S." For example SMPCL-2A-12VDC.

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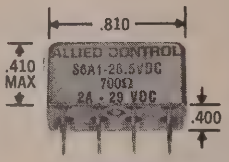
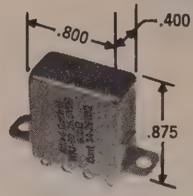
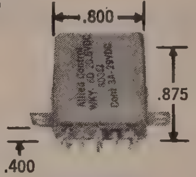


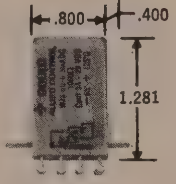
SERIES S6A1



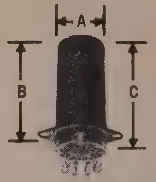
SERIES WKJ-6D



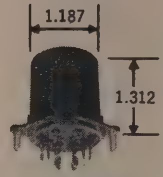
SERIES WKY-6D



SERIES WJS-6D



SERIES MH/MHB/MHJ



SERIES MHY-12D

Now per MIL-R-3901

FEATURES

- **Series S:** ½ Size Crystal Can, 2 amps
- **Series WKJ/WKY:** Crystal Can, 3 amps
- **Series WJS:** Sensitive, Long Crystal Can, 3 amps
- **Series MH/MHB/MHJ:** Miniature Round Can, 5 amps
- **Series MHY:** Miniature Round Can, 10 amps

Specification per MIL-R-5757 and MIL-R-39016 as applicable.

	(Dim. in Inches) A	B	C
DPDT	.635	1.312	1.796
4PDT*	1.046	1.312	1.750
6PDT*	1.187	1.312	1.750

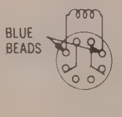
* Mounting bracket includes studs

CRYSTAL CAN RELAYS

Bifurcated contacts make these relays ideal for dry circuit loads up to rated amperage.

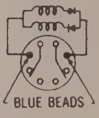
Catalog No.	Contact Arrangement	Coil Res.	Input	Contact Rating
SERIES S — DC RELAYS				
S6-A1-12VDC	DPDT	140Ω	12.0V	2 Amp
S6-A1-26.5VDC	DPDT	700Ω	26.5V	2 Amp
SERIES WKJ/WKY — DC RELAYS				
WKJ-6D-12VDC	DPDT	150Ω	12.0V	3 Amp
WKJ-6D-26.5VDC	DPDT	600Ω	26.5V	3 Amp
WKJ-6D-115VDC	DPDT	10,000Ω	115.0V	3 Amp
WKY-6D-12VDC	DPDT	150Ω	12.0V	3 Amp
WKY-6D-26.5VDC	DPDT	600Ω	26.5V	3 Amp
WKY-6D-115VDC	DPDT	10,000Ω	115.0V	3 Amp
SERIES WJS — DC RELAYS				
WJS-3D-5.0Madc	SPDT	1,000Ω	7.5Madc	3 Amp
WJS-3D-3.2Madc	SPDT	2,500Ω	4.8Madc	3 Amp
WJS-3D-1.6Madc	SPDT	10,000Ω	2.4Madc	3 Amp
WJS-6D-6.3Madc	DPDT	1,000Ω	9.4Madc	3 Amp
WJS-6D-4.0Madc	DPDT	2,500Ω	6.0Madc	3 Amp
WJS-6D-2.0Madc	DPDT	10,000Ω	3.0Madc	3 Amp

DC RELAYS

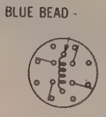


DC

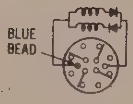
AC RELAYS



AC



DC



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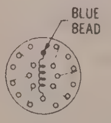

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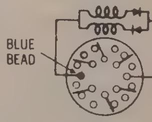

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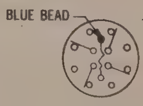
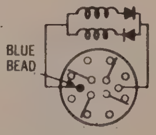
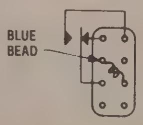


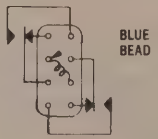
DC



AC



SPDT



DPDT

MINIATURE ROUND CAN RELAYS

Series MH/MHB/MHJ — DC Relays — up to 5 amps

Catalog No.	Contact Arrangement	Coil Res.	Input	Temp. Range	Contact Rating
SERIES MH — DC RELAYS					
MH-6D-12VDC	DPDT	82Ω	12.0V	−55°C to +85°C	5 Amp
MH-6D-26.5VDC	DPDT	400Ω	26.5V		5 Amp
MH-6D-115VDC	DPDT	6,500Ω	115.0V		5 Amp
MH-12D-12VDC	4PDT	60Ω	12.0V		5 Amp
MH-12D-26.5VDC	4PDT	300Ω	26.5V		5 Amp
MH-12D-115VDC	4PDT	5,000Ω	115.0V		5 Amp
MH-18D-12VDC	6PDT	48Ω	12.0V		5 Amp
MH-18D-26.5VDC	6PDT	240Ω	26.5V		5 Amp
MH-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp
SERIES MHB — DC RELAYS					
MHB-6D-12VDC	DPDT	65Ω	12.0V	−65°C to +125°C	5 Amp
MHB-6D-26.5VDC	DPDT	325Ω	26.5V		5 Amp
MHB-6D-115VDC	DPDT	6,000Ω	115.0V		5 Amp
MHB-12D-12VDC	4PDT	50Ω	12.0V		5 Amp
MHB-12D-26.5VDC	4PDT	250Ω	26.5V		5 Amp
MHB-12D-115VDC	4PDT	5,000Ω	115.0V		5 Amp
MHB-18D-12VDC	6PDT	40Ω	12.0V		5 Amp
MHB-18D-26.5VDC	6PDT	200Ω	26.5V		5 Amp
MHB-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp
SERIES MHJ — DC RELAYS					
MHJ-12D-12VDC	4PDT	50Ω	12.0V	−65°C to +125°C	5 Amp
MHJ-12D-26.5VDC	4PDT	250Ω	26.5V		5 Amp
MHJ-12D-115VDC	4PDT	5,000Ω	115.0V		5 Amp
MHJ-18D-12VDC	6PDT	40Ω	12.0V		5 Amp
MHJ-18D-26.5VDC	6PDT	200Ω	26.5V		5 Amp
MHJ-18D-115VDC	6PDT	3,500Ω	115.0V		5 Amp
(MHJ capabilities 20G to 2000 Hz)					
SERIES MHB-MHJ — AC RELAYS					
MHB-6A-115VAC	DPDT	4215/ 4215	115.0V	−65°C to +125°C	5 Amp
MHJ-12A-115VAC	4PDT	2765/ 2765	115.0V		5 Amp
MHJ-18A-115VAC	6PDT	2635/ 2635	115.0V		5 Amp
(MHJ capabilities 20G to 2000 Hz)					
SERIES MHY — AC AND DC RELAYS					
MHY-12A-115VAC	4PDT	2635/ 2635	115.0V	−55°C to +85°C	10 Amp
MHY-12D-12VDC	4PDT	40Ω	12.0V	−65°C to +125°C	10 Amp
MHY-12D-26.5VDC	4PDT	200Ω	26.5V		10 Amp
MHY-12D-115VDC	4PDT	3,500Ω	115.0V		10 Amp

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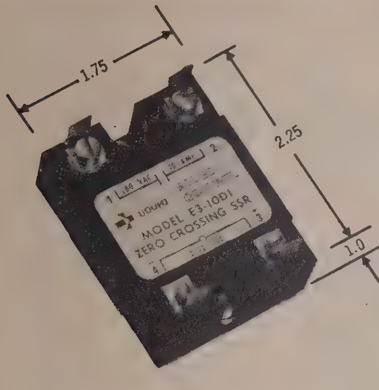
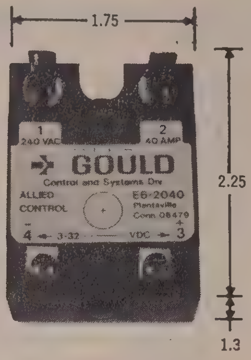
Allied Control Relays

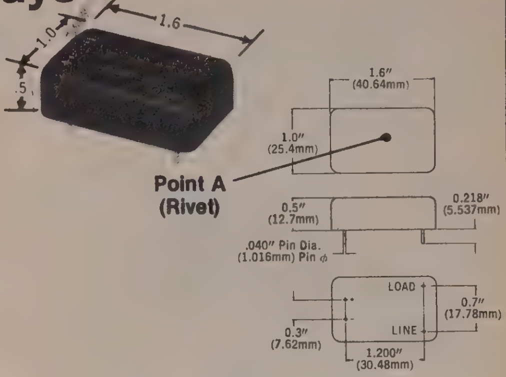
Solid State Relays


1.75
2.25
1.0
MODEL E3-10D1
ZERO CROSSING SSR

SERIES E3 — Optically isolated, zero crossing.


1.75
2.25
1.3
1
240 VAC
2
40 AMP
GOULD
Control and Systems Div
ALLIED
CONTROL
E6-2040
Plantsville
Conn 06479
4
3-32
VDC
3

SERIES E6 — Optically isolated, zero crossing, "integral cycling."


1.6
1.0
.5
Point A
(Rivet)
1.6″
(40.64mm)
1.0″
(25.4mm)
0.5″
(12.7mm)
0.218″
(5.537mm)
.040″ Pin Dia.
(1.016mm) Pin ⌀
LOAD
LINE
0.7″
(17.78mm)
0.3″
(7.62mm)
1.200″
(30.48mm)

SERIES E22 — Optically isolated, miniature full-wave power switching pc mounting.

FEATURES:

- Bounceless switching
- Long life
- Integrated circuit compatibility
- High noise immunity
- Photo isolated

Note: Consult factory for technical data on heat sink and special applications:

Catalog Number	Max. Load Current	Input	Output (AC)	Contact Type	Surge One Cycle	Max. Contact Voltage Drop	Off State Leakage Current	Pick-up Voltage	Drop-out Voltage	Input Impedance
SERIES E3										
E3-10D1A	10A	3-32VDC	280	A	100A	1.6V	8MA	3VDC	1VDC	2200Ω
E3-10D1B	10A	3-32VDC	280	B	100A	1.6V	8MA	3VDC	1VDC	2200Ω
E3-10A0A	10A	20-28VAC	280	A	100A	1.6V	8MA	18VAC	10VAC	10KΩ
E3-10A0B	10A	20-28VAC	280	B	100A	1.6V	8MA	18VAC	10VAC	10KΩ
E3-10A4A	10A	100-135VAC	280	A	100A	1.6V	8MA	90VAC	10VAC	40KΩ
E3-10A4B	10A	100-135VAC	280	B	100A	1.6V	8MA	90VAC	10VAC	40KΩ
E3-25D1A	25A	3-32VDC	280	A	250A	2V	8MA	3VDC	1VDC	2200Ω
E3-25D1B	25A	3-32VDC	280	B	250A	2V	8MA	3VDC	1VDC	2200Ω
E3-25A0A	25A	20-28VAC	280	A	250A	2V	8MA	18VAC	10VAC	10KΩ
E3-25A0B	25A	20-28VAC	280	B	250A	2V	8MA	18VAC	10VAC	10KΩ
E3-25A4A	25A	100-135VAC	280	A	250A	2V	8MA	90VAC	10VAC	40KΩ
E3-25A4B	25A	100-135VAC	280	B	250A	2V	8MA	90VAC	10VAC	40KΩ
E3-40D1A	40A	3-32VDC	280	A	400A	2V	8MA	3VDC	1VDC	2200Ω
E3-40D1B	40A	3-32VDC	280	B	400A	2V	8MA	3VDC	1VDC	2200Ω
E3-40A0A	40A	20-28VAC	280	A	400A	2V	8MA	18VAC	10VAC	10KΩ
E3-40A0B	40A	20-28VAC	280	B	400A	2V	8MA	18VAC	10VAC	10KΩ
E3-40A4A	40A	100-135VAC	280	A	400A	2V	8MA	90VAC	10VAC	40KΩ
E3-40A4B	40A	100-13	280	B	400A	2V	8MA	90VAC	10VAC	40KΩ
SERIES E6										
E6-1010	10A	3-32VDC	120	A	100A	1.6V	6MA	3VDC	1VDC	1KΩ
E6-2010	10A	3-32VDC	240	A	100A	1.6V	7.5MA	3VDC	1VDC	1KΩ
E6-4010	10A	3-32VDC	480	A	100A	1.6V	8MA	3VDC	1VDC	1KΩ
E6-1025	25A	3-32VDC	120	A	250A	2V	6MA	3VDC	1VDC	1KΩ
E6-2025	25A	3-32VDC	240	A	250A	2V	7.5MA	3VDC	1VDC	1KΩ
E6-4025	25A	3-32VDC	480	A	250A	2V	8MA	3VDC	1VDC	1KΩ
E6-1040	40A	3-32VDC	120	A	400A	2V	6MA	3VDC	1VDC	1KΩ
E6-2040	40A	3-32VDC	240	A	400A	2V	7.5MA	3VDC	1VDC	1KΩ
E6-4040	40A	3-32VDC	480	A	400A	2V	8MA	3VDC	1VDC	1KΩ
SERIES E22										
E22N	4A	3-32VDC	260	A	60A	1.6V	5MA	3VDC	1VDC	2200Ω

1. Max current load when proper heat sink applied.

Gould Inc., Industrial Controls Division
100 Relay Road, Plantsville, CT 06479
Telephone (203) 621-6771
TWX 710-473-0079

GOULD
Electronics

Grayhill INC.

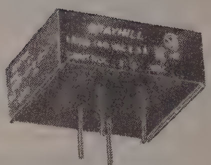
Solid State Relays

PC Mount and Plug In

V

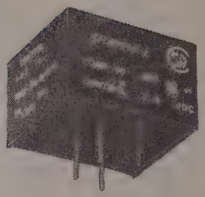
3A

H



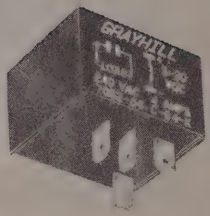
2.5A

F



4A

K



4A

Relays are shown at 50% actual size.

Miniature But Mighty

.680 Square Inch Area

Use Style V

1/2 The Size Of Hockey Pucks

Replace With S and N

- CMOS and TTL Compatible
- Excellent Transient Protection
- High Blocking Voltage
- High Surge Current Rating
- Minimal RFI And EMI
- Zero Voltage Turn-On
- UL And CSA Certified
- 100% Tested
- Loads Up To 25 Amps

Dimensions

Body length, width, and height in inches.

B = 2.1 x 1.1 x 1.0
D* = 1.8 x 1.5 x 1.0
F = 1.2 x 1.0 x 0.9
H = 1.2 x 1.0 x 0.5
K = 1.2 x 1.0 x 0.9
L* = 1.2 x 1.0 x 0.5
M* = 1.2 x 1.0 x 0.9
N* = 1.2 x 1.0 x 0.9
S* = 1.2 x 1.0 x 0.9
V = 1.7 x 0.4 x 1.0

*For styles L, M, N and S, heat sink extends the length to 2.2″; for style D, extended length is 2.8″.

Specifications

	24 Vac Load	120 Vac Load	240 Vac Load
Blocking Voltage:	200V	400V	600V
Zero Voltage & Offset:	6V	8V	18V

Transient Protection: (Relay does not turn on):
3000 Volts per microsecond for the 2.5, 3, 4, and 25 Amp relays.
4000 Volts per microsecond for the 6, 10, 12, and 15 Amp relays.

Surge Current Rating (At 1 full cycle duration):
60 Amps for the 2.5, 3, 4, and 6 Amp relays.
110 Amps for the 10 Amp relay.
150 Amps for the 12 and 15 Amp relays.
250 Amps for the 25 Amp relay.

Input Impedance: Average 2000 Ohms for control ranges of 3-30 Vdc and 3-32 Vdc. Average 6000 Ohms for control ranges of 6-30 Vdc and 6-32 Vdc.

Mounting: Panel mount styles are rated as if 6 x 6 x ⅛″ Aluminum plate, or as if they had an equivalent heat sink attached. Styles L, M, N, and S mount on Hockey Puck relay centers.

UL Recognition and CSA Certification: UL file number E58632 and CSA file number 38763 apply to all relays shown here.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

. . . Transient Protected

Ordering Information

Loads		Control	Description		Ordering Information	
Load Vac	Max. Amps	Range Vdc	Pkg. Style	Mounting and/or Termination	Part Number	Unit Price
24	2.5	3-32	H	PC	70S2-04-D-02-H	$15.25
24	2.5	6-32	H	PC	70S2-05-D-02-H	15.25
24	3	3-32	V	PC, In-line	70S2-04-D-03-V	12.14
24	3	6-32	V	PC, In-line	70S2-05-D-03-V	12.14
24	4	3-32	F	PC	70S2-04-D-04-F	15.00
24	4	6-32	F	PC	70S2-05-D-04-F	15.00
24	4	3-32	K	Plug-in	70S2-04-D-04-K	15.80
24	4	6-32	K	Plug-in	70S2-05-D-04-K	15.80
120	2.5	3-32	H	PC	70S2-04-B-02-H	15.25
120	2.5	6-32	H	PC	70S2-05-B-02-H	15.25
120	3	3-32	V	PC, In-line	70S2-04-B-03-V	12.91
120	3	6-32	V	PC, In-line	70S2-05-B-03-V	12.91
120	4	3-32	F	PC	70S2-04-B-04-F	15.00
120	4	6-32	F	PC	70S2-05-B-04-F	15.00
120	4	3-32	K	Plug-in	70S2-04-B-04-K	15.80
120	4	6-32	K	Plug-in	70S2-05-B-04-K	15.80
120	6	3-30	N	Bulkhead/Tabs	70S2-04-B-06-N	17.90
120	6	6-30	N	Bulkhead/Tabs	70S2-05-B-06-N	17.90
120	6	3-30	S	Bulkhead/Screws	70S2-04-B-06-S	18.71
120	6	6-30	S	Bulkhead/Screws	70S2-05-B-06-S	18.71
120	6	3-32	L	PC	70S2-04-B-06-L	15.35
120	6	6-32	L	PC	70S2-05-B-06-L	15.35
120	6	3-32	M	PC	70S2-04-B-06-M	15.25
120	6	6-32	M	PC	70S2-05-B-06-M	15.25
120	6	3-30	B	Bulkhead/Tabs	70S2-03-B-06-B	23.50
120	6	3-30	D	Bulkhead/Tabs	70S2-03-B-06-D	23.00
120	10	3-32	M	PC	70S2-04-B-10-M	16.95
120	10	6-32	M	PC	70S2-05-B-10-M	16.95
120	10	3-30	B	Bulkhead/Tabs	70S2-03-B-10-B	23.65
120	10	3-30	D	Bulkhead/Tabs	70S2-03-B-10-D	23.15
120	12	3-30	N	Bulkhead/Tabs	70S2-04-B-12-N	19.55
120	12	6-30	N	Bulkhead/Tabs	70S2-05-B-12-N	19.55
120	12	3-30	S	Bulkhead/Screws	70S2-04-B-12-S	20.60
120	12	6-30	S	Bulkhead/Screws	70S2-05-B-12-S	20.60
120	15	3-30	B	Bulkhead/Tabs	70S2-03-B-15-B	24.60
120	15	3-30	D	Bulkhead/Tabs	70S2-03-B-15-D	24.10
120	25	3-30	S	Bulkhead/Screws	70S2-03-B-25-S	27.35
240	2.5	3-32	H	PC	70S2-04-C-02-H	16.65
240	2.5	6-32	H	PC	70S2-05-C-02-H	16.65
240	3	3-32	V	PC, In-line	70S2-04-C-03-V	14.32
240	3	6-32	V	PC, In-line	70S2-05-C-03-V	14.32
240	4	3-32	F	PC	70S2-04-C-04-F	16.45
240	4	6-32	F	PC	70S2-05-C-04-F	16.45
240	4	3-32	K	Plug-in	70S2-04-C-04-K	17.25
240	4	6-32	K	Plug-in	70S2-05-C-04-K	17.25
240	6	3-30	N	Bulkhead/Tabs	70S2-04-C-06-N	19.40
240	6	6-30	N	Bulkhead/Tabs	70S2-05-C-06-N	19.40
240	6	3-30	S	Bulkhead/Screws	70S2-04-C-06-S	20.16
240	6	6-30	S	Bulkhead/Screws	70S2-05-C-06-S	20.16
240	6	3-32	L	PC	70S2-04-C-06-L	16.75
240	6	6-32	L	PC	70S2-05-C-06-L	16.75
240	6	3-32	M	PC	70S2-04-C-06-M	16.75
240	6	6-32	M	PC	70S2-05-C-06-M	16.75
240	6	3-30	B	Bulkhead/Tabs	70S2-03-C-06-B	24.45
240	6	3-30	D	Bulkhead/Tabs	70S2-03-C-06-D	23.95
240	10	3-32	M	PC	70S2-04-C-10-M	18.65
240	10	6-32	M	PC	70S2-05-C-10-M	18.65
240	10	3-30	B	Bulkhead/Tabs	70S2-03-C-10-B	24.60
240	10	3-30	D	Bulkhead/Tabs	70S2-03-C-10-D	24.10
240	12	3-30	N	Bulkhead/Tabs	70S2-04-C-12-N	21.35
240	12	6-30	N	Bulkhead/Tabs	70S2-05-C-12-N	21.35
240	12	3-30	S	Bulkhead/Screws	70S2-04-C-12-S	22.34
240	12	6-30	S	Bulkhead/Screws	70S2-05-C-12-S	22.34
240	15	3-30	B	Bulkhead/Tabs	70S2-03-C-15-B	25.90
240	15	3-30	D	Bulkhead/Tabs	70S2-03-C-15-D	25.40
240	25	3-30	S	Bulkhead/Screws	70S2-03-C-25-S	28.62

Other Relays

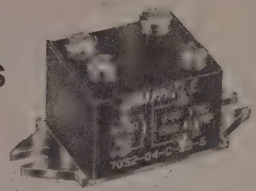
DC to AC Hybrid Relays and DC to DC Solid State Relays are also available. Contact GRAYHILL.

Discount Schedule

1-9	....Unit Price
10-24	....Less 20%
25-49	....Less 28%
50-99	....Less 34%
100-249	....Less 40%
250 UP...	Contact GRAYHILL

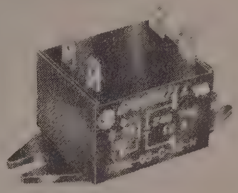
Panel Mount

S



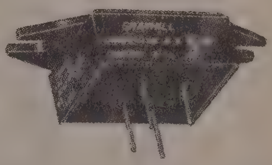
6A, 12A, 25A

N



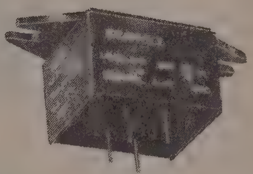
6A, 12A

L



6A

M



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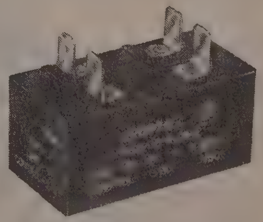
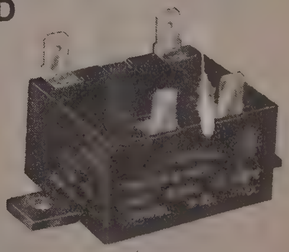
B



6A, 10A, 15A

D



6A, 10A, 15A

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USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
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SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?

GUARDIAN ELECTRIC MANUFACTURING COMPANY

1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

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1310S/1315S 5 amps 4PDT 1418
1310PS/1315PS 5 amps 4PDT 1418
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1360 1422
1380 1423
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SOLENOIDS

Pull Type

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2HD Heavy Duty Box Frame 1428
3HD Heavy Duty Box Frame 1428
4 Box Frame 1428
4HD Heavy Duty Box Frame 1428
11 Box Frame 1428
11HD Heavy Duty Box Frame 1428
12 Laminated 1428
14 Laminated 1428
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SOLENOIDS

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22 Box Frame 1429
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28 Box Frame 1429
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34 U Frame 1429
38 U Frame 1429
42 U Frame 1429

Push Type

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16P Laminated 1429
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Tubular Pull Type

T3.5x9 1430
T4x7 1430
T4x12 1430
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LT4x7 1430
LT4x12 1430
LT4x16 1430
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LT8x16 1431
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TP4x16 1430
TP6x12 1431
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TP8x16 1431
TP12x13 1431
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GUARDIAN ELECTRIC MANUFACTURING COMPANY
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

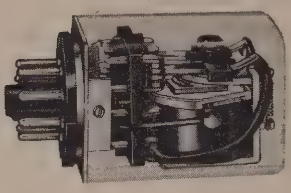
ENCLOSED RELAYS

1210/1215/1210N

- **Contacts rated 10 amps at 120VAC**
- A.C. coil voltages (1210) 24, 10, 240
- D.C. coil voltages (1215) 12, 24
- DPDT termination 8 pin octal
- 3 PDT termination 11 pin octal style
- Neon test available (1210N)
- Polycarbonate cover
- Weight 3.5 oz (99 grams)
- L—1.375″, W—1.375″, H—2.187″
- Sockets available see page **1B** • 1422

(5 amps only)

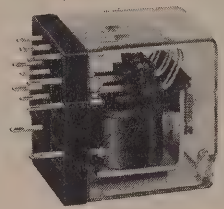
SERIES 1210/1215/1210N



1220/1225

- **Contacts rated 10 amps at 120VAC**
- A.C. coil voltages (1220) 24, 120
- D.C. coil voltages (1225) 12, 24, 110D
- Contact arrangements DPDT (2C) 3 PDT (3C)
- Terminal for solder or socket application
- Polycarbonate cover
- Weight 3 oz. (85 grams)
- L—1.703″, W—1.578″, H—1.687″
- Sockets available see page **1B** • 1422

SERIES 1220/1225

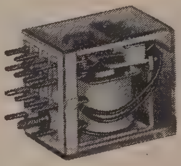


1310/1315/ 1310P/1315P-4C

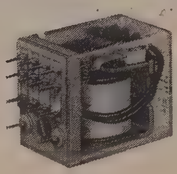
- **Contacts rated 5 amps at 30VDC and 120 VAC resistive**
- 3 amps inductive, and 1/8 H.P. at 120VAC
- A.C. coil voltages (1310) 12, 24, 48, 120
- D.C. coil voltages (1315) 12, 24, 48, 90, 110
- Contact arrangements DPDT (2C), 4PDT (4C)
- Test lamp available 1310N, 1315N
- 1310, 1315 termination socket or solder lug
- 1310P, 1315P termination printed circuit solder
- 1310S/1315S/1310PS/1315PS environmental seal
- 1310PVS/1315PVS processing seal (must be vented)
- Polycarbonate cover
- Weight 1.250 oz. (35 grams)
- L—1.109″, W—0.859″, H—1.343″
- Sockets available see page **1B** • 1422

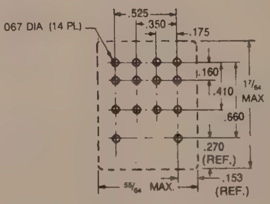
1310 PVS (CSA Pending)
1315 PVS

SERIES 1310/1315



SERIES 1310P/1315P-4C





Guardian No.		Coil Voltage	Coil Res. Ω	Cont. Comb.
	1210-2C-24A	24AC	54	DPDT
	1210-3C-24A	24AC	54	3PDT
	1210-2C-120A	120AC	1110	DPDT
	1210-3C-120A	120AC	1110	3PDT
	1210-2C-240A	240AC	5000	DPDT
	1210-3C-240A	240AC	5000	3PDT
	1215-2C-12D	12DC	75	DPDT
	1215-3C-12D	12DC	75	3PDT
	1215-2C-24D	24DC	300	DPDT
	1215-3C-24D	24DC	300	3PDT
	1215-2C-110D	110DC	6500	DPDT
	1215-3C-110D	110DC	6500	3PDT
	1210N-2C-120A	120AC	1110	DPDT
	1210N-3C-120A	120AC	1110	3PDT
	1220-2C-24A	24AC	54	DPDT
	1220-2C-120A	120AC	1110	DPDT
	1220-2C-240A	240AC	5000	DPDT
	1220-3C-24A	24AC	54	3PDT
	1220-3C-120A	120AC	1110	3PDT
	1220-3C-240A	240AC	5000	3PDT
	1225-2C-12D	12DC	75	DPDT
	1225-2C-24D	24DC	300	DPDT
	1225-2C-110D	110DC	6500	DPDT
	1225-3C-12D	12DC	75	3PDT
	1225-3C-24D	24DC	300	3PDT
	1225-3C-110D	110DC	6500	3PDT
1310P-2C-12A	1310-2C-12A	12AC	45	DPDT
1310P-2C-24A	1310-2C-24A	24AC	160	DPDT
1310P-2C-48A	1310-2C-48A	48AC	670	DPDT
1310P-2C-100A		100AC	3000	DPDT
1310P-2C-110A		110AC	3450	DPDT
1310P-2C-120A	1310-2C-120A	120AC	3900	DPDT
1310S-4C-12A	1310-4C-12A	12AC	45	4PDT
1310S-4C-24A	1310-4C-24A	24AC	160	4PDT
1310S-4C-48A	1310-4C-48A	48AC	670	4PDT
1310S-4C-120A	1310-4C-120A	120AC	3900	4PDT
1310PS-4C-12A	1310P-4C-12A	12AC	45	4PDT
1310PS-4C-24A	1310P-4C-24A	24AC	160	4PDT
1310PS-4C-48A	1310P-4C-48A	48AC	670	4PDT
1310PS-4C-120A	1310P-4C-120A	120AC	3900	4PDT
	1310PVS-4C-12A	12AC	45	4PDT
	1310PVS-4C-24A	24AC	160	4PDT
	1310PVS-4C-48A	48AC	670	4PDT
	1310PVS-4C-120A	120AC	3900	4PDT
1315P-2C-12D	1315-2C-12D	12DC	160	DPDT
1315P-2C-24D	1315-2C-24D	24DC	650	DPDT
1315P-2C-48D	1315-2C-48D	48DC	2600	DPDT
1315P-2C-90D	1315-2C-90D	90DC	9000	DPDT
1315P-2C-110D	1315-2C-110D	110DC	11000	DPDT
1315S-4C-12D	1315-4C-12D	12DC	160	4PDT
1315S-4C-24D	1315-4C-24D	24DC	650	4PDT
1315S-4C-48D	1315-4C-48D	48DC	2600	4PDT
1315S-4C-90D	1315-4C-90D	90DC	9000	4PDT
1315S-4C-110D	1315-4C-110D	110DC	11000	4PDT
	1310B-4C-120A	120AC	3900	4PDT
	1315B-4C-24A	24AC	650	4PDT
	1315B-4C-110D	110DC	11000	4PDT
	1310N-4C-120A	120AC	3900	4PDT
	1315N-4C-24A	24AC	650	4PDT
	1315N-4C-110D	110DC	11000	4PDT
1315PS-4C-12D	1315P-4C-12D	12DC	160	4PDT
1315PS-4C-24D	1315P-4C-24D	24DC	650	4PDT
1315PS-4C-48D	1315P-4C-48D	48DC	2600	4PDT
1315PS-4C-90D	1315P-4C-90D	90DC	9000	4PDT
1315PS-4C-110D	1315P-4C-110D	110DC	11000	4PDT
	1315PVS-4C-12D	12DC	160	4PDT
	1315PVS-4C-24D	24DC	650	4PDT
	1315PVS-4C-48D	48DC	2600	4PDT
	1315PVS-4C-90D	90DC	9000	4PDT
	1315PVS-4C-110D	110DC	11000	4PDT

GUARDIAN ELECTRIC MANUFACTURING COMPANY
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

ENCLOSED RELAYS

1330/1335

- **Contacts rated 5 amps resistive at 30VDC and 120VAC 3 amps inductive, 1/8 H.P. at 120VAC**
- A.C. coil voltages (1330) 12, 24, 48, 120
- D.C. coil voltages (1335) 12, 24, 48
- Contact arrangement DPDT (2C)
- 1330/1335 termination solder lug or socket
- 1330P/1335P termination printed circuit solder
- 1330PS/1335PS processing seal (must be vented)
- Polycarbonate cover
- Weight .75 oz (21 grams)
- L—0.89", W—0.750", H—1.093"
- Sockets available see page **1B** • 1422

1330 1330S 1330 1330S pending

1345

- **1345 contacts rated 10 amps at 12VDC, 120VAC, 5 amps 30VDC, 240VAC**
- 1345T 5 amp tungsten lamp rating at 120VAC
- 1345J 15 amp rating at 120VAC
- 1345S processing seal (must be vented)
- D.C. coil voltages 6, 12, 24
- Contact arrangement SPST N.O. (1A), SPST N.C. (1B), SPDT (1C)
- Termination printed circuit
- Weight 1.0 oz. (28 grams)
- L—1.22", W—0.766", H—1.188"

1345 1345T 1345S 1345J
1345

1360PC/1365PC

- **Contacts rated 5 amps at 30VDC and 120 VAC**
- A.C. coil voltages (1360) 24, 120
- D.C. coil voltages (1365) 12, 24,
- Contact arrangement DPDT (2C)
- Termination suitable for socket or printed circuit
- Nylon cover
- Sockets available see page **1B** • 1422
- Weight 1 oz. (28 grams)
- L—1.093", W—1.093", H—1.00"

1380/1385

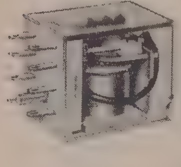
- **Contacts rated 7.5 amps at 120VAC, 5 amps at 240VAC, 10 amps at 30VDC 1/3 H.P. at 120VAC**
- A.C. coil voltages (1380) 12, 24, 48, 120, 240
- D.C. coil voltages (1385) 12, 24, 48, 90, 110
- Contact arrangement 4DPT (4C)
- 1380/1385 termination solder lug or socket
- 1380P/1385P termination printed circuit solder
- Polycarbonate cover
- Sockets available see page **1B** • 1423
- Weight 25 oz. (71 grams)
- L—1.614", W—1.11", H—1.381"

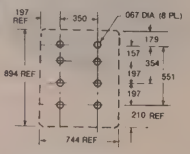
1390/1395

- **Contacts rated 13 amps at 30VDC, 120VAC, 240VAC, 1/3 H.P. at 120VAC, 240VAC**
- A.C. coil voltages (1390) 12, 24, 48, 120, 240
- D.C. coil voltages (1395) 12, 24, 48, 90, 110
- Contact arrangement DPDT (2C)
- 1390/1395 termination solder lug or socket
- 1390P/1395P termination printed circuit
- 1390F/1395F flange mount cover
- 1390S/1395S/1390PS/1395PS environmental seal
- 1390PVS/1395PVS processing seal (must be vented)
- Polycarbonate cover
- Sockets available see page **1B** • 1423
- Weight 1.25 oz. (35 grams)
- L—1.11", W—0.859", H—1.312"

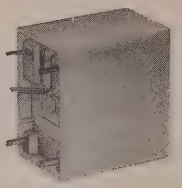
· 1390 PVS
· 1395 PVS (CSA Pending)

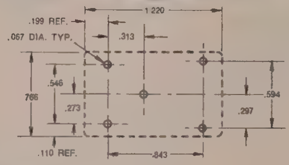
SERIES 1330/1335



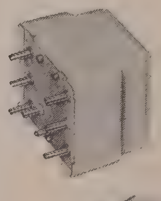


SERIES 1345

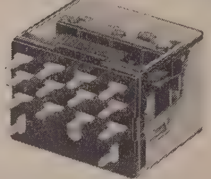


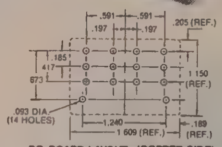


SERIES 1360PC/1365PC



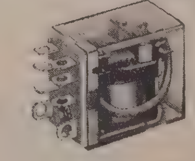
SERIES 1380/1385

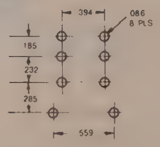




P.C. BOARD LAYOUT (COPPER SIDE)

SERIES 1390/1395





Guardian No.		Coil Voltage	Coil Res. Ω	Cont. Comb.
	1330-2C-12A	12AC	50	DPDT
	1330-2C-24A	24AC	245	DPDT
	1330-2C-48A	48AC	1050	DPDT
	1330-2C-120A	120AC	5400	DPDT
	1330P-2C-12A	12AC	50	DPDT
	1330P-2C-24A	24AC	245	DPDT
	1330P-2C-48A	48AC	1050	DPDT
	1330P-2C-120A	120AC	5400	DPDT
	1330PVS-2C-12A	12AC	50	DPDT
	1330PVS-2C-24A	24AC	245	DPDT
	1330PVS-2C-48A	48AC	1050	DPDT
	1330PVS-2C-120A	120AC	5400	DPDT
	1335-2C-12D	12DC	125	DPDT
	1335-2C-24D	24DC	500	DPDT
	1335-2C-48D	48DC	2000	DPDT
	1335P-2C-12D	12DC	125	DPDT
	1335P-2C-24D	24DC	500	DPDT
	1335P-2C-48D	48DC	2000	DPDT
	1335PVS-2C-12D	12DC	125	DPDT
	1335PVS-2C-24D	24DC	500	DPDT
	1335PVS-2C-48D	48DC	2000	DPDT
	1345-1A-12D	12DC	1400	SPST NO
	1345-1A-24D	24DC	5600	SPST NO
	1345J-1A-12D	12DC	440	SPST
	1345J-1A-24D	24DC	1760	SPST
	1345T-1A-12D	12DC	192	SPST
	1345T-1A-24D	24DC	768	SPST
	1345-1B-12D	12DC	1400	SPST NC
	1345-1B-24D	24DC	5600	SPST NC
	1345-1C-12D	12DC	1400	SPDT
	1345-1C-24D	24DC	5600	SPDT
	1360PC-2C-24A	24AC	150	DPDT
	1360PC-2C-120A	120AC	3500	DPDT
	1365PC-2C-12D	12DC	150	DPDT
	1365PC-2C-24D	24DC	600	DPDT
	1380-4C-12A	12AC	20	4PDT
	1380-4C-24A	24AC	80	4PDT
	1380-4C-48A	48AC	350	4PDT
	1380-4C-120A	120AC	2500	4PDT
	1380P-4C-12A	12AC	20	4PDT
	1380P-4C-24A	24AC	80	4PDT
	1380P-4C-48A	48AC	350	4PDT
	1380P-4C-120A	120AC	2500	4PDT
	1385-4C-12D	12DC	100	4PDT
	1385-4C-24D	24DC	350	4PDT
	1385-4C-48D	48DC	1600	4PDT
	1385-4C-90D	90DC	5000	4PDT
	1385-4C-110D	110DC	7000	4PDT
	1385P-4C-12D	12DC	100	4PDT
	1385P-4C-24D	24DC	350	4PDT
	1385P-4C-48D	48DC	1600	4PDT
	1385P-4C-90D	90DC	5000	4PDT
	1385P-4C-110D	110DC	7000	4PDT
1390S-2C-12A	1390-2C-12A	12AC	45	DPDT
1390S-2C-24A	1390-2C-24A	24AC	160	DPDT
1390S-2C-48A	1390-2C-48A	48AC	670	DPDT
1390S-2C-120A	1390-2C-120A	120AC	3900	DPDT
1395PS-2C-12A	1390P-2C-12A	12AC	45	DPDT
1395PS-2C-24A	1390P-2C-24A	24AC	160	DPDT
1395PS-2C-48A	1390P-2C-48A	48AC	670	DPDT
1395PS-2C-120A	1390P-2C-120A	120AC	3900	DPDT
	1390F-2C-12A	12AC	45	DPDT
	1390F-2C-24A	24AC	160	DPDT
	1390F-2C-48A	48AC	670	DPDT
	1390F-2C-120A	120AC	3900	DPDT
	1390PVS-2C-12A	12AC	45	DPDT
	1390PVS-2C-24A	24AC	160	DPDT
	1390PVS-2C-48A	48AC	670	DPDT
	1390PVS-2C-120A	120AC	3900	DPDT
1395S-2C-12D	1395-2C-12D	12DC	160	DPDT
1395S-2C-24D	1395-2C-24D	24DC	650	DPDT
1395S-2C-48D	1395-2C-48D	48DC	2600	DPDT
1395S-2C-90D	1395-2C-90D	90DC	9000	DPDT
1395S-2C-110D	1395-2C-110D	110DC	11000	DPDT
1395PS-2C-12D	1395P-2C-12D	12DC	160	DPDT
1395PS-2C-24D	1395P-2C-24D	24DC	650	DPDT
1395PS-2C-48D	1395P-2C-48D	48DC	2600	DPDT
1395PS-2C-90D	1395P-2C-90D	90DC	9000	DPDT
1395PS-2C-110D	1395P-2C-110D	110DC	11000	DPDT
	1395F-2C-12D	12DC	160	DPDT
	1395F-2C-24D	24DC	650	DPDT
	1395F-2C-48D	48DC	2600	DPDT
	1395F-2C-90D	90DC	9000	DPDT
	1395F-2C-110D	110DC	11000	DPDT
	1395PVS-2C-12D	12DC	160	DPDT
	1395PVS-2C-24D	24DC	650	DPDT
	1395PVS-2C-48D	48DC	2600	DPDT
	1395PVS-2C-90D	90DC	9000	DPDT
	1395PVS-2C-110D	110DC	11000	DPDT

GUARDIAN ELECTRIC MANUFACTURING COMPANY
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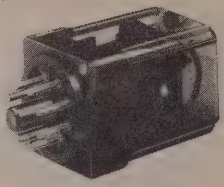
ENCLOSED RELAYS

1410

- **Contacts rated 10 amps at 120/240VAC 1/6 H.P. at 120VAC, 1/3 H.P. at 240VAC**
- A.C. coil voltages (1410) 12, 24, 120, 240
- D.C. coil voltages (1415) 12, 24, 110
- Contact arrangement SPDT (1C) DPDT (2C) 3PDT (3C)
- Neon test 1410N, 1415N
- Termination 1C and 2C 8 pin octal 3C 11 pin octal style
- Polycarbonate cover
- Weight 3.5 oz. (99 grams)
- L—1.375″, W—1.375″, H—2.187″
- Sockets available see page **1B** • 1423

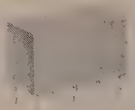
SERIES 1410

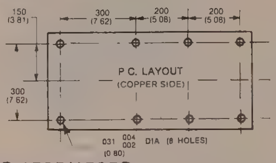


1495/1495S

- **Contacts rated 2 amps at 120VAC, lamp 30VDC**
- Designed to meet FCC part 68 1500 volt surge test
- DIP package
- 1495S processing seal (must be vented)
- D.C. coil voltages 3, 5, 6, 12, 24
- Polyester enclosure
- Weight .18 oz (5 grams)
- L—0.795″, W—0.386″, H—0.449″

SERIES 1495/1495S

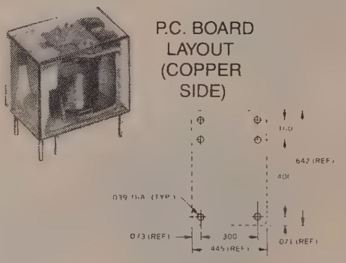




1505/1505S

- **Contacts rated 1 amp at 30VDC 0.5 amps at 120VAC**
- D.C. coil voltages 5, 6, 12, 24
- Contact arrangement SPDT (1C)
- 1505S processing seal (must be vented)
- Termination printed circuit solder .100″ grid pattern
- Polycarbonate cover
- Weight .13 oz. (3.7 grams)
- L—.642″, W—.445″, H—.465″

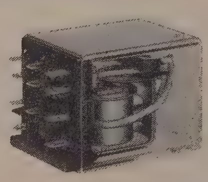
SERIES 1505/1505S

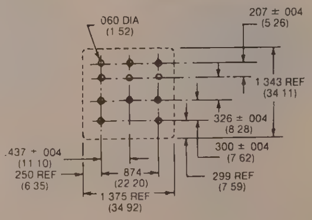


1510/1515

- **Contacts rated 12 amps at 120VAC and 30VDC, 1/3 H.P. at 120VAC, 1/2 H.P. at 120/240VAC, 1/2 H.P. or 3VA at 600VAC**
- A.C. coil voltages (1510) 6, 12, 24, 48, 120
- D.C. coil voltages (1515) 6, 12, 24, 48, 90, 110
- Contact arrangements SPDT (1C), DPDT (2C), 3PDT (3C)
- 1510/1515 termination solder lug or socket
- 1510P/1515P termination printed circuit
- 1510F/1515F flange mount cover
- Neon light 1510N, 1515N
- Polycarbonate cover
- Sockets available see page **1B** • 1423
- Weight 3 oz. (85 grams)
- L—1.531″, W—1.406″, H—1.906″

SERIES 1510/1515





Guardian No.		Coil Voltage	Coil Res. Ω	Cont. Comb.
	1410-2C-12A	12AC	24	DPDT
	1410-2C-24A	24AC	85	DPDT
	1410-2C-120A	120AC	2250	DPDT
	1410-2C-240A	240AC	9110	DPDT
	1415-2C-12D	12DC	120	DPDT
	1415-2C-24D	24DC	472	DPDT
	1415-2C-110D	110DC	10000	DPDT
	1410-3C-12A	12AC	18	3PDT
	1410-3C-24A	24AC	24	3PDT
	1410-3C-120A	120AC	1700	3PDT
	1410-3C-240A	240AC	7200	3PDT
	1415-3C-12D	12DC	120	3PDT
	1415-3C 24D	24DC	472	3PDT
	1415-3C-110D	110DC	10000	3PDT
	1495-2C-3D	3DC	17	DPDT
	1495-2C-5D	5DC	45	DPDT
	1495-2C-6D	6DC	66	DPDT
	1495-2C-12D	12DC	280	DPDT
	1495-2C-24D	24DC	1070	DPDT
	1495S-2C-3D	3DC	17	DPDT
	1495S-2C-5D	5DC	45	DPDT
	1495S-2C-6D	6DC	66	DPDT
	1495S-2C-12D	12DC	280	DPDT
	1495S-2C-24D	24DC	1070	DPDT
	1505-1C-3D	3DC	21	SPDT
	1505-1C-6D	6DC	84	SPDT
	1505-1C-12D	12DC	333	SPDT
	1505-1C-24D	24DC	1330	SPDT
	1505S-1C-3D	3DC	21	SPDT
	1505S-1C-6D	6DC	84	SPDT
	1505S-1C-12D	12DC	333	SPDT
	1505S-1C-24D	24DC	1330	SPDT
1510F-1C-12A	1510-1C-12A	12AC	21	SPDT
1510F-1C-24A	1510-1C-24A	24AC	85	SPDT
1510F-1C-48A	1510-1C-48A	48AC	340	SPDT
1510F-1C-120A	1510-1C-120A	120AC	2250	SPDT
1510F-2C-12A	1510-2C-12A	12AC	21	DPDT
1510F-2C-24A	1510-2C-24A	24AC	85	DPDT
1510F-2C-48A	1510-2C-48A	48AC	340	DPDT
1510F-2C-120A	1510-2C-120A	120AC	2250	DPDT
1510F-3C-12A	1510-3C-12A	12AC	18	3PDT
1510F-3C-24A	1510-3C-24A	24AC	72	3PDT
1510F-3C-48A	1510-3C-48A	48AC	288	3PDT
1510F-3C-120A	1510-3C-120A	120AC	1700	3PDT
	1510P-1C-12A	12AC	21	SPDT
	1510P-1C-24A	24AC	85	SPDT
	1510P-1C-48A	48AC	340	SPDT
	1510P-1C-120A	120AC	2250	SPDT
	1510P-2C-12A	12AC	21	DPDT
	1510P-2C-24A	24AC	85	DPDT
	1510P-2C-48A	48AC	340	DPDT
	1510P-2C-120A	120AC	2250	DPDT
	1510P-3C-12A	12AC	18	3PDT
	1510P-3C-24A	24AC	72	3PDT
	1510P-3C-48A	48AC	288	3PDT
	1510P-3C-120A	120AC	1700	3PDT
1515F-1C-12D	1515-1C-12D	12DC	120	SPDT
1515F-1C-24D	1515-1C-24D	24DC	472	SPDT
1515F-1C-48D	1515-1C-48D	48DC	1800	SPDT
1515F-1C-90D	1515-1C-90D	90DC	6800	SPDT
1515F-1C-110D	1515-1C-110D	110DC	10000	SPDT
1515F-2C-12D	1515-2C-12D	12DC	120	DPDT
1515F-2C-24D	1515-2C-24D	24DC	472	DPDT
1515F-2C-48D	1515-2C-48D	48DC	1800	DPDT
1515F-2C-90D	1515-2C-90D	90DC	6800	DPDT
1515F-2C-110D	1515-2C-110D	110DC	10000	DPDT
1515F-3C-12D	1515-3C-12D	12DC	120	3PDT
1515F-3C-24D	1515-3C-24D	24DC	472	3PDT
1515F-3C-48D	1515-3C-48D	48DC	1800	3PDT
1515F-3C-90D	1515-3C-90D	90DC	6800	3PDT
1515F-3C-110D	1515-3C-110D	110DC	10000	3PDT
	1515P-1C-12D	12DC	120	SPDT
	1515P-1C-24D	24DC	472	SPDT
	1515P-1C-48D	48DC	1800	SPDT
	1515P-1C-90D	90DC	6800	SPDT
	1515P-1C-110D	110DC	10000	SPDT
	1515P-2C-12D	12DC	120	DPDT
	1515P-2C-24D	24DC	472	DPDT
	1515P-2C-48D	48DC	1800	DPDT
	1515P-2C-90D	90DC	6800	DPDT
	1515P-2C-110D	110DC	10000	DPDT
	1515P-3C-12D	12DC	120	3PDT
	1515P-3C-24D	24DC	472	3PDT
	1515P-3C-48D	48DC	1800	3PDT
	1515P-3C-90D	90DC	6800	3PDT
	1515P-3C-110D	110DC	10000	3PDT

GUARDIAN ELECTRIC MANUFACTURING COMPANY
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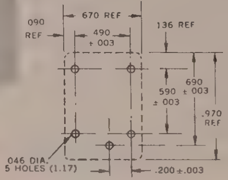
ENCLOSED RELAYS

1565

- **Contacts rated 6 amps at 120VAC 3 amps at 30VDC and 240VAC 1/3HP at 120VAC**
- D.C. coil voltages 3, 6, 12, 24
- Contact arrangements SPST N O (1A), SPDT (1C)
- Termination printed circuit
- Nylon cover
- Weight .42 oz (12 grams)
- L—0.970″, W—0.678″, H—0.810″

SERIES 1565



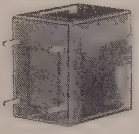
1575

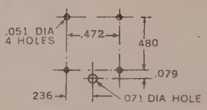
- **Contacts ratings 5 amps at 30VDC and 120VAC**
- 1575S processing seal (must be vented)
- 1575T 5 amp tungsten lamp rating at 120VAC
- D.C. coil voltages 5, 6, 12, 24, 48
- Contact arrangements SPST N.O. (1A), SPDT (1C)
- Termination printed circuit
- Polypropylene cover
- Weight .5 oz. (14 grams)
- L—0.850″, W—0.614″, H—0.882″

Open & Sealed

Sealed only

SERIES 1575



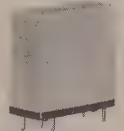


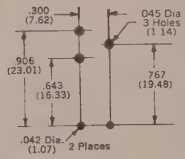
P.C. LAYOUT
(COPPER SIDE)

1655

- **Contacts rated 10 amps 30VDC and 120VAC**
- 1655S processing seal (must be vented)
- D.C. coil voltages 3, 5, 6, 12, 24, 48 VDC
- Contact arrangments SPST NO (1A), SPST NC (1B), SPDT (1C)
- Termination printed circuit
- Polypropylene cover
- Weight .53 oz. (15 grams)
- L—1.157″, W—.500″, H-1.125″

SERIES 1655

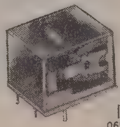


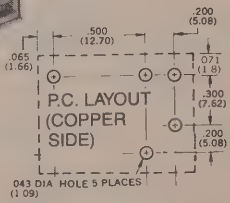


1675

- **Contacts rated 5 amps at 30VDC and 120VAC**
- 1675S processing seal (must be vented)
- D.C. coil voltages 3, 5, 6, 12, 24
- Contact arrangement SPDT (1C)
- Termination printed circuit
- Polycarbonate plastic cover
- Weight .27 oz. (8 grams)
- L—0.831″, W—0.642″, H—0.547″

SERIES 1675



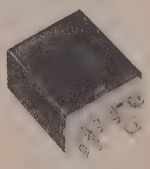


1690

- **Contacts rated at 120/240VAC and 30VDC, 15A at 30VDC/120VAC/240VAC**
- A.C. coil voltages (1690) 24, 120, 240
- D.C. coil voltages (1695) 12, 24, 110
- Contact arrangement SPDT (1C)
- Termination solder lug or socket
- 1690F/1695F flange mount cover
- Polycarbonate cover
- Sockets available see page
- Weight 1.5 oz. (43 grams)
- L—1.110″, W—0.831″, H—1.629″

Pending

SERIES 1690



Guardian No.	Coil Voltage	Coil Res. Ω	Cont. Comb.
1565-1A-3D	3DC	11	SPST NO
1565-1A-6D	6DC	45	SPST NO
1565-1A-12D	12DC	180	SPST NO
1565-1A-24D	24DC	720	SPST NO
1565-1C-3D	3DC	11	SPDT
1565-1C-6D	6DC	45	SPDT
1565-1C-12D	12DC	180	SPDT
1565-1C-24D	24DC	720	SPDT
1575-1C-6D	6DC	100	SPDT
1575-1C-12D	12DC	400	SPDT
1575-1C-24D	24DC	1600	SPDT
1575-1C-48D	48DC	6400	SPDT
1575S-1C-6D	6DC	100	SPDT
1575S-1C-12D	12DC	400	SPDT
1575S-1C-24D	24DC	1600	SPDT
1575S-1C-48D	48DC	6400	SPDT
1575T-1A-6D	6DC	48	SPDT
1575T-1A-12D	12DC	192	SPDT
1575T-1A-24D	24DC	768	SPDT
1575T-1A-48D	48DC	3072	SPDT
1575TA-1C-6D	6DC	48	SPDT
1575TA-1C-12D	12DC	192	SPDT
1575TA-1C-24D	24DC	768	SPDT
1757TA-1C-48D	48DC	3072	SPDT
1655-1A-3D	3DC	16	SPST NO
1655-1A-5D	5DC	48	SPST NO
1655-1A-6D	6DC	75	SPST NO
1655-1A-12D	12DC	280	SPST NO
1655-1A-24D	24DC	1100	SPST NO
1655-1A-48D	48DC	3500	SPST NO
1655-1B-3D	3DC	16	SPST NC
1655-1B-5D	5DC	48	SPST NC
1655-1B-6D	6DC	75	SPST NC
1655-1B-12D	12DC	280	SPST NC
1655-1B-24D	24DC	1100	SPST NC
1655-1B-48D	48DC	3500	SPST NC
1655-1C-3D	3DC	16	SPDT
1655-1C-5D	5DC	48	SPDT
1655-1C-6D	6DC	75	SPDT
1655-1C-12D	12DC	280	SPDT
1655-1C-24D	24DC	1100	SPDT
1655-1C-48D	48DC	3500	SPDT
1655S-1A-3D	3DC	16	SPST NO
1655S-1A-5D	5DC	48	SPST NO
1655S-1A-6D	6DC	75	SPST NO
1655S-1A-12D	12DC	280	SPST NO
1655S-1A-24D	24DC	1100	SPST NO
1655S-1A-48D	48DC	3500	SPST NO
1655S-1B-3D	3DC	16	SPST NC
1655S-1B-5D	5DC	48	SPST NC
1655S-1B-6D	6DC	75	SPST NC
1655S-1B-12D	12DC	280	SPST NC
1655S-1B-24D	24DC	1100	SPST NC
1655S-1B-48D	48DC	3500	SPST NC
1655S-1C-3D	3DC	16	SPDT
1655S-1C-5D	5DC	48	SPDT
1655S-1C-6D	6DC	75	SPDT
1655S-1C-12D	12DC	280	SPDT
1655S-1C-24D	24DC	1100	SPDT
1655S-1C-48D	48DC	3500	SPDT
1675-1C-5D	5DC	56	SPDT
1675-1C-6D	6DC	80	SPDT
1675-1C-12D	12DC	320	SPDT
1675-1C-24D	24DC	1280	SPDT
1675S-1C-5D	5DC	56	SPDT
1675S-1C-6D	6DC	80	SPDT
1675S-1C-12D	12DC	320	SPDT
1675S-1C-24D	24DC	1280	SPDT
1690-1C-24A	24AC	160	SPDT
1690-1C-120A	120AC	3900	SPDT
1690-1C-240A	240AC	16000	SPDT
1695-1C-12D	12DC	160	SPDT
1695-1C-24D	24DC	650	SPDT
1695-1C-110D	110DC	11000	SPDT
1690F-1C-24A	24AC	160	SPDT
1690F-1C-120A	120AC	3900	SPDT
1690F-1C-240A	240AC	16000	SPDT
1695F-1C-12D	12DC	160	SPDT
1695F-1C-24D	24DC	650	SPDT
1695F-1C-110D	110DC	11000	SPDT

GUARDIAN ELECTRIC MANUFACTURING COMPANY
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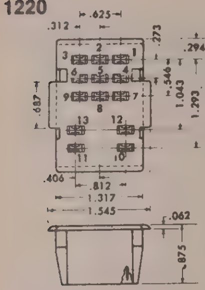
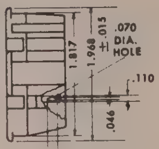
SOCKETS & HARDWARE

1220

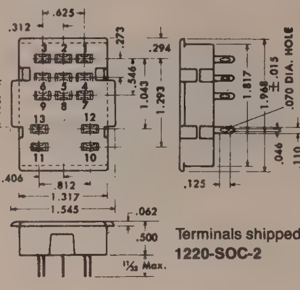


.625
.312
.273
.294
.546
1.043
1.293
.687
.406
.812
1.317
1.545
.062
.875



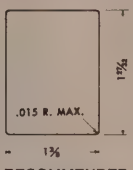
1.817
1.968 ± .015
.070 DIA. HOLE
.110
.046
.125

Terminals shipped loose
1220-SOC-1



.625
.312
.273
.294
.546
1.043
1.293
.687
.406
.812
1.317
1.545
.062
.500
1/32 Max.
.125
1.817
1.968 ± .015
.070 DIA. HOLE
.046
.110

Terminals shipped loose
1220-SOC-2

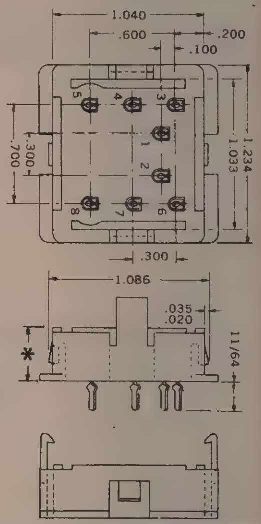


.015 R. MAX.
1 3/8
1 27/32

RECOMMENDED CHASSIS CUTOUT SOC-1

1360

TERMINAL NUMBERS ON SOCKET BOTTOM

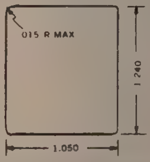


1.040
.600
.200
.100
.700
.300
1.234
1.033
.300
1.086
.035
.020
11/64
*

USE .070 DIA. HOLES FOR TERMINALS
1360-1

Socket may be soldered directly to PC board (O/A height = 1.320") or snapped through underside of chassis (O/A height = 1.208" when using recommended .062" chassis thickness). Connections by soldering may be made before or after insertion of socket into chassis.

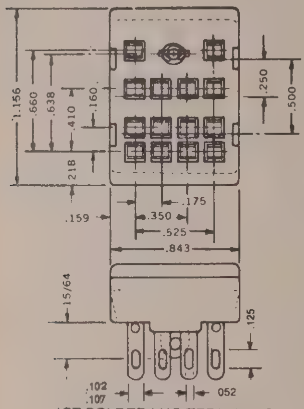
RECOMMENDED MTG. LAYOUT



.015 R MAX
1.240
1.050

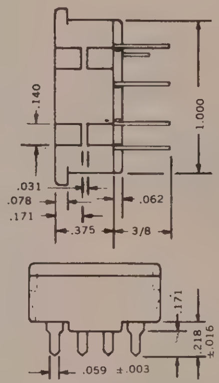
.062" CHASSIS THICKNESS

1310



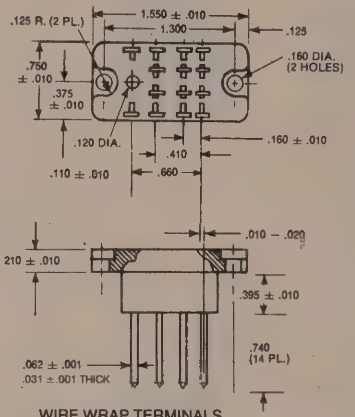
1.156
.660
.638
.410
.160
.218
.250
.500
.159
.175
.350
.525
.843
15/64
.125
.102
.107
.052

1ST SOLDER LUG TERMINALS
1310-1ST



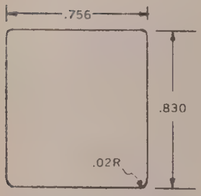
.140
1.000
.031
.078
.171
.062
.375
3/8
.171
.218 ±.016
.059 ±.003

PRINTED CIRCUIT TERMINALS
1310-2PC

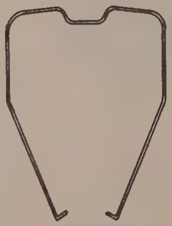


.125 R. (2 PL.)
1.550 ± .010
1.300
.125
.160 DIA. (2 HOLES)
.750 ± .010
.375 ± .010
.120 DIA.
.410
.160 ± .010
.110 ± .010
.660
.010 – .020
210 ± .010
.395 ± .010
.740 (14 PL.)
.062 ± .001
.031 ± .001 THICK

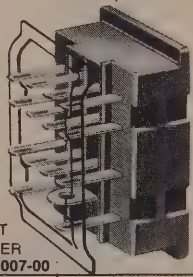
WIRE WRAP TERMINALS
1310-4WW



.031" TO .062" THICK CHASSIS RECOMMENDED MTG. LAYOUT FOR 1330-1ST

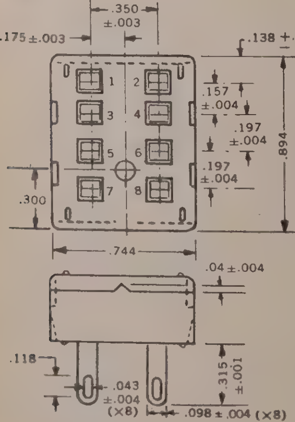


141-200080-00
1310/1380/1390 HDC



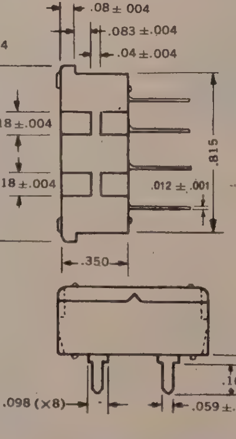
CLIP SOCKET RETAINER
141-200007-00
1310-SRC

1330



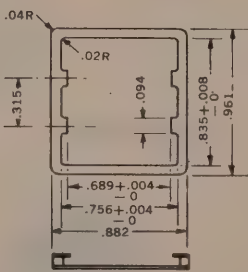
.350 ±.003
.175 ±.003
.138 +.004 −0
.157 ±.004
.197 ±.004
.197 ±.004
.894
.300
.744
.04 ±.004
.118
.043 ±.004 (×8)
.315 ±.001
.098 ±.004 (×8)
1
2
3
4
5
6
7
8

SOLDER LUG TERMINALS
1330-1ST



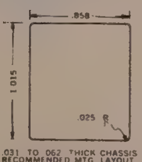
.08 ± 004
.083 ±.004
.04 ±.004
.118 ±.004
.118 ±.004
.815
.012 ± .001
.350
.098 (×8)
.16
.177
.059 ±.004 (×8)

PRINTED CIRCUIT TERMINALS
1330-2PC



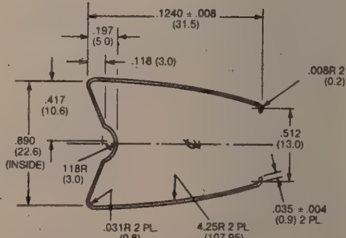
.04R
.02R
.315
.094
.835 +.008 −0
.961
.689 +.004 −0
.756 +.004 −0
.882

SOCKET RETAINER CLIP
141-200069-00
1330-SRC



.858
1.015
.025 R

.031 TO .062 THICK CHASSIS RECOMMENDED MTG LAYOUT.



.1240 ± .008 (31.5)
.197 (5.0)
.118 (3.0)
.008R 2 PL. (0.2)
.417 (10.6)
.512 (13.0)
.890 (22.6) (INSIDE)
118R (3.0)
.031R 2 PL. (0.8)
4.25R 2 PL. (107.95)
.035 ± .004 (0.9) 2 PL.

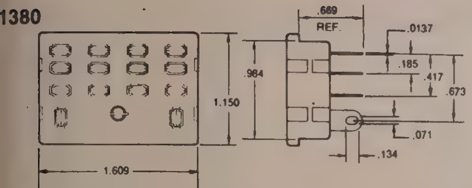
RELAY HOLD DOWN CLIP
141-200072-00
1330-HDC

GUARDIAN ELECTRIC MANUFACTURING COMPANY

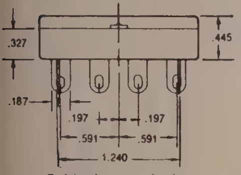
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / **TWX 910-221-5073**

SOCKETS & HARDWARE

1380

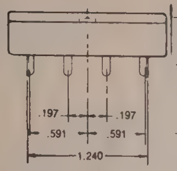


.669
REF.
.0137
.185
.417
.673
.984
1.150
.071
.134
1.609



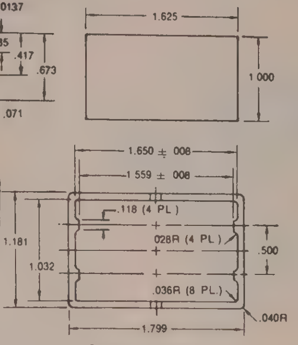
.327
.445
.187
.197
.197
.591
.591
1.240

Solder lug terminals
1380-1ST



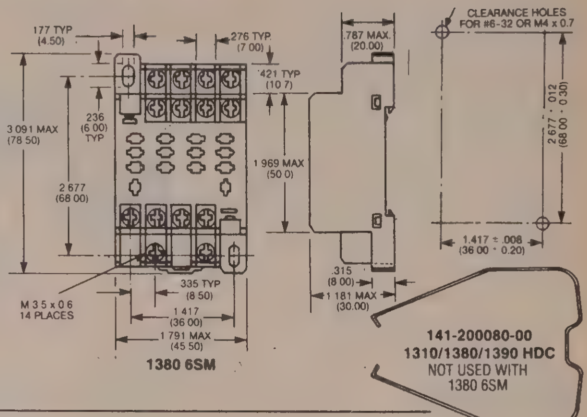
.197
.197
.591
.591
1.240

Printed circuit terminals
1380-2PC



1.625
1.000
1.650 ± .008
1.559 ± .008
.118 (4 PL)
.028R (4 PL)
1.181
1.032
.500
.036R (8 PL)
.040R
1.799

Socket retainer clip
141-200081-00
1380-SRC

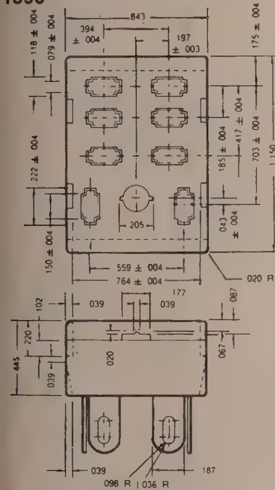


177 TYP (4.50)
.276 TYP (7.00)
.421 TYP (10.7)
.787 MAX. (20.00)
CLEARANCE HOLES FOR #6-32 OR M4 x 0.7
3.091 MAX (78.50)
.236 (6.00) TYP
2.677 (68.00)
1.969 MAX (50.0)
2.677 ± .012 (68.00 ± 0.30)
M 3.5 x 0.6 14 PLACES
.335 TYP (8.50)
1.417 (36.00)
1.791 MAX (45.50)
.315 (8.00)
1.181 MAX (30.00)
1.417 ± .008 (36.00 ± 0.20)

1380 6SM

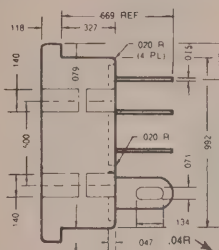
141-200080-00
1310/1380/1390 HDC
NOT USED WITH
1380 6SM

1390

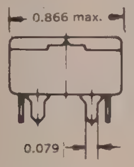


.118 ± .004
.079 ± .004
.394 ± .004
.843
.197 ± .003
.175 ± .004
.222 ± .004
.185 ± .004
.417 ± .004
.703 ± .004
1.150
.205
.043 ± .004
.150 ± .004
.559 ± .004
.764 ± .004
.020 R (4 PLACES)
.102
.039
.177
.039
.087
.220
.445
.039
.020
.067
.039
.187
.098 R
.036 R

Solder lug terminals
1390-1ST

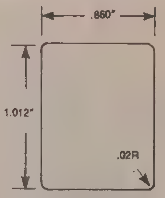


.669 REF
.327
.118
.020 R (4 PL)
.140
.079
.015
.199
.020 R
.400
.992
.071
.140
.134
.047
.079



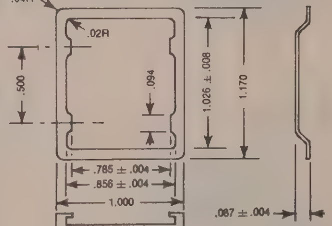
0.866 max.
0.079

printed circuit
terminals
1390-2CS



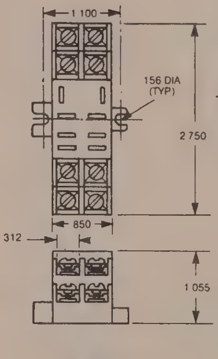
.860"
1.012"
.02R

Recommended
mounting dimensions



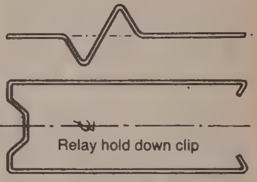
.04R
.02R
.500
.094
1.026 ± .008
1.170
.785 ± .004
.856 ± .004
1.000
.087 ± .004

Socket retainer clip
141-200079-00
1390-SRC



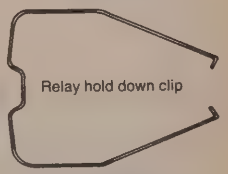
1.100
.156 DIA (TYP)
2.750
.850
.312
1.055

1390-5SM



Relay hold down clip

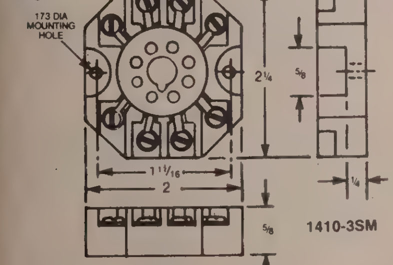
141-200090-00
1390 HDC-2



Relay hold down clip

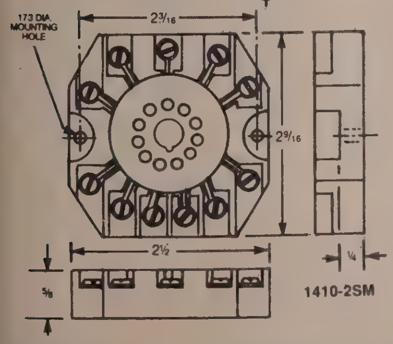
141-200080-00
1310-200080-00
(cannot be used on
1390-6SM)

1410



.173 DIA MOUNTING HOLE
2¼
⅝
1¹¹⁄₁₆
2
¼
⅝

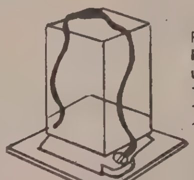
1410-3SM



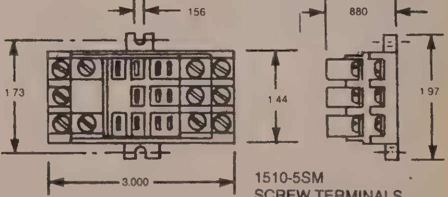
.173 DIA MOUNTING HOLE
2³⁄₁₆
2⁹⁄₁₆
2½
¼
⅝

1410-2SM

1510

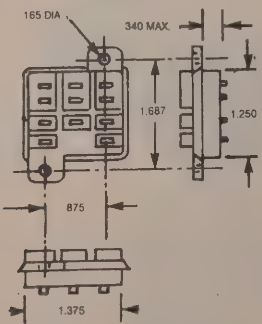


Relay Hold Down Clip
PN 141-200093-00
used with
1510-1ST
1510-187QC
1510-2PC



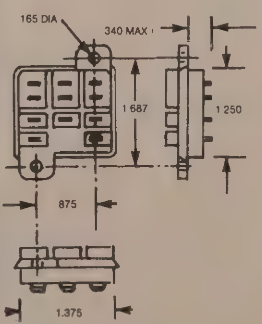
.156
.880
1.73
1.44
1.97
3.000

1510-5SM
SCREW TERMINALS



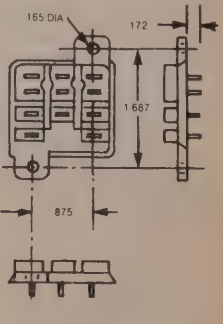
.165 DIA
.340 MAX.
1.687
1.250
.875
1.375

1510-1ST
SOLDER TERMINALS



.165 DIA
.340 MAX
1.687
1.250
.875
1.375

1510-187QC
3/16 QC. TERMINALS



.165 DIA
.172
1.687
.875

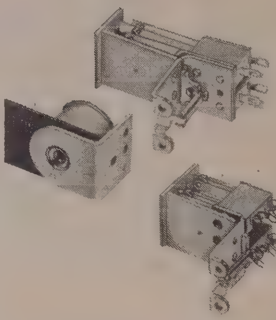
1510-2PC
PC TERMINALS

OPEN RELAYS

200

- Match coil and contact switch assemblies to build the relay you need
- Contact assemblies in standard and midget sizes
- Coil: L—1.750″, W—1.125″, H—.890″
- Standard contacts L—2.625″, W—1.031″, H—1.843″
- Midget contacts L—1.812″, W—1.093″, H—1.781″

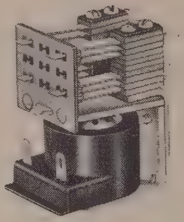
SERIES 200



640/645V

- **Contacts rated 10 amps at 120VAC**
- A.C. coil voltages (640) 24, 120, 240
- D.C. coil voltages (645) 12, 24, 110
- Termination solder lugs
- Contact configuration SPDT (1C), DPDT (2C), 4PDT (4C)
- Weight 3.5 oz (99 grams)
- L—1.875″, W—1.093″, H—2.156″

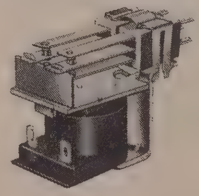
SERIES 640U/645U



900/905/910/915

- **Contacts rated 10 amps at 120VAC**
- A.C. coil voltages (900/910) 24, 120, 240
- D.C. coil voltages (905/915) 12, 24
- 900/905 termination solder lug
- 910/915 termination .187″ quick connect
- Contact configuration DPDT (2C)
- Weight 6 oz. (170 grams)
- L—2.687″, W—1.078″, H—1.781″

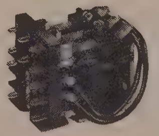
SERIES 900/905/910/915



1240/1245

- **Contacts rated 10 amps at 120VAC**
- A.C. coil voltages (1240) 24, 120
- D.C. coil voltages (1245) 12, 24
- Termination solder lug
- Contact configurations DPDT (2C), 3PDT (3C)
- Weight 2.5 oz. (71 grams)
- L—1.734″, W—1.031″, H—1.250″

SERIES 1240/1245



COIL ASSEMBLIES

Guardian No.	Voltage	Coil Res. Ω
200-6A	6AC	1.8
200-12A	12AC	6.8
200-24A	24AC	26.8
200-120A	120AC	550
200-240A	240AC	2950
200-6D	6DC	12.2
200-12D	12DC	49.4
200-24D	24DC	203
200-32D	32DC	355
200-110D	110DC	3920
200-5,000D	†DC	5000
200-10,000D	†DC	10000

CONTACT SWITCH ASSEMBLIES

Guardian No.	Type	Cont. Amps	Cont. Comb.
200-1	Standard	8	SPDT
200-2	Standard	8	DPDT
200-4	Standard	12.5	DPDT
200-5	Standard	8	4PDT
200-M1	Midget	10	SPDT
200-M2	Midget	10	DPDT
200-M5	Midget	8	4PDT

CONTACT SWITCH PARTS

Guardian No.	Type
200-3	Standard
200-M3	Midget

† Plate Circuit

Guardian No.	Voltage	Contact Amps	Cont. Comb.
640U-C-24A	24AC	24	SPDT
640U-2C-24A	24AC	24	DPDT
640U-4C-24A	24AC	24	4PDT
640U-C-120A	120AC	550	SPDT
640U-2C-120A	120AC	550	DPDT
640U-4C-120A	120AC	550	4PDT
640U-2C-240A	240AC	2950	DPDT
645U-C-12D	12DC	50	SPDT
645U-2C-12D	12DC	50	DPDT
645U-4C-12D	12DC	50	4PDT
645U-C-24D	24DC	200	SPDT
645U-2C-24D	24DC	200	DPDT
645U-4C-24D	24DC	200	4PDT
645U-C-110D	110DC	4000	SPDT
645U-2C-110D	110DC	4000	DPDT
645U-4C-110D	110DC	4000	4PDT
900-2C-24A	24AC	24	DPDT
900-2C-120A	120AC	750	DPDT
900-2C-240A	240AC	2950	DPDT
905-2C-6D	6DC	8	DPDT
905-2C-12D	12DC	32	DPDT
905-2C-24D	24DC	130	DPDT
910-2C-24A	24AC	24	DPDT
910-2C-120A	120AC	750	DPDT
910-2C-240A	240AC	2950	DPDT
915-2C-6D	6DC	8	DPDT
915-2C-12D	12DC	32	DPDT
915-2C-24D	24DC	130	DPDT
1240-2C-24A	24AC	54	DPDT
1240-3C-24A	24AC	54	3PDT
1240-2C-120A	120AC	1110	DPDT
1240-3C-120A	120AC	1110	3PDT
1240-2C-240A	240AC	5000	DPDT
1240-3C-240A	240AC	5000	3PDT
1245-2C-12D	12DC	75	DPDT
1245-3C-12D	12DC	75	3PDT
1245-2C-24D	24DC	300	DPDT
1245-3C-24D	24DC	300	3PDT

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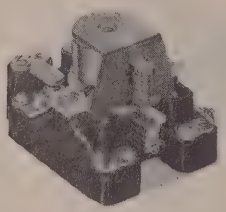
POWER RELAYS

2600/2605/2620/2625

- **Contact ratings 25 amps 240VAC 1 H.P. 120/240VAC**
- A.C. coil voltages (2600/2620) 24, 120, 240
- D.C. coil voltages (2605/2625) 12, 24, 110
- 2600U/2605U DPDT contact configuration
- 2620U/2625U DPST N.O. contact configuration
- Termination screw terminals (quick connect kits available see 2600U - Q.C. term kit)
- 10 amp auxiliary switch available 2600U-SPDT-Aux. Sw.
- Weight 8 oz. (227) grams
- L—3.312″, W—2.500″, H—2.062″

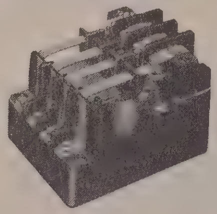
SERIES 2600U/2605U



2700/2705

- **Contact rating 30 amps at 277VAC, 25 amps at 28VDC**
- A.C. coil voltages (2700) 12, 24, 120, 240
- D.C. coil voltages (2705) 12, 24, 110
- Contact configuration 4PDT (4C)
- Termination screw terminals
- Cover available (2700C)
- Weight 10 oz. (284 grams)
- L—3.250″, W—2.50″, H—2.093″

SERIES 2700/2705



8105

- **Contact rating 200 AMPS at 240 VAC**
- D.C. coils 12, 24
- Contacts latching DPST
- Coil requires 250 millisec. pulse
- Termination 2 steel and 2 jaw terminals
- Weight 26 oz. (737S)
- L—4.062″, W—2.656″, H—1.250″ (not including Terminals)

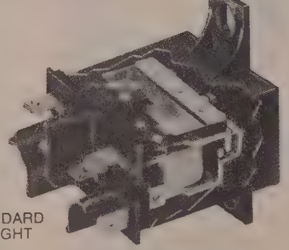
SERIES 8105

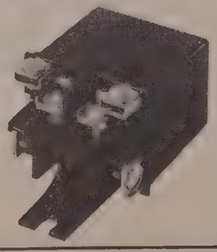
8320/8325

- **Contact ratings 30 AMPS 120/240VAC**
- A.C. coil voltages (8320) 24, 120, 240 VAC
- D.C. coil voltages (8325) 12, 24, 110 VAC
- Contact configuration DPST DM (2X)
- Termination 8320/8325 screw terminal
- Termination 8320Q/8325Q .250″ Q.C.
- Standard cover 8320/8325
- Low profile cover 8320C/8325C
- Weight 3 oz. (84g)
- 8320/8325 L—1.718″, W—2.50″, H—2.062″
- 8320C/8325C L—2.875″, W—1.718″, H—1.375″

pending

SERIES 8320/8325


STANDARD HEIGHT


LOW PROFILE

Guardian No.	Voltage	Cont. Amps	Cont. Comb.
2600U-DPDT-24A	24AC	20	DPDT
2600U-DPDT-120A	120AC	500	DPDT
2600U-DPDT-240A	240AC	2000	DPDT
2605U-DPDT-12D	12DC	40	DPDT
2605U-DPDT-24D	24DC	160	DPDT
2605U-DPDT-110D	110DC	3500	DPDT
2620U-DPST-24A	24AC	20	DPST
2620U-DPST-120A	120AC	500	DPST
2620U-DPST-240A	240AC	2000	DPST
2625U-DPST-12D	12DC	40	DPST
2625U-DPST-24D	24DC	160	DPST
2625U-DPST-110D	110DC	3500	DPST

Guardian No.	Voltage	Cont. Amps	Cont. Comb.
2700-4PDT-12A	12AC	2.65	4PDT
2700-4PDT-24A	24AC	10 6	4PDT
2700-4PDT-120A	120AC	265	4PDT
2700-4PDT-240A	240AC	1060	4PDT
2705-4PDT-12D	12DC	42.5	4PDT
2705-4PDT-24D	24DC	170	4PDT
2705-4PDT-110D	110DC	3660	4PDT

Guardian No.	Coil Voltage	Coil Res	Cont. Comb.
8105-DPST-L-12D	12DC	72	DPST-Latching
8105-DPST-L-24D	24DC	288	DPST-Latching
8105-DPST-L-110D	110DC	6050	DPST-Latching

Guardian No.	Coil Voltage	Coil Res	Cont. Comb.
8320-2X-24A	24AC	64	DPST-DM
8320-2X-120A	120AC	1600	DPST-DM
8320-2X-240A	240AC	6400	DPST-DM
8320C-2X-24A	24AC	64	DPST-DM
8320C-2X-120A	120AC	1600	DPST-DM
8320C-2X-120A	120AC	1600	DPST-DM
8320CQ-2X-24A	24AC	64	DPST-DM
8320CQ-2X-120A	120AC	1600	DPST-DM
8320CQ-2X-240A	240AC	6400	DPST-DM
8320Q-2X-24A	24AC	64	DPST-DM
8320Q-2X-120A	120AC	1600	DPST-DM
8320Q-2X-240A	240AC	6400	DPST-DM
8325-2X-12D	12DC	72	DPST-DM
8325-2X-24D	24DC	288	DPST-DM
8325-2X-110D	110DC	6050	DPST-DM
8325C-2X-12D	12DC	72	DPST-DM
8325C-2X-24D	24DC	288	DPST-DM
8325C-2X-110D	110DC	6050	DPST-DM
8325CQ-2X-12D	12DC	72	DPST-DM
8325CQ-2X-24D	24DC	288	DPST-DM
8325CQ-2X-110D	110DC	6050	DPST-DM
8325Q-2X-12D	12DC	72	DPST-DM
8325Q-2X-24D	24DC	288	DPST-DM
8325Q-2X-110D	110DC	6050	DPST-DM

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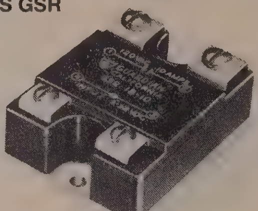
SOLID STATE

10, 25, 40 Amp SPNO—
GSR Series

Standard size, industiral relay with photo isolated input, "zero voltage" turn-on and internal snubber. Fully encapsulated for general purpose use. Termination: 6-32 screws (2) and 8-32 screws (2). Mounting: 2 holes on 1.87" centers. Shipping weight: 4 oz. L—2.25", W—1.75", H—0.88".

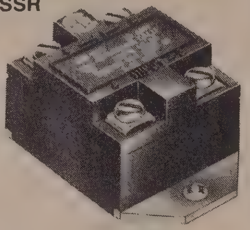
SERIES GSR



10 Amp SPNO Miniature—
MSSR Series

High performance, miniature relay offers 50% reduced weight and size. Photo isolated, "zero voltage" switching. Snubbered triac output. Optional 1mA microprocessor input. Termination: 6-32 screws. Mounting: 2 holes on 1.87" centers. Shipping weight: 2 oz.
L—2.25", W—1.25", H—0.81".

SERIES MSSR



2.5, 10, 20, 30 Amp SPNO—
TSSR Series

High performance, economical relay in miniature size. Photo isolated, "zero voltage" switching. Snubbered triac output. Optional 1mA microprocessor input. Termination: 0.187" QC (2) and 0.25" QC (2). Mounting: 2 holes on 0.187" centers. Shipping weight: 2 oz.
L—2.25", W—1.25", H—0.81".

SERIES TSSR

Guardian No.	Input		Output		Cont. Comb.
	VDC	mA (max)	VAC	A (max)	
GSR-1B-10	3-32	10	20-140	10	SPNO
GSR-2B-10	3-32	10	40-280	10	SPNO
GSR-1E-10	3-32	10	20-140	25	SPNO
GSR-2E-10	3-32	10	40-280	25	SPNO
GSR-1K-10	3-32	10	20-140	40	SPNO
GSR-2K-10	3-32	10	40-280	40	SPNO
MSSR-1B-10	3-32	5	20-140	10	SPNO
MSSR-1B-20	3-32	1	20-140	10	SPNO
MSSR-1B-30	3.5-8	12	20-140	10	SPNO
MSSR-2B-10	3-32	5	40-280	10	SPNO
MSSR-2B-20	3-32	1	40-280	10	SPNO
MSSR-2B-30	3.5-8	12	40-280	10	SPNO
TSSR-1H-10	3-32	5	20-140	2.5	SPNO
TSSR-1H-20	3-32	1	20-140	2.5	SPNO
TSSR-1H-30	3.5-8	12	20-140	2.5	SPNO
TSSR-2H-10	3-32	5	40-280	2.5	SPNO
TSSR-2H-20	3-32	1	40-280	2.5	SPNO
TSSR-2H-30	3.5-8	12	40-280	2.5	SPNO
TSSR-1B-10	3-32	5	20-140	10	SPNO
TSSR-1B-20	3-32	1	20-140	10	SPNO
TSSR-1B-30	3.5-8	12	20-140	10	SPNO
TSSR-2B-10	3-32	5	40-280	10	SPNO
TSSR-2B-20	3-32	1	40-280	10	SPNO
TSSR-2B-30	3.5-8	12	40-280	10	SPNO
TSSR-1G-10	3-32	5	20-140	20	SPNO
TSSR-1G-20	3-32	1	20-140	20	SPNO
TSSR-1G-30	3.5-8	12	20-140	20	SPNO
TSSR-2G-10	3-32	5	40-280	20	SPNO
TSSR-2G-20	3-32	1	40-280	20	SPNO
TSSR-2G-30	3.5-8	12	40-280	20	SPNO
TSSR-1F-10	3-32	5	20-140	30	SPNO
TSSR-1F-20	3-32	1	20-140	30	SPNO
TSSR-1F-30	3.5-8	12	20-140	30	SPNO
TSSR-2F-10	3-32	5	40-280	30	SPNO
TSSR-2F-20	3-32	1	40-280	30	SPNO
TSSR-2F-30	3.5-8	12	40-280	30	SPNO

5 Amp SPDT—LCT Series

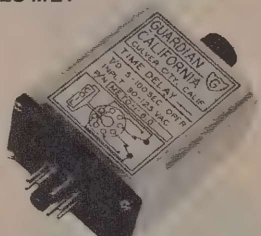
Low cost C-MOS timer. AC/DC input 1% repeatability. .187" tab terminal base. Delays from .5-2650 secs. Shipping weight: 3 oz.
LCT 1XX Series: Delay on Operate
LCT 2XX Series: Delay on Release
LCT 3XX Series: Interval On

SERIES LCT

10 Amp DPDT—MET Series

Low cost, excellent repeatability. AC or DC inputs available. 10 A output rating at 120VAC, 50-60 Hz resistive. Three standard delay ranges: 0.5-15, 0.5-100, 100-300 sec. Accuracy: 10% of nominal setting. Repeatability: 1% within fixed conditions. MET-O Series: Delay on operate. MET-R Series: Delay on release. Termination: Radio type plug. Shipping weight: 6 oz.
L—2.4", W—1.9", H—2.9".

SERIES MET



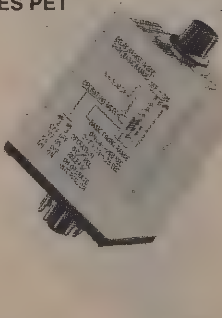
10 Amp DPDT—PET Series

Field programmable from 5 operating modes with selectable delays from .3 sec. to 2.2 hrs. Double pole double throw 10 amp contacts. High accuracy P-MOS Digital timing network, with outstanding repeatability. Standard 11 pin radio type pin. Shipping weight: 5 oz. L—2.4", W—1.9", H—4.0".

5 Operating Modes

1. Delay-on operate
2. Delay-on release
3. Delay-on both operate and release
4. Interval on
5. One shot

SERIES PET



Guardian No.	Input Voltage	Output		Cont. Comb.	Time Delay, Sec.
		VAC	Amp		
LCT-111-10	24-60VDC & 24-120VAC	120	5	SPDT	0.5-10
LCT-112-10		120	5	SPDT	2-40
LCT-113-10		120	5	SPDT	16-320
LCT-114-10		120	5	SPDT	128-2560
LCT-211-10	24-60VDC & 24-120VAC	120	5	SPDT	0.5-10
LCT-212-10		120	5	SPDT	2-40
LCT-213-10		120	5	SPDT	16-320
LCT-214-10		120	5	SPDT	128-2560
LCT-311-10	24-60VDC & 24-120VAC	120	5	SPDT	0.5-10
LCT-312-10		120	5	SPDT	2-40
LCT-313-10		120	5	SPDT	16-320
LCT-314-10		120	5	SPDT	128-2560
MET-O-100-24A	24AC	120	10	DPDT	0.5-100
MET-O-300-24A	24AC	120	10	DPDT	100-300
MET-O-015-120A	120AC	120	10	DPDT	0.5-15
MET-O-100-120A	120AC	120	10	DPDT	0.5-100
MET-O-300-120A	120AC	120	10	DPDT	100-300
MET-O-100-240A	240AC	120	10	DPDT	0.5-100
MET-O-015-24D	24DC	120	10	DPDT	0.5-15
MET-O-100-24D	24DC	120	10	DPDT	0.5-100
MET-O-300-24D	24DC	120	10	DPDT	100-300
MET-R-100-24A	24AC	120	10	DPDT	0.5-100
MET-R-300-24A	24AC	120	10	DPDT	100-300
MET-R-015-120A	120AC	120	10	DPDT	0.5-15
MET-R-100-120A	120AC	120	10	DPDT	0.5-100
MET-R-300-120A	120AC	120	10	DPDT	100-300
MET-R-015-24D	24DC	120	10	DPDT	0.5-15
MET-R-100-24D	24DC	120	10	DPDT	0.5-100
MET-R-300-24D	24DC	120	10	DPDT	100-300

Guardian No.	Selectable Input Voltage	Output		Cont. Comb.	Selectable Time Delay
		VAC	Amp		
PET-1481	24D, 24A, 120A	120	10	DPDT	.3 sec.-2.2 hrs

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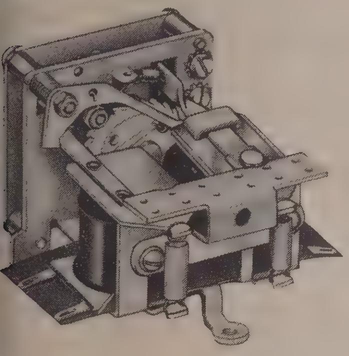
STEPPERS

MER Electrical Reset



MC Midget

Continuous Rotation

Wiper moves in one direction only. Partic- larly adaptable to repetitive sequence unctions. 24 bridging contact deck is evenly divisible by eight possible equences.
-$3\frac{3}{8}$″—W-$2\frac{15}{16}$″—H-$2\frac{3}{16}$″.

PER—Electrical Reset

ame operation as MER.
-$3\frac{3}{8}$″—W-$3\frac{7}{16}$″—H-$3\frac{1}{32}$″.

MER—Electrical Reset

Will control a sequence of operations and then reset automatically to zero or home from any desired position by energizing the reset magnet. Frequently used to count by various mechanical groups and then reset automatically. Positive interlock assures reset on a pulse as short as $\frac{1}{100}$ of a second. By interconnecting two or more, total may be increased, counting by tens or other convenient multiple. 24 contacts.
L-$3\frac{5}{16}$″—W-$3\frac{3}{8}$″—H-$2\frac{3}{16}$″.

PC—Continuous Rotation

40 contacts. Wiper moves in one direction only. Self-stepping speeds up to 20 steps per second.
Mechanical life expectancy up to 4 million steps.
L-$3\frac{3}{8}$″—W-$3\frac{7}{16}$″—H-$3\frac{1}{32}$″.

PAS—Add and Subtract

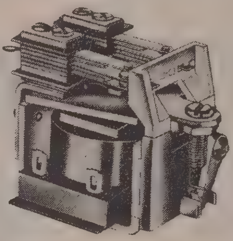
Bi-directional stepper supplied with 0.058″ AMP QC terminals in circle on deck Includes form "C" cam switch.
L-$3\frac{1}{2}$″—W-$3\frac{9}{16}$″—H-$3\frac{1}{2}$″.

Guardian No. Model — Volts	Watts	Volt Amperes	No. of Points	No. of Active Contacts	Max. Steps per Second	Shipping Weight Ounces
MC-120AC	17	30	24	24	20	$9\frac{1}{2}$
PC-120AC	20	35	40	40	20	17
MER-120AC	20-7 ¶	40-10 ¶	24	22	20	$11\frac{1}{2}$
MER-24DC	20-8 ¶		24	22	20	$11\frac{1}{2}$
PER/40-120AC	35-7 ¶	60-10 ¶	40	36	20	22
PAS-120AC	35	60	40	40+	20	22

¶ Listings are for stepping coil and reset coil, respectively.
+ Includes Zero (0) position.
All coils intermittant duty.

840LS/845LS—

On/Off Mechanical Latching Relay

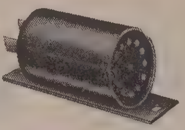


Compact relay for positive on/off control. Impulse as short as 20ms reverses switch position. Holds last position even with coil de-energized. 1 to 4 poles. Contacts rated 10A at 120VAC, 60 Hz, non-inductive. Power requirement: AC-22VA, DC-10W. Duty cycle: Intermittent. Termination: Solder lug. Mounting: 8-32 single tapped hole. Shipping weight: 5.2 oz.
L-$2\frac{1}{4}$″—W-$1\frac{29}{64}$″—H-$2\frac{7}{32}$″.

Guardian No.	Voltage	Coil Res. ±10%	Cont. Comb.
840LS-C-24A	24AC	9	SPDT
840LS-2C-24A	24AC	9	DPDT
840LS-4C-24A	24AC	9	4PDT
840LS-C-120A	120AC	200	SPDT
840LS-2C-120A	120AC	200	DPDT
840LS-4C-120A	120AC	200	4PDT
845LS-C-12D	12DC	14.4	SPDT
845LS-2C-12D	12DC	14.4	DPDT
845LS-4C-12D	12DC	14.4	4PDT
845LS-C-24D	24DC	55	SPDT
845LS-2C-24D	24DC	55	DPDT
845LS-4C-24D	24DC	55	4PDT

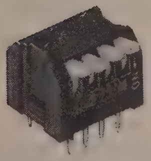
705—Rotomite

Maximum control in minimum space. High contact rating of 3A resistive, 1A inductive (50% PF) @ 120VAC, 60Hz. Continuous duty life over 1 million steps. Geared for continuous rotation hrough 12 positions. Applications include computers, business machines, lighting and vending controls, counting and sorting devices. L-3″—H-$1\frac{17}{64}$″ (includes mounting plate)—D-$1\frac{13}{64}$″.

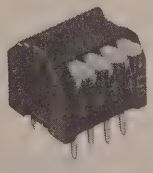


Guardian No.	No. Points	Coil Voltage	Shpg. Wt. Ounces
705-12P-12D	12	12DC	5
705-12P-24D	12	24DC	5

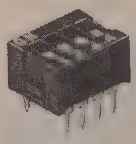
MINIATURE DIP SWITCHES



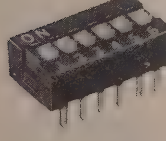
Piano Type, Up Off DNT Series



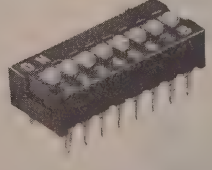
Piano Type, Up On DNP Series



Recessed Slide DNE Series



Standard Slide DNS Series



Light Touch Slide DNF Series

4, 6 and 8 Pole PC Board Switches

Mount directly to PC board for quick and easy circuit changes. Ideal for computers, vending machines, meters. Solvent resistant case. PC termination similar to IC and LSI packages with 0.1″ grid spacing. Variety of case and actuator styles. Gold plated contacts rated 50VDC at 100mA without switching, 5VDC at 100mA with switching, 25VDC at 25mA with switching. Electrical life: 10,000 operations minimum. Dimensions: See ordering chart.

Guardian No. Type / No. of Poles	L	W	H
DNS-04	0.461″	0.378″	0.236″
DNS-06	0.661″	0.378″	0.236″
DNS-08	0.858″	0.378″	0.236″
DNF-04	0.461″	0.378″	0.236″
DNF-06	0.661″	0.378″	0.236″
DNF-08	0.858″	0.378″	0.236″
DNE-04	0.461″	0.378″	0.256″
DNP-04	0.504″	0.433″	0.382″
DNP-08	0.902″	0.433″	0.382″
DNT-04	0.504″	0.433″	0.382″
DNT-08	0.902″	0.433″	0.382″

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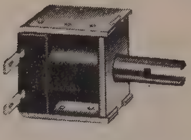
BOX FRAME, U-FRAME AND LAMINATED SOLENOIDS

No. 2 AC

Box frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1⅝″, W—1 7/16″, H—1⅝″

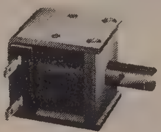
No. 2



No. 2HD AC or DC

Heavy duty, long life box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1 13/16″, W—1 7/16″, H—1 11/16″

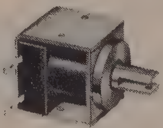
No. 2HD



No. 3HD DC

Heavy duty box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1 25/32″, W—1 7/16″, H—1⅝″

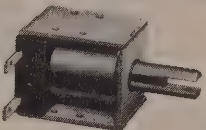
No. 3HD



No. 4 AC or DC

Box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—2 1/16″, W—1 7/16″, H—1⅝″

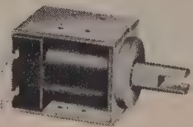
No. 4



No. 4HD AC or DC

Heavy duty box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—2 3/16″, W—1 7/16″, H—1⅝″

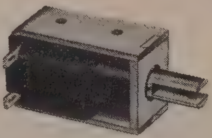
No. 4HD



No. 11 AC or DC

Box-frame. Push and pull types. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1⅞″, W—15/16″, H—1 3/16″

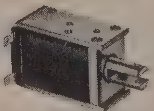
No. 11



No. 11HD AC or DC

Heavy duty box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—2⅛″, W—15/16″, H—1¼″

No. 11HD



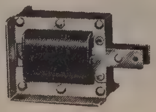
No. 11P AC or DC

Same as No. 11 Except push type. Pushrod. L—
D—

No. 12 AC

High efficiency laminated model. Coil finish: Acetate yarn coalesced with acetone. Termination: External leads.
L—1⅝″, W—1¼″, H—1 7/16″.

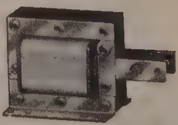
No. 12



No. 14 AC

High efficiency laminated model. Coil finish: Acetate yarn coalesced with acetone. Termination: External leads.
L—2 7/16″, W—1 15/16″, H—2 1/16″.

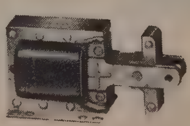
No. 14



No. 16 AC

High efficiency laminated model. Coil finish: Uni-Guard® II molded polyester. Termination: Dual purpose—solder lug and 0.187″ QC.
L—1⅝″, W—1¼″, H—1½″.

No. 16



Guardian No.	Duty	Coil Voltage	Ohms	Lifts and Strokes 25°C (Minimum)	Lifts and Strokes 25°C (Maximum)	Shpg. Wt. oz.
2	Inter.	120AC	60	56 oz. at ⅛″	15 oz. at ¾″	10
2	Cont.	120AC	166	21 oz. at ⅛″	4.5 oz. at ¾″	10
2	Inter.	12DC	5	90 oz. at ⅛″	3 oz. at ¾″	10
2	Cont.	12DC	14	40 oz. at ⅛″	2 oz. at ¾″	10
2	Inter.	24DC	20	90 oz. at ⅛″	3 oz. at ¾″	10
2	Cont.	24DC	58	40 oz. at ⅛″	2 oz. at ¾″	10
2HD	Inter.	120AC	36	64 oz. at ⅛″	20 oz. at ¾″	13
2HD	Cont.	120AC	113	25 oz. at ⅛″	9 oz. at ¾″	13
2HD	Inter.	24DC	20	96 oz. at ⅛″	10 oz. at ¾″	13
2HD	Cont.	24DC	64	48 oz. at ⅛″	6 oz. at ¾″	13
3HD	Inter.	120AC	25	88 oz. at ⅛″	6 oz. at 1″	14
3HD	Cont.	120AC	100	26 oz. at ⅛″	4 oz. at 1″	14
3HD	Inter.	12DC	5.2	160 oz. at 1/16″	7.5 oz. at ¾″	14
3HD	Cont.	12DC	13	99 oz. at 1/16″	4 oz. at ¾″	14
3HD	Inter.	24DC	21	160 oz. at 1/16″	7.5 oz. at ¾″	14
3HD	Cont.	24DC	53	99 oz. at 1/16″	4 oz. at ¾″	14
4	Inter.	120AC	37	38 oz. at ⅛″	44 oz. at 1″	14.5
4	Cont.	120AC	133	10 oz. at ⅛″	12 oz. at 1″	14.5
4	Inter.	12DC	3.8	108 oz. at ⅛″	12 oz. at 1″	14.5
4	Cont.	12DC	3.3	60 oz. at ⅛″	5 oz. at ⅞″	14.5
4	Inter.	24DC	15	108 oz. at ⅛″	12 oz. at 1″	14.5
4	Cont.	24DC	54	60 oz. at ⅛″	5 oz. at ⅞″	14.5
4	Inter.	110DC	346	108 oz. at ⅛″	12 oz. at 1″	14.5
4	Cont.	110DC	1300	60 oz. at ⅛″	5 oz. at ⅞″	14.5
4HD	Inter.	120AC	15	67 oz. at ⅛″	32 oz. at 1¼″	16
4HD	Cont.	120AC	53	20 oz. at ⅛″	11 oz. at 1¼″	16
4HD	Inter.	12DC	3.8	132 oz. at ⅛″	18 oz. at ¾″	16
4HD	Cont.	12DC	13.1	84 oz. at ⅛″	6 oz. at ¾″	16
4HD	Inter.	24DC	15	132 oz. at ⅛″	18 oz. at ¾″	16
4HD	Cont.	24DC	50	84 oz. at ⅛″	6 oz. at ¾″	16
4HD	Inter.	110DC	350	132 oz. at ⅛″	18 oz. at ¾″	16
4HD	Cont.	110DC	1200	84 oz. at ⅛″	6 oz. at ¾″	16
11	Inter.	24AC	3.5	31 oz. at ⅛″	24 oz. at ¾″	5
11	Cont.	24AC	8	15 oz. at ⅛″	10 oz. at ¾″	5
11	Inter.	120AC	85	31 oz. at ⅛″	24 oz. at ¾″	5
11	Cont.	120AC	200	15 oz. at ⅛″	10 oz. at ¾″	5
11	Inter.	6DC	2	60 oz. at ⅛″	3 oz. at ¾″	5
11	Cont.	6DC	4.5	40 oz. at ⅛″	1.5 oz. at ¾″	5
11	Inter.	12DC	8	60 oz. at ⅛″	3 oz. at ¾″	5
11	Cont.	12DC	18	40 oz. at ⅛″	1.5 oz. at ¾″	5
11	Inter.	24DC	31	60 oz. at ⅛″	3 oz. at ¾″	5
11	Cont.	24DC	72	40 oz. at ⅛″	1.5 oz. at ¾″	5
11HD	Inter.	120AC	75	30 oz. at ⅛″	13 oz. at 1″	8
11HD	Cont.	120AC	165	15 oz. at ⅛″	5 oz. at 1″	8
11HD	Inter.	12DC	7.2	60 oz. at ⅛″	1.5 oz. at ⅞″	8
11HD	Cont.	12DC	17	40 oz. at ⅛″	2.5 oz. at ⅝″	8
11HD	Inter.	24DC	24	60 oz. at ⅛″	1.5 oz. at ⅞″	8
11HD	Cont.	24DC	68	40 oz. at ⅛″	2.5 oz. at ⅝″	8
11P	Inter.	24AC	3.5	20 oz. at ⅛″	12.8 oz. at ¾″	5.5
11P	Cont.	24AC	8	9.6 oz. at ⅛″	5.6 oz. at ¾″	5.5
11P	Inter.	120AC	85	20 oz. at ⅛″	12.8 oz. at ¾″	5.5
11P	Cont.	120AC	200	9.6 oz. at ⅛″	5.6 oz. at ¾″	5.5
11P	Inter.	6DC	2	32.8 oz. at ⅛″	4 oz. at ¾″	5.5
11P	Cont.	6DC	4.5	20 oz. at ⅛″	1.2 oz. at ¾″	5.5
11P	Inter.	24DC	31	32.8 oz. at ⅛″	4 oz. at ¾″	5.5
11P	Cont.	24DC	72	20 oz. at ⅛″	1.2 oz. at ¾″	5.5
11S*	Inter.	120AC	85	31 oz. at ⅛″	24 oz. at ¾″	5.5
11S*	Cont.	120AC	200	15 oz. at ⅛″	10 oz. at ¾″	5.5
11S*	Inter.	24DC	31	60 oz. at ⅛″	3 oz. at ¾″	5.5
11S*	Cont.	24DC	72	40 oz. at ⅛″	1.5 oz. at ¾″	5.5
12	Inter.	120AC	100	48 oz. at ⅛″	9 oz. at ⅞″	6
12	Cont.	120AC	150	28 oz. at ⅛″	6 oz. at ⅞″	6
14	Inter.	120AC	11	132 oz. at ⅛″	112 oz. at 1½″	9
14	Cont.	120AC	18	96 oz. at ⅛″	56 oz. at 1½″	9
16	Inter.	120AC	41	110 oz. at ⅛″	36 oz. at ¾″	7.5
16	Cont.	120AC	85	63 oz. at ⅛″	15 oz. at ¾″	7.5
16	Inter.	240AC	200	110 oz. at ⅛″	36 oz. at ¾″	7.5
16	Cont.	240AC	350	63 oz. at ⅛″	15 oz. at ¾″	7.5

*Available with switch

GUARDIAN ELECTRIC MANUFACTURING COMPANY
1550 W. CARROLL AVENUE / CHICAGO, ILLINOIS 60607 / TEL (312) 243-1100 / TWX 910-221-5073

BOX FRAME, U-FRAME AND LAMINATED SOLENOIDS

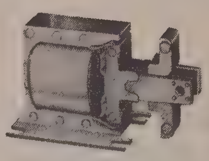
No. 16P AC

Same as No. 16 Except push type. Pushrod. L—13/16″, D—1/8″.

No. 18 AC

High efficiency laminated model. Coil finish: Acetate yarn coalesced with acetone. Termination: Solder lugs.
L—2½″, W—1 13/16″, H—2 3/32″.

No. 18



No. 18P AC

Same as No. 18 Except push type. Pushrod. L—1 1/16″, D—3/16″.

No. 22 AC or DC

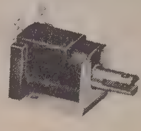
Box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.110″ QC lugs.
L—1 5/32″, W—3/4″, H—3/4″.

No. 22

No. 24 AC or DC

U-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1¼″, W—27/32″, H—1″.

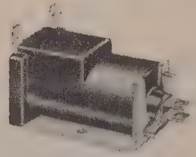
No. 24



No. 26 AC or DC

U-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1¾″, W—7/32″, H—1 3/16″.

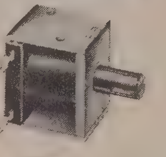
No. 26



No. 28 AC or DC

Box-frame. Push and pull types. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1⅛″, W—1 7/32″, H—1 3/16″.

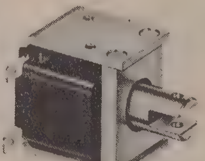
No. 28



No. 28HD AC or DC

Heavy duty box-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1 5/16″, W—15/16″, H—1¼″.

No. 28HD



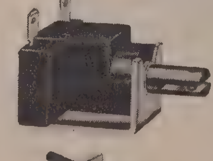
No. 28P AC or DC

Same as No. 28 Except push type. Pushrod.
L—3/32″ , D— 1 23/32.

No. 34 AC or DC

U-frame. Coil construction: Uni-Guard® II molded bobbin and coil cover. Termination: 0.187″ QC lugs.
L—1⅛″, W—3/4″, H—1 5/64″.

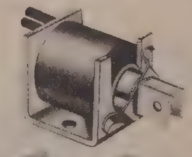
No. 34



No. 38 AC or DC

U-frame. Coil finish: Acetate yarn coalesced with acetone. Termination: 6″ leads.
L—49/64″, W—11/16″, H—3/4″.

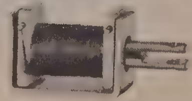
No. 38



No. 42 DC

Economical U-frame. Termination: Solder pin.
L—21/32″, W—0.312″, H—31/64″.

No. 42



* Available with switch

Guardian No.	Duty	Coil Voltage	Ohms	Lifts and Strokes 25°C (Minimum)	(Maximum)	Shpg. Wt. oz.
16P	Inter.	120AC	41	88 oz. at 1/8″	22.5 oz. at 3/4″	7.5
16P	Cont.	120AC	85	50.5 oz. at 1/8″	12 oz. at 3/4″	7.5
18	Inter.	120AC	8.8	336 oz. at 1/8″	190 oz. at 7/8″	16.5
18	Cont.	120AC	19.7	152 oz. at 1/8″	90 oz. at 7/8″	16.5
18	Inter.	240AC	45	336 oz. at 1/8″	190 oz. at 7/8″	16.5
18	Cont.	240AC	78	152 oz. at 1/8″	90 oz. at 7/8″	16.5
18P	Inter.	120AC	8.8	315 oz. at 1/8″	187 oz. at 7/8″	16.5
18P	Cont.	120AC	19.7	137 oz. at 1/8″	90 oz. at 7/8″	16.5
22	Inter.	120AC	590	13.5 oz. at 1/16″	2.5 oz. at 1/2″	1.75
22	Cont.	120AC	980	7 oz. at 1/16″	1 oz. at 1/2″	1.75
22	Inter.	6DC	4	17 oz. at 1/16″	2 oz. at 3/8″	1.75
22	Cont.	6DC	9	11 oz. at 1/16″	1 oz. at 3/8″	1.75
22	Inter.	12DC	16	17 oz. at 1/16″	2 oz. at 3/8″	1.75
22	Cont.	12DC	36	11 oz. at 1/16″	1 oz. at 3/8″	1.75
22	Inter.	24DC	60	17 oz. at 1/16″	2 oz. at 3/8″	1.75
22	Cont.	24DC	144	11 oz. at 1/16″	1 oz. at 3/8″	1.75
24	Inter.	120AC	310	20 oz. at 1/16″	4 oz. at 5/8″	5
24	Cont.	120AC	500	15 oz. at 1/16″	2 oz. at 5/8″	5
24	Inter.	12DC	13	28 oz. at 1/16″	3 oz. at 1/2″	5
24	Cont.	12DC	28.8	15 oz. at 1/16″	1.5 oz. at 1/2″	5
24	Inter.	24DC	52	28 oz. at 1/16″	3 oz. at 1/2″	5
24	Cont.	24DC	114	15 oz. at 1/16″	1.5 oz. at 1/2″	5
24S	Inter.	24DC	52	28 oz. at 1/16″	3 oz. at 1/2″	5.5
24S	Cont.	24DC	114	15 oz. at 1/16″	1.5 oz. at 1/2″	5.5
26	Inter.	120AC	140	32 oz. at 1/16″	2 oz. at 7/8″	6
26	Cont.	120AC	250	15 oz. at 1/16″	6 oz. at 5/8″	6
26	Inter.	12DC	8	44 oz. at 1/16″	3 oz. at 3/4″	6
26	Cont.	12DC	20	24 oz. at 1/16″	3 oz. at 1/2″	6
26	Inter.	24DC	33	44 oz. at 1/16″	3 oz. at 3/4″	6
26	Cont.	24DC	85	24 oz. at 1/16″	3 oz. at 1/2″	6
28	Inter.	24AC	7.5	26 oz. at 1/16″	5 oz. at 1/2″	5
28	Cont.	24AC	17.4	15 oz. at 1/16″	4 oz. at 1/2″	5
28	Inter.	120AC	220	26 oz. at 1/16″	5 oz. at 1/2″	5
28	Cont.	120AC	400	15 oz. at 1/16″	4 oz. at 1/2″	5
28	Inter.	6DC	3.3	40 oz. at 1/16″	3 oz. at 1/2″	5
28	Cont.	6DC	7.7	23 oz. at 1/16″	2 oz. at 1/2″	5
28	Inter.	12DC	13	40 oz. at 1/16″	3 oz. at 1/2″	5
28	Cont.	12DC	27	23 oz. at 1/16″	2 oz. at 1/2″	5
28	Inter.	24DC	50	40 oz. at 1/16″	3 oz. at 1/2″	5
28	Cont.	24DC	104	23 oz. at 1/16″	2 oz. at 1/2″	5
28HD	Inter.	120AC	200	33 oz. at 1/16″	9 oz. at 1/2″	6
28HD	Cont.	120AC	350	13 oz. at 1/16″	4 oz. at 1/2″	6
28HD	Inter.	12DC	13	26 oz. at 1/8″	5 oz. at 3/8″	6
28HD	Cont.	12DC	24	14 oz. at 1/8″	3 oz. at 3/8″	6
28HD	Inter.	24DC	50	26 oz. at 1/8″	5 oz. at 3/8″	6
28HD	Cont.	24DC	90	14 oz. at 1/8″	3 oz. at 3/8″	6
28P	Inter.	24AC	7.5	32 oz. at 1/16″	5.5 oz. at 1/2″	5.5
28P	Cont.	24AC	17.4	19.2 oz. at 1/16″	4 oz. at 1/2″	5.5
28P	Inter.	120AC	220	32 oz. at 1/16″	5.5 oz. at 1/2″	5.5
28P	Cont.	120AC	400	19.2 oz. at 1/16″	4 oz. at 1/2″	5.5
28P	Inter.	6DC	3.3	32 oz. at 1/16″	2.4 oz. at 1/2″	5.5
28P	Cont.	6DC	7.7	20 oz. at 1/16″	1.6 oz. at 1/2″	5.5
28P	Inter.	12DC	13	32 oz. at 1/16″	2.4 oz. at 1/2″	5.5
28P	Cont.	12DC	27	20 oz. at 1/16″	1.6 oz. at 1/2″	5.5
28P	Inter.	24DC	50	32 oz. at 1/16″	2.4 oz. at 1/2″	5.5
28P	Cont.	24DC	104	20 oz. at 1/16″	1.6 oz. at 1/2″	5.5
28S	Inter.	24DC	50	40 oz. at 1/16″	3 oz. at 1/2″	5.5
28S	Cont.	24DC	104	23 oz. at 1/16″	2 oz. at 1/2″	5.5
34	Inter.	120AC	400	16 oz. at 1/16″	3 oz. at 3/8″	3
34	Cont.	120AC	865	8.75 oz. at 1/16″	2.5 oz. at 3/8″	3
34	Inter.	12DC	17.5	12 oz. at 1/16″	2 oz. at 1/4″	3
34	Cont.	12DC	36	7 oz. at 1/16″	1.5 oz. at 1/4″	3
34	Inter.	24DC	66	12 oz. at 1/16″	2 oz. at 1/4″	3
34	Cont.	24DC	145	7 oz. at 1/16″	1.5 oz. at 1/4″	3
38	Inter.	120AC	860	6.75 oz. at 1/16″	0.75 oz. at 3/8″	1
38	Cont.	120AC	1500	4.5 oz. at 1/16″	0.5 oz. at 3/8″	1
38	Inter.	24DC	72	4.5 oz. at 1/32″	1.75 oz. at 3/16″	1
38	Cont.	24DC	160	3.5 oz. at 1/32″	0.5 oz. at 3/16″	1
42	Inter.	12DC	32	2.5 oz. at 1/32″	0.5 oz. at 1/8″	3
42	Cont.	12DC	72	1.5 oz. at 1/32″	0.25 oz. at 1/8″	3
42	Inter.	24DC	128	2.5 oz. at 1/32″	0.5 oz. at 1/8″	3
42	Cont.	24DC	288	1.5 oz. at 1/32″	0.25 oz. at 1/8″	3

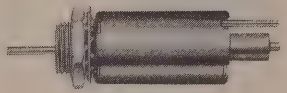
QUICK CONNECT LEADS

Lead wire adapters specifically designed for Guardians's Uni-Guard® II coil construction. Minimum overall length 6″, 22 gauge wire (U/L style 1015, temperature rating 105°C). Termination: 0.187″ or 0.110″ insulated female QC lug. Opposite end stripped 1/4″ minimum. 2 required for each solenoid.

Guardian No.	Lug Size
LW-22.187	0.187″
LW-22.110	0.110″

TUBULAR SOLENOIDS

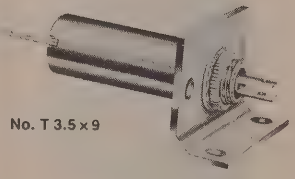
Tubular solenoids are available in either pull (T series) or push (TP series). TP series dimensions are identical to T series. Notched assembly of shell and bushing permits tightening of mounting nut without damaging coil. Insulation material: Class "A" (110°C). Termination: 6″ leads. Mounting hardware included. T and TP series recognized under the Component Program of Underwriters' Laboratories, Inc. Long life versions (LT series) available with same dimensions as T series. LT series expected life rating: 100 million operations.



Typical Push Type Solenoid

No. T 3.5×9

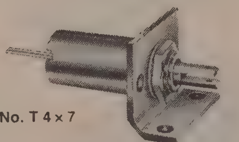
L—1 1/8″, D—7/16″. Mounting thread size: 5/16-32 UNEF. Bracket: W—1 1/8″, holes on 13/16″ centers. TP pushrod: L—1/2″, D—1/16″.



No. T 3.5×9

No. T 4×7

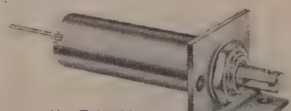
L—7/8″, D—1/2″. Mounting thread size: 3/8-32 UNEF. Bracket: W—1 1/8″, holes on 13/16″ centers. TP pushrod: L—.23/64″, D—1/16″.



No. T 4×7

No. T 4×12

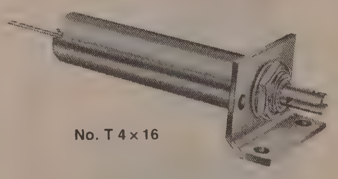
L—1 1/2″, D—1/2″. Mounting thread size: 3/8-32 UNEF. Bracket: W—1 1/8″, holes on 13/16″ centers. TP pushrod: L—1 15/64″, D—1/16″.



No. T 4×12

No. T 4×16

L—2″, D—1/2″. Mounting thread size: 3/8-32 UNEF. Bracket: W—1 1/8″, holes on 13/16″ centers. TP pushrod: L—1 15/64″, D—1/16″.



No. T 4×16

Guardian No.	Duty	Coil Voltage	Ohms	Lifts and Strokes 25°C (Minimum)	(Maximum)	Shpg. Wt. oz.
T3.5×9	Inter.	12DC	14	8.5 oz. at 1/32″	1.2 oz. at 1/2″	0.9
T3.5×9	Cont.	12DC	80	5.5 oz. at 1/32″	0.75 oz. at 5/16″	0.9
T3.5×9	Inter.	24DC	57	8.5 oz. at 1/32″	1.2 oz. at 1/2″	0.9
T3.5×9	Cont.	24DC	260	5.5 oz. at 1/32″	0.75 oz. at 5/16″	0.9
LT3.5×9	Inter.	12DC	15	4.75 oz. at 1/32″	0.6 oz. at 3/8″	1.2
LT3.5×9	Cont.	12DC	72	1.8 oz. at 1/32″	0.2 oz. at 3/8″	1.2
LT3.5×9	Inter.	24DC	60.6	4.75 oz. at 1/32″	0.6 oz. at 3/8″	1.2
LT3.5×9	Cont.	24DC	288	1.8 oz. at 1/32″	0.2 oz. at 3/8″	1.2
TP3.5×9	Inter.	12DC	14	6.8 oz. at 1/32″	0.96 oz. at 1/2″	0.9
TP3.5×9	Cont.	12DC	80	4.4 oz. at 1/32″	0.6 oz. at 5/16″	0.9
TP3.5×9	Inter.	24DC	57	6.8 oz. at 1/32″	0.96 oz. at 1/2″	0.9
TP3.5×9	Cont.	24DC	260	4.4 oz. at 1/32″	0.6 oz. at 5/16″	0.9
T4×7	Inter.	12DC	20	12 oz. at 1/32″	0.8 oz. at 3/8″	1.1
T4×7	Cont.	12DC	60	6 oz. at 1/32″	1 oz. at 3/16″	1.1
T4×7	Inter.	24DC	80	12 oz. at 1/32″	0.8 oz. at 3/8″	1.1
T4×7	Cont.	24DC	240	6 oz. at 1/32″	1 oz. at 3/16″	1.1
LT4×7	Inter.	12DC	16	11 oz. at 1/32″	0.25 oz. at 3/8″	1.1
LT4×7	Cont.	12DC	48	3.25 oz. at 1/32″	0.25 oz. at 3/8″	1.1
LT4×7	Inter.	24DC	64	11 oz. at 1/32″	0.25 oz. at 3/4″	1.1
LT4×7	Cont.	24DC	192	3.25 oz. at 1/32″	0.25 oz. at 3/8″	1.1
TP4×7	Inter.	24DC	80	9.6 oz. at 1/32″	0.64 oz. at 3/8″	1.1
TP4×7	Cont.	24DC	240	4.8 oz. at 1/32″	0.8 oz. at 3/16″	1.1
T4×12	Inter.	12DC	10	14 oz. at 1/32″	1.5 oz. at 7/8″	1.7
T4×12	Cont.	12DC	41	7 oz. at 1/32″	1.5 oz. at 1 1/4″	1.7
T4×12	Inter.	24DC	38	14 oz. at 1/32″	1.5 oz. at 7/8″	1.7
T4×12	Cont.	24DC	160	7 oz. at 1/32″	1.5 oz. at 1/4″	1.7
LT4×12	Inter.	12DC	8	16 oz. at 1/16″	1.5 oz. at 1/2″	1.5
LT4×12	Cont.	12DC	33.8	7.5 oz. at 1/16″	0.75 oz. at 1/2″	1.5
LT4×12	Inter.	24DC	32	16 oz. at 1/16″	1.5 oz. at 1/2″	1.5
LT4×12	Cont.	24DC	135	7.5 oz. at 1/16″	0.75 oz. at 1/2″	1.5
TP4×12	Inter.	24DC	38	11.2 oz. at 1/32″	1.2 oz. at 7/8″	1.7
TP4×12	Cont.	24DC	160	5.6 oz. at 1/32″	1.2 oz. at 1/4″	1.7
T4×16	Inter.	12DC	6	7 oz. at 1/16″	4 oz. at 1″	1.9
T4×16	Cont.	12DC	36	6.5 oz. at 1/16″	1.5 oz. at 1/2″	1.9
T4×16	Inter.	24DC	24	7 oz. at 1/16″	4 oz. at 1″	1.9
T4×16	Cont.	24DC	145	6.5 oz. at 1/16″	1.5 oz. at 7/8″	1.9
LT4×16	Inter.	12DC	4.8	16 oz. at 1/16″	5.5 oz. at 1/2″	2.1
LT4×16	Cont.	12DC	28.8	8 oz. at 1/16″	2 oz. at 1/2″	2.1
LT4×16	Inter.	24DC	19.2	16 oz. at 1/16″	5.5 oz. at 1/2″	2.1
LT4×16	Cont.	24DC	115	8 oz. at 1/16″	2 oz. at 1/2″	2.1
TP4×16	Inter.	12DC	6	5.6 oz. at 1/16″	3.2 oz. at 1″	1.9
TP4×16	Cont.	12DC	36	5.2 oz. at 1/16″	1.2 oz. at 7/8″	1.9
TP4×16	Inter.	24DC	24	5.6 oz. at 1/16″	3.2 oz. at 1″	1.9
TP4×16	Cont.	24DC	145	5.2 oz. at 1/16″	1.2 oz. at 7/8″	1.9

GUARDIAN ELECTRIC MANUFACTURING COMPANY

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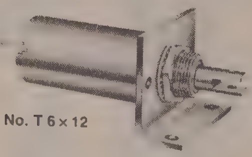
TUBULAR SOLENOIDS

No. T 6 × 12

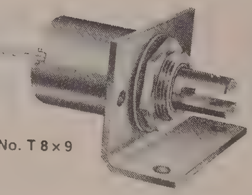
L—1½″, D—¾″. Mounting thread size: 15/32-32 UNEF. Bracket: W—1⅜″, holes on 1 1/16″ centers. TP pushrod: L—1″, D—3/32″.



No. T 6 × 12

No. T 8 × 9

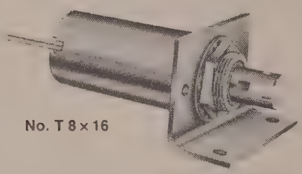
L—1⅛″, D—1″. Mounting thread size: ¾-24 UNS. Bracket: W—2″, holes on 1½″ centers. TP pushrod: L—½″, D—⅛″.



No. T 8 × 9

No. T 8 × 16

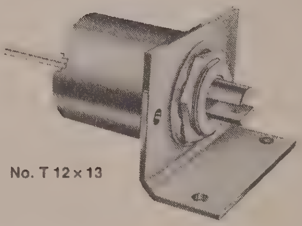
L—2″, D—1″. Mounting thread size: ¾-24 UNS. Bracket: W—2″, holes on 1½″ centers. TP pushrod: L—1¼″, D—⅛″.



No. T 8 × 16

No. T 12 × 13

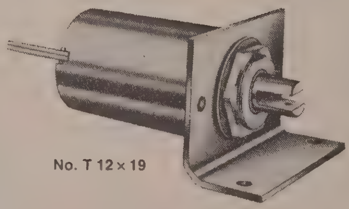
L—1⅝″, D—1½″. Mounting thread size: 1-27 UNS. Bracket: W—2½″, holes on 2″ centers. TP pushrod: L—1 1/32″, D—3/16″.



No. T 12 × 13

No. T 12 × 19

L—2⅜″, D—1½″. Mounting thread size: 1-27 UNS. Bracket: W—2½″, holes on 2″ centers. TP pushrod: L—1 21/32″, D—3/16″.



No. T 12 × 19

Guardian No.	Duty	Coil Voltage	Ohms	Lifts and Strokes 25°C (Minimum)	(Maximum)	Shpg. Wt. oz.
T6×12	Inter.	12DC	6.5	30 oz. at 1/16″	4 oz. at ¾″	3
T6×12	Cont.	12DC	41	12 oz. at 1/16″	1 oz. at ¾″	3
T6×12	Inter.	24DC	25	30 oz. at 1/16″	4 oz. at ¾″	3
T6×12	Cont.	24DC	165	12 oz. at 1/16″	1 oz. at ¾″	3
LT6×12	Inter.	12DC	3.6	36 oz. at 1/16″	3 oz. at ½″	3.4
LT6×12	Cont.	12DC	25	14 oz. at 1/16″	1.5 oz. at ½″	3.4
LT6×12	Inter.	24DC	14.4	36 oz. at 1/16″	3 oz. at ½″	3.4
LT6×12	Cont.	24DC	102	14 oz. at 1/16″	1.5 oz. at ½″	3.4
TP6×12	Inter.	12DC	6.5	24 oz. at 1/16″	3.2 oz. at ¾″	3
TP6×12	Cont.	12DC	41	9.6 oz. at 1/16″	0.8 oz. at ¾″	3
TP6×12	Inter.	24DC	25	24 oz. at 1/16″	3.2 oz. at ¾″	3
TP6×12	Cont.	24DC	165	9.6 oz. at 1/16″	0.8 oz. at ¾″	3
T8×9	Inter.	12DC	7.5	52 oz. at 1/16″	6 oz. at 7/16″	6
T8×9	Cont.	12DC	36	23 oz. at 1/16″	3 oz. at 7/16″	6
T8×9	Inter.	24DC	30	52 oz. at 1/16″	6 oz. at 7/16″	6
T8×9	Cont.	24DC	145	23 oz. at 1/16″	3 oz. at 7/16″	6
LT8×9	Inter.	12DC	9.1	52 oz. at 1/16″	4 oz. at ½″	5.1
LT8×9	Cont.	12DC	27.4	20.5 oz. at 1/16″	1.75 oz. at ½″	5.1
LT8×9	Inter.	24DC	24.5	52 oz. at 1/16″	4 oz. at ½″	5.1
LT8×9	Cont.	24DC	109.7	20.5 oz. at 1/16″	1.75 oz. at ½″	5.1
TP8×9	Inter.	24DC	30	41.6 oz. at 1/16″	4.8 oz. at 7/16″	6
TP8×9	Cont.	24DC	145	18.4 oz. at 1/16″	2.4 oz. at 7/16″	6
T8×16	Inter.	12DC	2.7	80 oz. at 1/16″	14 oz. at ⅞″	7.8
T8×16	Cont.	12DC	26	35 oz. at 1/16″	5.5 oz. at ⅞″	7.8
T8×16	Inter.	24DC	15	80 oz. at 1/16″	14 oz. at ⅞″	7.8
T8×16	Cont.	24DC	105	35 oz. at 1/16″	5.5 oz. at ⅞″	7.8
LT8×16	Inter.	12DC	2.5	88 oz. at 1/16″	30 oz. at ½″	6.8
LT8×16	Cont.	12DC	18	48 oz. at 1/16″	7 oz. at ½″	6.8
LT8×16	Inter.	24DC	10.2	88 oz. at 1/16″	30 oz. at ½″	6.8
LT8×16	Cont.	24DC	72	48 oz. at 1/16″	7 oz. at ½″	6.8
TP8×16	Inter.	12DC	2.7	64 oz. at 1/16″	11.2 oz. at ⅞″	7.8
TP8×16	Cont.	12DC	26	28 oz. at 1/16″	4.4 oz. at ⅞″	7.8
TP8×16	Inter.	24DC	15	64 oz. at 1/16″	11.2 oz. at ⅞″	7.8
TP8×16	Cont.	24DC	105	28 oz. at 1/16″	4.4 oz. at ⅞″	7.8
T12×13	Inter.	12DC	3.6	150 oz. at ⅛″	14 oz. at ¾″	10.5
T12×13	Cont.	12DC	20	50 oz. at ⅛″	4 oz. at ¾″	10.5
T12×13	Inter.	24DC	14	150 oz. at ⅛″	14 oz. at ¾″	10.5
T12×13	Cont.	24DC	85	50 oz. at ⅛″	4 oz. at ¾″	10.5
LT12×13	Inter.	12DC	2.6	190 oz. at ⅛″	16 oz. at ¾″	14.2
LT12×13	Cont.	12DC	15.5	96 oz. at ⅛″	4 oz. at ¾″	14.2
LT12×13	Inter.	24DC	10.7	190 oz. at ⅛″	16 oz. at ¾″	14.2
LT12×13	Cont.	24DC	62.2	96 oz. at ⅛″	4 oz. at ¾″	14.2
TP12×13	Inter.	24DC	14	120 oz. at ⅛″	11.2 oz. at ¾″	10.5
TP12×13	Cont.	24DC	85	40 oz. at ⅛″	3.2 oz. at ¾″	10.5
T12×19	Inter.	12DC	2.4	150 oz. at ⅛″	12 oz. at 1½″	21.4
T12×19	Cont.	12DC	14	80 oz. at ⅛″	5 oz. at 1½″	21.4
T12×19	Inter.	24DC	9.5	150 oz. at ⅛″	12 oz. at 1½″	21.4
T12×19	Cont.	24DC	59	80 oz. at ⅛″	5 oz. at 1½″	21.4
LT12×19	Inter.	12DC	1.7	172 oz. at ⅛″	64 oz. at ¾″	19
LT12×19	Cont.	12DC	10	126 oz. at ⅛″	12 oz. at ¾″	19
LT12×19	Inter.	24DC	6.9	172 oz. at ⅛″	64 oz. at ¾″	19
LT12×19	Cont.	24DC	39.7	126 oz. at ⅛″	12 oz. at ¾″	19
TP12×19	Inter.	24DC	9.5	120 oz. at ⅛″	9.6 oz. at 1½″	21.4
TP12×19	Cont.	24DC	59	64 oz. at ⅛″	4 oz. at 1½″	21.4

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms	**1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code	**3**•1103
Batteries, Product Selection Guide	**3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide	**2**•1003
Capacitors, Basic Formulas	**1A**•1093
Capacitors, Miniglossary	**1A**•1069
Capacitors, Product Selection Guide	**1A**•1003
Circuit Boards (Printed), Product Selection Guide	**2**•1089
Coils, Chokes, & Inductors, Product Selection Guide	**1A**•1219
Connectors, Miniglossary	**2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide	**2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide	**1A**•1309
Delay Lines, Product Selection Guide	**1A**•1445
Discrete Semiconductors, Product Selection Guide	**1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide	**1B**•1021
EBCDIC Code	**3**•1153
Encapsulation, Miniglossary	**2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide	**2**•1801
Filters, Product Selection Guide	**1A**•1577
Instruments, Graphic Recording, Product Selection Guide	**3**•1381
Instruments, Panel Meters, Product Selection Guide	**3**•1321
Instruments, Test & Measuring, Product Selection Guide	**3**•1182
Interconnection Systems, Product Selection Guide	**2**•1873
Keyboards & Keypads, Product Selection Guide	**1B**•1759
Microwave Components, Product Selection Guide	**1A**•1685
Military Qualified Products Lists	**1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide	**1B**•1121
Opto Semiconductors, Miniglossary	**1B**•1218
Oscilloscopes, Product Selection Guide	**3**•1361
Panel Hardware, Product Selection Guide	**2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide	**1A**•2017
Power Supplies, Miniglossary	**3**•1455
Power Supplies, AC, Product Selection Guide	**3**•1815
Power Supplies, DC, Product Selection Guide	**3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide	**1B**•1255
Relay Contact Forms	**1B**•1317
Relays, Electromechanical, Miniglossary	**1•B**1292
Relays, Product Selection Guide	**1B**•1289
Resistor Color Codes	**1A**•1791
Resistors, Product Selection Guide	**1A**•1789
Servo Components, Miniglossary	**3**•1935
Solenoids, Product Selection Guide	**1B**•1481
Switches, Product Selection Guide	**1B**•1499
Thyristors/High Power Diodes, Miniglossary	**1A**•1652
Transducers & Encoders, Product Selection Guide	**1B**•1827
Transformers, Product Selection Guide	**1A**•2115
Wire & Cable, Product Selection Guide	**2**•1935

HAMLIN INC

LAKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
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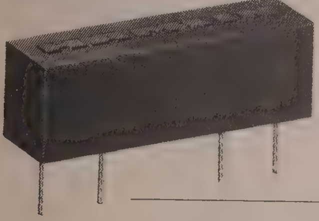
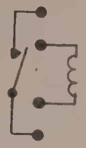
REED RELAYS





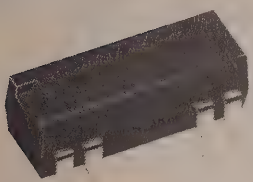
HE3321A

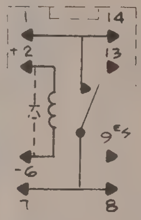
HE3351A

1A

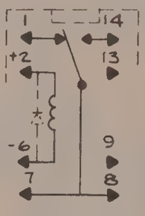
HE3300 SERIES — SIP

Relay Part Number	Coil Voltage (V)	Coil Resistance (Ω) (± 10%)	Must Operate Voltage V Max.	Must Release Voltage V Min.	Contact Form	Switch Voltage Max. (V)	Switch Current Max. (A)	Switch Rating Max. (W)	Min. Voltage Hold-Off VDC	Contact Resistance (Ω)	List Price
HE3321A0400	5	500	3.75	0.5	1A	200	0.500	10	250	.200	$2.13
HE3321A1200	12	500	9.0	1.0	1A	200	0.500	10	250	.200	2.13
HE3321A2400	24	2000	16.0	2.0	1A	200	0.500	10	250	.200	2.13
HIGH-VOLTAGE HOLD-OFF RELAY											
HE3351A0500	5	125	4.0	0.5	1A	300	0.500	20	800	.200	$2.43
HE3351A1200	12	500	9.0	1.0	1A	300	0.500	20	800	.200	2.43
HE3351A2400	24	2000	18.0	2.0	1A	300	0.500	20	800	.200	2.43





HE721A



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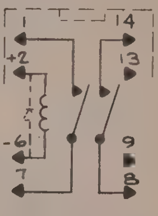
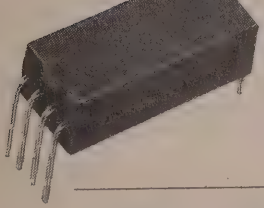


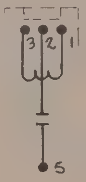
HE722A

HE700 SERIES — DIP

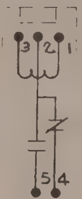
Hamlin 8 pin .275 package is available in 1A, 2A, 1B, 1C inputs — 5, 12, 24 volt — standard mercury-wetted.

Relay Part Number	Coil Voltage (V)	Coil Resistance (Ω) (± 10%)	Must Operate Voltage V Max.	Must Release Voltage V Min.	Contact Form	Switch Voltage Max. (V)	Switch Current Max. (A)	Switch Rating Max. (W)	Min. Voltage Hold-Off VDC	Contact Resistance (Ω)	List Price
HE721A0500	5	500	3.75	0.5	1A	200	.500	10	250	.200	$3.45
HE721A0510	5	500	3.75	0.5	1A	200	.500	10	250	.200	3.85
HE721A1200	12	1000	8.0	1.0	1A	200	.500	10	250	.200	3.85
HE721A1210	12	1000	8.0	1.0	1A	200	.500	10	250	.200	4.25
HE721C0500	5	200	3.75	0.5	1C	200	.250	3	250	.200	6.09
HE721C0510	5	200	3.75	0.5	1C	200	.250	3	250	.200	6.49
HE721C1200	12	500	8.0	1.0	1C	200	.250	3	250	.200	6.23
HE721C1210	12	500	8.0	1.0	1C	200	.250	3	250	.200	6.63
HE721C2400	24	2000	16.0	2.0	1C	200	.250	3	250	.200	6.76
HE721C2410	24	2000	16.0	2.0	1C	200	.250	3	250	.200	7.16
HE722A0500	5	200	3.75	0.5	2A	200	.500	10	250	.200	4.93
HE722A0510	5	200	3.75	0.5	2A	200	.500	10	250	.200	5.33
HE722A1200	12	500	8.0	2.0	2A	200	.500	10	250	.200	5.02
HE722A1210	12	500	8.0	2.0	2A	200	.500	10	250	.200	5.42
HE722A2400	24	2150	16.0	4.0	2A	200	.500	10	250	.200	5.42
HE722A2410	24	2150	16.0	4.0	2A	200	.500	10	250	.200	5.82





HE1121A



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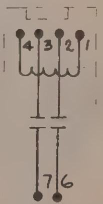

HE1122A

HE1100 SERIES

Economically priced, 0.1" × 1.0" spacing. Molded body.

Relay Part Number	Coil Voltage (V)	Coil Resistance (Ω) (± 10%)	Must Operate Voltage V Max.	Must Release Voltage V Min.	Contact Form	Switch Voltage Max. (V)	Switch Current Max. (A)	Switch Rating Max. (W)	Min. Voltage Hold-Off VDC	Contact Resistance (Ω)	List Price
HE1121A0400	5	500	4	0.5	1A	200	.500	10	300	.150	$2.91
HE1121A1200	12	500	9	1	1A	200	.500	10	300	.150	2.91
HE1121A2400	24	2000	18	2	1A	200	.500	10	300	.150	3.09
HE1121C0500	5	125	4	0.5	1C	200	.250	3	250	.200	4.48
HE1121C1200	12	500	9	1	1C	200	.250	3	250	.200	4.48
HE1121C2400	24	2000	18	2	1C	200	.250	3	250	.200	4.48
HE1122A0500	5	75	4	0.5	2A	200	.500	10	300	.150	3.36
HE1122A1200	12	300	9	1	2A	200	.500	10	300	.150	3.36
HE1122A2400	24	1200	18	2	2A	200	.500	10	300	.150	3.54

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USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

SPECS?
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CUSTOM?
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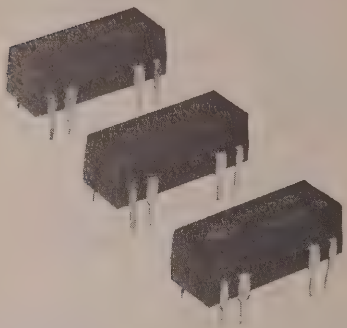
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?

EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

HASCO COMPONENTS INC. / **REED RELAYS**

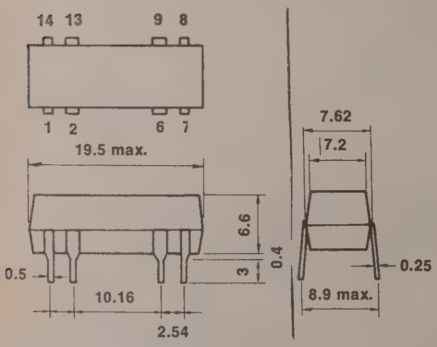
OKI
electric
industry
company, ltd.



FEATURES

- De-activated rhodium contacts. for stable contact resistance.
- Standard TO-116 Terminal Grid fits all standard DIP sockets.
- Interface directly with RTL, DTL, TTL, HTL logic.
- Molded epoxy package for environmental immunity.
- Automatic insertion compatible.
- Relay testing services test report available.

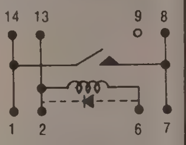
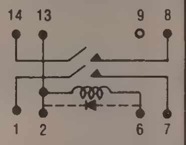
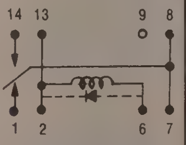
STRUCTURE (Unit in mm)



D SERIES DIP REED RELAYS

Hasco Components, Inc. is the exclusive agent for OKI's reed switches and reed relays. We also carry a wide range of Hasco electromechanical relays. If you need additional information on high quality, low priced products, please contact us.

CHARACTERISTICS

Contact Form	Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ω)	Circuit Schematic (Top view)
1A	**D51A05 (D)**	5	3.75	0.5	500	
	D51A12 (D)	12	9.0	1.2	800	
	D51A24 (D)	24	18.0	2.4	2000	
2A	**D52A05 (D)**	5	3.75	0.5	140	
	D52A12 (D)	12	9.0	1.2	400	
	D52A24 (D)	24	18.0	2.4	1300	
1C	**D51C05 (D)**	5	3.75	0.5	200	
	D51C12 (D)	12	9.0	1.2	500	
	D51C24 (D)	24	18.0	2.4	1500	

(D); clamp diode optional

ENGINEERING DATA

	1A, 2A	**1C**
Operate time	0.5msec max.	0.5msec. max.
Release time	0.2msec max.	0.2msec max.
Bounce time	0.5msec max.	2.0msec max.
Contact resistance	150mΩ max. (initial)	150mΩ max. (initial)
Contact ratings	DC10VA max.	DC3VA max.
	DC100V max.	DC30V max.
	DC1.0A max. (carry only)	DC0.5A max. (carry only)
	DC0.5A max. (switched)	DC0.25A max. (switched)
Life expectancy	50 x 10^6 operations at signal level	30 x 10^6 operations at signal level
	3 x 10^6 full rated load	1 x 10^6 at full rated load
Breakdown voltage	DC250V across open contacts	DC200V across open contacts
	DC500V between coil and contact	DC500V between coil and contact
Insulation resistance	$10^9\Omega$ min.	$10^9\Omega$ min.
Vibration	20G (10 ~ 2000Hz)	20G (10 ~ 2000Hz)
Thermal shock	−55 ~ 105°C	−55 ~ 105°C
Moisture resistance	60°C-90% 240 hours	60°C-90% 240 hours
Terminal strength	225g	225g
Operating temperature	−40 ~ 85°C	−40 ~ 85°C
Storage temperature	−55 ~ 105°C	−55 ~ 105C°

EXCLUSIVE AGENT FOR OKI REED RELAYS IN USA AND CANADA

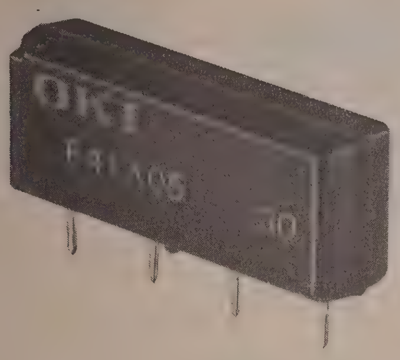
HASCO COMPONENTS, INC. / 214-22 WATERS EDGE DRIVE, BAYSIDE, NY 11360 / (212) 428-5155 TWX: 710-582-5750

HASCO
COMPONENTS INC.

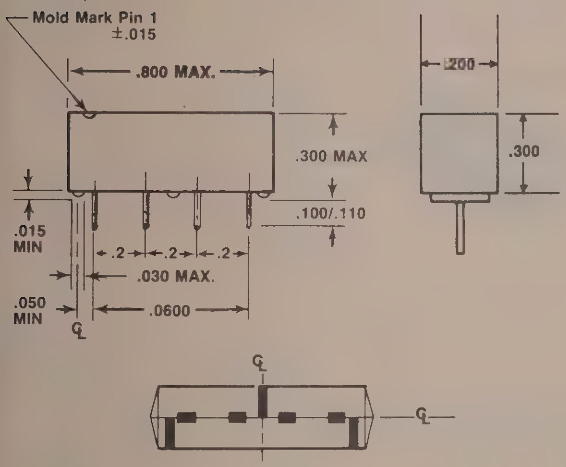
REED RELAYS

"HI-REL" SIP REED RELAY F41A SERIES

OKI
electric
industry
company, ltd.



SIP REED RELAY



FEATURES

- New small SIP configuration
- High quality — low price
- Resistance to cleaning solvents
- Automatic insertion compatible
- Relay testing services test report available

CONTACTS

Form: 1A
Current: 0.5 amps DC max.
Voltage: 100V DC max.
Power: 10 watts max.
Contact Resistance: 0.10Ω max.
Breakdown Voltage
(one minute between open contacts): 200V DC min.
Operations: 200 x 10^{6} Low Level
Contact Resistance Stability Delta: 0.005Ω max.
Magnetostrictive Twist: 0.12Ω max.
Average Number of Bounces: 10 max.

INSULATION RESISTANCE

10^{11}Ω min. at 25°C, 85% R.H., 100V DC (contact to contact, coil to contacts for 5 seconds).

10^{11}Ω min. at 25°C, 50% R.H., 100V DC (contact to contact, coil to contacts for 5 seconds) 4 hrs. after aqueous cleaning cycle.

LIFE

Low Level: 2 x 10^{8} operations, min. at 30 millivolts DC, 10 milliamps resistive load switched hot.

Low Intermediate Level: 5 x 10^{7} operations at 10V DC, 4 milliamps resistive load switched hot.

End Points: 1 failure to operate or 1 failure to release, (Operate/Release time $>$ 2 msec) or contact resistance $>$ 0.5 ohm, 5 msec after energizing coil.

RESISTANCE TO CLEANING SOLVENTS

Withstand without detriment to performance and marking, immersion in Freon TMC for 2 cycles. Each cycle 2 minutes in vapor @ 97°F plus 2 minutes spray, with 2 minutes in air between cycles.

Withstand without detriment to performance and marking aqueous cleaning with Kester 5779 Bio-Kleen 5% solution for 2 minutes and hot-air drying (200°F) for 4 minutes.

SPEED

Operate Time (Incl. Bounce): 500 µsec max.
Release Time (Incl. Bounce) (Diode Suppressed): 500 µsec max.

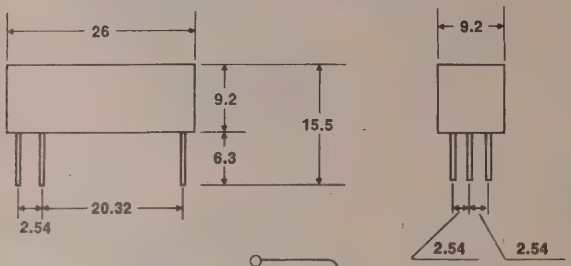
COIL

Resistance: 450Ω min.
Nominal Voltage: 5V DC and 12V DC.
Pickup Voltage: 3.8V DC max.
Dropout Voltage: 0.5V DC min.

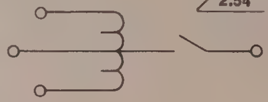
HASCO COMPONENTS INC. / REED RELAYS

FORM 1A LOW COST RRB SERIES REED RELAYS

STRUCTURE (Unit in mm)



CIRCUIT SCHEMATIC



ENGINEERING DATA

Operate Time: 8.8 ms max. (Rated voltage operation)
Release Time: 4.1 ms max. (Rated voltage operation)
Bounce Time: 0.5 ms max. (Rated voltage operation)
Contact Resistance: 150 mΩ max. (Initial value)
Breakdown Voltage: Between open contacts DC 250V min.
Between coil and contact DC 3000V min.
Insulation Resistance: 10^9 Ω min. (DC 100V)
Contact Ratings: DC 10W AC 10VA
DC 100V max. AC 100V max.
0.3A max. (switched), 1.0A max. (carry only)
Life Expectancy: 1 x 10^6 min. (Mechanical operations)
5 x 10^6 min. (24V, 50 mA resistance load)
1 x 10^6 min. (48V, 120 mA induction load)
Vibration: 20G (10 ~ 2000 Hz)
Shock Resistance: 50G (11 ms)
Operating Temperature: −20 ~ 60°C
Storage Temperature: −30 ~ 80°C

SPECIFICATIONS

Contact Form	1A
Part Number	**RRB61A08S**
Nominal Voltage (V) (at 20°C)	8
Must Operate (V) (at 20°C)	5.6
Continuous Voltage (Max. V)	12
Must Release (V)	1.0
Coil Resistance (Ω) = 10% (at 20°C)	700

Other coil voltages available.

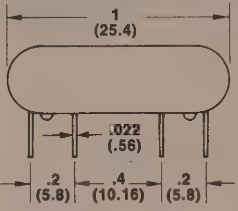
$.78 each at 1K & up

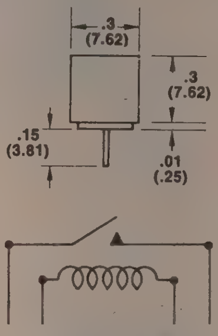
DRY CONTACT REED RELAYS 700 SIP/800 SERIES

FEATURES

- Choice or normal, heavy duty or hi voltage
- Epoxy sealed

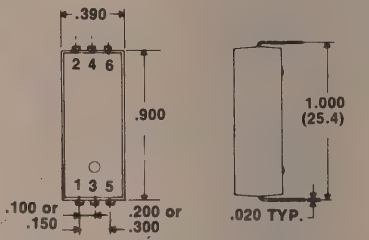
SERIES 700

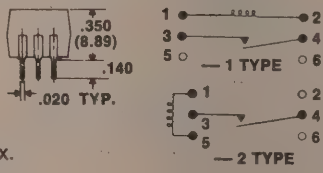




( ) Indicates Millimeters

SERIES 800





ENGINEERING DATA

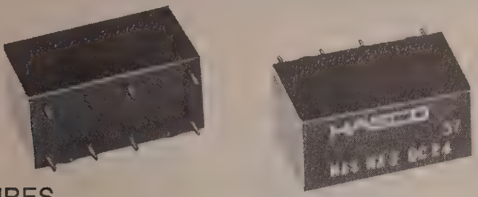
Operate Time: 0.5 mSec max.
Release Time: 0.2 mSec max.
Bounce Time: 0.5 mSec max.
Contact Resistance: 150 mΩ max. (initial)
Life Expectancy: 50 x 10^6 operations at signal level
3 x 10^6 at full rated load
Insulation Resistance: 10^{9}Ω min.
Vibration: 20G (10-2000 Hz)
Thermal Shock: −55~105°C
Moisture Resistance: 60°C - 90% 240 hours
Terminal Strength: 225g
Operating Temperature: −40~85°C
Storage Temperature: −55~105°C

SPECIFICATIONS FOR SERIES 700 AND 800

Part Number	Nominal Voltage (V)	Must Operate (V)	Must Release (V)	Coil Resistance (Ohms)	Contact Rating	Breakdown Voltage
711-811-5	5-6	3.75	0.5	500	10VA DC max. 100V DC max. 1.0A max. carry 0.5 max. switching	250V DC across contacts 1000V DC contacts to coil
711-811-12	12	9.0	1.2	500		
711-811-24	24	18.0	2.4	2000		
HEAVY DUTY						
712-812-5	5-6	3.75	0.5	400	70VA DC max. 100V DC max. 2.5 max. carry 1.0A max. switching	300V DC across contacts 1000V DC contacts to coil
712-812-12	12	9.0	1.2	400		
712-812-24	24	18.0	2.4	1600		
HIGH VOLTAGE						
713-813-5	5-6	3.75	0.5	400	50VA DC max. 400 DC max. 2.5A max. carry 1.0A max. switching	750V DC across contacts 1000V DC contacts to coil
713-813-12	12	9.0	1.2	400		
713-813-24	24	18.0	2.4	1600		

HASCO COMPONENTS INC. RELAYS

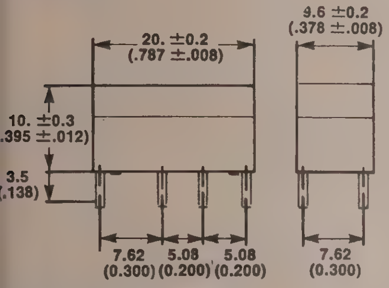
DPDT - 2 AMP DIP OR PC RELAY HAS 112



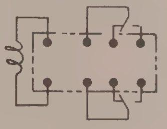
FEATURES

- Available fully sealed or "semi" sealed.
- Employing 16 pin, IC spacing.
- Low profile for tight spacing.
- Coil voltages: 5, 6, 9, 12, 24 & 48.
- Compatible and competitive!

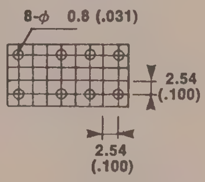
DIMENSIONS Unit: mm (inch)



SCHEMATICS



MOUNTING HOLE LAYOUT



For sealed unit specify "S"

COIL RATING

Type	Rated Voltage	Coil Resistance	Pull-in Voltage	Drop-out Voltage
HAS 112	5V DC	45 ohms	Less than 75% of rated voltage	Less than 10% of rated voltage
HAS 112	6V DC	60 ohms		
HAS 112	9V DC	140 ohms		
HAS 112	12V DC	280 ohms		
HAS 112	24V DC	1,070 ohms		
HAS 112	48V DC	4,000 ohms		

As for the resistance value, pull-in voltage and drop-out voltage, they show the value at ambient temperature, 20°C, and the tolerance is ±10%.

RATING — PERFORMANCE

Applicable Voltage: ±15% of rated voltage

Ambient Temperature: −25°C to +50°C (But not to be frozen)

Contact Specification:
- Contact Arrangement: DPDT
- Max. Switching Wattage: 60VA/30W (Max. voltage 125V AC or DC, Max. current 1.25 Amp)
- Material: Silver alloy (Gold clad contact is also available upon request)
- Contact Resistance: Less than 100 milliohms (Initial value)

Operating Time: Approx. 6 ms

Release Time: Approx. 5 ms

Anti-shock: False operation Approx. 20G — Endurance 100 G

Anti-vibration: False operation 10 to 55 Hz 1.5 mm—Endurance 10 to 55 Hz 1.5 mm

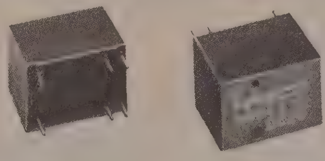
Insulation Resistance: More than 100 Meg. ohms at 500V DC

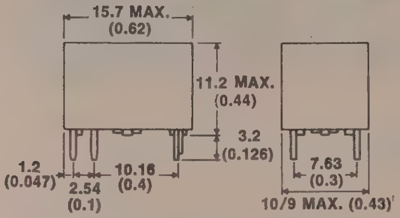
Dielectric Strength: 1,000V AC 1 minute (Contact to coil) — 500V AC 1 minute (Contact to contact)

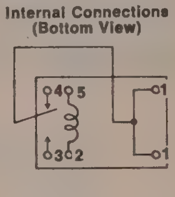
Life Expectancy: Mechanical 10 million times — Electrical more than 200 thousand at resistive load (110V AC 0.3 Amp, 24V DC 1.25 Amp)

Weight: Approx. 4.5 g

SPDT - 1 AMP DIP OR PC RELAY HAS 111



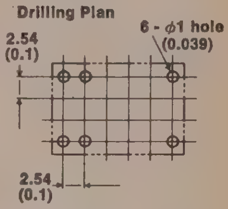




Specifications subject to change without notice.

Unit: mm (inch)

For sealed unit specify "S"



FEATURES

- Small size 1A switching capacity.
- Available semi or fully sealed.
- Voltages 1.5-48 volts available.
- Hi-quality, yet inexpensive.

Type	Contact Arrangement	Nom. Volt. (V)	Coil Resist. (Ω) ±10%)	Nom. Curr. (mA)	Pick-Up Volt. (V)	Drop-Out Volt. (V)	Max. Volt. (V)*	Nom. Pwr (W) Cons'ption
HAS-111-3V	SPDT 1 Form C	3	20	150	2.1	0.3	3.3	0.45
HAS-111-5V		5	56	89.3	3.5	0.5	5.5	
HAS-111-6V		6	80	75	4.2	0.6	6.6	
HAS-111-9V		9	180	50	6.3	0.9	9.9	
HAS-111-12V		12	320	37.5	8.4	1.2	13.2	
HAS-111-24V		24	1280	18.8	16.8	2.4	26.4	
HAS-111-48V		48	5120	9.4	33.6	4.8	52.8	

Data measured at 20°C,* measured at 40°C.

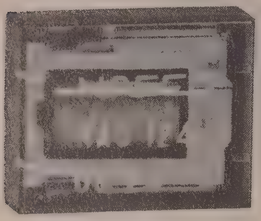
RATING PERFORMANCE

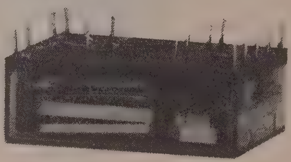
Specifications			Note
Coil	Nominal Voltage	1.5, 3, 5, 6, 9, 12, 24, 48 VDC	
	Nominal Power Consumption	0.45W	
	Pick-up Voltage	70% of nominal voltage	
	Drop-out Voltage	10% of nominal voltage	
Contact	Contact Arrangement	SPDT, 1 Form C	
	Contact Material	Silver-Palladium (Gold overlay)	
	Contact Resistance	Max. 100 mΩ	at initial value
	Max. Switching Power	DC 30W/AC 60 VA	at resistive load
	Max. Switching Voltage	60 VDC/120 VAC	
	Max. Switching Current	1A DC/AC	
Time	Operate Time	Approx. 2 mS	at nominal voltage
	Release Time	Approx. 1 mS	
	Bounce Time (Operating)	Max. 2 mS	no bounce in break contact
	Bounce Time (Releasing)	Max. 7 mS	no bounce in make contact
Insulation Resistance		Min. 100 MΩ	at 500 VDC
Dielectric Strength		500 VAC	1 minute
Vibration Resistance		1.5 mm DA 10 ~ 55 Hz	
Temperature Range		−25°C ~ +55°C	
Life	Mechanical Life	500 x 10^4 times	
	Electrical Life	50 x 10^4 times	at 24 VDC, 1A resistive load
		10 x 10^4 times	at 120 VAC, 0.5A, resistive load
Weight		Approx. 4 g	

HASCO
COMPONENTS INC.

RELAYS

LOW PROFILE RELAYS - HAS 122, 124, & 116 FLATPACKS





FEATURES

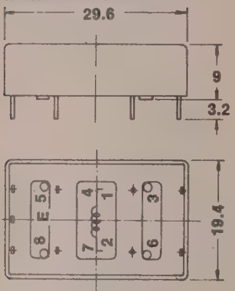
- Available in 2, 4 or 6 poles.
- Voltages - 5, 6, 12, 24 and 48.
- Bifurcated contacts.
- Fully sealed versions are in stock.
- Form D available.
- Latching available.
- Nitrogen filled.

COMPATIBLE AND COMPETITIVE!

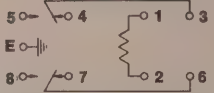
Type	Rated Voltage	Resistance Value	Rated Power	Pull-in Voltage	Drop-out Voltage
2 Pole (122)	6V DC	115Ω	0.13W	80%V or less than rated voltage	10%V or more than rated voltage
	12V DC	430Ω	0.33W		
	24V DC	1,650Ω	0.35W		
	48V DC	6,000Ω	0.38W		
4 Pole (124)	6V DC	80Ω	0.45W		
	12V DC	280Ω	0.51W		
	24V DC	1,150Ω	0.50W		
	48V DC	4,100Ω	0.56W		
6 Pole (116)	6V DC	35Ω	1.03W	80%V or less than rated voltage	
	12V DC	130Ω	1.11W		
	24V DC	500Ω	1.15W		
	48V DC	1,900Ω	1.21		

TYPE 122

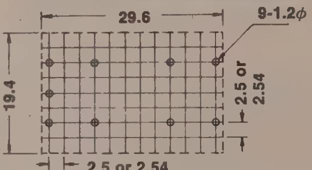
External dimensions



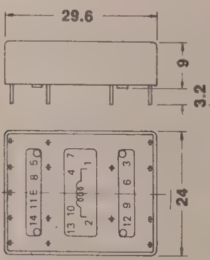
Internal wiring



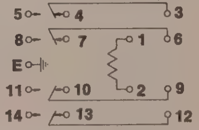
Printed circuit board hole dimensions



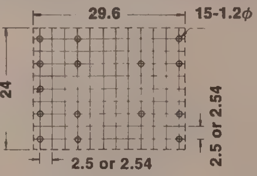
TYPE 124



Internal wiring

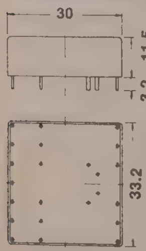


Printed circuit board hole dimensions

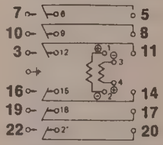


TYPE 116

External dimensions

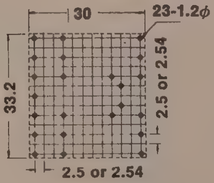


Internal wiring



Note: Note polarities for latching type.

Printed circuit board hole dimensions



Note: terminals (#3, 4) are provided to latching type only.
Note: •mark holes not required for standard type.

RATING PERFORMANCE

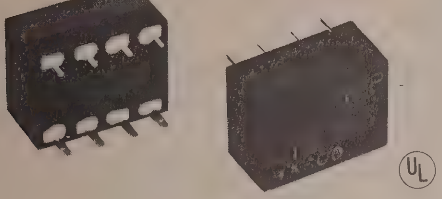
TYPE		TYPE-116	TYPE-122/124	
Applicable Voltage		80~120%	2T: 80~170% 4T: 80~140%	
Ambient Temperature		−10~+50°C	−10~+65°C	
Contact:	Switching Capacity	30V DC 3A 100V AC 3A (COSφ=1)	30W (COSφ=1) V max 110V DC I max — 1A	
	Material	Movable: Gold clad on silver palladium alloy Stationary: Silver palladium alloy		
	Shape	Single contact	Twin contact (card lift off drive)	
	Contact Resistance (initial)	50 mΩ or less	100 mΩ or less	
Static Capacity	Contact-to-Contact	——	About 4 PF	
	Contact-to-Coil	——	About 6 PF	
	Contact-to-Ground	——	About 6 PF	
Operating Time		About 6 ms	About 7 ms	
Release Time		About 3 ms	About 3 ms	
Anti vibration	No Excitation	10G	Standard 10G Latching 5G	10G 10G
	Excitation	20G	20G	20G
Insulation Resistance		1,000 MΩ or more at 500V DC		
Dielectric Strength		Contact-to-contact 1,000V AC 1 minute Contact-to-coil 2,500V 1 minute	Contact-to-contact 750V AC 1 minute Contact-to-coil 1,000V AC 1 minute	
Life Expectancy	Mechanical (million times)	10	4T: 100 6T: 50	100 100
	Electrical	100 thousand (max. load)	5 million times (24V DC 1A resistance load)	
Weight		About 10g	4T: About 15g 6T: About 20g	2T: About 13g 4T: About 15g
PC Board Mounting Pitch		15mm		12.5mm

HASCO COMPONENTS, INC. / 214-22 WATERS EDGE DRIVE, BAYSIDE, NY 11360 / (212) 428-5155 TWX: 710-582-5750

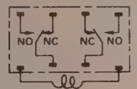
HASCO
COMPONENTS INC.

RELAYS

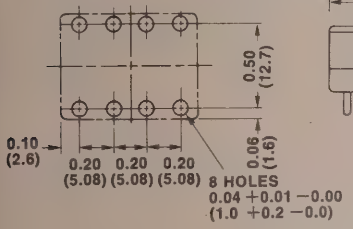
DPDT MINI 3 OR 5 AMP RELAY SSD203P RELAY SERIES

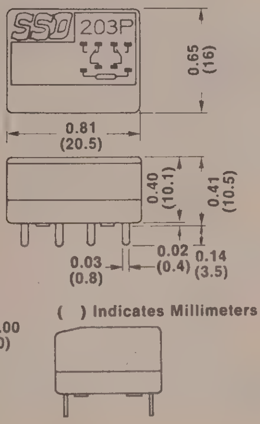


WIRING DIAGRAM



MOUNTING DIMENSIONS





MAXIMUM LOAD RATING:
125V AC 3A, 250V AC 2.5A, 30V DC 3A and 5A

This double pole, double throw miniature relay gives **3** Amp or **5** Amp switching in a **small package** only .81″ x .65″ x .41″ (20.5 x 16 x 10.5mm) at low cost. It's the perfect answer for applications in Industrial Controls, Computer Peripherals and a wide range of others.

FEATURES

- Miniature Size: .81″ x .65″ x .41″, 20.5 x 16 x 10.5mm
- Printed circuit terminals
- Double pole, double throw
- Low cost
- Can be flow soldered
- Fully sealed nitrogen filled option

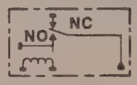
SPECIFICATIONS

Maximum Voltage: 120% of rated voltage at 20°C
Must Operate Voltage: 75% of rated voltage at 20°C
Operate Time: 5 ms
Coil Temperature Rise: 65°C max. at rated voltage
Insulation Resistance: 100M ohm min. at 500V DC
Dielectric Strength:
2000V AC 1 minute between coil and terminal
750V AC 1 minute between contacts
Electric Life: 100,000 operations
Mechanical Life: 10 million operations
Contact Material: Silver alloy
Contact Resistance: 100m ohm max. (4 to 6V DC, 1A)
Operating Temperature Range: −10°C to +65°C

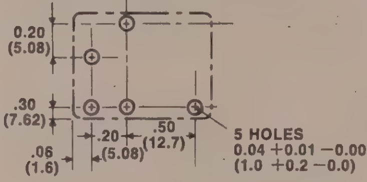
Rated Voltage (V)	5 DC	6 DC	12 DC	24 DC
Rated Current (mA)	120	100	50	25
Coil Resistance (Ω)	42	60	240	960

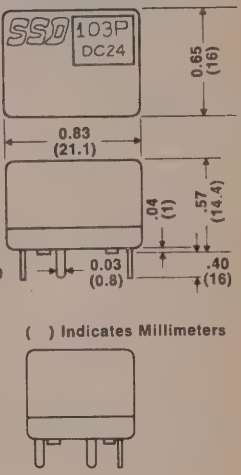
SPDT 3 OR 5 AMP RELAY SSD103P RELAY SERIES

WIRING DIAGRAM



MOUNTING DIMENSIONS





MAXIMUM LOAD RATING:
125V AC 3A, 250V AC 2.5A, 30V DC 3A SSD105P (125V AC 5A type) also available

This single pole, double throw miniature relay gives **3** or **5** Amp switching in a **small package** only .83″ x .63″ x .57″ (21 x 16 x 14.4mm) at low cost. It is ideal for use in Computer Peripherals, Industrial Controls and a wide range of other applications.

FEATURES

- Miniature Size: .83″ x .63″ x .57″, 21 x 16 x 14.4mm
- Printed circuit terminals
- Single pole, double throw
- Can be flow soldered
- Fully sealed nitrogen filled option

SPECIFICATIONS

Maximum Load Voltage: 150% of rated voltage at 20°C
Must Operate Voltage: 65% of rated voltage at 20°C
Operate Time: 5 ms
Coil Temperature Rise: 50°C max. at rated voltage
Insulation Resistance: 250 ohm min. at 500V DC
Dielectric Strength:
2000V AC 1 minute between coil and terminal
750V AC 1 minute between contacts
Surge Voltage Resistance: 7000V DC min. between coil and terminals at 20°C 65% RH, 40 sec., 3 times
Electric Life: 100,000 operations
Mechanical Life: 20 million operations
Contact Material: Silver alloy
Contact Resistance: 70m ohm max. (4 to 6V DC, 1A)
Operating Temperature Range: −30°C to +70°C

Rated Voltage (V)	6 DC	9 DC	12 DC	24 DC
Rated Current (mA)	75	50	37	18.5
Coil Resistance (Ω)	80	180	320	1280
Rated Current Tolerance: ±15%-20% at 20°C				

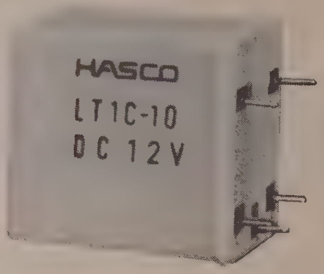
HASCO COMPONENTS, INC. / 214-22 WATERS EDGE DRIVE, BAYSIDE, NY 11360 / (212) 428-5155 TWX: 710-582-5750

HASCO
COMPONENTS INC.

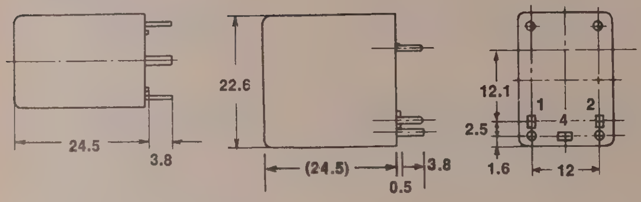
RELAYS

LT MINIATURE POWER RELAYS SPDT 3, 5 & 10 AMP

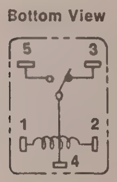
508/TV-5

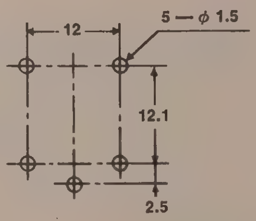


LT DIMENSIONS



CIRCUIT DIAGRAM AND MOUNTING





FEATURES

- Miniature, lightweight relay which requires less mounting space.
- UL 508/TV-5 available.
- High reliable relay with dielectric strength, 2000V which employs the specific construction.
- Economical and favorable price for simple construction.
- Fully sealed.

GENERAL CHARACTERISTICS

Contact Material: Gold plated on silver for 2A — Silver cadmium oxide for 5A.

Ambient Temperature: −20 to +60°C (not to freeze).

Ambient Humidity: 45 to 85% (not to be dewy).

Operating Time: Less than 20 mS.

Release Time: Less than 20 mS.

Contact Resistance (at initial): Less than 100 milliohms at 6V DC, 1A.

Insulation Resistance: 500V DC, more than 100M Ohms.

Dielectric Strength: Between contacts: 500V AC (50/60 Hz) 1 minute — Between coil and contact; 2,000V AC (50/60 Hz) 1 minute.

Vibration: 6G (10 to 55 Hz).

Shock: 10G.

(The above mentioned values are at normal temperature and humidity.)

CHARACTERISTICS

Contact Arrangement: SPDT (Form C).

Power Consumption: Approx. 0.36W to approx. 0.5W.

Temperature Rise: Less than 40 deg. after applied max. continuous voltage.

COIL RATINGS

Rated Voltage (V)	DC6	DC9	DC12	DC24
Rated Current (mA)	60	40	30	15
Coil Resistance (Ω)	100	225	400	1600

* Coil rated current tolerance is +15%, −20% at ambient temp. of 20°C.

MAXIMUM LOAD RATINGS

Type	Load	Voltage	AC 125V	DC 24V
3A	Resistive	(cos ϕ = 1)	3A	3A
	Inductive	(cos ϕ = 0.4 T = 7 ms)	1.2A	1.2A
5A	Resistive	(cos ϕ = 1)	5A	5A
	Inductive	(cos ϕ = 0.4 T = 7 ms)	2A	2A
10A	Resistive	(cos ϕ = 1)	10A	10A
	Inductive	(cos ϕ = 0.4 T = 7 ms)	4A	4A

SPECIFICATIONS

Maximum Continuous Voltage: 115% of rated voltage at 20°C.

Operating Voltage: Less than 80% of rated voltage at 20°C.

Opening Voltage: More than 10% of rated voltage at 20°C.

Coil Temperature Rise: LT 1C 3/LT 1C 5—Less than 50°C at rated voltage. LT 1C 10—Less than 60°C at rated voltage.

Initial Contact Resistance: Less than 100 mΩ (1A 6V DC).

Insulation Resistance: More than 100 MΩ (500V DC).

Dielectric Strength: Between coil and contact — AC 1500V for 1 minute. Between contacts — AC 750V for 1 minute

Electrical Life: More than 100,000 operations at rated voltage.

Mechanical Life: More than 5,000,000 operations.

Contact Material: LT 1C 3 — Gold plated over silver
LT 1C 5 and LT 1C 10 — Silver alloy.

Operating Temperature: LT 1C 3/LT 1C 5 — 30°C ~ +20°C.
LT 1C 10 — 30°C ~ +50°C.

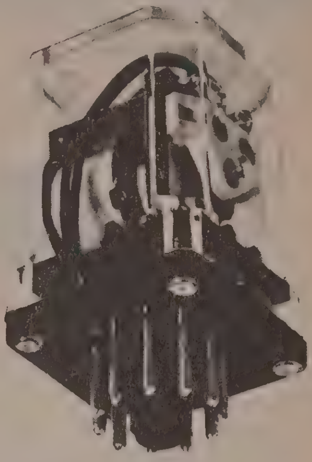
Contact Form: Form C (SPDT).
Form A (SPST)
Form B (SPNC)

ISKRA

• Ceramic Caps, Discs, Feed Thru • Ferrites • Meters • Motors, fractional H.P. • Semiconductors • Switches • Speakers • Trimmer Pots

GENERAL PURPOSE RELAYS

ECONOMY PLUG-IN TYPE — SERIES PR



General purpose relay enclosed in a clear polycarbonate dust cover. The PR Relay is a ruggedly constructed, UL recognized relay; available in contact arrangements up through 3 form C (3PDT) and with a mechanical life of 10 million operations, minimum. Approximate weight: 3 oz. (85 g). Other features include:

- Manual test access standard
- Anti-shock base construction
- Indicator lamp available
- Extremely low priced

Technical Specifications

GENERAL:

OPERATE TIME
15 ms. max. @ nominal voltage

RELEASE TIME
10 ms max.

LIFE EXPECTANCY

Mechanical: 10 million operations

DIELECTRIC STRENGTH
1500 VRMS 60 Hz Hipot test between all elements

INSULATION RESISTANCE
100 M Ω minimum

TEMPERATURE RANGE
PR relays will operate continuously in ambient temperatures of −45° to 75° C for D.C. coils and −45° to 55° C for A.C. coils.

CONTACTS:

CONTACT RATING/MATERIAL

Contact material	Ag-CdO (other materials on request)
Contact rating (Resistive)	10 A @ 240 VAC max.
Contact rating (Inductive)	¼ H.P. @ 240 VAC - 1 phase.

CONTACT ARRANGEMENTS
All types of the Series PR are available in standard contact arrangements up to 3PDT.

AGENCY APPROVALS:

U.L. recognized

COIL DATA:

COIL VOLTAGE/RESISTANCE

	D.C. COILS		A.C. COILS
VOLTS	D.C. RESISTANCE	VOLTS	D.C. RESISTANCE
6	29	6	4.2
12	105	12	17
24	420	24	70
110	8400	120	1300
220	8400 *	240	6700

COIL RESISTANCE
Standard coils are available with a tolerance of plus or minus 10% measured in an ambient of 20°C.

* Coils for DC versions may be supplied only for voltages not exceeding 110V. In the event of 220V. 10kOhm/2 W series resistors are supplied along with the relays, to be connected in series with the energizing winding.

PULL-IN VOLTAGE
80% of nominal

POWER CONSUMPTION

Rated voltage	DC relays	AC relays
6— 48V	1.3 W approx.	2 VA (50 Hz) approx.
60—110V	1.5 W approx.	
220 V	2.5 W approx. with series resistor	1.8 VA (60 Hz) approx.

ORDERING INFORMATION:

☐ PR - ☐ ☐ - ☐

TYPE
58: Octal Plug-In
59: 11-Pin Plug-In

CONTACTS
A: SPDT
B: DPDT
C: 3PDT

1
0: D.C.
6: 60Hz. A.C.

COIL VOLTAGE
006... 6V
012... 12V
024... 24V
048... 48V
060... 60V
110...110V
220...220V

ISKRA ELECTRONICS INC.
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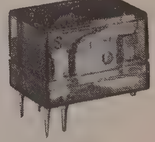
ITT Components

A Unit of ITT Corporation

Sub Miniature Printed Circuit Board Relays

MZ RELAY



1 Amp SPDT
L — 0.606″,
W — 0.449,
H — 0.433″

CONTACT DATA

Arrangement — 1 Form C

Material — Gold overlay silver-palladium alloy

Resistance — 100 milliohms maximum (initial value)

Ratings — 50μ amps to 1 amp at 30V DC or 120V AC, resistive

Life Expectancy — Mechanical: 20 million operations
Electrical: 500,000 operations minimum at 1 amp 24V DC resistive load
200,000 operations minimum at 0.5 amps 120V AC resistive load

COIL DATA

Voltages — 1.5 to 24 volts DC

Power (at 20°C) —
Standard type: Operate—0.22 watt, Nominal—0.45 watt, Maximum—1 watt
High sensitive type: Operate—0.1 watt, Nominal—0.2 watt, Maximum—1 watt

Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — 100 megohms minimum at 500V DC

Dielectric Strength — 500V AC (50/60 Hz), between all insulated elements

Temperature Range — Standard type: −40°C to +55°C
(at nominal voltage) High sensitive type: −30°C to +75°C

Time Values — Operate <3 ms standard, <6 ms sensitive; release <1 ms

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2.5 mm (0.98 in.)

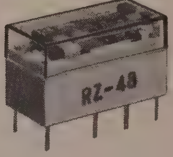
Approximate Weight — 3.5 gr. (0.12 oz.)

Enclosure — Polycarbonate

Standard Coil and Contact Combination (20°C)

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Standard Types					
1.5	1.05	2.0	5	MZ-1.5HG	$1.95
3	2.1	4.1	20	MZ-3HG	$1.95
5	3.5	6.8	56	MZ-5HG	$1.95
6	4.2	8.1	80	MZ-6HG	$1.95
9	6.3	12.2	180	MZ-9HG	$1.95
12	8.4	16.2	320	MZ-12HG	$1.95
24	16.8	32.4	1280	MZ-24HG	$1.95
High Sensitive Type					
1.5	1.05	3.0	12	MZ-1.5HS	$2.15
3	2.1	6.0	45	MZ-3HS	$2.15
5	3.5	10.0	120	MZ-5HS	$2.15
6	4.2	12.0	180	MZ-6HS	$2.15
9	6.3	18.0	400	MZ-9HS	$2.15
12	8.4	24.0	700	MZ-12HS	$2.15
24	16.8	48.0	2800	MZ-24HS	$2.15
Latching Types					
3	2.1	NA	5.7	MZL-3	$2.75
5	3.5	NA	15	MZL-5	$2.75
6	4.2	NA	21	MZL-6	$2.75
9	6.3	NA	50	MZL-9	$2.75
12	8.4	NA	87	MZL-12	$2.75
24	16.8	NA	350	MZL-24	$2.75

RZ/RZL RELAYS



1 Amp DPDT
L — 0.795″,
W — 0.386″,
H — 0.457″

CONTACT DATA

Arrangement — DPDT (B-M) — RZ, RZ( )W Type

Material — Gold overlaid silver-palladium alloy

Max. Switching Power —
30W/50VA — Single Contact
17W/30VA — Bifurcated contact at resistive load

Max. Switching Current —
1.25A AC or DC — Single Contact
0.7A AC or DC — Bifurcated contact at resistive load

Max. Switching Voltage —
150V DC/125V AC — Single Contact
100V DC/90V AC — Bifurcated contact at resistive load

Contact Resistance (Pin-pin) — 100mΩ Max.

Capacitance — 1.5PF max. between open contact
0.5PF max. between adjacent change-over contact

Life Expectancy —
Mechanical: 20 million operations — Single Contact
15 million operations — Bifurcated contact
Electrical: 0.5 million operations at 1.25A 24V DC or 0.4A 125V AC at resistive load — Single contact
0.5 million operations at 0.7A 24V DC or 0.25A 125V AC at resistive load — Bifurcated contact

COIL DATA

Nominal Voltage — 3 to 48 V DC — RZ, RZ( )W Type,
3 to 24V DC — RZ1, RZ1( )W Type

Power (at 20°C) — Nominal: 515 ∼ 560 mW — RZ, RZ( )W Type,
Operate: 200 ∼ 324 mW — RZ, RZ( )W Type
Max: 1050 mV

Temperature Range — −40°C ∼ +65°C — RZ RZ( )W Type
(at nominal voltage) −40°C ∼ +75°C — RZ1 RZ1( ) Type

GENERAL DATA

Dielectric Strength — 500V AC (50/60 Hz) between open contacts, 1000V AC contact-coil

Insulation Resistance — 1000 MΩ min. at 500V DC

Timing — Operate <4 ms, release <2

Bounce Time — Approx. 1 ms on operate
Approx. 4 ms on release

Vibration Resistance — 10 to 60 Hz amplitude 1.5 mm (10G)

Shock Resistance — Destruction shock: 100G (11 ms ±1 ms)
Unerror shock: 10G (11 ms ± 1 ms)

Surge Strength — 1500V AC between all conductors

Standard Coil and Contact Combinations (20°C

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Standard types					
5	3.2	7.0	45	RZ-5	$3.00
6	3.8	8.4	66	RZ-6	$3.00
9	5.1	12.6	140	RZ-9	$3.00
12	7.6	16.8	280	RZ-12	$3.00
24	15.2	33.6	1070	RZ-24	$3.00
48	36.0	67.2	4000	RZ-48	$3.55
Latching types					
5	3.2	NA	8.4	RZL-5	$4.00
6	3.8	NA	12	RZL-6	$4.00
9	5.7	NA	27	RZL-9	$4.00
12	7.6	NA	52	RZL-12	$4.00
24	15.2	NA	192	RZL-24	$4.00
48	36.0	NA	820	RZL-48	$4.30

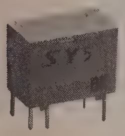
ITT Components

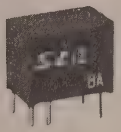
A Unit of ITT Corporation

Sub Miniature Printed Circuit Board Relays

SY/SZ RELAYS

1 Amp SPDT
L — 0.492″,
W — 0.291″,
H — 0.374″





CONTACT DATA

Arrangement — 1 Form C

Material — Gold overlay silver-palladium

Resistance — Max. 100 mΩ (initial value)

Ratings — 0.5A, 120V AC or 1A, 24V DC (resistive)

Life Expectancy — Mechanical: Min. 5 million operations
Electrical: SZ Min. 200,000 operations at rated load
SY Min. 150,000 operations at rated load

COIL DATA

Voltages — 1.5 to 24V DC

Power (at 20°C) —
SZ Operate — 0.15 watt (0.16 watt for 18V coil, 0.18 watt for 24V coil)
Nominal — 0.3 watt (0.32 watt for 18V coil, 0.36 watt for 24V coil)
SY Operate — 0.075 watt
Nominal — 0.15 watt

Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — 100 MΩ minimum at 500V DC

Dielectric Strength — 500V AC (50, 60 Hz), between all conductors

Temperature Range — −40°C to +70°C (18V coil: −30°C to +65°C, 25V coil; −30°C to +60°C) (at nominal voltage)

Time Values (approx.) — Operate 1.5 mS, Release 1 mS (at nominal voltage)

Vibration Resistance — 20G (10 ∼ 300 Hz) amplitude 3 mm

Shock Resistance — 50G

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.)

Approximate Weight — 1.7 gr (0.06 oz.)

Enclosure — Polybutylene terephthalate (PBT)

Nominal Coil Voltage	Coil Resistance	Operate Voltage	Type No.	List Price
3	30	2.1	SZ-3	$2.25
5	83	3.5	SZ-5	$2.25
6	100	3.9	SZ-6	$2.25
9	270	6.3	SZ-9	$2.25
12	480	8.4	SZ-12	$2.25
18	1000	12.6	SZ-18	$2.25
24	1600	16.8	SZ-24	$2.25
5	167	3.5	SY-5	$2.50
6	240	4.2	SY-6	$2.50
9	540	6.3	SY-9	$2.50
12	960	8.4	SY-12	$2.50

RY RELAY

1 Amp DPDT
L — 0.795″,
W — 0.386″,
H — 0.472″

CONTACT DATA

Arrangement — 2 Form C, 2 Form D

Material — Gold overlay silver-palladium

Resistance — Max. 100 mΩ (initial)

Ratings — 0.5A 120V AC or 1A 24V DC (resistive)

Life Expectancy — Mechanical: Min. 20 million operations
Electrical: Min. 500,000 operations at 1A 24V DC
Min. 200,000 operations at 0.5A 120V AC

COIL DATA

Voltages — 4.5 to 48V DC

Power (at 20°C) —
Operate — 0.075 watt (0.098 watt for 18V, 24V coil, 0.138 watt for 48V coil)
Nominal — 0.15 watt (0.2 watt for 18V, 24V coil, 0.3 watt for 48V coil)

Operate (at 20°C) — 68 ∼ 71% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — 1000 MΩ min. at 500V DC

Dielectric Strength — 500V AC between open contact
1000V AC between all other conductors

Temperature Range — −40°C ∼ +80° at nominal voltage

Surge Strength — 1500V between all conductors

Time Values (max.) — Operate 6 ms, Release 3 ms at nominal voltage

Vibration Resistance — 10G (10 ∼ 55 Hz)

Shock Resistance — 10G 11 ±1 ms) — Unerror, 100G (6 ±1 ms) — Destruction

Enclosure — Polybutylene terephthalate (PBT)

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Operate Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
B-M (2 form C)					
5	3.6	12.5	167	RY-5W	$3.80
6	4.3	15.0	240	RY-6W	$3.80
9	6.4	22.5	540	RY-9W	$3.80
12	8.5	30.0	960	RY-12W	$3.80
24	16.8	51.6	2880	RY-24W	$3.80
48	32.6	84.0	7680	RY-48W	$4.30
M-B (2 form D)					
5	3.3	7.1	55	RY-5D	$4.00
6	4.0	8.5	80	RY-60	$4.00
9	5.9	12.8	180	RY-9D	$4.00
12	7.9	17.0	320	RY-12D	$4.00
24	15.8	34.1	1280	RY-24D	$4.00
48	31.8	65.8	4800	RY-48D	$4.65

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ITT Components
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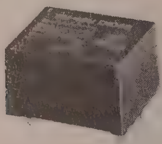
Miniature Printed Circuit Board Relays



SM RELAYS

0.5 Amps DPDT, SPDT

L — 0.618″, 0.618″
W — 0.504″, 0.394″
H — 0.390″, 0.390″

CONTACT DATA

Arrangement — 2 Form C, 1 Form C, bifurcated crossbar
Material — Gold-silver nickel, bifurcated crossbar
Load — Maximum switched power: 30VA, resistive
Maximum switched current: 0.5A, resistive
Maximum switched voltage: 100V, resistive
Life — Mechanical: 200 million operations minimum
Electrical: 0.5 x 10^6 operations minimum at rated load
Timing — Operate: < 3.5ms
Release: < 2ms
Bounce: < 0.7ms on operate, < 5ms on release

COIL DATA (@ 20°C)

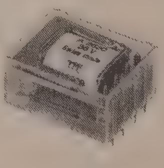
Operate power — 100mW — DPDT, 85mW — SPDT
Nominal power — 200mW — DPDT, 170mW — SPDT
Maximum power — 1.0W — DPDT or SPDT

Standard Coil and Contact Combinations (20°C)

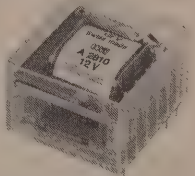
	Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
SPDT	5	3.6	12.1	148	SM1-D1101	$6.60
	12	8.6	29.0	852	SM1-D1102	$6.60
	24	17.1	57.6	3350	SM1-D1103	$6.60
	48	34.1	117	13,830	SM1-D1104	$7.10
DPDT	5	3.6	12.6	135	SM2-D1005	$8.65
	12	8.6	29.3	724	SM2-D1012	$8.65
	24	17.1	57.1	2760	SM2-D1024	$8.65
	48	34.1	114.6	11,100	SM2-D1048	$9.80

PZ & PZM RELAYS

L — 1.142″,
W — 0.677″,
H — 0.591″



L — 1.142″,
W — 0.977″,
H — 0.630″



L — 1.181″,
W — 1.386″,
H — 0.866″ PZ-6,

1 Amp DPDT, 4PDT, 6PDT, DPST

CONTACT DATA

Arrangement — 2 Form C, 4 Form C, 6 Form C, 2 Form A
Material — Silver-palladium, bifurcated crossbar
Gold overlay silver palladium, bifurcated crossbar
Load — Maximum switched power: 30VA, resistive
Maximum switched current: 1A, resistive
Maximum switched voltage: 100V, resistive
Life — Mechanical: PZ types: 2 x 10^8 operations minimum
PZM types: 5 x 10^6 operations minimum
Electrical: AgPd types: 3 x 10^6 operations at rated load, minimum
AuAg types: 5 x 10^5 operations at rated load, minimum
Timing — Operate: PZ-2: < 10ms, PZ-4: < 9ms, PZ-6: < 13ms, PZ-2A: < 12ms
Release: PZ-2, 4: < 3ms, PZ-6: < 4 ms, PZ-2A: < 2.5ms, PZM-2: < 8ms
PZM-4: < 18ms, PZM-6 (1 winding): < 19ms, PZM-6 (2 windings): < 3.5ms
Bounce: 4ms on operate
PZ(M)-2: < 1.5ms, PZ(M)-4: < 6 ms, PZ-6 < 4ms, PZM-6: < 6ms

COIL DATA (@ 20°C)

Operate power — PZ-2: 0.5W, PZ-4: 0.5W, PZ-6: 0.4W, PZ-2A: 0.3W
PZM-2: 1.1W, PZM-4: 1W, PZM-6 (1 winding): 1W
Nominal Power — PZ-2: 0.6-0.8W, PZ4: 0.6-0.9W, PZ-6: 0.5-0.7W, PZ-2A: 0.35-0.45W
PZM-2: 1.3W, PZM-4: 1.2W, PZM-6 (1 winding): 1.2W
Maximum power — PZ-2:1W, PZ-4: 2W, PZ-6: 2.8W, PZ-2A: 1W
PZM-2: 1.1W, PZM-4: 1W, PZM-6 (1 winding): 1W

Coil Data — Standard Relays

DC Nominal Voltage	Coil Resistance ±10%, Ohms	Ordering Code		List Price	
		Ag/Pd Contacts*	AgPd/Au Contacts†	Ag/Pd	AgPd/Au
PZ-2					
6	60	A 2400	A 2406	$5.60	$7.75
12	210	A 2410	A 2416	$5.60	$7.75
18	500	A 2412	A 2419	$5.60	$7.75
24	850	A 2420	A 2426	$5.60	$7.75
36	1600	A 2430	A 2436	$5.60	$7.75
48	3000	A 2440	A 2446	$5.60	$7.75
PZ-2A					
6	90	B 70100	B 70106	$5.60	$7.75
12	360	B 70110	B 70116	$5.60	$7.75
18	780	B 70112	B 70119	$5.60	$7.75
24	1350	B 70120	B 70126	$5.60	$7.75
36	3000	B 70130	B 70136	$5.60	$7.75
48	5500	B 70140	B 70146	$5.60	$7.75
PZ-4					
6	40	A 2640	A 2646	$6.90	$10.70
12	210	A 2600	A 2606	$6.90	$10.70
18	450	A 2611	A 2619	$6.90	$10.70
24	850	A 2610	A 2616	$6.90	$10.70
36	1600	A 2620	A 2626	$6.90	$10.70
48	3000	A 2630	A 2636	$6.90	$10.70
60	4800	A 2650	A 2656	$6.90	$10.70
PZ-6					
6	66	A 2800	A 2806	$9.95	$15.20
12	230	A 2810	A 2816	$9.95	$15.20
18	520	A 2812	A 2819	$9.95	$15.20
24	900	A 2820	A 2826	$9.95	$15.20
36	1900	A 2830	A 2836	$9.95	$15.20
48	3600	A 2840	A 2846	$9.95	$15.20
60	6100	A 2850	A 2856	$9.95	$15.20

* Silver Palladium alloy, 70% Silver, 30% Palladium
† Gold/Silver alloy, 80% Gold, 20% Silver

Coil Data — Latching Relays††

DC Nominal Voltage	Coil Resistance ±10%, Ohms	Ordering Code		List Price	
		Ag/Pd Contacts*	AgPd/Au Contacts†	Ag/Pd	AgPd/Au
PZM-2					
6	26	B 2400	B 2406	$8.30	$10.05
12	120	B 2410	B 2416	$8.30	$10.05
18	240	B 2420	B 2426	$8.30	$10.05
24	480	B 2430	B 2436	$8.30	$10.05
36	930	B 2440	B 2446	$8.30	$10.05
48	1980	B 2450	B 2456	$8.30	$10.05
PZM-4					
6	26	B 2500	B 2506	$9.50	$13.05
12	120	B 2510	B 2516	$9.50	$13.05
18	240	B 2520	B 2526	$9.50	$13.05
24	460	B 2530	B 2536	$9.50	$13.05
36	1260	B 2540	B 2546	$9.50	$13.05
48	1840	B 2550	B 2556	$9.50	$13.05
60	2900	B 2560	B 2566	$9.50	$13.05
PZM-6, 1 WINDING					
6	27	B 2700	B 2706	$11.25	$16.10
12	120	B 2710	B 2716	$11.25	$16.10
18	260	B 2720	B 2726	$11.25	$16.10
24	560	B 2730	B 2736	$11.25	$16.10
36	1090	B 2740	B 2746	$11.25	$16.10
48	2080	B 2750	B 2756	$11.25	$16.10
60	3300	B 2760	B 2766	$11.25	$16.10
PZM-6, 2 WINDINGS					
6/6	60/19	B 2600	B 2606	$13.30	$18.05
12/12	240/110	B 2610	B 2616	$13.30	$18.05
24/24	900/360	B 2630	B 2636	$13.30	$18.05
48/48	1460/1400	B 2650	B 2656	$13.30	$18.05

†† Remanant latch — designed for pulse operation. For additional technical information contact factory.

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ITT Components
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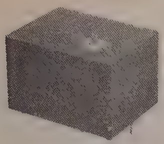
Miniature General Purpose Relays

LZ RELAY



5 Amp SPDT
L — 0.843″
W — 0.646″
H — 0.583″

CONTACT DATA

Arrangement — 1 Form C
Material — 5A type: Gold overlay silver-nickel alloy (single)
3A type: Gold overlay silver (single)
1A type: Gold overlay silver-palladium alloy (bifurcated)
Load — 5A type: 5A @ 30V DC or 120V AC. 4A @ 240V AC resistive. ⅛ HP
3A type: 3A @ 30V DC or 120V AC, 2.5A @ 240V AC resistive, 1/10 HP
1A type: 1A @ 30V DC or 120V AC, resistive
Life — Mechanical: 20 million operations minimum
Electrical: 0.1 x 10⁶ operations minimum at rated load
Timing — Operate: < 5ms (standard type), < 6ms (high sensitive type)
Release: < 2ms

COIL DATA (@ 20°C)

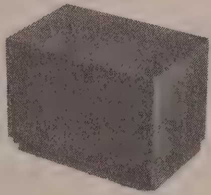
Operate power — 210mW (standard type), 150mW (high sensitive type)
Nominal power — 450mW (standard type), 330mW (high sensitive type)
Maximum power — 1.4W

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10, Ohms	Ordering Code		
				5A*	3A	List Price
Standard types						
5	3.25	8.3	56	LZ-5H	LZ-5	$2.20
6	3.90	9.9	80	LZ-6H	LZ-6	$2.20
9	5.85	14.9	180	LZ-9H	LZ-9	$2.20
12	7.80	19.8	320	LZ-12H	LZ-12	$2.20
24	15.6	39.6	1280	LZ-24H	LZ-24	$2.20
48	28.8	79.2	3800	LZ-48H	LZ-48	$2.35
High sensitive types						
5	3.25	9.8	80	—	LZ-5S	$2.35
6	3.90	11.7	110	—	LZ-6S	$2.35
9	5.85	17.6	250	—	LZ-9S	$2.35
12	7.80	23.4	440	—	LZ-12S	$2.35
24	15.6	45.6	1780	—	LZ-24S	$2.35

* Add $0.05 to List Price

GZ RELAY



5 Amp DPDT
L — 1.098″
W — 0.728″
H — 0.866″

CONTACT DATA

Arrangement — 2 Form C
Material — Heavy duty type: Gold overlay silver-nickel alloy (single)
Standard type: Gold overlay silver-nickel alloy (single)
Low level type: Gold overlay silver-palladium (bifurcated)
Life — Mechanical: 10 million operations minimum
Electrical: 0.1 x 10⁶ operations minimum at rated load
Timing — Operate: < 10ms
Release: < 5ms

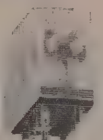
COIL DATA (@ 20°C)

Operate power — 270mW
Nominal power — 650mW
Maximum power — 1W

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10%, Ohms	Ordering Code	List Price
Heavy duty type 5 Amp					
6	3.8	9.0	55	GZ-6H	$4.95
12	7.6	18.0	220	GZ-12H	$4.95
24	15.2	36.0	880	GZ-24H	$4.95
48	27.8	63.4	2700	GZ-48H	$4.95
Standard types 3 Amp					
6	3.8	9.0	55	GZ-6	$4.80
12	7.6	18.0	220	GZ-12	$4.80
24	15.2	36.0	880	GZ-24	$4.80
48	27.8	63.4	2700	GZ-48	$4.80
Low level types 1 Amp					
6	3.8	9.0	55	GZ-6W	$5.40
12	7.6	18.0	220	GZ-12W	$5.40
24	15.2	36.0	880	GZ-24W	$5.40
48	27.8	63.4	2700	GZ-48W	$5.40

ITT-2R ITT-2H RELAY



10 Amps DPDT
L — 1.098″
W — 0.843″
H — 1.362″

CONTACT DATA

Arrangement — 2 Form C
Materials — Gold flashed silver, button
Load — 10A type: 10A @ 30V DC/120V AC, resistive, ¼ HP
5A type: 5A @ 30V DC/120V AC, resistive, ⅛ HP
Life — Mechanical: 50 million operations minimum
Electrical: 10A type: 0.1 x 10⁶ operations minimum at rated load
5A type: 0.5 x 10⁶ operations minimum at rated load
Timing — Operate: < 20ms
Release: < 20ms (AC relays), < 10ms (DC relays)

COIL DATA (@ 20°C)

Operate power — 500-575mW (DC relays), 2.0-2.3VA (AC relays)
Nominal power — 900mW (DC relays), 1.2VA (AC relays)
Maximum power — 2.2W (DC relays), 2.7VA (AC relays)

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10% DC, Ohms ±15% AC	Ordering Code		List Price
				Printed Ciruit	Standard	
5A types, DC Coils						
6	4.5	9.3	40	ITT-2BAR	ITT-2AR	$4.85
12	9	18.6	160	ITT-2BBR	ITT-2BR	$4.85
24	18	37.2	650	ITT-2BCR	ITT-2CR	$4.85
5A types, AC Coils						
24	19.2	30.6	180	ITT-2ZBCR	ITT-2ZCR	$5.05
115	92	146.6	4270	ITT-2ZBFR	ITT-2ZFR	$5.50
10A types, DC Coils						
6	4.8	9.3	40	ITT-2BAH	ITT-2FAH	$6.50
12	9.6	18.6	160	ITT-2BBH	ITT-2FBH	$6.50
24	19.2	37.2	650	ITT-2BCH	ITT-2FCH	$6.50
10A types, AC Coils						
24	20.4	30.6	180	ITT-2ZBCH	ITT-2ZFCH	$6.80
115	97.8	146.6	4270	ITT-2ZBFH	ITT-2ZFFH	$7.15

ITT-4 RELAYS

5 Amp 4PDT
L — 1.098″
W — 0.843″
H — 1.362″

CONTACT DATA

Arrangement — 4 Form C
Material — 5A type: Gold-flashed silver-cadmium-oxide, button
3A type: Gold-flashed silver, button
1A type: Gold-silver alloy, cross-bar
Load — 5A type: 5A @ 30V DC/120V AC, resistive, ⅛ HP
3A type: 3A @ 30V DC/120V AC, resistive, 1/10 HP
1A type: 1A @ 30V DC/120V AC, resistive
Life — Mechanical: 5A and 3A types: 50 million operations minimum
1A type: 20 million (DC relays), 10 million (AC relays) operations minimum
Electrical: 0.2 x 10⁶ operations minimum at rated load
Timing — Operate: < 20ms
Release: < 20ms (AC relays), < 10ms (DC relays)

COIL DATA (@ 20°C)

Operate power — 500mW (DC relays), 2.0VA (AC relays)
Nominal power — 900mW (DC relays), 1.2VA (AC relays)
Maximum power — 2.2W (DC relays), 2.7W (AC relays)

Standard Coil and Contact Combinations (20°C)

Nominal Voltage	Pull-In Voltage	Maximum Continuous Voltage	Coil Resistance ±10% DC, ±15% AC Ohms	Ordering Code		List Price
				Printed Circuit	Standard	
3A types, DC Coils						
6	4.5	9.3	40	ITT-4BAR	ITT-4AR	$5.30
12	9	18.6	160	ITT-4BBR	ITT-4BR	$5.30
24	18	37.2	650	ITT-4BCR	ITT-4CR	$5.30
3A types, AC Coils						
24	19.2	30.6	180	ITT-4ZBCR	ITT-4ZCR	$5.60
115	92	146.6	4270	ITT-4ZBFR	ITT-4ZFR	$5.85
5A types, DC Coils						
6	4.5	9.3	40	ITT-4BAH	ITT-4AH	$5.65
12	9	18.6	160	ITT-4BBH	ITT-4BH	$5.65
24	18	37.2	650	ITT-4BCH	ITT-4CH	$5.65
5A types, AC Coils						
24	19.2	30.6	180	ITT-4ZBCH	ITT-4ZCH	$5.95
115	92	146.6	4270	ITT-4ZBFH	ITT-4ZFH	$6.25

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Sub Miniature Printed Circuit Board Relays

VG RELAY

L — 0.925″,
W — 0.386″,
H — 0.984″

CONTACT DATA

Arrangement — 1 Form C (SPDT)

Material & Rating —
VG-( )H, — Silver alloy 5A 24V DC or 120V AC resistive
VG-( ), VG-( )S — Silver alloy 3A 30V DC or 120V AC resistive
VG-( )L, VG-( )LS — Gold overlaid silver alloy 1A 30V DC or 120V AC resistive

Life Expectancy — Mechanical: 10 million operations
Electrical: 100,000 operations at rated load
30,000 operations at TV Rating

COIL DATA

Voltage — 5 to 48V DC (High sensitive type — to 24V DC)

Power (at 20°C) — Standard type: operate 0.18 ~ 0.2W
nominal 0.36 ~ 0.4W
High sensitive type: operate 0.1 ~ 0.13W
nominal 0.2 ~ 0.26W

Max. Operate (at 20°C) — 70% of nominal voltage

Duty — Continuous

GENERAL DATA

Insulation Resistance — Min. 1000 MΩ at 500V DC

Dielectric Strength — 750V AC (50/60 Hz) between open contacts
4000V AC (50/60 Hz) between coil and contacts

Surge Strength — 7000V (1 × 40 μs)

Temperature Range (at Nominal voltage) —
Standard type −40°C to +75°C } Non-carrying condition of contacts
High sensitive type −40°C to +85°C }

Time Value (at Nominal voltage) — Operate Max. 8 ms
Release Max. 5 ms

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2 mm (0.08 in.)

Weight — 12 gr (Approx.)

Coil Data			Ordering Code Gold Overlaid Silver Alloy					
Nom. Coil Voltage	Coil Resist. in Ohm ±10% at 20°C	Must operate Voltage at 20°C	5A 1 Form C	List Price	3A 1 Form C	List Price	1A 1 Form C	List Price
Standard Type								
5	69	3.5	VG- 5H	$2.75	VG- 5	$2.65	VG- 5L	$2.85
6	100	4.2	VG- 6H	$2.75	VG- 6	$2.65	VG- 6L	$2.85
9	225	6.3	VG- 9H	$2.75	VG- 9	$2.65	VG- 9L	$2.85
12	400	8.4	VG-12H	$2.75	VG-12	$2.65	VG-12L	$2.85
18	870	12.6	VG-18H	$2.75	VG-18	$2.65	VG-18L	$2.85
24	1450	16.8	VG-24H	$2.75	VG124	$2.65	VG-24L	$2.85
48	6000	33.6	VG-48H	$2.85	VG-48	$2.75	VG-48L	$2.95
High Sensitive Type								
5	120	3.5			VG- 5S	$2.80	VG- 5LS	$3.00
6	150	4.2			VG- 6S	$2.80	VG- 6LS	$3.00
9	325	6.3			VG- 9S	$2.80	VG- 9LS	$3.00
12	575	8.4			VG-12S	$2.80	VG-12LS	$3.00
18	1400	12.6			VG-18S	$2.80	VG-18LS	$3.00
24	2230	16.8			VG-24S	$2.80	VG-24LS	$3.00

LZG RELAY

L — 0.862″,
W — 0.685″,
H — 0.634″

CONTACT DATA

Arrangement — [LZG-( )VM — SPST (N-O) only]

Material & Rating — Silver tin oxide alloy
[LZG-( )VM]: 10A at 24V DC or 120V AC resistive

Resistance — (Initial value) Silver tin oxide alloy — Max. 100 mΩ (at 6V, 1A)

Life Expectancy — Mechanical: 20 million operations
Electrical: 100,000 operations

COIL DATA

Voltage — 1.5 to 24V DC

Power (at 20°C) — Standard type: operate 0.19W
nominal 0.45W
maximum 1.4W

Operate (at 20°C) — 65% of nominal voltage

Duty — Continuous

GENERAL

Insulation Resistance — Min. 250 MΩ at 500 VDC

Dielectric Strength — 750V AC (50/60 Hz) between open contacts
2500V AC (50/60 Hz) between all other conductors

Surge Strength — 7000V (1 × 40 μs)

Temperature Range (at Nominal voltage) —
Standard type: −40°C to +70°C — Non-carrying condition of contacts

Time Value (at Nominal voltage) — Operate Max. 7 ms
Release Max. 4 ms

Mounting — For direct printed circuit mounting on grid spacing of 2.54 mm (0.1 in.) up to board thickness of 2.5 mm (0.098 in.)

Weight — 9.2 gr (Approx.)

Coil Data			Ordering Code 10A	List Price
Nominal Coil Voltage	Coil Resistance in Ohms ±10% at 20°C	Must Operate Voltage at 20°C		
Standard Type				
1.5	5	0.97	LZG 1.5VM	$2.70
3	20	1.95	LZG 3VM	$2.70
5	56	3.25	LZG 5VM	$2.70
6	80	3.90	LZG 6VM	$2.70
9	180	5.85	LZG 9VM	$2.70
12	320	7.80	LZG 12VM	$2.70
18	720	11.70	LZG 18VM	$2.70
24	1280	15.60	LZG 24VM	$2.70

ITT Components
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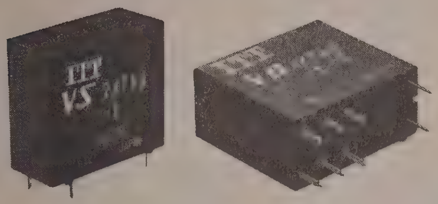
Miniature Power Relays

VB/VS RELAY

L — 1.150″
W — 0.508″
H — 0.996″



CONTACT DATA

Arrangement — 1 Form A, B or C 10 Amp (VS)
2 Form A, B or C 5 Amp (VB)
Material — Silver Nickel (Standard)
Rating — 5 or 10 Amp at 24V DC or 240V AC
⅙ or ⅓ HP 120V AC motor load
Inrush Current — 51 or 78A at 120 V AC
Max. Carrying Current — SPDT 14A, DPDT 7A
Life Expectancy — Mechanical 5 million operations
Electrical: 100,000 operations at 5 or 10A 24V DC or 240V AC
200,000 operations at 5 or 10A 120V AC resistive
3.5 or 7A 24V DC or 240V AC
30,000 operations at ⅙ or ⅓ 120V AC motor load

COIL DATA

Nominal Voltage — 3 to 60V DC
Power (at 20°C) — Nominal: 0.72W Standard Type
0.53W High Sensitive Type
Operate: 0.35W Standard Type
0.26W High Sensitive Type
Maximum: 1.4W

GENERAL

Dielectric Strength — Min. 1000V AC between open contact
Min. 5000V AC between all other conductors
Insulation Resistance — Min. 1000MΩ at 500V DC between conductors
Surge Strength — 10,000V
Temperature Range — (TV types) −40°C to +50°C
Standard types) −40°C to +65°C
(Sensitive types) −40°C to +75°C

Standard Coil and Contact Combinations

Type	Nominal Voltage DC (V)	Coil Resistance −10% at 20°C (V)	Must Operate Voltage at 20°C (V)	Ordering Code	List Price
Standard Types					
SPDT	5	36	3.5	VS- 5TBU-E	$3.25
	6	50	4.2	VS- 6TBU-E	$3.25
	12	200	8.4	VS-12TBU-E	$3.25
	24	820	16.8	VS-24TBU-E	$3.25
DPDT	5	36	3.5	VB- 5TBU-E	$3.80
	6	50	4.2	VB- 6TBU-E	$3.80
	12	200	8.4	VB-12TBU-E	$3.80
	24	820	16.8	VB-24TBU-E	$3.80
High Sensitive Type					
SPDT	5	47	3.5	VS- 5STBU-E	$3.35
	6	68	4.2	VS- 6STBU-E	$3.35
	12	270	8.4	VS-12STBU-E	$3.35
	24	1100	16.8	VS-24STBU-E	$3.35
DPDT	5	47	3.5	VB- 5STBU-E	$3.90
	6	68	4.2	VB- 6STBU-E	$3.90
	12	270	8.4	VB-12STBU-E	$3.90
	24	1100	16.8	VB-24STBU-E	$3.90

VF RELAY

L — 1.968″
W — 1.268″
H — 0.949″

CONTACT DATA

Arrangement — 1 Form A
Material — Silver Alloy

Rating:

Classification	Rating		Maximum Inrush Current
	Resistive	Motor Load	
H	30A 250V AC	2HP 25A 250V AC	70A 200V AC
M	25A 250V AC	1.5HP 20A 250V AC	60A 200V AC
L	20A 250V AC	1HP 15A 250V AC	55A 100V AC

Maximum Carry Current — 30A
Life Expectancy — Mechanical: 5 million operations
Electrical: 200,000 operations at motor load
100,000 operations at resistive load

COIL DATA

Nominal Voltage — 3 to 60V DC
Power (at 20°C) — Nominal: 1.2W
Operate: 0.59W
Maximum: 3.0W

GENERAL DATA

Dielectric Strength — 1200V AC between open contacts
4000V AC between all other conductors
Insulation Resistance — 1000MΩ (min.) at 500V DC
Surge Voltage — 10,000V
Timing (approx.) — Operate: 15ms at nominal
Release: 3ms at nominal
Weight — 55 gr
Vibration — 10 - 55Hz
Shock — 20G

Standard Coil and Contact Combinations

Coil Data at 20°C			Ordering Code		List Price
Nominal Coil Voltage	Coil Resistance in Ohms ±10%	Must Operate Voltage	Quick Connect Terminals	PCB Coil Terminals	
6	30	4.2	VF- 6HU	VFB- 6HU	$5.70
12	120	8.4	VF-12HU	VFB-12HU	$5.70
24	480	16.8	VF-24HU	VFB-24HU	$5.70
48	1920	33.6	VF-48HU	VFB-48HU	$5.70
6	30	4.2	VF- 6MU	VFB- 6MU	$5.20
12	120	8.4	VF-12MU	VFB-12MU	$5.20
24	480	16.8	VF-24MU	VFB-24MU	$5.20
48	1920	33.6	VF-48MU	VFB-48MU	$5.20
6	30	4.2	VF- 6LU	VFB- 6LU	$4.85
12	120	8.4	VF-12LU	VFB-12LU	$4.85
24	480	16.8	VF-24LU	VFB-24LU	$4.85
48	1920	33.6	VF-48LU	VFB-48LU	$4.85

ITT Components

A Unit of ITT Corporation

Solid-State Relays

ITT Components offers a full line of Solid-State Relays to cover a wide range of switching and isolation applications where long life, environmental ruggedness, low RFI, no contact bouncing and logic circuitry compatibility are prime requisites.

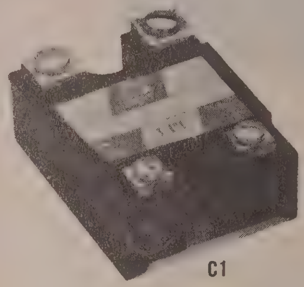
These SSRs feature:

- Photo-transistor or reed relay coupling.
- Various chassis mounting or printed circuit board mounting housings.
- AC switching.
- Zero-crossing or random switching.

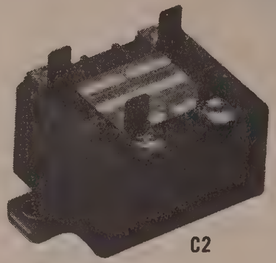
AC output models can switch:

- Voltages of 120, 240, 330, 480V AC.
- Currents of 0.5, 2, 3, 7, 10, 25 or 30A AC.

A full line of input-output modules (DC and AC input as well as DC and AC output) to fit microprocessor based controls is also available.
Do not hesitate to call us for any additional information you might need.


C1

P9


C2

P6

P1

INPUT				OUTPUT		
PACKAGE	VOLTAGE	TYPE	COUPLING	VOLTAGE	TYPE OF SWITCHING	CURRENT
C1	5	D	RC	120	R	10
CHASSIS MOUNT C1 C2 PRINTED CIRCUIT MOUNT P1 P6 P9	3(3-32) 5 12 24 120 240	D → DC A → AC	PC- PHOTO TRANSISTOR COUPLED RC- REED RELAY COUPLED	12 120 240 330 480 V AC	X- ZERO CROSSING SWITCHING R- RANDOM CROSSING SWITCHING	0.5 1 2 3 7 10 25 30 A-AC

Example: C1-3D-PC-240X10

A Chassis mount, "hockey-puck" housing, the input circuit is driven with 3-32V DC, and it switches a 240V, 10A output triac. The relay features photo-transistor coupling, and zero cross-over switching.

I-O MODULES

Input	Housing	Logic Supply Voltage	Input Voltage
I	P7	5D/15D/24D	10D/120A/240A

NOT ANY COMBINATION OF THE ABOVE PARAMETERS IS POSSIBLE. PLEASE CONSULT US FOR ANY OTHER COMBINATION OF VOLTAGE, CURRENT, PACKAGE, ETC.

Output	Housing	Signal Pick-Up Voltage	Output Voltage	Output Current
0	P7	5D/15D/24D	60D/120A/240A	3

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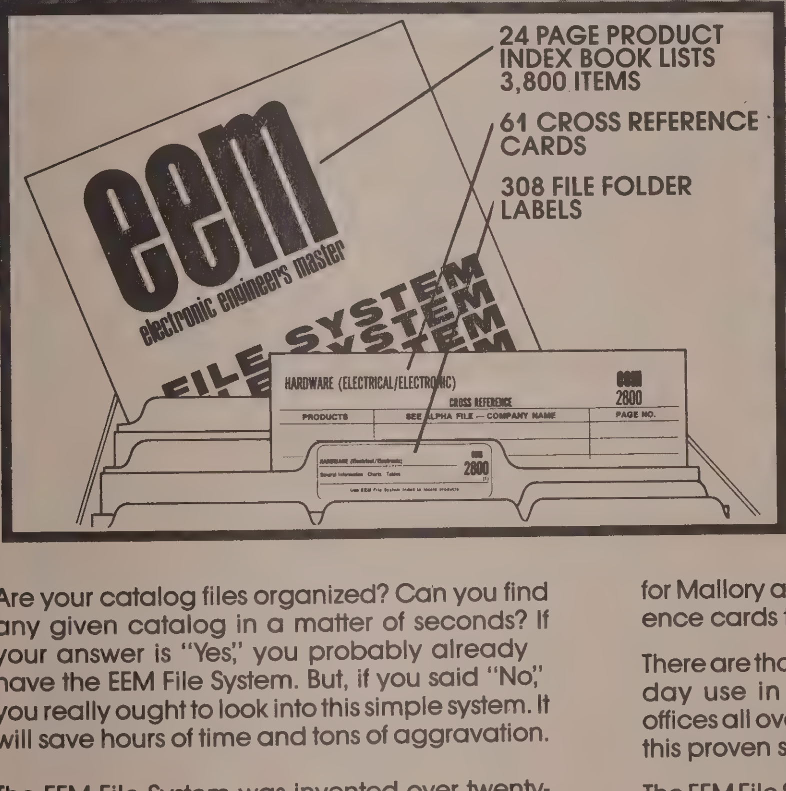
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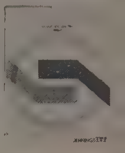
vacuum relays

ITT Jennings manufactures Vacuum and Gas Relays to exacting standards for use in transferring high voltage circuits. They are available in voltage ranges up to 30 KVAC, with up to 75 A. current ratings, and with operating frequencies through the VHF band. These relays are widely used in airborne, mobile and marine communications where their characteristics are particularly desirable. They have high operating speeds, withstand high voltages and carry heavy currents with high reliability . . . without developing high contact resistance or generating electrical noise. The majority of applications for these relays includes the switching of antennas, frequency bands, transmit/receive modes, power circuits and elements in pulse forming networks.

ITT Jennings also produces a line of defibrillator (or capacitance discharge) vacuum relays used in medical defibrillation units, or any application that calls for a capacitor discharge circuit — research lasers and communications power supplies for example. Operating characteristics are shown under relay type RGD1 through 9.



Relay Type	Contact Configuration	KV Peak Rated Operating Voltage			Continuous Current Amps, RMS			Contact Capacitance	
		DC - 60 Hz	2.5 MHz	16 MHz	DC - 60 Hz	2.5 MHz	16 MHz	Open Contact to Ground (pF)	Between Open Contacts (pF)
SPST									
RF40, 40A	Latch	3.6	3.6	3.2	12	10	6	1.6	1.6
RF41, 42	N/C, N/O	3.6	3.6	3.2	12	10	7	1.6	1.6
RF5A	N/C	7.5	7.5	7	12	10	5	1.6	1.6
RF43	Latch	7	7	6	12	10	6	1.6	1.6
RF4A, 4B	N/C, Latch	8	7	6	30	25	15	4.0	4.0
RF4T	N/C	7	6	5	20	17	10	2.5	10
RF50, 51	N/C, N/O	10	7	6	12	10	6	1.6	1.6
RD5A, 5B RD6A, 6B	N/O, N/C	12	10	8	15	10	6	1.0	.5
RS8, 10	N/O, N/C	28	25	12	75	35	22	1.5	.7
RJ8A	N/O	28	25	12	110	60	40	1.0	1.3
SPDT									
RF1D, 1E		2	2	2	8	6	4	2.0	1.6
RF1J	Latch	3.6	3.6	3.2	12	10	7.5	2.5	2.5
RF60^1, 60A^1 RF61	Latch^1	3.6	3.6	3.2	12	10	6	2.0	2.0
RJ1A		3.5	2.5	2.0	18	14	9	2.5	2.0
RJ1H		2.5	Hot Break		3.0	Hot Break		N/A	N/A
RF62, RF63^1, 63A^1	Latch^1	7	7	6	12	10	6	1.1	1.6
RF3A, 3C^1	Latch^1	8	7	6	30	25	15	2.5	4.0
RJ2B, 2C		12	10	8	50	30	17	1.0	.5
RB1D, 1E, RB1H, 1J		12	10	8	15	10	6	1.0	.5
RF10B		15	13	10	75	22	15	1.5	1.8
RE6B		25	20	15	25	13	8	2.5	1.0
DPDT & 4PDT									
RB7A, 7B		7	4	3	14	9	4	2.0	1.0
RB3		12/6*	10/5*	8/4*	30	10	6	2.5	1.0
RB4	4PDT	15	12	10	20	10	6	2.5	1.0
RB2A		20	15	10	20	12	6	2.5	1.0
Gas Filled/DPDT									
RGD6, RGD9†		7.5	N/A	N/A	30	N/A	N/A	0.1	N/A
RGD7		7.5	N/A	N/A	30	N/A	N/A	0.1	N/A
RGD1		18	N/A	N/A	30	N/A	N/A	0.1	N/A
RGD5		18	N/A	N/A	30	N/A	N/A	0.1	N/A

* Lower contacts.
† Gold plated contacts

SEND FOR 24 PAGE VACUUM RELAY CATALOG NO. C203.

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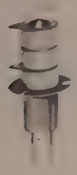
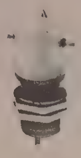
DIVISION OF ITT CORPORATION

1B•1452

vacuum relays


RF4A

RF5A


RD5B

RS8

RJ8A

RF1D

RF60

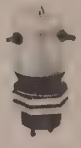
RJ1A/RJ1H

RF3A

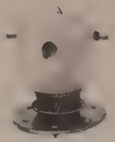
RF40

RJ2B

RB1D


RB1E

RF10B


RE6B

RB7A

RGD1,5

Contact Resistance (Ohms)	Operate Time (ms, Max.)	Release Time (ms, Max.)	Coil Resistance (26.5 VDC Coil)	Shock (Peak g's)	Expected Mech. Life Ops.x10^6	Weight (Oz, Max.)	Connector Type**	Relay Type
.020	10	N/A	47	50	1	1	S	**SPST** RF40, 40A
.020	10	10	290	50	1	1	S	RF41, 42
.050	12	12	920	30	1	1	S	RF5A
.020	10	N/A	47	50	1	1	S	RF43
.015	18/10[2]	18/NA[2]	156/6.7[2]	50	1	2	S	RF4A, 4B[2]
.020	10	10	156	50	1	2	S	RF4T
.020	15	15	290	50	1	1	S	RF50, 51
.010	18	8	265	30	1	3	N300/400	RD5A, 5B, RD6A, 6B
.003	30	10	120	30	1	7	S	RS8, 10
.003	18	8	120	30	2	10	S	RJ8A
.05	10	10	920	30	2	1	S	**SPDT** RF1D, 1E
.05	10	N/A	18	50	1	1	S	RF1J
.02	10	NA/10[3]	47/290[3]	50	1	1	S	RF60, 60A, 61[3]
.01	8	8	335	50	2	1	S	RJ1A
.03	6	6	335	50	1	1	S	RJ1H
.02	10	10[4]/NA	290[4]/47	50	1	1	S	RF62[4], RF63, 63A
.015	18/10[5]	18/NA[5]	156/12[5]	50	1	2	S	RF3A, 3C[5]
.012	18	9	270	50	.5	3	S	RJ2B, 2C
.012	18	8/9[6]	265	30	1	3	N300/400	RB1D, 1E, RB1H[6], 1J[6]
.012	30	10	225	30	.1	16	S	RF10B
.012	25	10	120	30	.5	7	N300/400	RE6B
.02	15	5	270	30	1	2	N300/400	**DPDT & 4PDT** RB7A, 7B
.01	20	8	120	30	.5	6	N300/400	RB3
.01	45	10	131	30	.1	16	N300/400	RB4
.01	20	10	225	30	.5	8	N300/400	RB2A
0.1	20	N/A	18***	10	.1	11	Flex.	**Gas Filled** RGD6, RGD9†
0.1	20	N/A	70	30	.1	11	Sol.	RGD7
0.1	25	N/A	52	10	.1	16	Sol.	RGD1
0.1	25	N/A	52	10	.1	10	Sol.	RGD5

** **S** — Standard Nickel: **N300** — Copper: **N400** — Heavy duty for up to 20% increase in voltage and current specifications: **Flex** — Flying Leads: **Sol.** — Solder on wire terminals.

*** 12 VDC Coil.

† Gold plated contacts

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DIVISION OF ITT CORPORATION

vacuum coaxial relays

ITT Jennings manufactures a broad line of coaxial relays for use where circuit currents must be contained completely within a coax system. Vacuum coaxial relays have high power handling capabilities at frequencies up to 600 MHz.

These relays and switches have characteristics that are well suited to airborne, marine and mobile communication systems, as well as fixed installations. Characteristics include: • Low insertion loss and VSWR • High RF power capability • High isolation • Fast operation • Low, stable contact resistance • No noise generation or IM distortion • Extreme high reliability combined with ruggedness for high altitude or heavy vibration environments • Small size and lightweight for their power handling capacity • Wide band-pass characteristics. Typical applications for these units might include multiple antenna-transmit switching systems such as high speed switching from omnidirectional to directional antennas, transmit-receive switching, and where elements are to be switched in transmitter and receivers. Other applications include crossbar matrices and switching trees.

RC41

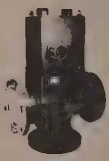
RC53

RC54

RC5

RC6

RC10


RC21

	HIGH POWER						
Model Number	**RC 41**	**RC 53**	**RC 54**	**RC 5**	**RC 6**	**RC 10**	**RC 21**
Power Rating (KW)	3	2.3	7.5	25	25	90	90
Frequency Range (MHz)	0-500	0-600	0-400	0-100	0-400	0-100	0-500
VSWR Max. @ 50 Ohms At MHz	1.1 500	1.1 600	1.1 300	1.05 60	1.1 150	1.05 60	1.15 500
Crosstalk Isolation (dB) At MHz	30 300	75 30	53 400	70 30	65 30	65 30	60 30
Insertion Loss (dB Max.)	.1	.1	.1	.02	.01	.02	.01
Coil Resistance (Ohms ± with 26.5 VDC Coil)	265	19	19	19.9	15.4	20.3	4.8
Contact Configuration	SPDT	DPDT	DPDT	SPST	SPDT	SPST	SPDT
Line/Connector	C	N	LC	1⅝	1⅝	3⅛	3⅛
Operate Time (ms Max.)	25	30	30	30	50	30	40
Weight (lbs. max.)	1	3	7	2	8	4	14

SEND FOR 20 PAGE VACUUM COAXIAL RELAY CATALOG NO. 503.

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eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

High Voltage Relays

Applications

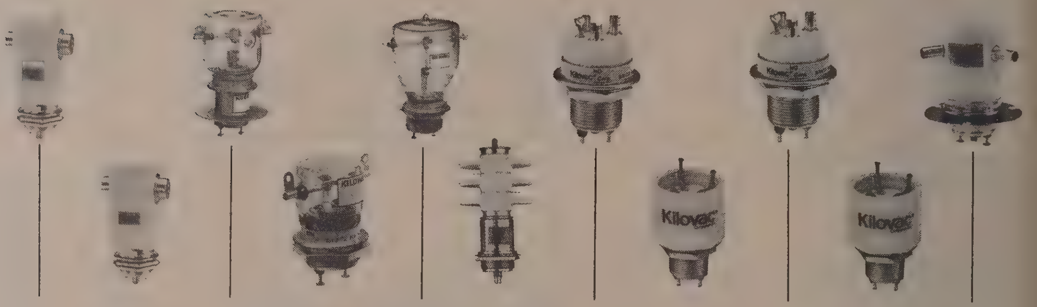
The capability to rapidly switch high voltages in a small package makes Kilovac® relays especially well suited for applications in ECM, communications, sonar and radar pulse forming networks, heart defibrillators and other capacitive discharge circuits, electrostatic coating equipment, laser and x-ray power supplies, digital antenna couplers (tuners), automatic dielectric-strength test equipment, and other high voltage equipment, or low voltage applications where extreme reliability is required.

Vacuum as a Dielectric

Since most high voltage arcs are initiated by ionization of the insulating medium, absence of any such medium (i.e., a hard vacuum) produces the greatest possible isolation between contact electrodes. In a vacuum of 10^{-8}mm of mercury, dielectric strengths can be achieved on the order of 2000 V/mil. A vacuum dielectric has the additional advantage of providing an inert (i.e., nonoxidizing) atmosphere in which high voltage contacts operate.

Low Contact Resistance

In conventional relays, contact resistance is variable from cycle to cycle. In Kilovac vacuum relays, it remains low and stable over the life of a relay (.015 ohms typical). Stability and low resistance are attributable to uniform cleanliness of parts, lack of oxidation or contamination, and use of only pure metals in the contact areas. Contact maintenance is never required.



Kilovac Part No.	KC-20	KC-22(1)	H-9	H-11/S2	H-23 H-24	K52C	HC-1	HC-2	HC-3(1)	HC-4(1)	KC-2
Contact Arrangement	SPST-NO	SPST-NO	SPST-NC	SPST-NO	SPST(2)	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT
Rated Operating Voltage (kVdc or 60 Hz peak)	28	25	15	9	30	100(4)	3.5	8	3.5	8	15
Test Voltage (kVdc)	30	28	20	12	35	110(4)	5	10	5	10	18
Continuous Current contacts closed, max (amps dc or 60 Hz peak)	110	65	15	15	30	1	25	25	18	15	50
Contact Resistance, max (ohms)	.005	.005	.015	.015	.015	2	.010	.010	.020	.020	.012
Operate Time, max (ms)	30	30	15	18	30	30	6	6	6	6	18
Coil Resistance (ohms ±10% @ 20° C)	120	120	265	250	120	28	335	335	335	335	250
Coil Voltage (Vdc, nominal)	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
Nominal Dimensions (inches)	1.31 Sq x 4.00H	1.31 Sq x 4.00H	1.3D x 2.75H	1D x 1.67H	2D x 3.62H	3.56D x 6.25H	.75D x 1.50H	1.13D x 1.88H	.75D x 1.50H	1.13D x 1.88H	1.00D x 2.50H
Nominal Weight (oz)	10	10	3	2	7	24	1	1.25	1	1.25	3
Mounting Style	Thr'ded Base	Thr'ded Base	Solder Flange	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Flange(3) Base

(1) Suitable for power switching applications. Consult factory for details. Also available: Part no. KC-28 for pulsed power.
(2) H-23: SPST-NC; H-24: SPST-NO.
(3) For threaded base, use part no. KC-11.
(4) In oil

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P.O. Box 4422EM Santa Barbara, CA 93103 USA
(805) 684-4560 • TWX 910-336-1141

Kilovac®
Corporation

High Voltage Relays

Small Size and Weight
The small contact gap and short contact travel possible with a vacuum dielectric result in minimal package size and weight.

Safety
Because contacts are sealed within the high voltage envelope, switching may be safely accomplished in explosive atmospheres.

Fast Switching Time
10 ms typical, due to small contact gap and short armature travel.

Electronegative Gas as a Dielectric
Kilovac gas-filled relays are pressurized with an electronegative gas mixture. This insulating medium offers several advantages, including high voltage isolation capability in a compact package. The primary advantage is its ability to suppress arcing in heart defibrillator and other capacitive discharge circuits.

Kilovac Medical Relays
Since 1964 Kilovac has produced and delivered thousands of high voltage relays especially designed for heart defibrillators. Kilovac produces several models of patient relays, safety discharge relays, and ECG relays, as well as a multifunction relay capable of performing all of these switching functions in a defibrillator.

KC-3	KC-8	HVS-1	H-4	H-35	H-8	H-12	H-17	H-25/S10	K42 A332(6)	H-14	H-16	H-18	H-19
SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPDT	SPST-NO	DPDT	DPDT	DPDT	DPDT
8	12	17	5	35	15	8	25	50	5	12	12	8	20
11	15	22	7.5	40	20	12	30	60	7	15	15	10	25
25	30	7	10	10	15	15	30	30	15	30	30	10	30
.015	.025	.015	.02	.015	.015	.015	.015	.015	.020	.015	.030	.020	.015
18	18	25	10	30	15	18	25	60	10	20	20	15	30
220	180	128	250	50	265	250	120	120	680	120	120	250	225
26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
.75D x 2.75H	1D x 2.50H	4.75L x 5H	1.88L x .75H	8.25L x 5.75H	1D x 3H	1D x 2.0H	2.38D x 3.57H	3D x 7.5H	.75D x 1.72 H	1.29D x 2.77H	1.03D x 3.26H	1.03D x 1.97H	1.80D x 3.25H
2.5	3	15	1	15	3	2	5	30	1	8	5	4	7
Flange Base	Flange Base	Foot Bracket	Foot Bracket	Foot Bracket	Thr'ded Base	Thr'ded Base	Flange Base	Thr'ded Base	Flange Base	Thr'ded Base	Thr'ded Base	Thr'ded Base	Thr'ded Base

(5) For threaded base, use part no. KC-12.
(6) K42 B332: SPST-NC.

Send for Kilovac catalog

Kilovac Corporation
P.O. Box 4422EM Santa Barbara, CA 93103 USA
(805) 684-4560 • TWX 910-336-1141

Kilovac®

ELECTRONIC TIME DELAYS AND SENSORS

To simplify systems interfacing and integration, we have a complete custom facility for the design and production of timing and sensing systems.

They are available with Leach MIL-Standard relays or special solid state outputs, manufactured with discrete circuitry or thick film hybrids manufactured to MIL-STD-883, Class B requirements.

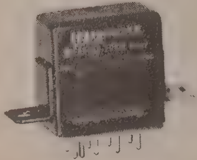
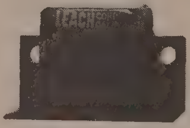
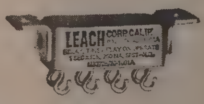
In addition to the standard products shown below, we can provide:

- —Combinations of voltage, frequency and phase sequence detection with built-in time delays for systems monitoring.
- —Solid state relays with up to 3PNO contacts and ratings up to 25 amperes to MIL-STD-704 power requirements.
- —Relay drivers for multiplex interface and isolation, conforming to MIL-R-28776.
- —Solid state switching devices, ac and dc motor controllers, circuit breakers, current sensors and remote power controllers.
- —Build to print hybrid, discrete /hybrid, and discrete designs available.

LEACH®
CONTROL PRODUCTS DIVISION

6900 ORANGETHORPE AVENUE
BUENA PARK, CALIFORNIA 90620
(714) 739-0770 TWX (910) 596-2867

Electronic Time Delays and Sensors

ENCLOSURE TYPES				
TYPE 10 1.5″x 1.5″x 1.8″ MATING SOCKET: SO-1021-7127	TYPE 10 1.5″x 1.5″x 2.3″ MATING SOCKET: SO-1021-7127 (SENSORS)	TYPE 20 1.2″x 1.0″x 1.8″ MATING SOCKET: SO-1048-8308	TYPE 30 1.0″x 1.0″x 1.3″ MATING SOCKET: SO-1048-8308	TYPE K MATING SOCKET: SO-1048-8308
TYPE 40 1.0″x 0.5″x 1.1″  MATING SOCKET: SO-1049-8309	TYPE 01 2.1″x 0.8″x 1.3″ 	TYPE 02 2.1″x 1.0″x 1.0″ 	TYPE 04 .790″x .390″x .210″ 	TYPE E (HALF SIZE XTAL CAN) 0.8″x 0.4″x 0.4″ 

Electronic Time Delays and Sensors

LEACH®

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BUENA PARK, CALIFORNIA 90620
(714) 739-0770 TWX (910) 596-2867

	LEACH Series Number	Enclosure Types Available	Timing Range (1)	Accuracy (1)	Contact Configuration	Contact Ratings	Temperature Range	Input Voltage (MIL-STD-704A)	Applicable MIL-R-83726 Slash Sheet
Time Delay Relays									
Time Delay On Operate* Relay Output*	R300	10, 20, 30	0.1 SEC TO 300 SEC	±2% TO ±10%	2PDT 4PDT	2 AND 10 AMP	−55°C TO +125°C	18 VDC TO 32 VDC	3, 14
Solid State Output	S300	20, 30, 40			SPNO	0.25A			
Hybrid/Relay	TDH-8000	K	.05-500 SEC	±10%	2PDT	10 AMP			
Time Delay On Release Positive Or Negative Control									
Relay Output*	R400	10, 20, 30	100MS TO 300 SEC	±2% TO ±10%	1PDT 3PDT	2 AND 10 AMP			4, 12
Solid State Output	S400	20, 30			SPNO	0.25A			
Hybrid/Relay	TDH-8000	K	.05-500 SEC	±10%	2PDT	10 AMP			
Hybrid Construction* Time Delay On Operate*	S5100	1/2 XTAL CAN	50MS TO 500 SEC						20, 21
Repeat Cycle Timer*	S5200								22
Voltage, Frequency, and Phase Sensors									
DC, Relay Output	V110	10	N/A	±2% TO ±10%	2PDT AND 4PDT	2 AND 10 AMP	−55°C TO +125°C	18 VDC TO 32 VDC	N/A
AC Undervoltage, Relay Output	V210							90 VAC TO 124 VAC 400 Hz	
Ac Overvoltage, Relay Output	V310								
AC Frequency, Relay Output	F410								
AC Phase Sequence, Relay Output	P510			N/A					
Proximity Sensors									
Solid State Output (2)	PS100	01 02 04	N/A	±.03″	SPNO SPNC SPNO	0.20A	−55°C TO +125°C	18 VDC TO 32 VDC	N/A

(1) EXTENDED TIMING RANGES AND GREATER ACCURACIES ARE AVAILABLE ON SPECIAL ORDER

(2) AVAILABLE FOR BOTH FERROUS AND NON FERROUS TARGET SENSING
SHORT CIRCUIT PROTECTION AVAILABLE
PACKAGES FOR MULTIPLE SENSORS AND HIGHER OUTPUT RATINGS ON SPECIAL ORDER

***TIME DELAY UNITS AVAILABLE QUALIFIED TO MIL-R-83726
SEE THE LEACH QUALIFIED PRODUCTS LIST**

QUICK REFERENCE GUIDE SUBMINIATURE RELAYS

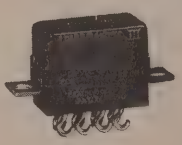
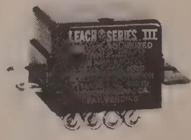
LEACH®

Leach subminiature relays have set the industry standards for technology and reliability for decades. With their proven high performance in the most demanding applications, they are ideal for your critical subsea, shipboard, ground-based and aerospace applications.

Our Balanced Force™ subminiature relays are rugged, high-environment relays for applications where size, weight and reliability are important. For systems where size and weight are critical, our Series III subminiature relays are the smallest, lightest aircraft relays made with their contact ratings, and are 40% the size and weight of our J and K Series relays, yet offer the same high performance. Both relay types are available in a variety of termination, mounting and operating configurations.

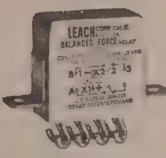
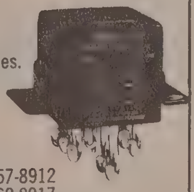
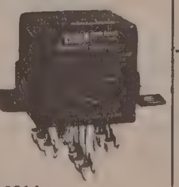
Subminiature Relays Dry Circuit to 10 Amps

LEACH®
RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

	Contact Rating (Amps)												
	28 VDC												
	Resistive	Inductive	Motor	Lamp	115/200 VAC 400 Hz, 3φ (Case Grounded)	Nominal Coil Voltage(s)	Coil Resistance(s)—(Ohms)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Shock, Minimum, G	Sinusoidal Vibration, Minimum, G	Weight, Maximum, Oz. (Grams)
Low Level to 5A, 2PDT Non-Latch & Latch Series X, XL Series III design, 5 mounting & 3 terminal types. 0.810″ x 0.410″ x 0.640″. Designed to MIL-R-6106. Sockets available: SO-1064-001 (Non-Latch) SO-1064-003 (Latch) 	5	3	2	1	Same as DC except inductive is 5A and motor is 3A	6.0 12.0 28.0 48.0 VDC DC LATCH 28.0 VDC	30 125 500 1600 730	4	4	0.5	200	30	.56 (16)
Low Level to 5A, 4PDT Non-Latch & Latch Series Y, YL Series III design, 5 mounting & 3 terminal types. 0.810″ x 0.810″ x 0.640″. Designed to MIL-R-6106. Sockets available: SO-1066-001 (Non-Latch) SO-1066-003 (Latch)  	5	3	2	1	Same as DC except inductive is 5A and motor is 3A	6.0 12.0 28.0 48.0 VDC DC LATCH 28.0 VDC	25 100 400 1275 600	6	6	0.5	200	30	.92 (26)
Low Level to 10A, 3 PDT Non-Latch & Latch Series YC, YCL Series III design, 5 mounting & 3 terminal types. 0.810″ x 0.810″ x 0.640″. Designed to MIL-R-6106. Sockets available: SO-1065-001 (Non-Latch) SO-1065-003 (Latch) 	10	6	4	2	Same as DC except inductive is 8A	6.0 12.0 28.0 48.0 VDC DC LATCH 28.0 VDC	25 100 400 1275 600	6	6	1.0	200	30	.99 (28)

Subminiature Relays Dry Circuit to 25 Amps (Cont'd)

LEACH®
RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

	Contact Rating (Amps)												
	28 VDC				115/200 VAC 400 Hz, 3φ (Case Grounded)	Nominal Coil Voltage(s)	Coil Resistance(s)—(Ohms)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Shock, Minimum, G	Sinusoidal Vibration, Minimum, G	Weight, Maximum, Oz. (Grams)
	Resistive	Inductive	Motor	Lamp									
Low Level to 12A, 2PDT Non-Latch & Latch Series J, JA & JL  Balanced Force* design. 4 mounting & 3 terminal types. DC - 1.015″x 0.515″x 1.000″ AC - 1.015″x 0.515″x 1.125″ Non-Latch applicable to MS27401. Latch applicable to MS27744. Sockets available: DC, Non-Latch SO-1049-8309(#16 Crimp) SO-1049-8526(#20 Crimp) AC-115VAC SO-1049-8772(#16 Crimp) 28VAC SO-1049-8774(#16 Crimp) DC, Latch SO-1055-8690(#16 Crimp)	DC Coil 12	8	4	2	Same as DC Rating	DC Non-Latch 6 12 28	DC Non-Latch 20 80 320	DC Non-Latch 10	DC Non-Latch 10	1	200	30	1.4 (40)
	AC Coil 10					DC Latch 6 12 28	DC Latch 38 150 600	DC Latch 10	DC Latch N/A				
						AC Coil (400 Hz) 115/28 (60 Hz) 115/28	AC Coil I, Max .040/.240 .024/.100	AC Coil 15	AC Coil 50				
Low Level to 12A, 4PDT Non-Latch & Latch Series K, KA & KL Balanced Force* design. 4 mounting & 3 terminal types. 1.015″x 1.015″x 1.000″ Non-Latch applicable to MS27400 Latch applicable to MS27745 Sockets available: DC, Non Latch SO-1048-8308(#16 Crimp) SO-1048-8518(#20 Crimp) AC-115VAC SO-1048-8776(#16 Crimp) 28VAC SO-1048-8779(#16 Crimp) DC, Latch SO-1056-8691(#16 Crimp)	DC Coil 12	8	4	2	Same as DC Rating	DC-Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15		200	30	DC Coil 2.5 (71)
	AC Coil 10					DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
						AC Coil (400 Hz) 115/28 (60 Hz) 115/28	AC Coil I, Max .040/.225 .018/.120 .028	AC Coil 20	AC Coil 50				AC Coil 2.7 (77)
Low Level to 25A, 1PDT Non-Latch & Latch Series JC. JCA & JCL(1) JS & JSA(2) Balanced Force* design. 50 ADC & 80A, 400 Hz overload capabilities. JS Series 20A overload capabilities. Special Models available. 3 mounting & 2 terminal types. DC-1.015″x 0.515″x 1.000″ AC-1.015″x 0.515″x 1.125″ Applicable MS, MIL-R-6106. Sockets available: DC, Non Latch SO-1063-9033 AC SO-1063-9034 DC, Latch SO-1063-9036	(1) JC, JCA & JCL 25	12	10	5	Same as DC Rating	DC Non-Latch 6 12 28	DC Non-Latch 20 80 320	DC Non-Latch 10	DC Non-Latch 10	1	200	30	1.6 (45)
	(2) JS & JSA Series Only 115V, 60 Hz Case Grounded 10	10	8	4	N/A	DC Latch 6 12 28	DC Latch 38 150 600	DC Latch 10	DC Latch N/A				
						AC Coil (400 Hz) 115/28 (60 Hz) 115/28	AC Coil I, Max .040/.240 .024/.100	AC Coil 15	AC Coil 50				
Low Level to 25A, 3PDT Non-Latch & Latch Series KC, KCA & KCL  Balanced Force* design. 50ADC & 80A, 400 Hz overload capabilities. Special Models available. 3 mounting & 2 terminal types. 1.015″x 1.015″x 1.000″ DC, Non-Latch applicable to MS27743. Latch applicable to MS27742. Sockets available: DC, Non-Latch SO-1057-8912 AC SO-1062-8917 DC, Latch SO-1058-8913	25	12	10	5	Same as DC except inductive 15A	DC Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15	1	200	30	3.0 (85)
						DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
						AC Coil (400 Hz) 115/28 (60 Hz) 115/28	AC Coil I, Max .040/.225 .018/.120 .028	AC Coil 20	AC Coil 50				
Low Level to 25A 3PST/NO, 2A 1PDT Aux. Non-Latch & Latch Series KD, KDA & KDL  Balanced Force* design. Same design as the Series KC with added auxiliary pole. Special Models available. 3 mounting & 2 terminal types. DC, Non-Latch applicable to MIL-R-6106/13. Latch applicable to MIL-R-6106/12. Sockets available: DC, Non-Latch SO-1059-8914 AC SO-1061-8916 DC, Latch SO-1060-8915	25	12	10	5	Same as DC except inductive 15A	DC Non-Latch 6 12 28	DC Non-Latch 18 70 290	DC Non-Latch 15	DC Non-Latch 15	1 Aux 4	200	30	3.0 (85)
	Aux 2	Aux 1		Aux .05		DC Latch 6 12 28	DC Latch 28 112 450	DC Latch 15	DC Latch N/A				
						AC Coil (400 Hz) 115/28 (60/Hz) 115/28	AC Coil 1, Max .040/.225 .018/.120 .028	AC Coil 20	AC Coil 50				

* Patented and T.M. Leach Corp.

POWER AND CONTROL RELAYS

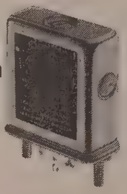
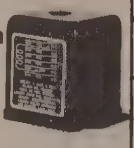
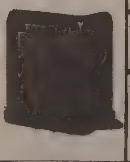
Leach power and control relays have been used for decades in commercial and military aircraft, trucks and buses, ships and tanks—any application that calls for proven durability, high performance and long life.

To ensure that you get the right relay for your application, our power and control relays are available in a broad range of configurations. You can choose from various terminal and mounting styles, dust and moisture resistant and hermetically-sealed enclosures, and a variety of operating ratings and characteristics.

Power and Control Relays

LEACH® RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

Contact Rating (Amps)
1 28 VDC
2 115 VAC, 400 Hz, 1φ
3 115 VAC, 50/60 Hz, 1φ

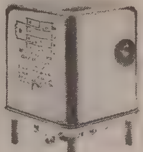
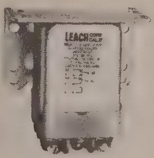
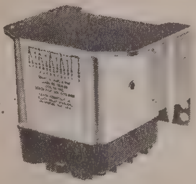
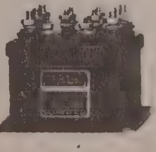
Power and Control Relays		Contact Rating (Amps)													
		Resistive	Inductive	Motor	Lamp	Resistive 115/200VAC, 3φ 400Hz (Case Grounded)	Contact Configuration	Resistance, Ohms ± 10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Lbs.
5 Amp, 2PDT **Series 9229** **Series 9235; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC 400 Hz. 1.750″x 1.531″x .687″. Applicable to MS25395, MS25321, MS25465, MS25455. 	1	5	3	1.5	.8	N/A	—	9229 248Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 55 to 2000 Hz	25	.18
	2	5	3	1.5	.8						DC Coils .020				
	3	4	2	1	.6			9235 310Ω		DC Coils .020	9235 N.A.				.20
5 Amp, 4PDT **Series 9220** **Series 9228; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC 400 Hz. 1.750″x 1.531″x 1.032″. Applicable to MS25267, MS25325, MS25467, MS25459.	1	5	3	1.5	.8	N/A	—	9220 248Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 55 to 2000 Hz	25	.30
	2	5	3	1.5	.8						DC Coils .020				
	3	4	2	1	.6			9228 200Ω		DC Coils .020	9228 N.A.				.30
5 Amp, 6PDT **Series 9226** **Series 9223; Magnetic Latch** Contact rating @ 28 VDC or 115 VAC, 400 Hz. 1.812″x 1.531″x 1.531″. Applicable to MS25269, MS25329, MS25469, MS25463. 	1	5	3	1.5	.8	N/A	—	9226 180Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 55 to 2000 Hz	25	.40
	2	5	3	1.5	.8						DC Coils .020				
	3	4	2	1	.6			9223 200Ω		DC Coils .020	9223 N.A.				.67
10 Amp, 2PDT **Series 9227** **Series 9237; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.781″x 1.531″x 1.032″. Applicable to MS25273, MS25323, MS25466, MS25457. 	1	10	6	4	2	10	—	9227 175Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 55 to 2000 Hz	25	.30
	2	10	6	4	2						DC Coils .020				
	3	6	4	3	1.5			9237 200Ω		DC Coils .020	9237 N.A.				.30

Power and Control Relays

LEACH®
RELAY DIVISION

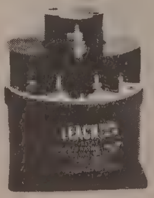
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

Contact Rating (Amps)
1 28 VDC
2 115 VAC, 400 Hz, 1φ
3 115 VAC, 50/60 Hz, 1φ

		Resistive	Inductive	Motor	Lamp	Resistive 115/200VAC, 3φ 400 Hz (Case Grounded)	Contact Configuration	Resistance, Ohms ± 10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Lbs.
10 Amp, 4PDT **Series 9224** **Series 9225; Magnetic Latch** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.812″x 1.531″x 1.531″. Applicable to MS25271, MS25327, MS25461, MS25468. 	1	10	6	4	2	10	—	9224 110Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 55 to 2000 Hz	25	.43
	2	10	6	4	2										
	3	6	4	3	1.5			9225 200Ω		DC Coils .020	DC Coils .020 9225 N.A.				.40
10 Amp, 2PDT **Series 9330** Contact rating @ 28 VDC or 115 VAC, 400 Hz. 1.781″x 1.531″x 1.032″. Applicable to MS24149. 	1	10	10	6	2	10	—	160Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .020	AC Coils .050	.002	10G 15 to 1500 Hz	25	.30
	2	10	10	6	2										
	3	6	4	3	1.5					DC Coils .020	DC Coils .020				.30
15 Amp, 4PDT **Series 9274** Contact rating @ 28 VDC or 3 phase 115/200 VAC, 400 Hz. 1.80″x 2.06″x 2.06″. Applicable to MS24568. 	1	10	10	6	3	15	—	92Ω	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .025	AC Coils .050	N.O. .003 N.C. .005	10G 1000 to 2000 Hz	50	.73
	2	15	10	6	3										
	3	10	6	4	2					DC Coils .025	DC Coils .020				
25 Amp **Series 9324—3PST/NO** 25 A, 115 VAC, 60 Hz. 1.47″x 2.50″x 2.40″. Applicable to MS27418. 	1	25	15	20	10	25	3PST/NO	160	28 VDC, 115 VAC, 400 Hz; 60 Hz	AC Coils .025	AC Coils .050	.002	10G 55 to 1500 Hz	25	.60
	2	25	25	20	10										
	3	25	25	12	10					DC Coils .020	DC Coils .010				
25 Amp **Series 9325—3PDT/NO** Mechanical interlock version of 9324. 3.71″x 3.00″x 3.20″. Applicable to MS27706. 	1	25	15	20	10	25	3PDT/NO	160	28 VDC, 115 VAC, 400 Hz, 60 Hz	AC Coils .025	AC Coils .050	.005	10G 55 to 1500 Hz	25	1.4
	2	25	25	20	10										
	3	25	25	12	10					DC Coils .020	DC Coils .010				
25 Amp **Series 9123—3PST/NO** 50g shock, 15g vibration. Auxiliary 5 amp contacts available. 3.30″x 3.73″x 2.50″. Repairable models available. Applicable to MS27997. 	1	25	25	25	N/A	25	3PST/NO	50	28 VDC 115 VAC, 400/60 Hz	.025	AC Coils .050 DC Coils .010	.002	15G 55 to 1500 Hz	50	1.25
	2	25	25	25	N/A										
	3	N/A	N/A	N/A	N/A										
25 Amp **Series 9339—3PST/NO** 25 A, 115 VAC, 60 Hz. 1.47″ x 2.50″ x 2.40″. Auxiliary Contact — 2 Amp.	1	25	15	20	10	25	3PST/NO 1PDT Aux.	160	28 VDC, 115 VAC, 400 Hz; 60 Hz	AC Coils .025	AC Coils .050	.002 .004 Aux.	10G 55 to 1500 Hz	25	.60
	2	25	25	20	10										
	3	25	25	12	10					DC Coils .020	DC Coils .010				

Power and Control Relays

LEACH®
RELAY DIVISION
5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

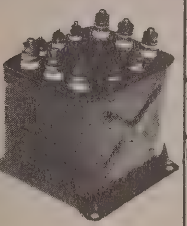
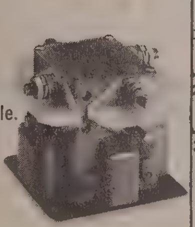
	Contact Rating (Amps)					Contact Configuration	Resistance, Ohms ±10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Oz./Lbs.
	28 VDC				Resistive 115/200VAC, 3φ 400 Hz (Case Grounded)									
	Resistive	Inductive	Motor	Lamp										
60 Amp Series "H," "HT" Auxiliary contacts 5 amps. Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27751. "HT" Power Transfer model 	50	20	20	10	60	3PDT 3PDT SPST/NO Aux. 3PST/NO SPST/NO SPST/NC Aux.	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω 115 VAC, .09A	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	.050	.025	.003	10G 70 to 1000 Hz	50	13.5 Oz.
60 Amp Series "HC" Center-Off Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27750. 	25	15	15	10	60	3PDT	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω	6, 12, 28 VDC	.035	.025	.003	10G 70 to 1000 Hz	50	14.0 Oz.
60 Amp Series "HL," "HLT" Magnetic Latch Repairable models available. Basic unit: 2.50" Dia. x 3.13". Applicable to MS27749. "HLT" Power Transfer model 	50	20	20	10	60	3PDT	6 VDC, 12Ω 12 VDC, 50Ω 28 VDC, 200Ω	6, 12, 28 VDC	.035	—	.003	10G 70 to 1000 Hz	50	14.0 Oz.
50 Amp Series 9124—3PST/NO 50g shock, 15g vibration. Auxiliary 5 amp contacts available. Applicable to MS27222. 3.30" x 3.73" x 2.50". Repairable models available. 	50	50	50	N/A	50	3PST/NO	50	28 VDC, 115 VAC, 400/60 Hz	.025	AC Coils .050 DC Coils .010	.002	15G 55 to 1500 Hz	50	125 lb.
50 Amp Series 9125—6PST/NO Mechanical interlock version of 9124. Design to MIL-R-6106. Aux. 5 amp contacts available. 6.21"x 3.80"x 2.70". 	50	50	50	N/A	50	6PST/NO	50	28 VDC, 115 VAC, 400/60 Hz	.030	AC Coils .050 DC Coils .010	.002	10G 70 to 1500 Hz	50	2.90 lb.
120 Amp Series "Z" Auxiliary contacts-5 amp. available in many models of contact. Configuration-consult factory. Available in repairable models. Design to MIL-R-6106. Basic unit: 3.65" Dia. x 4.28". 	50	30	30	N/A	120	3PDT 3PST/NO 3PST/NO SPST/NO SPST/NC Aux. 3PDT W/SPST/NO or SPST/NC Aux.	6 VDC, 1.2 A 12 VDC, .6 A 28 VDC, .31 A 115 VAC, .12 A	6, 12, 28 VDC 115 VAC 400 Hz 115 VAC 60 Hz	.060	.040	.004	10G 70 to 1000 Hz	15	2.0 lb.

Power and Control Relays

LEACH®
RELAY DIVISION

5915 AVALON BLVD., LOS ANGELES, CA 90003
(213) 232-8221 TWX (910) 321-2303

Contact Rating (Amps)
1 28 VDC
2 115/200 VAC 400 Hz 3φ
3 115/200VAC50/60Hz3φ

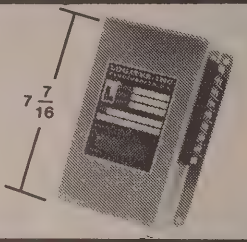
Relay	Contact Rating (Amps)	Resistive	Inductive	Motor	Lamp	Resistive 220/440 VAC 60 Hz 3φ (Case Grounded)	Contact Configuration	Resistance, Ohms ±10% @ 25°C for 28 VDC	Nominal Coil Voltage(s)	Operate Time, Maximum (MS)	Release Time, Maximum (MS)	Bounce Time, Maximum (MS)	Sinusoidal Vibration, Minimum, G	Shock, Minimum, G	Weight, Maximum, Oz./Lbs.
100 Amp Series "ZC" Center-Off Repairable models available. Design to MIL-R-6106. Basic unit: 3.65" Dia. x 4.28". 	1	50	30	30	N/A	N/A	3PDT 3PST	6 VDC, .8 A 12 VDC, .4 A 28 VDC, .23 A 115 VAC, .09 A	6, 12, 28 VDC	.060	.040	.004	10G 70 to 1000 Hz	15	2.0 lb.
	2	100	100	60	N/A	N/A			115 VAC 400 Hz						
	3	N/A	N/A	N/A	N/A	N/A			115 VAC 60 Hz						
120 Amp Series "ZL" Magnetic Latch Repairable models available. Design to MIL-R-6106. Basic unit: 3.65" Dia. x 4.28". 	1	50	30	30	N/A	N/A	3PDT	28 VDC, .215 A	6, 12, 28 VDC	.060	N/A	.004	10G 70 to 1000 Hz	15	2.0 lb.
	2	120	120	80	N/A				115 VAC 400 Hz						
	3	N/A	N/A	N/A	N/A	N/A			115 VAC 60 Hz						
100 Amp Series 9213 Sealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. Design to MIL-R-6106 . 	1	100	100	100	N/A	50	3PST/NO 4PST/NO	44.5	28 VDC	AC Coils .040	AC Coils .060	.010	10G 55 to 1500 Hz	25	2.7 lb.
	2	100	100	100	N/A				115 VAC, 400 Hz						
	3	50	50	50	N/A				115 VAC, 60 Hz	DC Coils .030	DC Coils .020				
25 to 100 Amp Series 9207 Unsealed rotary, 1, 2, 3 and 4 pole. Auxiliary contacts from 5 amps. Design to MIL-R-6106. 	1	100	100	100	N/A	50	3PST/NO 4PST/NO	44.5	28 VDC	.030	AC Coils .050	.010	10G 55 to 500 Hz	50	1.6 lb.
	2	100	100	100	N/A				115 VAC, 400 Hz						
	3	50	50	50	N/A				115 VAC, 60 Hz		DC Coils .020				
25 to 400 Amp Solenoid Type Power Contactors 1PST, 2PST Types shown: 3PST/NO, 25 amps. Design to MIL-R-6106. 	1	7064: 25 50	25 50	25 50	N/A 25	N/A N/A	3PST/NO 1PDT	Varying	28 VDC	.040	.015	N/A	2G 250 to 500 Hz	25	2.6 lb.
	1	7264: 200	100	200	N/A	N/A	1PST/NO								
	1	7401: 400	100	400	N/A	N/A	1PST/NO 1PST/NO								
300 Amp Series A Sealed Contactor SPST-NO. Auxiliary contacts — 5 amps. MIL-R-6106/33 (pending). 	1	300	100	250	N/A	N/A	1PST/NO 1PST/NO IPNO/IPNC Aux. 1PST/NO 2PDT/Aux. 1PST/NO 2PNO 1PNC Aux.	60	28 VDC	.035	0.15	.004	10G 70 to 500 Hz 5G 500 to 1500 Hz	25	28 oz.
	2	N/A	N/A	N/A	N/A										
	3	N/A	N/A	N/A	N/A										

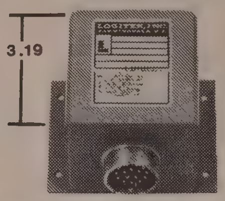
LOGITEK INC.

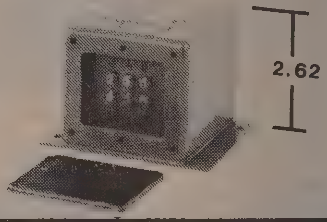
101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200 TWX 510 224-6253

ELECTRONIC MONITORS & CONTROLS

POWER MONITORS • AC & DC VOLTAGE MONITORS • FREQUENCY MONITORS • PHASE MONITORS







APPLICATIONS

Logitek power monitoring equipment is used to continuously monitor the characteristics of AC and DC electric power systems for conformance to their design acceptable limits. This type of continuous surveillance is of particular importance in such systems where undetected power line malfunctions could cause major system failure, utilization equipment malfunction, or erroneous operation. Without continuous monitoring, utilization equipment operators are often unaware that their equipment is malfunctioning or of its slow degradation until functional failure.

EQUIPMENT TYPES

Individual units are available to monitor AC or DC voltage, line frequency, phase to phase voltage unbalance and phase angle unbalance, each for both high and low limits, or to monitor for phase loss and/or reversal. "Power Monitors" are also available incorporating any combination of these monitoring functions within a single unit. Units generally fail into two categories: those in which the limits of high and low voltage, frequency and pick-up and drop-out time delay are factory pre-set, and those in which the limits are factory set, but field adjustable. Models are also available with two limit sets, one set for abnormal condition limits and a second set of limits for emergency conditions.

OPERATING CHARACTERISTICS

The equipment is connected to the power line to be monitored where it continuously measures the desired characteristics. Should any one of these characteristics exceed the pre-set acceptable limits, the drop-out time delay will begin. If the condition persists for a time longer than the drop-out time delay, the output control circuit will de-energize. Once the control circuit de-energizes, the power line must return to normal for a time exceeding the pick-up time delay before the control circuit will re-energize. In the case of phase loss or reversal, however, the control circuit will de-energize immediately bypassing the time delay circuits. Control circuits normally consist of relay contacts, but various logic levels can also be provided. Standard units are generally supplied with a single control circuit responsive to any type anomaly, however, equipment providing many variations can be specified for particular applications. Examples of variations include control circuits which provide a logic level output, a separate output for each characteristic being monitored, both real time and delayed time signal outputs and manual reset or override capabilty.

SPECIFICATIONS

ELECTRICAL

Input Voltage	28 VDC, 120/208, 120/240, 277/480 VAC
Input Frequency	50/60/400 HZ
Sense Voltage	As Required
Sense Frequency	As Required
Accuracy	± 1%, ± 5%
Phase Sequence	A + B + C
Phase to Phase Voltage Unbalance/Phase Angle Shift	5-10%
Time Delay (Pick-Up and Drop Out)	250 Milliseconds to 10 Seconds, factory set or field adjustable
Relay Contacts	DPDT, 3PDT
Contact Rating	2 Amp, 10 Amp

PHYSICAL

Finish	Gloss Blue #15177, FED-STD-595, Meet or exceed MIL-E-5556 or 5557
Connector	Glass to Metal Seal Solder Hooks, MS3113H-20-16PN Connector, Barrier Strip

ENVIRONMENTAL

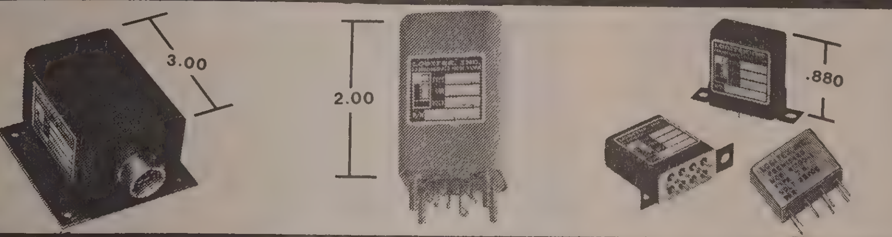
Temperature	− 55 °C to + 125 °C, − 40 °C to + 85 °C, − 10 °C to + 70 °C
Vibration	Per MIL-E-5272, Procedure II, 10 - 80 HZ @ .06″ D.A. 80 - 2000 HZ 20g's
Shock	Per MIL-E-5272, Procedure V, 50g's 11 ± 1 Millisecond, any axis
Acceleration	Per MIL-E-5272, Procedure I, 20g's Steady state, any axis
Humidity	Per MIL-E-5272, Procedure I
Altitude	Per MIL-E-5272, Procedure IV, Condition F, 100,000 Feet
General	Per MIL-E-5400R, Class 4 except Paragraph 3.1.29

LOGITEK INC.

101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200 TWX 510 224-6253

ELECTRONIC MONITORS & CONTROLS

TIME DELAY RELAYS • SOLID STATE FLASHERS • REPEAT CYCLE & INTERVAL TIMERS



APPLICATIONS

The design of complex electrical distribution systems often requires that certain operations be delayed or sustained for a precise interval of time from occurrence of a control or initializing signal. Combinations of various timing devices can be used for sequential startup or shutdown programs, load transfer or shedding, or delayed transfer to avoid race conditions. In addition, pulsers, interval timers, and flashers are used in applications such as operating instrument panel warning lights or other annunciator devices, landing gear, door open indicators and navigation lights.

EQUIPMENT TYPES

Several timing functions are available to facilitate the different timing and sequencing requirements ordinarily required. These include "delay on make," providing a time delay from application of the control signal to output circuit energization; "delay on break," providing immediate energization which sustains for a timed interval; "delayed interval," providing a delay on make followed by a timed "energized" interval and then return to the de-energized state. "Controlled" timers generally fall into two categories: timers which produce an immediate transfer of the control circuit upon application of a control signal and then a time delayed release after removal of the control signal and "true delay on break" timers which generate a timed interval and relay transfer after removal of all operating power.

OPERATING CHARACTERISTICS

Logitek timing devices are generally CMOS integrated circuits appropriately protected from line transients and other line perturbations and either a solid state or electromechanical relay output circuit. Since there are no large capacitive timing or storage elements in these devices, recycle times (the time after control removal which will cause a new timing cycle within specified accuracy) are very short. In addition, the use of CMOS IC digital counting circuits allows the use of very stable timing elements resulting in excellent stability through wide temperature ranges.

SPECIFICATIONS

ELECTRICAL

Input Voltage	28, 115, 120, 220 VAC/DC
Timing Range	50 Milliseconds to 1000 seconds
Accuracy	± 10%, ± 5%, ± 2%
Contacts	
Relay	DPDT, 3PDT; 2 AMP, 10 AMP
Solid State	.5 AMP, 2 AMP, 2.5 AMP, 4 AMP, 5 AMP
Radio Interference	MIL-1-6181D, MIL-1-26600

PHYSICAL

Finish	Gloss Blue #15177, FED-STD-595, meet or exceed MIL-E-5556 or 5557, Flat Black per MIL-E-5556
Connector	Glass to Metal Seal Solder Hooks, MIL-STD Connector, Octal Plug

ENVIRONMENTAL

Temperature	−55°C to +125°C, −55°C to +85°C, −55°C to +71°C, −30°C to +30°C
Vibration	Per MIL-E-5272, Procedure II, 10 - 80 HZ @ .06" D.A. 80 - 2000 HZ 20g's
Shock	Per MIL-E-5272, Procedure V, 50g's 11 ±1 Millisecond, any axis
Acceleration	Per MIL-E-5272, Procedure I, 20g's Steady state, any axis
Humidity	Per MIL-E-5272, Procedure I
Altitude	Per MIL-E-5272, Procedure IV, Condition F, 100,000 Feet
General	Per MIL-E-5400R, Class 4 except Paragraph 3.1.29

• QUALITY ASSURANCE

Logitek equipment is manufactured in accordance with

- MIL-Q-9858A
- MIL-I-45208

All production equipment undergoes a 100 hour burn-in schedule to insure in-service reliability.

• APPLICATIONS

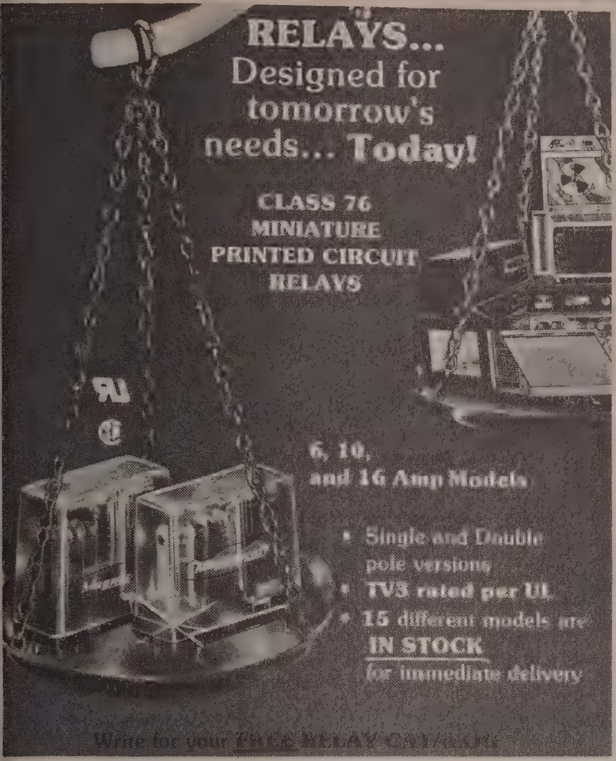
- Aircraft, Electrical Systems
- Mobile Radar Systems
- Equipment Test Stations
- Tanks
- Mobile Missile Launchers
- Offshore Drilling Rigs
- Computer Systems
- Shipboard Electrical Systems
- Hospital Auxiliary Power Systems

• SPECIAL PRODUCTS

Logitek's engineering department is available to discuss your application of our product or to design special equipment to satisfy your system requirements.

EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.



RELAYS...
Designed for tomorrow's needs... Today!

CLASS 76 MINIATURE PRINTED CIRCUIT RELAYS

6, 10, and 16 Amp Models

- Single and Double pole versions
- TV3 rated per UL
- 15 different models are **IN STOCK** for immediate delivery

Write for your FREE RELAY CATALOG

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CLASS #389
HEART OF A RELAY

CLASS 389
20 AND 30 AMP POWER RELAY
Designed to switch larger contact loads

- **Contact Combinations:** Contacts are available with 1, 2 or 3 poles.
- Class B (130°C) insulation
- **Terminals:** 1/4" quick-connect or printed circuit types

22 different models **IN STOCK** for immediate delivery
Write for your **FREE RELAY BROCHURE**

RELAYS...
Designed for tomorrow's needs... Today!

240 VAC
OUTPUT
25 A
INPUT
VDC

MAGNECRAFT SOLID STATE RELAYS
Dependability That's Out of This World

- **Output current ratings 2 to 40 amps**
- **A.C. and D.C. Input**
- ***Zero voltage switching***
- **Opto isolation between input and output**
- **P.C. terminals and screw terminals**
- **Matching heat sinks...**IN STOCK

19 different models **IN STOCK** for immediate delivery.
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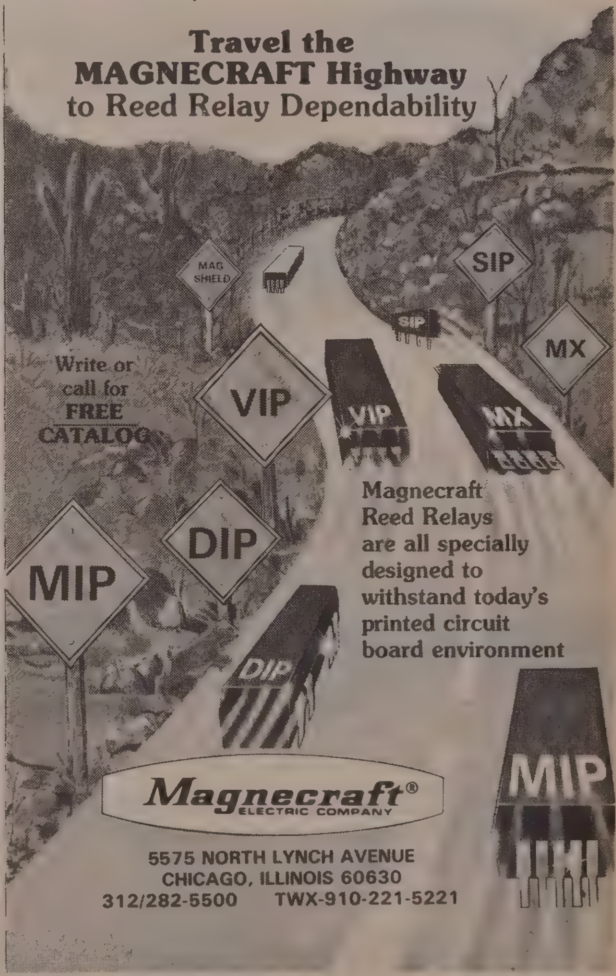
MAGNECRAFT ELECTRIC CO. PRODUCTS INCLUDE: Low Profile Relays, Miniature Industrial Relays, Miniature Printed Circuit Relays, General Purpose and Power Relays, General Purpose Industrial Relays, Molded In-Line Packaged Reed Relays, Mercury Wetted Relays, Dual In-Line Packaged Reed Relays, Solid State Relays, Mercury Displacement Relays, Current Sensing Relays, Time Delay Relays, Coaxial & R.F. Switching Relays, Sensitive Relays, Telephone Type Relays, Latching Relays, Sealed Relays, Actuators and Buzzers.



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Magnecraft Reed Relays are all specially designed to withstand today's printed circuit board environment

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CHICAGO, ILLINOIS 60630
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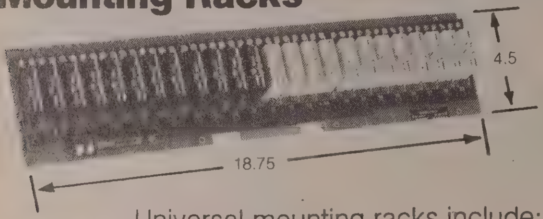
Opto 22. Solid state of the art.

Power I/O Systems

The most versatile I/O system available – also the most complete; Choices of 4, 8, 16, 24 or 32 module mounting racks; three logic voltages; 120 VAC, 240 VAC, 60 VDC, or 200 VDC load voltages; allow maximum flexibility in system design. The first true plug-in system per NEMA ICS2-230.02 simplifies maintenance, installation and modification. Provides power interface & optical isolation between the μP (or other logic) & industrial power.

Mounting Racks



Universal mounting racks include:

- ☐ LED status indicator
- ☐ Plug connection for logic signals
- ☐ UL Recognized, CSA Certified

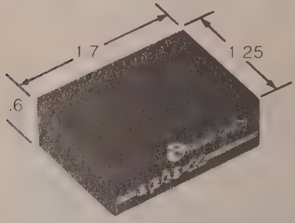
CONTROL VIA BARRIER STRIP

PB4	**4 MODULE POSITIONS**
PB4R	**4 MODULE POSITIONS (ISOLATED CONTROL)**
PB16T	**16 MODULE POSITIONS**

CONTROL VIA EDGE CONNECTOR

PB8	**8 MODULE POSITIONS**
PB16A	**16 MODULE POSITIONS**
PB16C	**16 MODULE POSITIONS-EXTRA BARRIER STRIP**
PB24	**24 MODULE POSITIONS**
PB24Q	**24 MODULE POSITIONS**
PB32DEC	**32 MODULE POSITIONS-CONNECTS TO DEC LSI 11**

I/O Modules



- ☐ 4000 V Optical Isolation
- ☐ Built-in Snubbers on AC output
- ☐ Zero Cross Switching on AC output
- ☐ UL Recognized, CSA Certified
- ☐ High Transient Immunity

OUTPUT MODULES

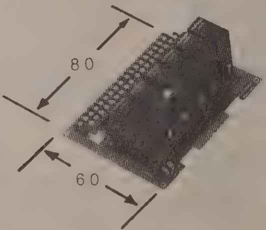
MODEL	DC Logic Voltage	Power Voltage	Power Current Rating Amps	1 Cycle Surge Rating Amps Peak
OAC5	5	12-140 VAC	3	80
OAC5A	5	24-280 VAC	3	80
ODC5	5	2-60 VDC	3	5
ODC5A	5	2-200 VDC	1	5
OAC5A5*	5	24-280 VAC	3	80
OAC15	15	12-140 VAC	3	80
ODC15	15	2-60 VDC	3	5
OAC24	24	12-140 VAC	3	80
ODC24	24	2-60 VDC	3	5
ODC24A	24	2-200 VDC	1	5

*Normally closed

INPUT MODULES

MODEL	DC Logic Voltage	Power Voltage
IAC5	5	90-140 VAC/DC
IAC5A	5	180-280 VAC/DC
IDC5	5	10-32 VDC/AC
IDC5B	5	4-16 VDC HIGH SPEED
IAC15	15	90-140 VAC/DC
IDC15	15	10-32 VDC/AC
IAC24	24	90-140 VAC/DC
IDC24	24	10-32 VDC/AC

Quad Pak™ High Density Power I/O Modules



MODEL	Power Voltage	Power Current Rating Amps	1 Cycle Surge Rating Amps Peak
OAC5Q	12-280 VAC	3	80
ODC5Q	2-60 VDC	3	5

Note: All Quad Pak® input & output modules operate with 5 VDC logic.

MODEL	Power Voltage
IAC5Q	90-140 VAC
IAC5AQ	180-280 VAC
IDC5Q	10-32 VDC
IDC5BQ	4-16 VDC

The OPTO 22 Direct Connection to Commonly Used Host Computers and Buses

OPTO 22 offers cables and/or adapter boards to facilitate connection to a wide variety of host computers and buses.

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MULTIBUS
STD BUS
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Q BUS
UNIBUS
VME BUS
APPLE II
DEC FALCON
IBM PC/SERIES 1
RCA MICROBOARD
ROCKWELL AIM/SBC
TI 990 SERIES

Optically Isolated SSRs

- ☐ TTL Compatible Control
- ☐ 4000 V Optical Isolation
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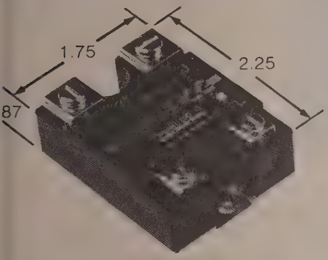
- ☐ Zero Cross Switching for low noise.
- ☐ Intergal snubber – tested twice at Rated & Surge Current for both resistive load & 0.5 power factor inductive load.

Power Series – AC Load†



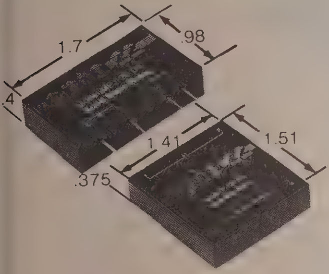
Chassis mount, heavy duty power relays untilizing two SCRs & the most advanced heat transfer design.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating* 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
3	120D3	240D3	55	3-32 VDC
10	120D10	240D10	110	3-32 VDC
25*	120D25	240D25	250	3-32 VDC
45*	120D45	240D45	650	3-32 VDC
10	120A10	240A10	110	85-280 VAC
25*	120A25	240A25	250	85-280 VAC
45*	120A45	240A45	650	85-280 VAC

*Also available with 380 VAC rating

PC Board Series – AC Load†

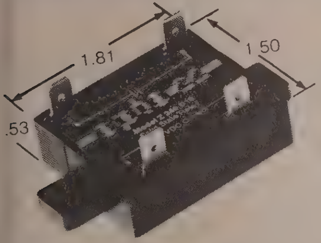


Two optimized configurations – the thin P series for edge stacked cards and the MP series where a small footprint is required.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
2	MP120D2	MP240D2	20	3-24 VDC
4	MP120D4	MP240D4	85	3-24 VDC
2	P120D2	P240D2	20	3-32 VDC
4	P120D4	P240D4	85	3-32 VDC

Liberator Z Series



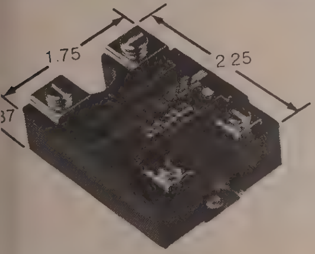
Designed for high volume the best buy in solid state relays.

Proof that quality does not have to cost more.

Instant Delivery From Stock

Output Current Rating Amps	Output Voltage Rating 120 VAC	240 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
10	Z120D10	Z240D10	110	3-32 VDC

480 Volt Transient Proof High Voltage Power Series



Advanced design provides transient immunity to 2000 volts!

Instant Delivery From Stock

Current Rating Amps	Output Voltage Rating 480 VAC	1 Cycle Surge (Amps) Peak	Control Voltage
10	480D10-12	110	3-32 VDC
15	480D15-12	150	3-32 VDC
10	480A10-12	110	85-280 VAC

†DC Load Relays

opto 22

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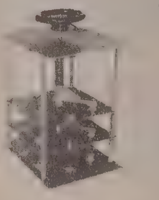
HIGH VOLTAGE DEVICES

RELAYS
SWITCHES
MEASUREMENT
CONTROL UNITS

AC
DC
RF
PULSE

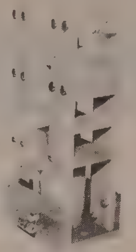
208V to 900 KV
ENERGY STORAGE
ELECTRONIC AND POWER
SAFETY AND ACCESSORIES

HV ROTARY SWITCHES



Ratings from 5 to 150KV, 1 to 200 amps. Either manual or electrical operators, depending upon requirements. Position detents and interlocks to prevent opening under load.

HIGH CURRENT SWITCHES



Models are available up to 20,000 amps continuous, and over 500,000 amps pulse, with voltage ratings of 6 volts to 300 KV peak test. Many are air cylinder or motor operated for high contact force.

HV RELAYS

HV relays of the air insulated type both for low and high current. This series has ratings from 1 to 200 amps continuous, 100 to 100,000 amps momentary and capacitor discharge. Peak test voltages from 5 to 300KV. Single or Multipole. NO, NC, and DT. Auxiliary contacts optional on all types. Extended life and tungsten contacts also available for high current closing. Usable in oil.

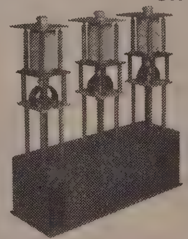
HV-RF SWITCHES

For RF applications, low loss G-7 Silicone glass insulation and non-magnetic materials are used. Switches available up to 50 MHz. 1 to 50 KV, 1 to 800 amps. Air or hydraulic, and spring actuated.

HV GROUNDING RELAYS

Extra high voltage low corona grounding relays of the air insulated type. Ratings up to 600 KV peak at 100 amps continuous. Solenoid, motor or air cylinder operated and spring or gravity return.

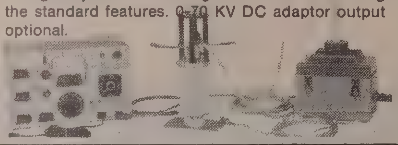
HIGH SPEED VACUUM CONTACTORS
(One Cycle) CIRCUIT BREAKERS



Vacuum switches, single phase, three phase, upright or low profile, for high reliability sealed arc interrupting or crobar shorting. 208V to 200 KV RMS operate. 50 to 4,000 amps continuous, 2,000 to 35,000 amps AC, 10 to 20,000 amps DC interrupt, 5,000 to 100,000 amps momentary and capacitor discharge.

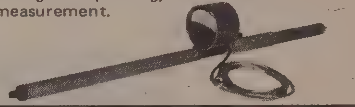
Hi-Pot TEST SETS
0-50 KV RMS, 0-50 KV DC

Specifically designed for testing HV Vacuum Devices as well as HV equipment and insulation. A built-in X-Radiation Monitor, Audible and Visible Breakdown Indicator, Breakdown Counter, and a 0-50 KV RMS Voltage Adjustment with large scale meter are among the standard features. 0-70 KV DC adaptor output optional.

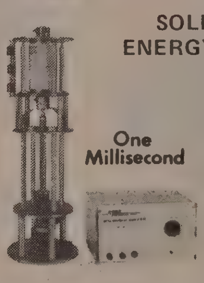


Hi-Z T.M. HV VOLTMETERS
SAFE POWER LINE USE AC - DC

Fully safe portable, all solid state, 2% to 5% accuracy. Taut band shielded high voltage measurement with minimum circuit loading. 0.0001 V to 50 KV AC and DC. Ideal for use with Elbow capacitance tap voltage test points. For cable test point or direct line voltage and phasing, or differential measurement.



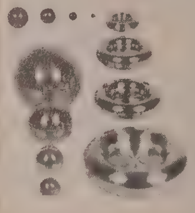
SOLENOID DRIVERS
ENERGY STORAGE UNITS



One Millisecond

For high speed or loss of power automatic circuit breaker trip and for high speed activation of contactor or circuit breaker solenoids. Energy storage up to 400 joules or more at 150 to 700 volts or more, 100 to 4,000 microfarad or more. Instantaneous SCR control available.

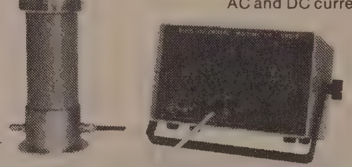
TOROIDS, SPHERES, CORONA SHIELDS



Geometrically designed to avoid excessive voltage gradients at connecting points and other areas needing shielding or balancing of electrostatic fields to increase withstand voltage and minimize corona. Diameters are to international standard metric sizes.

HV DIGITAL MULTIMETERS

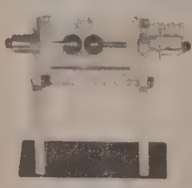
Easy to read, 4½-digit display; 0.05% basic accuracy. 0.0001 volt to 900 KV. Battery/AC with charger. Recorder and scope outputs. DC, AC RMS average, AC RMS true, ohms, megohms, AC and DC current.



WIDE BAND HV VOLTAGE DIVIDERS

Precision compensated resistance-capacitance voltage dividers for 15KV to 900KV, DC to 10MHz or to 0.02μ Sec rise time pulse. 1,000/1 ratio matched to 1 megohm, 20 to 50 pf display or recorder, or as required. Accuracy and stability 0.1% to 3%.

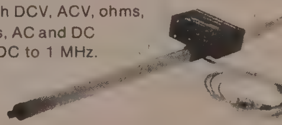
HV ADJUSTABLE SPARK GAPS



Non-melting carbon spheres, 1 cm to 10 cm and heavy wall aluminum spheres, 10 cm and above. Dust tight transparent covers used 1 KV to 88 KV. Open style to 670 KV. Direct reading micrometer type calibrating device.

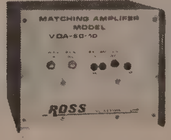
HV DIGITAL PROBES

HV DC, AC, & Wideband DC-1 MHz Safety Probes for any digital display or VTVM. Also available complete with large 4½-digit display 0.1% to 5% AC/DC accuracy, safety handle digital voltmeter. Battery/AC with charger. Removable Digital Display or Multimeter. 0.0001 volt to 200 KV. 0.05% accuracy basic, with DCV, ACV, ohms, megohms, AC and DC current. DC to 1 MHz.



WIDE BAND MATCHING AMPLIFIERS

NEW! Fiber Optics Transmission



AC or rechargable battery/AC operated. DC to 1 MHz. 1 megohm or higher input to 50 ohm load. Cable driver has a maximum output to 10V PK (20V PK to PK) and maximum input of 10V to 1,000V PK direct from signal source. With Ross wide band HV dividers useful from 0.1V to over 900KV.

ROSS ENGINEERING CORP.

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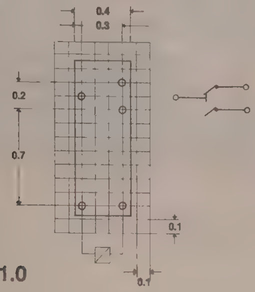
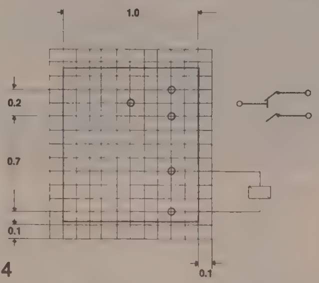
power relay for printed circuit board application

- Available for Horizontal or Vertical Mounting
- Available Nominal Coil Voltage from 6V to 60V DC
- Obtain Inflammability Class UL 94-V0 or UL-V1

RELAYS TYPE 175

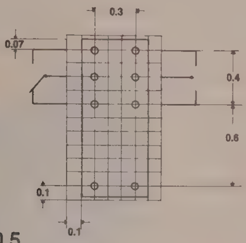


175 A
1.12 x 0.4 x 1.0

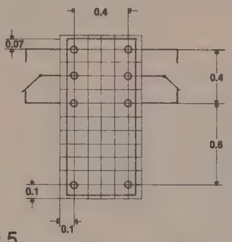


175 B
1.12 x 1.0 x 0.4

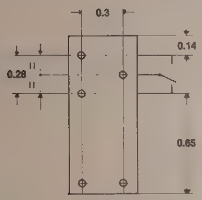
RELAYS TYPE 281



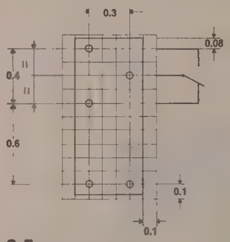
281 A
1.14 x 1.0 x 0.5



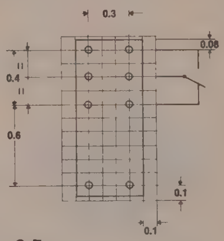
281 B
1.14 x 1.0 x 0.5



281 C
1.14 x 1.0 x 0.5



281 D
1.14 x 1.0 x 0.5



281 G
1.14 x 1.0 x 0.5

SPECIFICATIONS

SERIES		175 A 175 B	281 A 281 B	281 C 281 D	281 G
COIL					
Rated voltage	V	6-60	6-60	6-60	6-60
Rated power	VA	0.50	0.80	0.80	0.80
Average operating power	VA	0.25	0.40	0.35	0.40
Permitted ambient temp.	°C	−25/ +70	−25/ +70	−25/ +70	−25/ +70
Pull in time	ms	7.5-10	7-10	7-10	7-10
Drop out time	ms	2-3	2-4	2-4	2-4
Thermal rating of coil at 40° C	W	1.0	1.2	1.2	1.2
Test voltage	VAC	1,000	1,000	1,000	1,000
CONTACT					
Contact material		AgCdO, AgCu	Ag, AgCdO	Ag, AgCdO	AgNi
Switching current	A	8	8	10	16
Current rating max.	VA	2,000	1,500	2,500	4,000
Life expectancy - max operations		2 x 10	10	10	10
Test voltage	VAC	4,000	4,000	4,000	4,000

RELAY ORDERING DATA

Type	Nominal Coil Voltage VDC	Operating Voltage of the Coil T20°C V	Coil Resistance Ohm
*175-01 A or B	6	4.2 - 10.6	80
*175-02 A or B	12	8.3 - 21.5	330
*175-03 A or B	24	16.8 - 40	1200
175-04 A or B	48	32.8 - 79	4700
175-05 A or B	60	42 - 98	7200
281-08 A,B,C,D,G	6	4.1 - 8.3	45
281-41 A,B,C,D,G	6	4.4 - 10.4	70
281-11 A,B,C,D,G	9	6.3 - 13.6	120
*281-12 A,B,C,D,G	12	8.0 - 17.6	180
281-35 A,B,C,D,G	12	8.8 - 20.8	270
*281-17 A,B,C,D,G	24	16.4 - 33.8	740
*281-18 A,B,C,D,G	24	17 - 36.5	880
281-19 A,B,C,D,G	24	17.5 - 41.5	1100
281-21 A,B,C,D,G	36	29.5 - 52.8	1800
281-24 A,B,C,D,G	48	35 - 82.5	4400
281-56 A,B,C,D,G	60	44 - 103	6850

* Preferred types at stock

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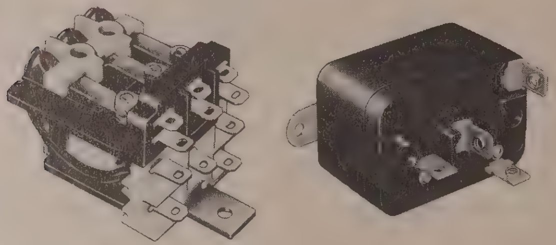
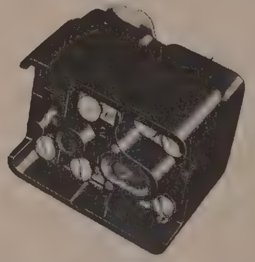
AC - DC GENERAL PURPOSE RELAYS

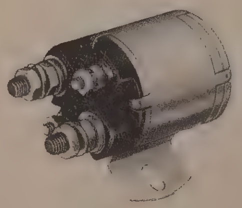


AC POWER RELAYS

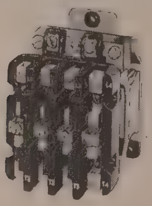


AC POWER CONTACTORS

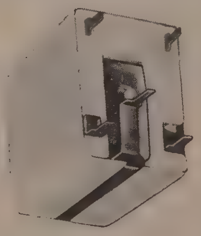
DC POWER CONTACTORS



AC INDUSTRIAL CONTACTORS



MINIATURE DC SENSITIVE RELAYS



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Stancor, 131 Godfrey Street, Logansport, Indiana 46947

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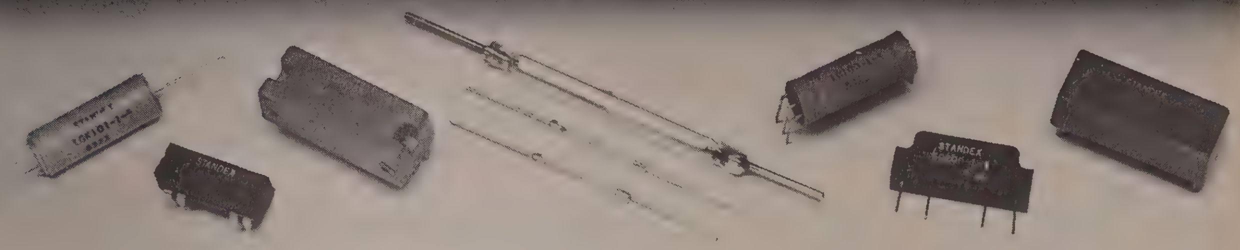
HAMILTON STANDARD CONTROLS

FASTEST GROWING MANUFACTURER OF REED SWITCHES AND RELAYS.

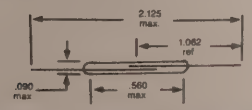


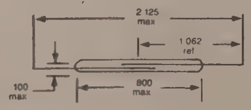
STANDEX REED RELAYS

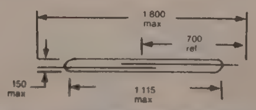
Series	Features	PART NUMBER	Coil V.D.C.	Coil Res. (OHMS) @ 20°C	Max. Pickup V.D.C. @ 20°C	Min. Dropout V.D.C. @ 20°C	Max. Coil Voltage
DK	• DIP and SIP • Compatible with Auto Insertion equipment • Available with GHG560, GR560 standard	DK1-5 DK1-6 DK1-12 DK1-24	5 6 12 24	500 200 500 2000	4.0 4.0 9.6 19.0	.5 .5 1.0 2.0	8 8 16 32
EG	• All materials UL 94V0 rated • Fully injection molded • Versions available to meet VDE requirements	EG200-1-5 EG200-1-6 EG200-1-12 EG200-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 8.0 16.0	.5 .5 1.0 2.0	8 8 16 32
JG	• UL Recognized under the Component Program of Underwriters Laboratories, Inc. Yellow Card No. E68451 • CSA No. LR42087-1 • Available with .100 or .150 - 1.0 pin spacings.	JG100-1-5 JG100-2-12 JG100-4-12	8 16 16	500 440 250	3.5 8.0 8.0	.5 1.0 1.0	8 16 16
LG	• Low cost • Fully encapsulated construction • UL recognized materials • Available with GK126 switch; GR100 standard	LG101-1-5 LG101-1-6 LG101-1-12 LG101-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 8.0 16.0	.5 .5 1.0 2.0	8 8 16 32
LC	• True Form C • Fully encapsulated • All materials UL 94V0 rated • Contact rated at 3VA	LC101-1-5 LC101-1-6 LC101-1-12 LC101-1-24	5 6 12 24	500 125 500 2000	3.5 4.0 9.0 18.0	.5 .5 1.0 2.0	8 8 16 32

STANDEX REED SWITCHES Electrical Characteristics

Switch Type	Glass Size	Power Rating VA, DC Max.	Switching Voltage VDC, Max.	Breakdown Voltage VDC, Min.	Switching Current Amp DC, Max.	Carry Current Amp DC, Max.	Contact Resistance MADO Max. at 10 MA; IVDC	Insulation Resistance Ohms Min.	Pull-in Range in AT	Remarks
GR560	A	10	100	250	0.5	1.0	100	10^{12}	7.5-50	General Purpose Switch
GR100	B	10	200	350	1.0	2.0	100	10^{12}	10-100	General Purpose Switch
GK560	A	10	100	250	0.5	1.0	150	10^{12}	25-100	For telecom applications and inductive loads
GK126	B	25*	200	350	1.0	2.0	150	10^{12}	20-800	For telecom applications and inductive loads. Handles pulse dialing applications
GHG560	A	10	100	250	0.5	1.0	75	10^{12}	7.5-50	For ATE and other low level or dry switching applications. Very stable contact resistance
GHG126	B	15	200	350	1.0	2.0	75	10^{12}	20-80	Stable Contact Resistance, performs well with high and low level loads
PRR100	B	10	200	1000	1.0	2.0	150	10^{12}	20-80	High Breakdown, TRIAC Switching
TS560	A	5	50	200	0.5	0.75	250	10^{9}	10-100	General purpose switch consumer products, proximity detectors
TS100	B	7.5	100	300	0.5	0.75	250	10^{9}	10-100	General purpose switch consumer products, proximity detectors
GRR100	B	10	250	350	1.0	2.0	100	10^{12}	20-60	Heavy Rhodium, medium differential switch







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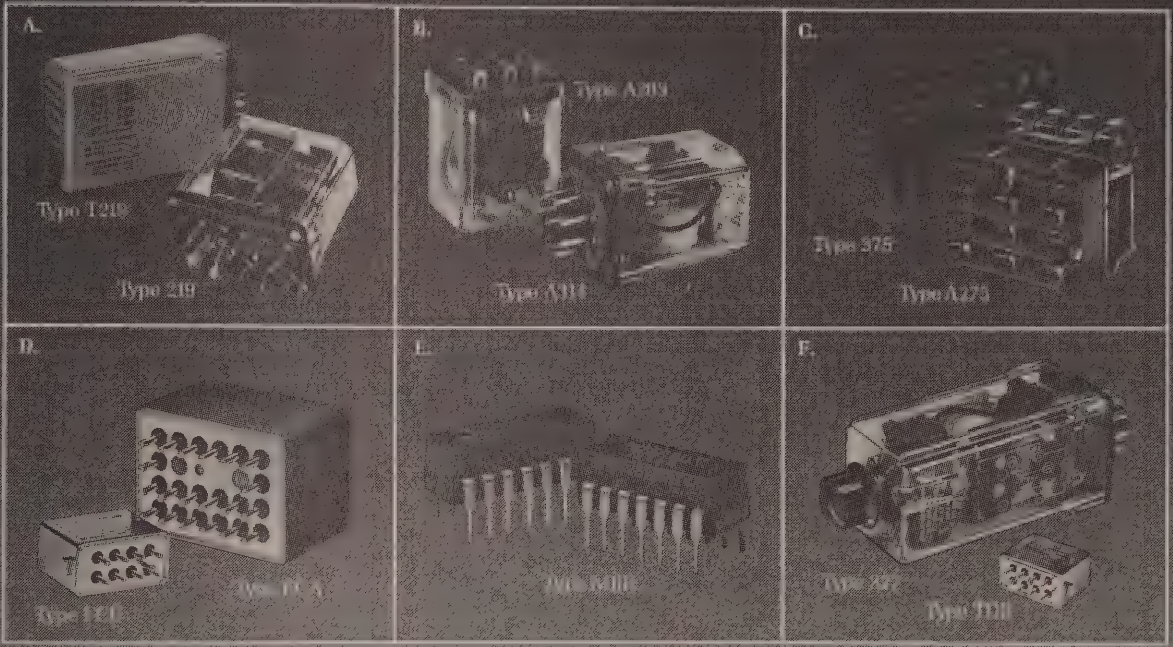

And that's not just a slick slogan — it's an iron-clad promise. You'll get exactly the relay you need at a tough-to-beat price. And you'll get it when or even before you need it. Time after time. You can count on it.

Because nobody can match Struthers-Dunn for relay experience and capability. And nobody will give you a broader choice of relays to match your every cost/performance objective. From low cost commercial/industrial relays to hi-rel military/aerospace relays. And everything in between. Here's the proof:

A. Hi-Rel Industrial Relays. A complete line from 1 to 100 amp for general purpose timing, latching, sequencing and over and under-voltage switching. Open and closed types. Contact arrangements to 6 poles. Plus compact 300-V and 600-V relays, including modular and field convertible relays.

B. Compact, General Purpose Plug-In Relays. Quality, cost-efficient plug-in relays with rectangular or octal base; 1, 2 or 3 poles; 10 amp; AC or DC coils; in open or enclosed styles.

C. Reversing Contactors. Compact, multipurpose contactors and starters for OEM applications. Sizes through 4. Open or enclosed types, with or without overloads.

D. Aerospace/Military Relays. Hermetically sealed relays in both miniature and power types to meet most applicable Mil specs. Low level to 25 amp; 1 to 6 PDT; AC or DC operation.

E. Reed Relays. Miniature and standard size dry reed relays for fast, light load service; plus mercury-wetted contact relays for long-life, no-bounce switching in PC and plug-in mounting models. Built to industrial or Mil specs.

F. Timers. A full range of time-delay relays for industrial or military applications. Range includes on and off delay, square or octal base, fixed or adjustable timing, monitor or repeat cycle, AC or DC input and miniature types. Plus motor, inertial and thermal timers.

Solid State, Hybrid and Special Relays. A wide variety of solid state and hybrid relays, plus custom-designed or modified relays to meet your most specialized application needs.

Available Locally from Your Nearby S-D Distributor. All of the most popular S-D relays are available immediately from the well-stocked shelves of our more than 100 distributor branches. When it comes to relays, no sooner said than Struthers-Dunn. For a copy of our comprehensive catalog and the name and number of your S-D representative or distributor, just give us a call or write Struthers-Dunn, Inc., Lambs Road, Pitman, NJ 08071. (609) 589-7500.

S-D

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STRUTHERS DUNN 1923 1983

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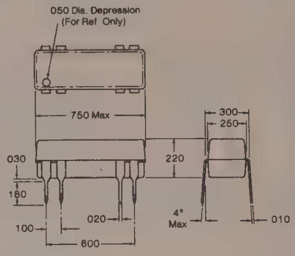
WABASH RELAY & ELECTRONICS DIVISION The Reed Relay Specialist

DIP PACKAGE DRY REED RELAYS 814 SERIES


050 Dia. Depression (For Ref Only)
750 Max
300
250
030
220
180
020
4° Max
010
100
600

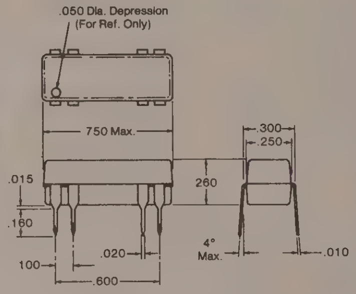
The 814 Series offers dry reed reliability and total isolation in a low profile IC type package, with DTL/TTL compatible coil drive available in most configurations.

SPECIFICATIONS — Contact Rating: 28 VDC or 0.110 Amps (switching); 3 watts; 200 milliohms max. initial contact resistance; 200 Volt pk. bkdn. **Temperature:** −55°C to +105°C. **Shock:** 100G max., 8 ±1 mSec. ½ wave. **Vibration:** 20G @ 10-5000 Hz. **Insulation Resistance:** 10^{10} Ohms min. **Capacitance:** 0.2 pf. **Operate Time (Typical):** to 0.5 mSec. **Release Time (Typical):** 0.1 mSec. **Life Expectancy:** 50 x 10^6 operations at signal level; 1 x 10^6 operations at rated load.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	16	365	814-101-01
	5	19	500	814-102-01
	6	19	500	814-103-01
	12/15	24	800	814-104-01
	24	30	1250	814-105-01

▲ Measured at 25°C.

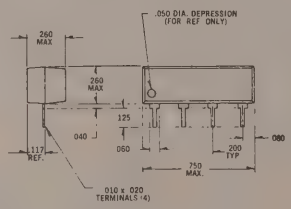
815 SERIES


.050 Dia. Depression (For Ref. Only)
750 Max.
.300
.250
.015
260
.160
.020
4° Max.
.010
100
.600

The 815 Series, with a profile slightly higher than the 814, offers increased versatility while maintaining the DIP package approach to hi-density printed circuit applications. Standard part numbers listed are subject to specifications shown for the 814 Series, however, the 815 has the capacity to offer dry reed switches to ½ Amp rating plus up to a 200 VDC max. switching voltage. Optional features include diode suppression, magnetic shielding and electrostatic shielding.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6 5/6 12/15 24	14 19 19 40	200 500 500 2150	815-101-01 815-102-01 815-103-01 815-104-01
2A	5/6 12/15 24	14 19 38	200 500 2000	815-201-01 815-202-01 815-203-01
1B	5/6 12/15 24	7 16 32	200 500 2000	815-221-01 815-222-01 815-223-01
1C	5/6 12/15 24	8 19 38	80 500 2000	815-241-01 815-242-01 815-243-01

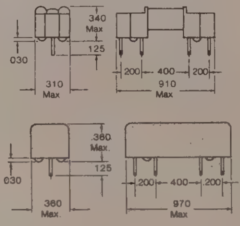
816 SERIES


.050 DIA. DEPRESSION (FOR REF ONLY)
260 MAX
260 MAX
125
040
060
080
117 REF.
200 TYP
750 MAX.
010 x 020 TERMINALS (4)

The 816 Series SIP (Single-Inline Package) provides the power handling capabilities of the 815 DIP while taking up less printed circuit board space. Standard part numbers listed are subject to specifications shown for the 814 Series; however, the 816 has the capacity to offer dry reed switches with ratings to 0.5 amps and 200 VDC. Optional features include diode suppression and magnetic shielding.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A SPST NO	5/6 5/6 12/15 24	14 19 19 40	200 500 500 2150	816-101 816-102 816-103 816-104
1B SPST NC	5/6 12/15 24	7 16 32	200 500 2000	816-221 816-222 816-223

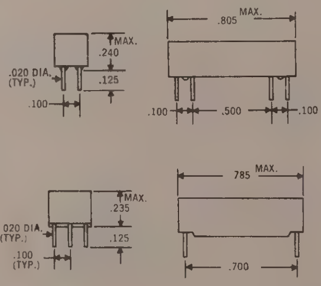
802/803 SERIES


340 Max
125
030
310 Max
200
400
200
910 Max
360 Max.
125
030
360 Max
200
400
200
970 Max

The 802 and 803 are sub-miniature reed relays in a Single-Inline package. They are both available in a 1 Form A configuration and are P.C. mountable. Contact ratings of 200 volts DC with total power handling of 10 watts is standard.

Contact Form	Nominal Voltage	Coil Resistance ±10%▲	Part Number
1A	5/6 12/15 24 5/6	500 500 2000 125	802-101 802-102 802-103 802-104
Enclosed 1A	5/6 12/15 24 5/6	500 500 2000 125	803-101 803-102 803-103 803-104

SUB-MINIATURE RR 804/806 SERIES

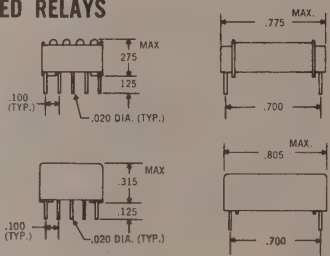

.805 MAX.
MAX. .240
.020 DIA. (TYP.)
.125
.100
.100
.500
.100
785 MAX.
MAX. .235
020 DIA. (TYP.)
.125
.100 (TYP.)
.700

The 804 and 806 sub-miniature reed relays come in a 1 Form A configuration. Both relays are P.C. mountable and are completely enclosed for environmental protection, extended life and easy cleaning. Call Wabash Relay & Electronics for complete details.

SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 0.5 Amp (switching), 1.0 Amp (carry), 10 Watts DC, 15 V-A (AC suppressed), 250 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^{10} ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 operations at dry ckt.; 50 x 10^6 operations at signal levels; 20 x 10^6 operations at rated load.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6 12/15 24	8 18 27	60 370 950	804-101 804-102 804-103
1A	5/6 12/15 24	12 24 38	500 1200 2000	806-101 806-102 806-103

SUB-MINIATURE DRY REED RELAYS 807/808 SERIES


.775 MAX.
MAX
275
125
.100 (TYP.)
.020 DIA. (TYP.)
.700
.805 MAX.
MAX
.315
.125
.100 (TYP.)
.020 DIA. (TYP.)
.700

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1B†	5/6 12/15 24	8 16 32	200 800 2000	807/808-211 807/808-212 807/808-213	1A	5/6 12/15 24	13 24 39	350 1200 3200	807/808-101 807/808-102 807/808-103
1C† *	5/6 12/15 24	8 16 32	125 500 2000	807/808-316 807/808-317 807/808-318	2A	5/6 12/15 24	10 20 32	200 800 2000	807/808-201 807/808-202 807/808-203

* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3 Pole. Forms A, B, & C.

wabash

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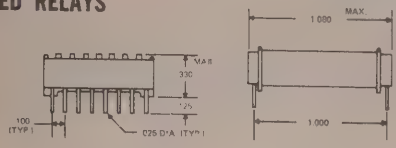
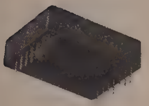
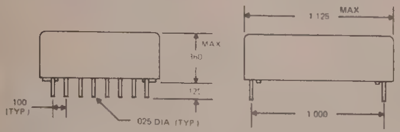
WABASH RELAY & ELECTRONICS DIVISION The Reed Relay Specialist

MINIATURE DRY REED RELAYS 827/828 SERIES







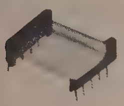
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	500	827/828-101	1B†	5/6	8	200	827/828-211
	12/15	28	800	827/828-102		12/15	16	800	827/828-212
	24	44	2000	827/828-103		24	32	2000	827/828-213
2A	5/6	14	200	827/828-201	1C† *	5/6	8	60	827/828-316
	12/15	29	800	827/828-202		12/15	16	240	827/828-317
	24	46	2000	827/828-203		24	32	960	827/828-318

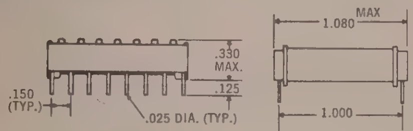
* (1A1B guarantee break-before-make)

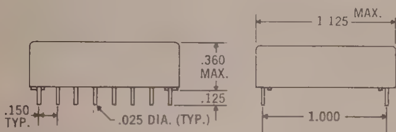
Contact Forms Available: 1, 2, 3, 4, & 6 Poles. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 150 VAC, 0.5 Amp (switching), 3 Amp (Carry), 10 Watts DC, 25 V-A (AC suppressed), 300 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 ops @ dry ckt.; 50 x 10^6 ops @ signal levels; 20 x 10^6 ops @ rated load.

MINIATURE DRY REED RELAYS 837/838







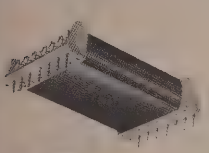
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	500	837/838-101	1B†	5/6	8	200	837/838-211
	12/15	28	800	837/838-102		12/15	16	800	837/838-212
	24	44	2000	837/838-103		24	32	2000	837/838-213
2A	5/6	14	200	837/838-201	1C† *	5/6	8	60	837/838-342
	12/15	29	800	837/838-202		12/15	16	240	837/838-343
	24	46	2000	837/838-203		24	32	960	837/838-344

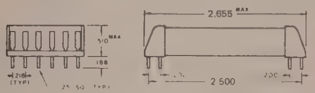
* (1A1B guarantee break-before-make)

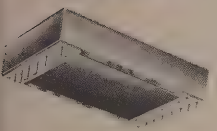
Contact Forms Available: 1, 2, 3, 4, & 6 Pole. Forms A, B, & C including magnetic latchers.

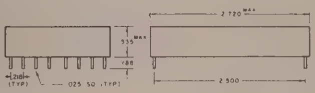
SPECIFICATIONS — Contact Ratings: (max.) 200 VDC, 150 VAC, 0.5 Amp (switching), 3 Amp (carry), 10 Watts DC, 25 V-A (AC suppressed), 300 Volts peak breakdown, 200 milliohms max. initial contact resistance. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0 to 1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 0.5 pf. **Life Expectancy:** 100 x 10^6 ops @ dry ckt.; 50 x 10^6 ops @ signal levels; 20 x 10^6 ops @ rated load.

STANDARD REED RELAYS 842/843 SERIES









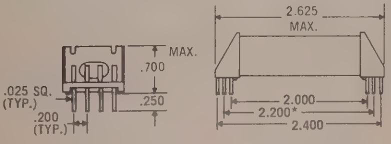
Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	150	842/843-101	1B†	5/6	9	100	842/843-209
	12/15	45	600	842/843-102		12/15	18	400	842/843-211
	24	90	2400	842/843-103		24	36	1600	842/843-213
	48	175	9000	842/843-104		48	72	6400	842/843-215
2A	5/6	20	100	842/843-201	1C† *	6	9	100	842/843-311
	12/15	41	400	842/843-202		12	18	400	842/843-315
	24	82	1600	842/843-203		24	36	1600	842/843-319
	48	165	6400	842/843-204		48	72	6400	842/843-323

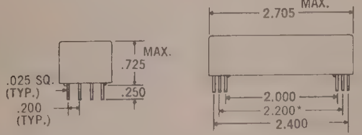
* (1A1B guarantee break-before-make)

Contact Forms Available: 1, 2, 3, 4, 5, 6, 8, & 12 Pole. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: 400 VDC, 250 VAC, 1.5 Amp (switching) 6 Amp (carry), 25 Watts, 40 V-A (AC suppressed) 50 milliohm max. initial contact resistance 500 volts peak breakdown. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max.@ 0-1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 1.5 pf. **Life Expectancy:** Dry ckt., 100 x 10^6 ops; signal level, 50 x 10^6 ops; rated power, 20 x 10^6 ops.
Available to 12 form A. True form C also available.

846/847 SERIES





* Spacing not available in 1 pole package.

Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number	Contact Form	Nom. Voltage	Max. Voltage	Coil Resist. ±10%▲	Part Number
1A	5/6	22	150	846/847-101	1B†	5/6	9	100	846/847-209
	12/15	45	600	846/847-102		12/15	18	400	846/847-211
	24	90	2400	846/847-103		24	36	1600	846/847-213
2A	5/6	20	100	846/847-201					
	12/15	41	400	846/847-202					
	24	82	1600	846/847-203					

Contact Forms Available: 1 & 2 Pole. Forms A, B, & C including magnetic latchers.

SPECIFICATIONS — Contact Ratings: 400 VDC, 250 VAC, 1.5 Amp (switching) 6 Amp (carry), 25 Watts, 40 V-A (AC suppressed) 75 milliohm max. initial contact resistance 500 volts peak breakdown. **Temperature:** −55°C to +105°C. **Shock:** 30 G max., 11 ±1 mSec. **Vibration:** 10 G max. @ 0-1700 Hz. **Insulation Resistance:** 10^9 Ohms min. **Capacitance:** 1.5 pf. **Life Expectancy:** Dry ckt., 100 x 10^6 ops; signal level, 50 x 10^6 ops; rated power, 20 x 10^6 ops.
True form C also available.

The relays shown here are just a sampling of the many designs and configurations manufactured by Wabash Relay & Electronics as standard products. We also offer design assistance and custom designed relays through our fully staffed engineering department. Should you require a custom designed relay, here are some parameters to consider:

U.L. and C.S.A. Recognition

Several relay series are recognized under the Component Program of Underwriters' Laboratories. Most of these relays also have C.S.A. recognition. Regardless of which series you are interested in, Wabash Relay can help you obtain the U.L. or C.S.A. recognition your design requires.

Wabash Relay & Electronics Division

1st & Weber Streets, Wabash, Indiana 46992
(219) 563-2191 TWX: 810-290-2722

Prints and specifications, if available, are the best design tool. The minimum information required for Wabash Relay to design a relay is:

Mechanical Specifications

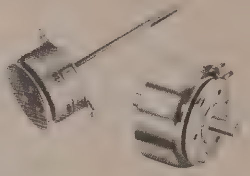
- Maximum length
- Maximum width
- Maximum height above P.C. board
- Pin configuration
- Open or covered
- Type of environment relay will be exposed to
- End Use

Electrical Specifications

- Switch configuration
- Nominal voltage
- Must operate voltage or current
- Must release voltage or current
- Coil resistance
- Switching current
- Contact resistance
- Carry current
- U.L. recognition required
- Special considerations (ESS, low thermal, high insulation resistance, etc.)

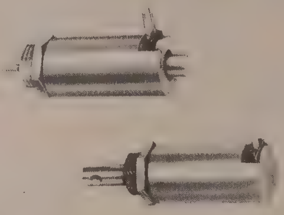
LEDEX® Solenoids

Over 300 choices of standard solenoid designs are available off-the-shelf from Ledex. But, if none of these meet your unique requirements, we'll provide you with custom engineered prototypes. Either way, Ledex offers you the widest variety of solenoids for your design.

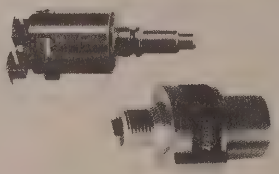


Rotary Solenoids
Step-turn-index-lock-punch-lift. For millisecond fast torque and endurance, specify a Ledex rotary solenoid.

Eight basic sizes, right or lefthand strokes from 10 to 110 degrees. Torque output to 117 pound-inches. Life of over 100 million cycles with endurance engineered models.



Linear Solenoids
Short-medium-long strokes are all available from one source – Ledex. Choose our low profile flat face push/pull for high force/short stroke; our low profile conical face push/pull for medium force/stroke and our tubular solenoids for long strokes. New Series 20 tubular solenoids provide 100 million actuations, quiet operation, push or pull, and economy – from stock. Rugged construction provides accurate repeatability after long usage. Our tubular solenoids have built-in impact cushions to absorb energy at the end of the stroke and electroless nickel plated plungers for longer life.



Custom Designed Solenoids
The Ledex Model 515 Dot Matrix solenoid has a special patented construction to control bounce, is easy to mount, uses standard terminals, operates at 1300 Hz., and has a life of 300 million actuations. Our printhammer solenoid was specially designed for quiet actuation to interface with plastic or metal daisy wheels while delivering variable force depending on the character.

Stepping Solenoids
Step 10-15-20 or 30 degrees with the highest torque a stepping solenoid makes – the Ledex Series 50-L. Square wave pulse drives either the unidirectional or bidirectional model for 10,000,000 steps with a non-accumulative accuracy of ±1°. Direct couple for mechanical ease and avoid linkages. Can be manually overridden in case of power failure.

Proportional Solenoids
Open loop/closed loop, variable position sensing is now possible by using the Ledex proportional solenoid with the Ledex controller for smooth, accurate response. Hydraulic systems can use our wet plunger type which requires no dynamic seals and provides up to 50 pounds force. Do away with pilot stages and expensive servo valves.

D-Frame Solenoids
Ledex D-Frame solenoids offer economical, long term service for users whose needs must be matched by a dependable product and reliable source. Eight standard models are available from stock with strokes up to 1.25". Quick connect terminals and class "B" coils are standard.

LEDEX INC., P.O. Box 427 • Vandalia, Ohio 45377 • USA

Call 513-898-3621

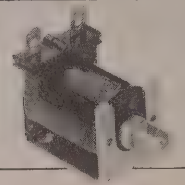
SEE OUR PAGES **1B**•1490-**1B**•1492 THIS SECTION.
ALSO SEE OUR PAGES IN SECTION 5100 **1B**•1672-**1B**•1674.

solenoids-4550

Manufacturer	EEM Page No.	Model/Series	Linear				Proportional (Servo)	Stepping	
			Frame Type						
			C	D	Tubular	Rotary		Unidirectional	Bidirectional
Airpax	1B•1291	7019			●				
		7007		●					
Deltrol Controls	1B•1482	C-6	●				●		
		C-9	●				●		
		D-11		●			●		
		D-22		●			●		
		D-28		●			●		
	1B•1483	D-2		●			●		
		D-3HD		●			●		
		D-4		●			●		
		D-4HD		●			●		
Densitron	1B•1485			●	●	●			
Electro-Mechanisms	1B•1486	SP	●				●		
		PO	●				●		
	1B•1487	SP-100	●				●		
		PO-100	●				●		
		SP-375	●				●		
		SP-650	●				●		
		SP-750	●				●		
		PO-375	●				●		
		PO-650	●				●		
		PO-750	●				●		
Guardian Electric	1B•1427	All						●	●
	1B•1428	Pull Type	●	●			●		
		Push Type		●			●		
	1B•1429	Pull Type	●	●			●		
		Push Type	●	●			●		
	1B•1430	T/TP			●		●		
	1B•1431	T/TP			●		●		
ITT Components	1B•1489	All	●	●	●				
Ledex Inc.	1B•1490	Rotary				●	●		
	1B•1491	20			●		●		
	1B•1492	Stepping						●	●
		D-Frame		●			●		
Liberty Controls	1B•1494	L-9	●				●		
		L-11		●			●		
		L-22		●			●		
		L-24	●				●		
		L-25	●				●		
		L-26	●				●		
		L-28		●			●		
		L-61	●				●		
	1B•1495	L-62	●				●		
		L-63	●				●		
		L-81		●			●		
		L-82		●			●		
		L-88		●			●		
		L-89		●			●		
		L-90		●			●		
		L-20	Clickers & Clappers						
		L-30	Push Type						
		L-40	Hinge Type Flapper						
Regdon	1B•1497	312		●			●		
		5U5	●				●		
		5U7	●				●		
		809		●			●		
		827		●			●		
		930		●			●		
		940		●			●		
		960		●			●		
		970		●			●		
		RX			●		●		

DELTROL SOLENOIDS

SEE SECTION 4500 FOR RELAYS



C-6 PULL TYPE

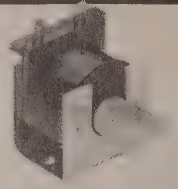
L = 1-1/8
W = 55/64
H = 1-17/64
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is one (1) minute on and three (3) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53685-83	24VDC	Cont.	124	4.7W
53686-83	24VDC	Int.	50.8	12W
53687-94	120VAC	Cont.	776	6.8VA
53688-94	120VAC	Int.	327	19.6VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4
DC Cont.	7	3	2	1-1/2
DC Int.	15	8	5	3-1/2
AC Cont.	10	7	5	4
AC Int.	21	13	11	8



C-9 PULL TYPE

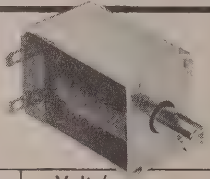
L = 1-1/16
W = 1-3/8
H = 1-13/16
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off. AC intermittent duty cycle is one (1) minute on and four (4) minutes off. Approx. 10 sq. in. heat sink required.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53676-83	24VDC	Cont.	66.5	8.6W
53677-83	24VDC	Int.	37.6	15.5W
53673-94	120VAC	Cont.	240	13.7VA
53674-94	120VAC	Int.	84.1	52VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2
DC Cont.	26	17	12	9	3
DC Int.	42	28	22	16	5
AC Cont.	21	16	15	14	10
AC Int.	54	43	39	37	27



D-11 PULL TYPE

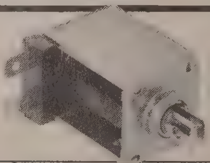
L = 1-27/32
W = 15/16
H = 1-3/16
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53736-81	12VDC	Cont.	18	8W
53736-82	24VDC	Cont.	72	8W
53736-87	12VDC	Int.	8	18W
53736-88	24VDC	Int.	32	18W
53738-84	120VAC	Cont.	200	12VA
53738-90	120VAC	Int.	85	42VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	38	28	16	11	4	3
DC Int.	55	40	24	22	10	6
AC Cont.	14	12	9	8	7	6
AC Int.	45	25	20	18	15	14



D-22 PULL TYPE

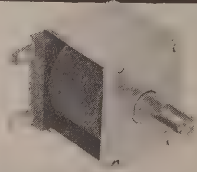
L = 1-1/4
W = 3/4
H = 3/4
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is 25% with three (3) minutes max. on and nine (9) minutes min. off in a repetitive cycle. Approx. 10 sq. in. heat sink required.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53723-81	12VDC	Cont.	35	4.2W
53723-82	24VDC	Cont.	141	4.2W
53723-87	12VDC	Int.	14.8	9.6W
53723-88	24VDC	Int.	60	9.6W
53724-84	120VAC	Cont.	1,090	6.5VA
53724-90	120VAC	Int.	724	8.5VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	3/8
DC Cont.	9	4	2-1/2	1-3/4	1
DC Int.	20	10	6	4	2
AC Cont.	6	3-1/2	2-3/4	2-1/2	1-3/4
AC Int.	8-1/2	5-1/2	4	3-1/2	2-1/2



D-28 PULL TYPE

L = 1-1/4
W = 1
H = 1-7/32
.187 QUICK CONNECT/SOLDER TERMINALS

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53708-81	12VDC	Cont.	27.1	5.5W
53708-82	24VDC	Cont.	108	5.5W
53708-87	12VDC	Int.	12.7	11.5W
53708-88	24VDC	Int.	51	11.5W
53706-84	120VAC	Cont.	420	8VA
53706-90	120VAC	Int.	220	21VA

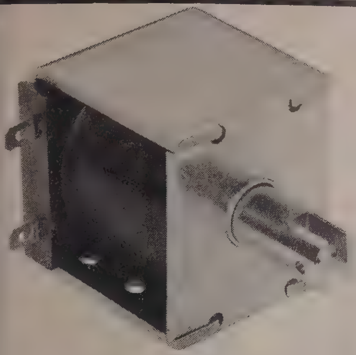
STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2
DC Cont.	20	10	6	4	2
DC Int.	35	19	12	8	3
AC Cont.	16	12	10	8	4
AC Int.	29	20	17	14	6

DELTROL SOLENOIDS

SEE SECTION 4500 FOR RELAYS

D-2 PULL TYPE



L = 1-9/16
W = 1-7/16
H = 1-5/8

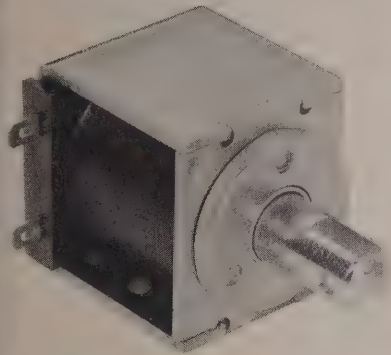
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53728-81	12VDC	Cont.	13.6	10.5W
53728-82	24VDC	Cont.	54.7	10.5W
53728-87	12VDC	Int.	4.92	29W
53728-88	24VDC	Int.	20.0	29W
53729-84	120VAC	Cont.	139	13VA
53729-90	120VAC	Int.	47.0	44VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	84	50	34	23	8	4
DC Int.	122	97	74	56	21	9
AC Cont.	27	20	17	16	14	5
AC Int.	69	56	50	45	36	15

D-3HD PULL TYPE



L = 1-3/4
W = 1-7/16
H = 1-5/8

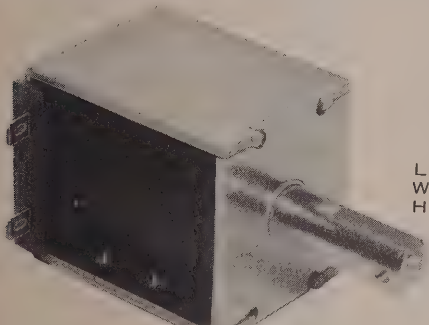
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53732-81	12VDC	Cont.	12.8	11.2W
53732-82	24VDC	Cont.	51.5	11.2W
53732-87	12VDC	Int.	5.3	27W
53732-88	24VDC	Int.	21.4	27W
53733-84	120VAC	Cont.	109	20VA
53733-90	120VAC	Int.	27	115VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	110	72	45	31	10	4
DC Int.	150	124	96	72	25	10
AC Cont.	35	26	23	22	21	13
AC Int.	112	88	80	78	68	40

D-4 PULL TYPE



L = 2
W = 1-7/16
H = 1-5/8

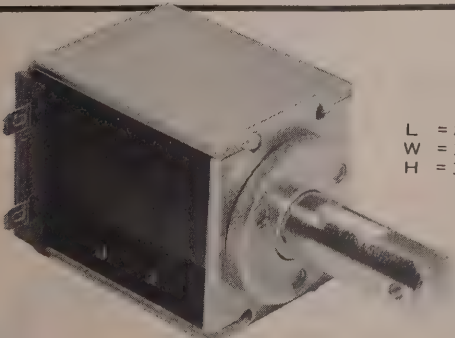
NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53717-81	12VDC	Cont.	12.3	11.5W
53717-82	24VDC	Cont.	50.4	11.5W
53717-87	12VDC	Int.	3.0	47.6W
53717-88	24VDC	Int.	12.3	47.6W
53718-84	120VAC	Cont.	133	11.5VA
53718-90	120VAC	Int.	37	60VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	94	66	46	34	14	7
DC Int.	142	122	106	92	52	30
AC Cont.	12	10	9	9	10	13
AC Int.	44	38	34	32	38	46

D-4HD PULL TYPE



L = 2-3/16
W = 1-7/16
H = 1-5/8

NOTE: Standard intermittent duty cycle at nominal voltage is three (3) minutes on and nine (9) minutes off.

			Coil	
Stock No.	Volts/ Type	Duty	Resist. (Ohms)	Power
53719-81	12VDC	Cont.	12.1	11.7W
53719-82	24VDC	Cont.	49.2	11.7W
53719-87	12VDC	Int.	3.8	38W
53719-88	24VDC	Int.	15.2	38W
53720-84	120VAC	Cont.	72.4	32VA
53720-90	120VAC	Int.	19.1	170VA

STROKE (INCHES) FORCE (OUNCES)

	1/16	1/8	3/16	1/4	1/2	3/4
DC Cont.	116	85	60	42	16	8
DC Int.	160	136	114	98	46	26
AC Cont.	24	20	19	18	21	24
AC Int.	84	72	64	60	66	76

ALL DIMENSIONS ARE NOMINAL.

DELTROL
controls DIVISION OF DEL TROL CORP

2745 S. 19th Street, Milwaukee, Wisconsin 53215 Phone (414) 671-6800, Telex 2-6871

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

SHINDENGEN SOLENOIDS

ROTARY ▪ PUSH/PULL ▪ TUBULAR ▪ HAMMER ▪ OPEN FRAME ▪ PERMANENT MAGNET ▪ LATCHING

STANDARD SOLENOID CONFIGURATIONS

Shindengen's affordable, high performance product offering includes a wide variety of standard solenoids such as rotary, push/pull and tubular types. The rotary solenoids are available with torque output from .12 kg-cm to 113 kg-cm and rotation in 25°, 35°, 45°, 67.5° and 95°. The push/pull types offer short linear strokes with high force capability from 3mm stroke with 450 grams starting force up to 6mm stroke with 45 kg starting force. The tubular line is for longer linear strokes from 12mm stroke with 50 grams starting force to 18mm stroke with 1.75 kg starting force.

marketed in the USA by

DENSITRON CORPORATION

SPECIAL SOLENOID CONFIGURATIONS

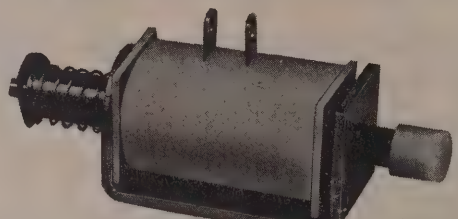
These solenoids can be made with Shindengen's technical/manufacturing capabilities to design, develop and produce custom designs to meet your specific performance, quality and price requirements. Some of the many options are: special armature plates, lengthened, flatted and tapped shafts.

DENSITRON CORPORATION
Electro-Magnetic Division
9 South Mulberry Street ▪ Troy, Ohio 45373 ▪ (513) 335-4871

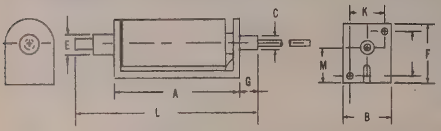
electro-mechanisms INCORPORATED

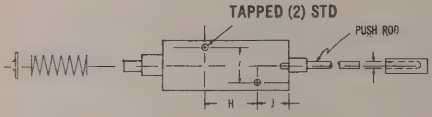
P.O. BOX A
AZUSA, CALIF. 91702
AREA CODE (818) 359-2535

MINI-SOLENOID ACTUATORS



SP SERIES PUSH TYPE





Frame: .... C1006 Iron — Cad-II Plated
Core: .... C1002 Electroless Nickel Plated
Plunger: .... C1002 Electroless Nickel Plated
Wire: .... 130°C Magnet Wire
Termination: ...... Heavy Leads — PVC, Type BU, 5″ Terminals — Solder Lugs
Tape: .... Mylar
Bobbin: .... 30% Glass Filled Nylon
Tip: .... Delrin
Pushrod: .... Phosphor Bronze
Tol: .... .xxx ±.005

3, 6, 12, 24, 48 VDC

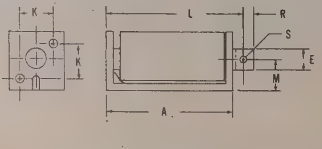
SPECIFICATIONS

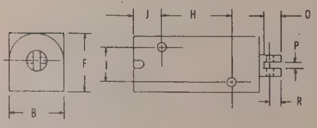
Note: Dimension L is shown with solenoid in energized position. Return Spring and Delrin Tip are Standard on all SP Series.

Part No.	A	B	C	D	E	F	G	H	I	J	K	L	M	S	Max. Stroke*	Weight Oz.	Tapped Holes	Wattage Nom.
SP-18	.403	.180	.062	.025	.068	.235	.085	3/16	3/32	1/8	*	.67	.145		3/16	.05	0-80	1.5
SP-25	.548	.236	.093	.036	.100	.298	.093	1/4	.136	1/8	*	.84	.180		1/4	.1	1-72	2
SP-37	.820	.360	.125	.051	.150	.430	.125	5/16	1/4	3/16	1/4	1.22	.250		3/8	.3	1-72	3
SP-50	.980	.488	.125	.051	.187	.530	.150	1/2	3/8	7/32	5/16	1.44	.285		1/2	.7	1-72	4.5
SP-62	1.215	.600	.187	.091	.250	.691	.178	5/8	7/16	1/4	7/16	1.732	.391		5/8	1.2	4-40	6
SP-75	1.621	.730	.240	.091	.306	.838	.172	5/8	7/16	1/4	1/2	2.15	.473		3/4	2.7	4-40	9

Standard Coils 105°C, Hi Temp Available. * Max Stroke, Standard Pushrod length.

PO SERIES PULL TYPE





Frame: .... C1006 Iron — Cad-II Plated
Core: .... C1002 Electroless Nickel Plated
Plunger: .... C1002 Electroless Nickel Plated
Wire: .... 130°C Magnet Wire
Termination: ...... Heavy Leads — PVC, Type BU, 5″ Terminals — Solder Lugs
Tape: .... Mylar
Bobbin: .... 30% Glass Filled Nylon
Tip: .... Delrin
Pushrod: .... Phosphor Bronze
Tol: .... .xxx ±.005

SPECIFICATIONS

Note: Dimension L is shown with solenoid in energized position.

Part No.	A	B	E	F	H	I	J	K	L	M	O	P	R	S	Max. Stroke	Weight Oz.	Tapped Holes	Wattage Nom.
PO-25	.548	.236	.100	.298	1/4	.136	1/8	*	.734	.180	.100	.025	.062	.031	1/4	.1	1-72	2
PO-37	.820	.360	.150	.430	5/16	1/4	3/16	1/4	.892	.250	.150	.051	.075	.031	3/8	.3	1-72	3
PO-50	.980	.488	.187	.530	1/2	3/8	7/32	5/16	1.180	.285	.200	.063	.106	.063	1/2	.7	1-72	4.5
PO-62	1.215	.600	.250	.691	5/8	7/16	1/4	7/16	1.434	.391	.200	.063	.094	.063	5/8	1.2	4-40	6
PO-75	1.621	.730	.306	.838	5/8	7/16	1/4	1/2	1.891	.473	.200	.063	.094	.063	3/4	2.7	4-40	9

Standard Coils 105°C, Hi Temp Available.

SPECIALS

ELECTRO-MECHANISMS, INC., is completely equipped, both engineering and production wise, to supply you with variations of our solenoids that you might need for your application. We are also capable of designing special types that you might need within the size range of our products. We would appreciate the opportunity to help you solve design and application problems you may have in the area of miniature solenoid actuators.

The force charts below represent three different duty cycles.

Nominal voltage represents continuous duty.

2X Nominal voltage represents a 25%, intermittent duty cycle 4X Nominal voltage represents a 6% intermittent duty cycle.

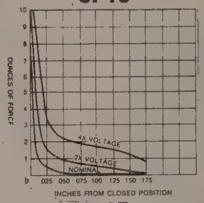
The duty cycle consists of two factors:

1. Percentage of time solenoid is energized in one complete operating cycle.

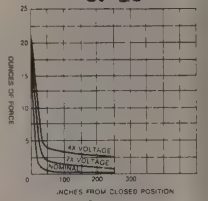
$$\text{(Ref: DUTY CYCLE} = \frac{\text{Time On}}{\text{Time On} + \text{Time Off}} \text{ X 100)}$$

2. Length of time of the longest single energization in one complete operating cycle.

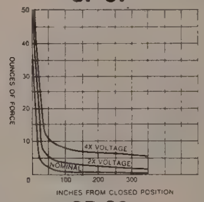
SP18



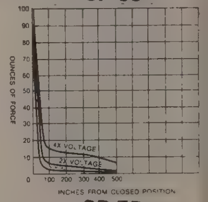
SP-25



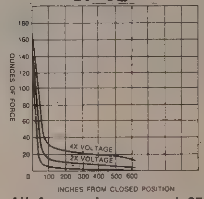
SP-37



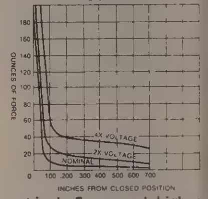
SP-50



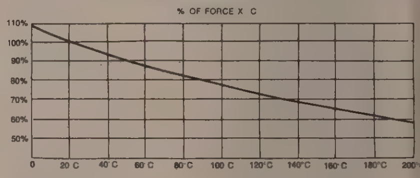
SP-62



SP-75



All forces shown are at 25° ambient. For use at higher ambient temperatures use the chart below to determine force at any given temperature.



FEATURES

ELECTRO-MECHANISMS micro-miniature solenoids offer you static and impact forces equal to standard solenoids 2 to 3 times the size of these units.

Because of their small size, they have extremely fast reaction time. As fast as 2 msec at 4x nominal voltage.

The unique design of PUSH or PULL action, offers many applications beyond the conventional pull type solenoid.

A complete line of 15 solenoids from 3/16″ O.D. to 1.250″ O.D. allows you to choose the correct solenoid with the force you require, from stock items.

The units are highly reliable with life of many millions of operations.

The solenoids are also available with coils in Class F and Class H for high temperature requirements.

Simplicity of design helps keep the costs down and allows us to pass these savings on to you, our customer.

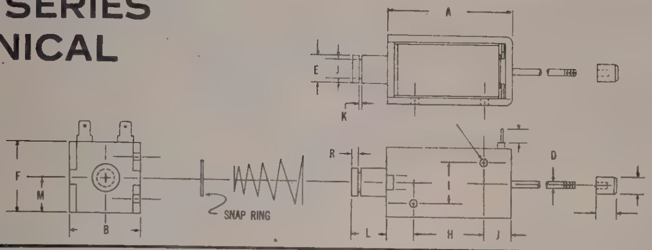
TYPICAL APPLICATIONS

- Hammers for high speed printers
- Camera shutter actuators
- Locking mechanisms for switches, adding machines and typewriters
- Interpossers for card punching and tape perforation
- Cam actuation
- Pen lifters for plotters
- Event markers for chart recorders
- Key actuators for numerical readouts on typewriters and adding machines
- For life testing different devices
- For indicator flags
- Sensing devices
- Remote switching and actuation

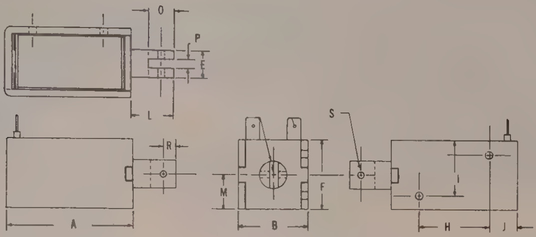
electro-mechanisms INCORPORATED

P.O. BOX A
AZUSA, CALIF. 91702
AREA CODE (818) 359-2535

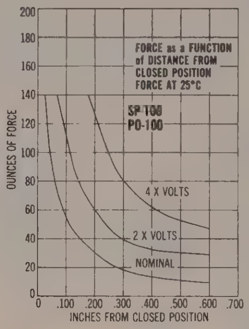
SP-100 SERIES 60° CONICAL


A
E
J
K
F
M
B
SNAP RING
R
D
T
L
H
J

PO-100 SERIES 60° CONICAL


O
P
E
L
R
A
M
B
S
F
I
H
J

11.5 WATTS VDC
3, 6, 12, 24, 48, 110
60° CONICAL



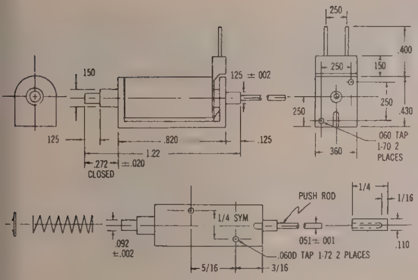
SPECIFICATIONS

Part No.	A	B	D	E	F	H	I	J	K	L	M	O	P	R	S	T	Height of Terms	Max. Stroke	Tapped Holes	Weight Oz.
SP-100	2.270	1.254	.092	.500	1.254	1.115	.750	.430	.040	.752	.627	*	*	.100	*	.343	.365	1	6-32	10
PO-100	2.270	1.254	*	.500	1.254	1.115	.750	.430	*	.700	.627	.375	.143	.168	.100	*	.365	1	6-32	10

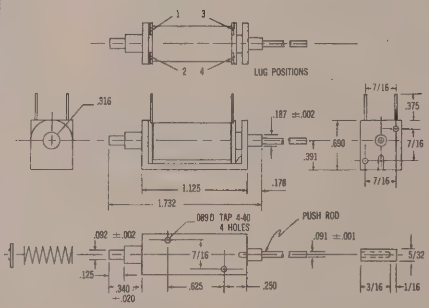
Standard Coils 130°C, Hi Temp Coils Available. * Not Applicable.

SOLENOIDS WITH MOLDED TERMINAL PINS

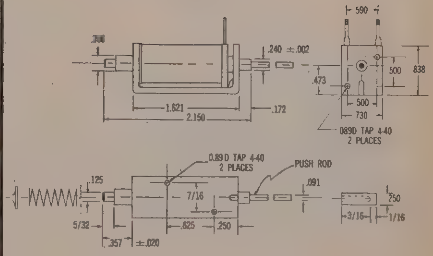
SERIES SP-375


250
400
150
125 ± .002
250
150
250
430
125
.820
.125
1.22
.272 ± .020
CLOSED
.360
060 TAP 1-70 2 PLACES
PUSH ROD
1/4 SYM
1/4
1/16
.092 ±.002
.051 ± .001
.060D TAP 1-72 2 PLACES
.110
5/16
3/16

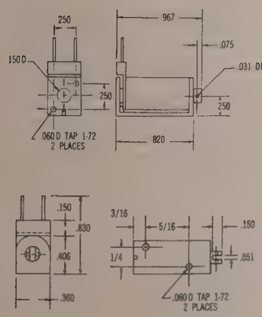
SERIES SP-650


1
3
2
4
LUG POSITIONS
.316
.187 ±.002
7/16
.375
.690
.391
7/16
7/16
1.125
.178
1.732
.089D TAP 4-40 4 HOLES
PUSH ROD
.092 ±.002
.091 ±.001
7/16
5/32
.125
.340 ±.020
.625
.250
3/16
1/16

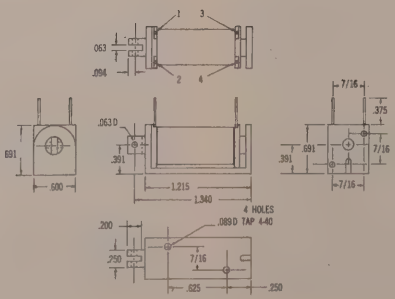
SERIES SP-750


.590
.240 ±.002
.473
.500
.838
1.621
2.150
.172
.500
.730
.089D TAP 4-40 2 PLACES
.125
0.89D TAP 4-40 2 PLACES
PUSH ROD
.091
7/16
.750
5/32
.625
.250
.357 ±.020
3/16
1/16

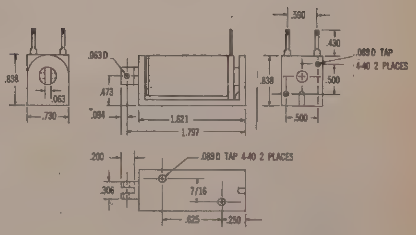
SERIES PO-375

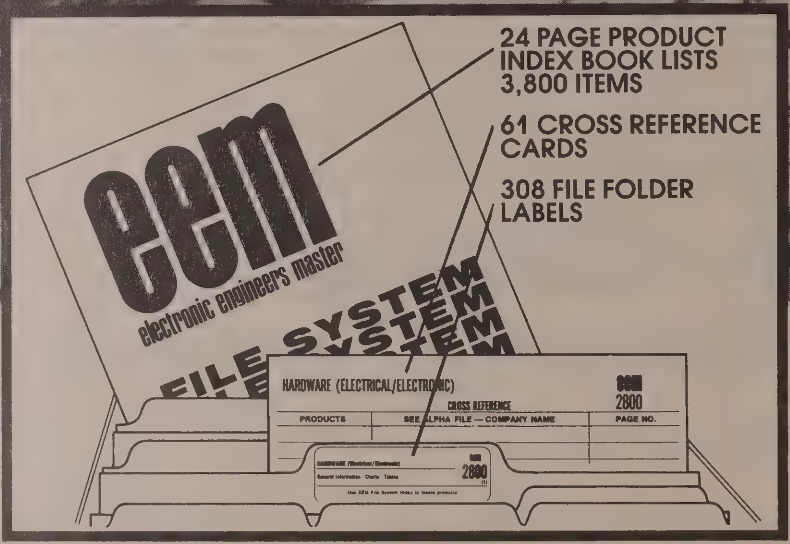

250
.967
150D
.075
.031 DIA
250
250
.060D TAP 1-72 2 PLACES
.820
.150
.830
.406
.360
3/16
5/16
.150
1/4
.051
.060D TAP 1-72 2 PLACES

SERIES PO-650


1
3
2
4
.063
.094
.063D
7/16
.375
.691
.391
.691
.391
7/16
7/16
.600
1.215
1.340
4 HOLES
.089D TAP 4-40
.200
.250
7/16
.625
.250

SERIES PO-750


.590
.430
.089D TAP 4-40 2 PLACES
.063D
.838
.063
.473
.838
.500
.730
.094
1.621
1.797
.500
.200
.089D TAP 4-40 2 PLACES
.306
7/16
.625
.250


24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
eem 2800
PRODUCTS
SEE ALPHA FILE — COMPANY NAME
PAGE NO.

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

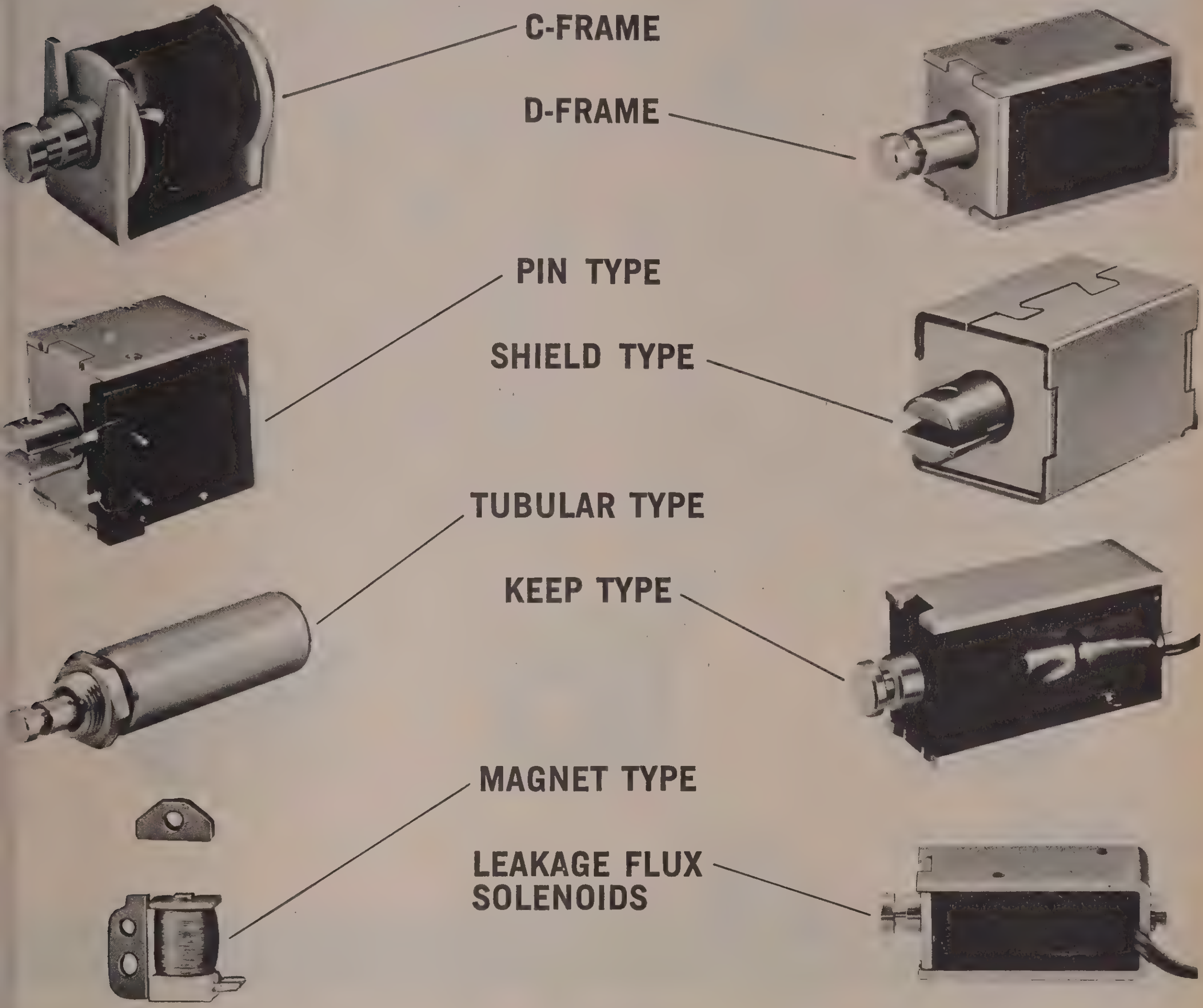
Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

ITT Components

A Unit of ITT Corporation

General Purpose Solenoids Push & Pull Types



FEATURES

- High pull efficiency — 20% greater than conventional electromagnets.
- Enclosed design for increased safety.
- Outstanding reliability — a life exceeding 500,000 cycles of operation.
- Conforms to UL requirements.
- Free from a magnetic leakage, contributing to your compact and high-density set design and planning.
- A wide selection in total travel and width offers move design possibilities.

For more information please write or call and receive a comprehensive catalog.

SPECIFICATIONS

A wide choice of optional features are available to meet varying individual needs.

- COIL FINISH
- COIL RESISTANCE
- CURRENT DRAIN
- DIMENSION
- DUTY CYCLE
- ENVIRONMENTAL PROTECTION
- FORCE
- TERMINATIONS
- TWO COILS
- VOLTAGE
- DC SOLENOIDS
- DIELECTRIC STRENGTH
- INSULATING MATERIALS
- INSULATION RESISTANCE
- KEEP SOLENOIDS
- LEAKAGE FLUX SOLENOIDS
- LIFE
- LINKAGE
- MARKING
- PUSH TYPE SOLENOIDS
- PLUNGER END CONFIGURATION
- MOUNTING

ITT COMPONENTS • 3201 South Standard Street • Santa Ana, California 92705 • Phone: (714) 751-3900 • TWX: 910-595-1744 • Telex: 68-1389

Ledex Solenoids & Switches

Solenoids and switches—Ledex has both the products and the people to help you with the quickest and best solutions to your design problems. Our wide selection of stock models lets you get a fast start on your prototype, and our expert engineering staff will work closely with you on custom designs. Ledex is where you'll find helpful solenoid and switch technology.

Solenoids

Rotary solenoids—choose from 250 standard stock models for prototype work. Shipped within 48 hours.

Series 20 tubular push or pull solenoids have life expectancies in excess of 100 million actuations.

Low profile push/pull, flat face, or conical solenoids are built for high force to size, and fast response.

Stepping solenoids—highest torque solenoid available. Extended life up to 10 million cycles minimum on unidirectional models or each direction on bidirectional models.

D-frame solenoids—eight standard models offer economical long term service.

Custom-designed solenoids feature unique construction and designs for special applications.

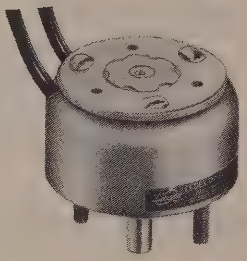
Pushbutton switches—All models stocked. Individual pushbuttons, flat panel pushbuttons, low profile rotary, binary selector, and keylock switches. Ganged and panel mounted switches with the look and feel of quality, by Rafi of West Germany.

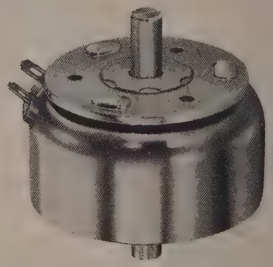
Rotary manual switches provide economy by simplifying circuitry, eliminating auxiliary circuit components and minimizing wiring. Reliable for military and commercial uses.

Stepping switches operate in −55°C to +80°C and switch 1A @ 120 VAC or 2A @ 28 VDC. More switching—less space.

Packaged switches handle high density transfer switching without relays in extreme environments. Meet relevant MIL specs.

Lucas surge suppressors provide sharp breakdown, low slope resistance, and long term voltage stability. They operate between −55°C and +175°C with response times as fast as 1 x 10^{-12} seconds. They feature improved energy ratings over standard zener diodes, and fail safe to short circuit.





Rotary Solenoids

Gross Torque in Pound-Inches by duty cycle for standard rotary strokes.

			25°		35°		45°		67½°		95°	
Model	O.D.(")	Ht. in.	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)	Cont. (stroke)	1/20 (duty)
1E	1	5/8	–	1.10			–	.62				
2E	1 1/8	21/32	.20	1.70	.15	1.30	.10	.89				
3B	1 5/8	7/8	.35	3.2	.25	2.3	.15	1.7	.09	.8		
3E	1 5/16	51/64	.35	3.2	.25	2.3	.15	1.18	.09	.89		
4E	1 9/16	61/64	.9	5.2	.6	3.5	.4	3.1	.2	1.9	.15	1.2
5B	1 7/8	1 13/64	1.8	10.0	0.9	8.3	.7	6.0	.5	4.0	.19	1.9
5S	1 7/8	1 3/64	1.9	13.2	.9	9.2	.7	6.9	.5	4.9	.20	2.6
6S	2 1/4	1 27/64	4.6	30.6	3.4	20.5	1.7	12.1	1.6	9.7	0.9	5.7
7B	2 3/4	2 5/64	9	35.5	5	32.0						
7S	2 3/4	1 55/64	11	46.6	6	42.0	5	32.8	2.5	19.3	1.5	11.6
8S	3 3/8	2 5/16	16	117	12	77	10	65	4.2	35	3.5	20

For detailed performance curves, write for Bulletin RS-1000. Many stock models to choose from.

LEDEX

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

Series 20 Tubular Solenoids

Available push or pull
Typical output, 1/10 duty

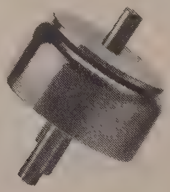
Model	½"	¾"	1"
Size	½" x 1"	1½" x ¾"	2" x 1"
Force .25 Stroke	1 oz. to 8½ oz.	¼ to 2½ lb.	¾ to 5½ lb.
Shaft diameter, push	.062"	.31"	.44"
Mounting	Thr'd Bushing	Thr'd Bushing	Thr'd Bushing
Weight	.84 oz.	2.6 oz.	6 oz.

For detailed performance curves, write for Series 20 literature.
Stock models available both push and pull, ½", ¾" and 1".

The new Ledex Series 20 offers the economical solution to your long life actuating needs. The solenoid is designed to operate quietly enough for an office environment, with reliability suited to very demanding applications.

A low friction nylon bushing and bobbin assembly provides for a life expectancy which can exceed 100 million actuations. And it sells for less than you would expect to pay. The problem of powdered metal flaking is eliminated through the metal-to-plastic bearing surface construction. The terminal version mates with standard connectors such as Berg Electronics. A special mounting nut is supplied, packed loose.

The Ledex Series 20 is ideal for applications where field servicing is prohibitive. Its high reliability provides definite advantages in applications involving computer peripheral equipment, business machine mechanisms, door interlocks, interposers, and gate releases.



Low Profile Solenoids

Typical output, 1/10 duty

Model	0	1		2		3		4		5SF		5EC		6	
Size	.75"D x ½" Conical Face	1.0"D x 7/32" Conical Face	Flat Face	1.125"D x 37/64" Conical Face	Flat Face	1.312"D x 11/16" Conical Face	Flat Face	1.562"D x 55/64" Conical Face	Flat Face	1.875"D x 1-1/16" Conical Face	Flat Face	1.875"D x 1-1/16" Conical Face	Flat Face	2.250D" x 1-21/64" Conical Face	Flat Face
Stroke (in.)	.020	.040	.040	.040	.040	.040	.040	.020	.020	.010	.010	.050	.050	.020	.020
Force (lbs.)	4.4	7.8	12.8	11.0	16.5	16.0	27.0	17.8	46.0	35.5	95.0	35.5	95.5	65.0	16.0
Stroke (in.)	.120	.120	.060	.120	.060	.120	.060	.200	.100	.250	.100	.250	.100	.250	.190
Force (lbs.)	1.0	2.4	3.3	3.6	5.3	7.8	10.0	6.1	11.8	16.2	20.0	16.2	20.0	33.0	30.0
Weight	⅞ oz.	1½ oz.		2¼ oz.		3¾ oz.		6 oz.		9 oz.		10½ oz.		1 lb. 5½ oz.	

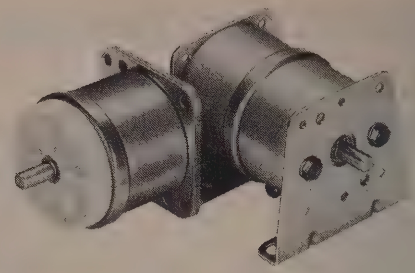
For detailed performance curves, write for catalog LS 1017. Many stock models to choose from.

LEDEX

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

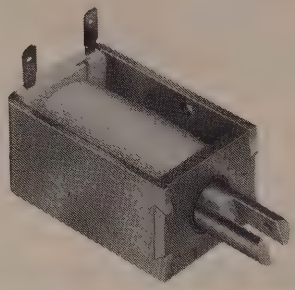
Phone: 513-898-3621
TWX: 810-450-2526
Telex: 28-8228

Stepping Solenoids



Summary Specifications	Unidirectional	Bidirectional
Voltage	6 to 220 VDC	6 to 220 VDC
High temperature	+85°C	+85°C
Low temperature	−40°C	−40°C
Length	1.9″	2.8″
Height	2¼″ (sq. plate)	2¼″
Weight	14 oz.	24 oz.

For more detailed specifications on 64 stock models, Catalog SS-7004.

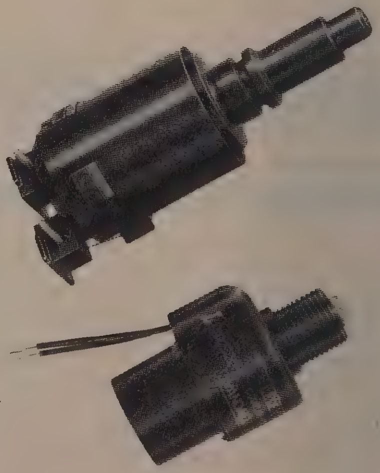


D-Frame Solenoids

Model	L6-22	L25-11H	L44-02H	L51-04H
Voltages	6,12,24,120 VAC or DC	6,12,24,120,240 VAC or DC	6,12,24,120,240 VAC or DC	6,12,24,120,240 VAC or DC
AC operating freq.	Std. 60 Hz.	Std. 60 Hz.	Std. 60 Hz.	Std. 60 Hz.
Dielectric strength	1000 VRMS	1000 VRMS	1000 VRMS	1000 VRMS
Plunger weight	.22 oz.	1.5 oz.	1.25 oz.	2.3 oz.
Total weight	1.7 oz.	6.25 oz.	13 oz.	15 oz.
Holding force (DC continuous)	@ 24 VDC cold 35 oz. @ 24 VDC hot 32 oz.	@ 24 VDC cold 7 lbs. @ 24 VDC hot 5 lbs.	@ 24 VDC cold 144 oz. @ 24 VDC hot 133 oz.	@ 24 VDC cold 176 oz. @ 24 VDC hot 152 oz.
Holding force (DC intermittent)	@ 24 VDC cold 37 oz. @ 24 VDC hot 35 oz.	@ 24 VDC cold 8 lbs. @ 24 VDC hot 5.5 lbs.	@ 24 VDC cold 180 oz. @ 24 VDC hot 158 oz.	@ 24 VDC cold 260 oz. @ 24 VDC hot 250 oz.
Holding force (AC continuous)	@ 120 VAC cold 9 oz. @ 120 VAC hot 6 oz.	@ 120 VAC cold 59 oz. @ 120 VAC hot 50 oz.	@ 120 VAC cold 60 oz. @ 120 VAC hot 55 oz.	@ 120 VAC cold 50 oz. @ 120 VAC hot 43 oz.
Holding force (AC intermittent)	@ 120 VAC cold 8 oz. @ 120 VAC hot 7 oz.	@ 120 VAC cold 90 oz. @ 120 VAC hot 85 oz.	@ 120 VAC cold 75 oz. @ 120 VAC hot 70 oz.	@ 120 VAC cold 110 oz. @ 120 VAC hot 88 oz.

For more information, write for Catalog DF-1201.

Custom Solenoids—Capability



	Dot Matrix Print Solenoid	Printhammer Solenoid
Force	3 lb. (1.36 kg) min. first pulse	.011 to .019 joules @ 5A typ.
Stroke	.018″ (.5 mm) min. stroke	.150″-.250″ travel
Insulation resistance	1000 megohms min.	1000 megohms
Dielectric	500 VDC min.	500 VDC min.
Coil resistance	5.3 to 5.9 ohms @ 25°C ±2°	1.9 ohm ±1 ohm @ +20°C
Weight	.33 oz. (9.1 gr)	1.14 oz (32 gr)
Life	300 million actuations	200 million actuations
Operating temperature	−10°C to 105°C	+70°C typ.

For more information, consult Ledex engineers.

LEDEX®

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

Phone: 513-898-3621
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Telex: 28-8228

eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

- **AC** alternating current
- **A/D** analog to digital
- **ADC** analog to digital converter
- **ADP** automatic data processing
- **AF** audio frequency
- **AFC** automatic frequency control
- **ALGOL** algorithmic language
- **AM** amplitude modulation
- **AND** a logical operator
- **AQL** acceptable quality level
- **ASCII** American national standard code for information interchange
- **AWG** American wire guage

B

- **BALUN** balanced to unbalanced
- **BASIC** beginners' all-purpose symbolic instruction code
- **BCD** binary-coded decimal
- **BNC** baby "N" connector
- **BUS** basic utility system

C

- **CAD** computer aided design
- **CAM** computer aided manufacture
- **CATV** cable television or community antenna television
- **CERMET** ceramic metal element
- **Comm.** communications
- **CMOS** complementary metal-oxide semiconductor
- **CPS** characters per second
- **CPU** central processing unit

D

- **D/A** digital to analog
- **DAC** digital to analog converter
- **DC** direct curent
- **DIL** dual in-line
- **DIP** dual in-line package
- **DPM** digital panel meter
- **DTL** diode transistor logic

E

- **EDP** electronic data processing
- **EBCDIC** extended binary coded decimal interchange code
- **EEPROM** electrically erasable PROM
- **EMC** electromagnetic compatibility
- **EMI** electromagnetic interference
- **EPROM** electrically programmable ROM
- **ESR** equivalent series resistance

F

- **FEP** fluorinated ethylene propylene Copolymar, 200° Teflon
- **FET** field-effect transistor
- **FM** frequency modulation
- **FORTRAN** formula translator

G

- **GaAsFET** gallium arsenide field effect transistor
- **GPIB** general purpose interface bus

H

- **HF** high frequency (3 to 30 MHz)
- **HIPOT** test, measurement and diagnostic equipment
- **HLL** high level language
- **HV** high voltage
- **Hz** Hertz

I

- **IC** integrated circuit
- **IF** intermediate frequency
- **IO** input/output (devices)
- **IR** insulation resistance (or) infrared

J

- **JFET** junction field effect transistor
- **JMOS** junction metal oxide semiconductor

K

- **kHz** kilohertz (10^3 hertz)
- **KSR** keyboard send receive

L

- **LC** inductance capacitance
- **LCD** liquid crystal display
- **LED** light-emitting diode
- **LF** low frequency (30 to 300 kHz)
- **LSI** large scale integration
- **LVDT** linear velocity displacement transformer

M

- **MATV** master antenna television
- **μF** microforad
- **MHz** megahertz
- **MOS** metal oxide semiconductor
- **MOSFET** metal oxide semiconductor field effect transistor
- **MOV** metal oxide varistor
- **MPU** microprocessor unit
- **MSI** medium scale integration

N

- **NBS** National Bureau of Standards
- **NIM** nuclear instrumentation module
- **NOR** not OR

O

- **OEM** original equipment manufacturer
- **OR** a logical operator

P

- **pF** picofarad
- **PC** printed circuit
- **PCB** printed circuit board
- **PIN** positive-intrinsic-negative (transistor)
- **PLA** programmable logic array
- **PPI** plan position indicator
- **PROM** programmable read only memory
- **PUT** programmable unijunction transistor

Q

- **QAM** quadrature amplitude modulation
- **Q (meter)** quality-factor meter

R

- **RAM** random access memory
- **RC** resistance-capacitance
- **RFI** radio frequency interference
- **RMS** root mean square
- **ROM** read only memory
- **RF** radio frequency
- **RFC** radio-frequency choke
- **RFI** radio-frequency interference
- **RTD** resistance-temperature detector
- **RTL** resistor transistor logic
- **RTV** room temperature vulcanizing
- **RW** read/write

S

- **SAS** silicon asymmetrical switch
- **SBC** single board (micro) computer
- **SBS** silicon bilateral switch
- **SCR** silicon-controlled rectifier
- **SIP** single in-line package
- **SSI** small scale integration
- **SSR** solid state relay
- **STL** Schottky transistor logic

T

- **TC** temperature coefficient
- **TCXO** temperature compensated crystal oscillator
- **TFE** tetrafluoride ethylene propylene Copolymer, 250° Teflon
- **TTL** transistor-transistor logic
- **TTY** teletypewriter

U

- **UHF** ultra high frequency (300 MHz to 3 GHz)
- **UL** Underwriters Laboratory
- **UPS** uninterruptible power supply

V

- **VAC** volts (of) alternating current
- **VAR** volt-ampere reactive
- **VCR** video cassette recorder
- **VDC** volts (of) direct current
- **VHF** very high frequency
- **VHSIC** very high speed integrated circuit
- **VLF** very low frequency (3 to 30 kHz)
- **VLSI** very large scale integration
- **VRM** voice recognition module
- **VTVM** vacuum tube volt meter
- **VU** volume unit
- **VSWR** voltage standing wave ratio

W

- **WPS** word processing software

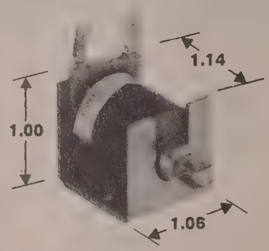
Y

- **YIG** yttrium iron garnet

LIBERTY CONTROLS, INC.

SOLENOIDS

L-9



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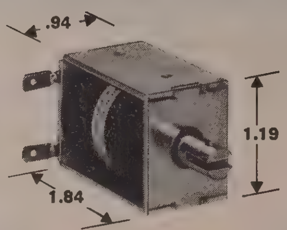

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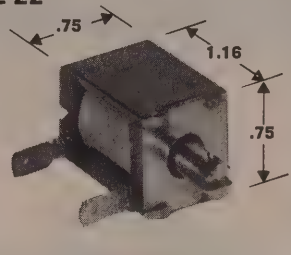

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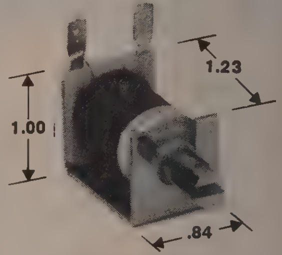

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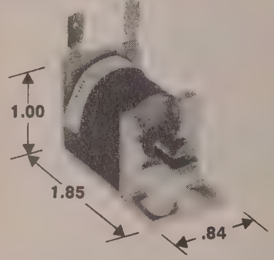

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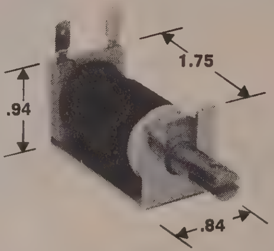

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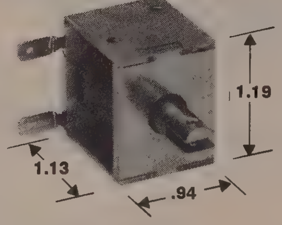

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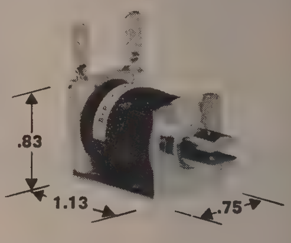

FORCE CURVE DATA

CONTINUOUS DUTY DC

TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1¼″
L-22	13	5	2	1	0.5	—	—	—	—	—
L-61	18	9	3	1	1	—	—	—	—	—
L-20	21	11	4	2	1	—	—	—	—	—
L-9	27	13	6.5	2.5	1.5	—	—	—	—	—
L-24	28	14	6	3	2	2	—	—	—	—
L-25	28	14	6	3	2	2	—	—	—	—
L-28	31	15	5	3	1	—	—	—	—	—
L-26	33	18	7	4	3	2	1	—	—	—
L-81	38	19	9.5	4	—	—	—	—	—	—
L-62	46	26	11	5	3	—	—	—	—	—
L-11	48	32	14	8	5	4	3	—	—	—
L-63	56	31	14	8	5	3	2	—	—	—
L-82	55	40	19	10	5	3	2	—	—	—
L-88	120	74	30	15	8	4	—	—	—	—
L-89	144	102	49	27	16	11	7	—	—	—
L-90	148	114	62	35	23	17	13	11	8	5

CONTINUOUS DUTY AC

TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1¼″
L-22	5.5	4	2.5	1.5	0.5	—	—	—	—	—
L-20	10	7	5	3.5	2	—	—	—	—	—
L-61	10	7	5	4	2	—	—	—	—	—
L-90	12	9	7	7	7	8	8	9	9	7
L-24	14	10	7	6	4	2	—	—	—	—
L-25	14	10	7	6	4	2	—	—	—	—
L-9	15	10.5	6.5	4.5	2.5	—	—	—	—	—
L-28	15	11	7	4.5	2	—	—	—	—	—
L-26	16	12	9	8	6	5	3	—	—	—
L-82	17	12	10	10	11	11	11	—	—	—
L-89	17	13	10.5	10	9.5	9	7	—	—	—
L-11	18	13	10	10	10	8	6	—	—	—
L-81	19	13	9	5	—	—	—	—	—	—
L-63	20	15	13	13	11	9	6	—	—	—
L-88	24	18	14	11	8	—	—	—	—	—
L-62	24	19	15	13	10	—	—	—	—	—

INTERMITTENT DUTY DC

TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1¼″
L-22	22	10	3	2	1	—	—	—	—	—
L-20	34	21	8	4	2	—	—	—	—	—
L-61	38	21	8	4	2	—	—	—	—	—
L-9	38	21	9	5	3	—	—	—	—	—
L-24	46	27	12	7	4	3	—	—	—	—
L-25	46	27	12	7	4	3	—	—	—	—
L-28	47	32	12	6	3	—	—	—	—	—
L-81	53	34	16	7	—	—	—	—	—	—
L-62	80	47	20	10	5	—	—	—	—	—
L-26	52	36	21	11	7	5	3	—	—	—
L-11	67	53	31	19	13	11	7	—	—	—
L-63	84	54	27	15	10	6	4	—	—	—
L-82	92	70	43	24	14	9	7	—	—	—
L-88	184	136	68	36	20	11	—	—	—	—
L-89	200	156	99	60	36	25	16	—	—	—
L-90	208	176	131	95	72	56	44	36	28	16

INTERMITTENT DUTY AC

TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1¼″
L-22	10	6	4	2	1.5	—	—	—	—	—
L-20	20	14	9	7	4	—	—	—	—	—
L-61	22	15	12	9	5	—	—	—	—	—
L-24	26	19	14	11	8	5	—	—	—	—
L-25	26	19	14	11	8	5	—	—	—	—
L-26	25	19	15	13	11	9	6	—	—	—
L-28	29	20	14	9	4	—	—	—	—	—
L-90	27	22	18	17	18	19	20	21	21	17
L-81	34	23	15	8	—	—	—	—	—	—
L-9	35	25	17	12	7	—	—	—	—	—
L-11	33	25	20	18	18	16	13	—	—	—
L-82	46	31	26	26	28	29	28	—	—	—
L-89	42	33	27	25	24	22	18	—	—	—
L-88	49	36	28	23	17	10	4	—	—	—
L-63	56	44	38	36	34	27	18	—	—	—
L-62	64	55	42	36	26	—	—	—	—	—

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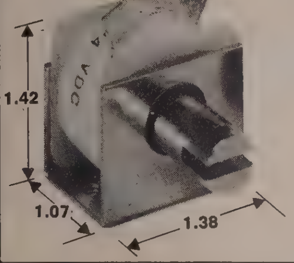
L-62



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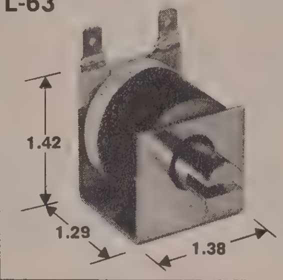

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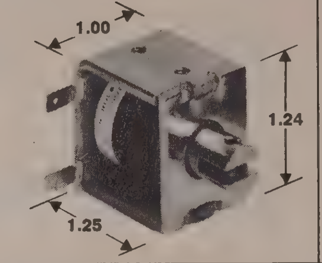

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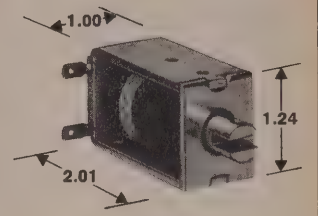

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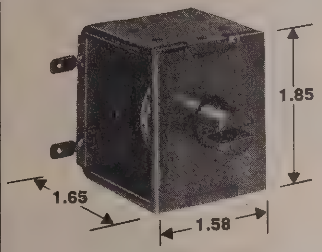

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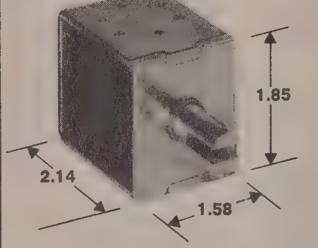

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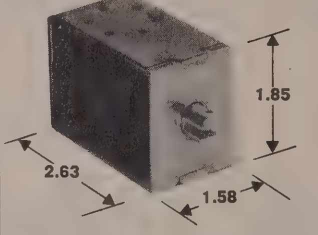

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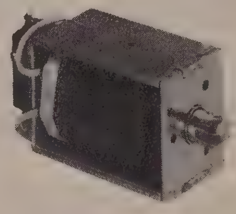


FORCE CURVE DATA

STANDARD VOLTAGES: 6, 12, 24, 48, 120, 240 AC
6, 12, 24, 48, 110, 220 DC

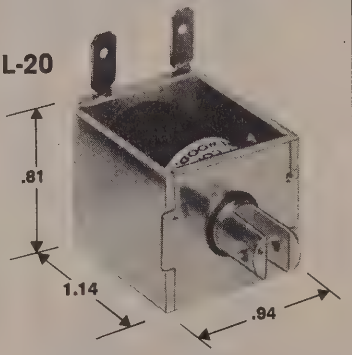
PULSE DUTY DC

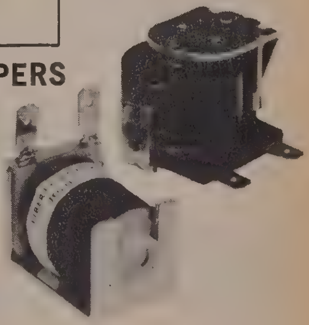
TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1 1/4″
L-22	38	25	11	6	3	—	—	—	—	—
L-20	62	50	27	14	8	—	—	—	—	—
L-61	67	51	27	14	8	—	—	—	—	—
L-24	68	52	32	20	13	8	—	—	—	—
L-25	68	52	32	20	13	8	—	—	—	—
L-26	74	62	43	30	22	17	11	—	—	—
L-9	84	63	35	18	11	—	—	—	—	—
L-28	83	70	43	23	13	—	—	—	—	—
L-11	90	80	53	42	37	34	26	—	—	—
L-81	107	89	64	34	—	—	—	—	—	—
L-82	136	117	90	62	40	26	16	—	—	—
L-62	172	142	89	43	27	—	—	—	—	—
L-63	168	147	105	67	45	28	16	—	—	—
L-88	276	241	180	94	71	40	—	—	—	—
L-89	265	234	190	149	110	82	58	—	—	—
L-90	266	230	188	154	126	106	94	89	68	40

PULSE DUTY AC

TYPE	1/16″	1/8″	1/4″	3/8″	1/2″	5/8″	3/4″	7/8″	1″	1 1/4″
L-22	19	14	9	6	3	—	—	—	—	—
L-61	44	32	24	20	11	—	—	—	—	—
L-20	48	36	26	19	11	—	—	—	—	—
L-24	52	38	30	25	18	—	—	—	—	—
L-25	52	38	30	25	18	—	—	—	—	—
L-11	54	42	34	32	30	27	23	—	—	—
L-28	62	46	34	21	11	—	—	—	—	—
L-9	72	53	34	24	15	—	—	—	—	—
L-26	72	53	43	39	36	30	20	—	—	—
L-90	80	58	47	45	46	47	50	51	51	43
L-81	90	61	41	25	—	—	—	—	—	—
L-82	96	66	53	52	54	55	51	—	—	—
L-89	98	75	61	57	54	50	43	—	—	—
L-63	103	80	70	67	60	50	34	—	—	—
L-62	117	91	76	66	48	—	—	—	—	—
L-88	138	101	76	63	47	31	13	—	—	—

L-20





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Now Liberty Controls offers a line of clickers and clappers. Especially designed for use on today's solid state keyboards, and disc drives.

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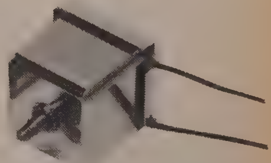
L-40

Hinge Type Flapper Solenoid



L-30

Push Type Solenoid

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EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

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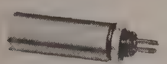
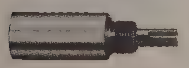
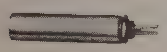
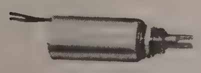
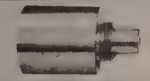
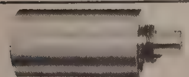
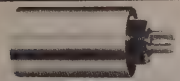
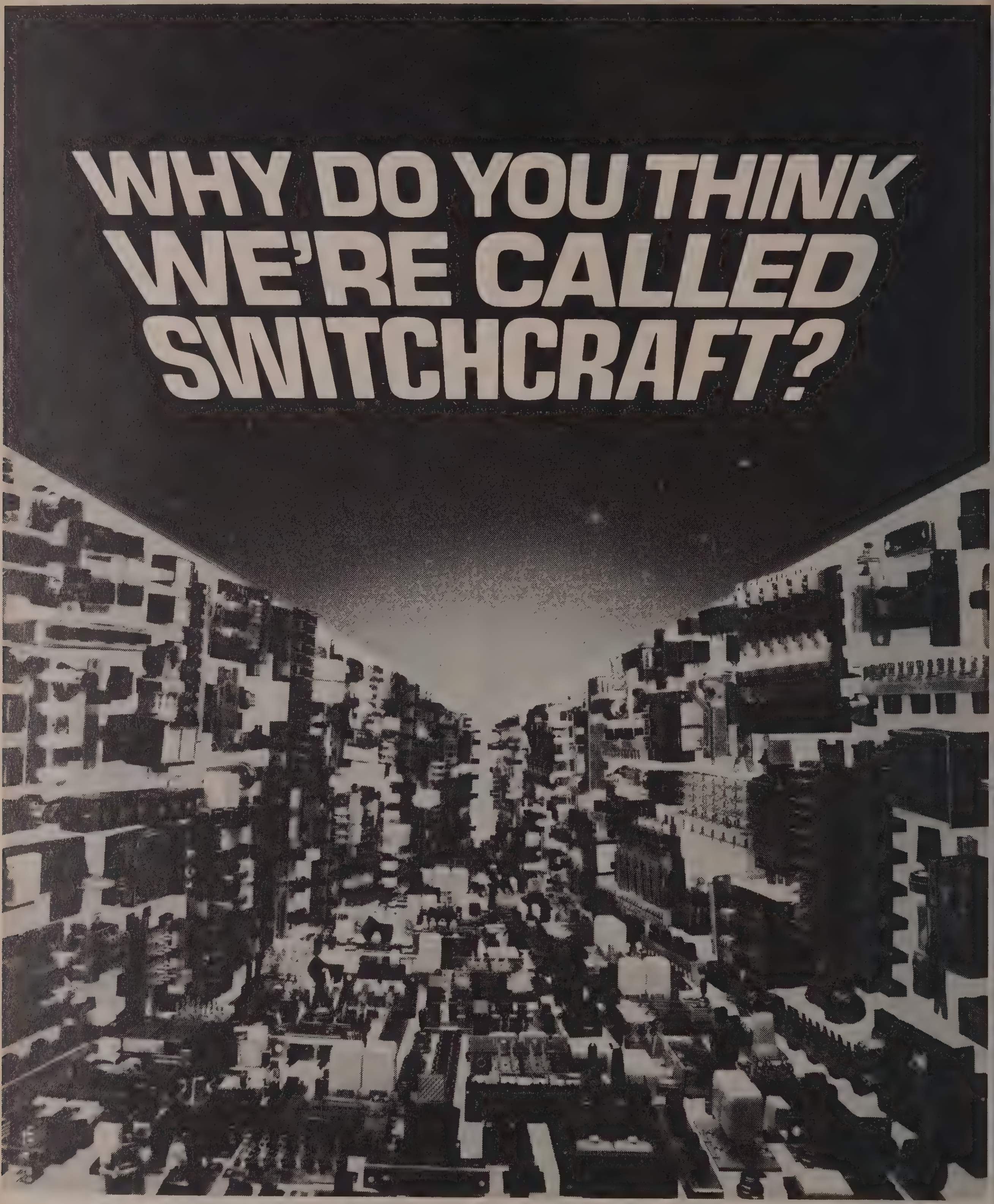
Box-Frame Solenoids (Pull Version) Push Version Also Available.

	Type	Volts	Duty	Oms	Forces and Strokes ounces @ inches		Body inches		
					(min.)	(max.)	H x	L x	W
	312-6005	24VDC	Cont.	144	22@1/32"	2@1/4"	3/4	1 5/32	3/4
	312-6006	24VDC	Int.	60	28@1/32"	4@1/4"	3/4	1 5/32	3/4
	312-6011	120VAC	Cont.	980	12@1/32"	2.5@1/4"	3/4	1 5/32	3/4
	312-6012	120VAC	Int.	650	20@1/32"	4@1/4"	3/4	1 5/32	3/4
	5U5-6053	24VDC	Cont.	114	14@1/16"	2.5@3/8"	15/16	1 1/4	27/32
	5U5-6054	24VDC	Int.	52	27@1/16"	5@3/8"	15/16	1 1/4	27/32
	5U5-6059	120VAC	Cont.	500	10@1/16"	4.5@3/8"	15/16	1 1/4	27/32
	5U5-6060	120VAC	Int.	310	17@1/16"	8.5@3/8"	15/16	1 1/4	27/32
	5U7-6065	24VDC	Cont.	85	15@1/8"	3@1/2"	15/16	1 3/4	27/32
	5U7-6066	24VDC	Int.	33	32@1/8"	7@1/2"	15/16	1 3/4	27/32
	5U7-6071	120VAC	Cont.	250	11@1/8"	7.5@1/2"	15/16	1 3/4	27/32
	5U7-6072	120VAC	Int.	140	18@1/8"	12@1/2"	15/16	1 3/4	27/32
	809-6101	24VDC	Cont.	104	12@1/8"	2@1/2"	1 3/16	1 1/8	15/16
	809-6102	24VDC	Int.	50	22@1/8"	3@1/2"	1 3/16	1 1/8	15/16
	809-6107	120VAC	Cont.	400	12@1/8"	5@1/2"	1 3/16	1 1/8	15/16
	809-6108	120VAC	Int.	220	24@1/8"	7@1/2"	1 3/16	1 1/8	15/16
	827-6113	24VDC	Cont.	72	24@1/8"	4@5/8"	1 3/16	1 7/8	15/16
	827-6114	24VDC	Int.	32	40@1/8"	8@5/8"	1 3/16	1 7/8	15/16
	827-6119	120VAC	Cont.	200	12@1/8"	6@5/8"	1 3/16	1 7/8	15/16
	827-6120	120VAC	Int.	85	20@1/8"	13@5/8"	1 3/16	1 7/8	15/16
	930-6125	24VDC	Cont.	54	63@1/8"	7@3/4"	1 5/8	2	1 7/16
	930-6126	24VDC	Int.	15	113@1/8"	25@3/4"	1 5/8	2	1 7/16
	930-6131	120VAC	Cont.	133	8@1/8"	7@3/4"	1 5/8	2	1 7/16
	930-6132	120VAC	Int.	37	36@1/8"	26@3/4"	1 5/8	2	1 7/16
	940-6137	24VDC	Cont.	50	78@1/8"	8@3/4"	1 5/8	2 3/16	1 7/16
	940-6138	24VDC	Int.	15	140@1/8"	18@3/4"	1 5/8	2 3/16	1 7/16
	940-6143	120VAC	Cont.	53	24@1/8"	15@3/4"	1 5/8	2 3/16	1 7/16
	940-6144	120VAC	Int.	15	100@1/8"	65@3/4"	1 5/8	2 3/16	1 7/16
	960-6149	24VDC	Cont.	58	50@1/8"	8@1/2"	1 5/8	1 9/16	1 7/16
	960-6150	24VDC	Int.	21	100@1/8"	18@1/2"	1 5/8	1 9/16	1 7/16
	960-6155	120VAC	Cont.	166	14@1/8"	10@1/2"	1 5/8	1 9/16	1 7/16
	960-6156	120VAC	Int.	60	45@1/8"	30@1/2"	1 5/8	1 9/16	1 7/16
	970-6161	24VDC	Cont.	58	65@1/8"	9@1/2"	1 5/8	1 25/32	1 7/16
	970-6162	24VDC	Int.	20	120@1/8"	24@1/2"	1 5/8	1 25/32	1 7/16
	970-6167	120VAC	Cont.	100	22@1/8"	16@1/2"	1 5/8	1 25/32	1 7/16
	970-6168	120VAC	Int.	125	85@1/8"	58@1/2"	1 5/8	1 25/32	1 7/16

Tubular Solenoids (Pull Version) Push Version Also Available.

	Type	Volts	Duty	Oms	Forces and Strokes ounces @ inches		Body inches	
					(min.)	(max.)	Length x	Dia.
	R7X9-6171	12VDC	Cont.	80	5@1/32"	1.2@5/32"	1 1/8	7/16
	R7X9-6172	12VDC	Int.	14	9@1/32"	2.5@5/32"	1 1/8	7/16
	R7X9-6173	24VDC	Cont.	260	5@1/32"	1.2@5/32"	1 1/8	7/16
	R7X9-6174	24VDC	Int.	57	9@1/32"	2.5@5/32"	1 1/8	7/16
	R8X7-6362	12VDC	Cont.	55	2.5@1/16"	1@3/16"	7/8	1/2
	R8X7-6363	12VDC	Int.	20	6@1/16"	1.5@3/16"	7/8	1/2
	R8X7-6364	24VDC	Cont.	240	2.5@1/16"	1@3/16"	7/8	1/2
	R8X7-6365	24VDC	Int.	80	6@1/16"	1.5@3/16"	7/8	1/2
	R8X12-6372	12VDC	Cont.	40	7@1/32"	1.5@1/4"	1 1/2	1/2
	R8X12-6373	12VDC	Int.	10	14@1/32"	4@1/4"	1 1/2	1/2
	R8X12-6374	24VDC	Cont.	160	7@1/32"	1.5@1/4"	1 1/2	1/2
	R8X12-6375	24VDC	Int.	38	14@1/32"	4@1/4"	1 1/2	1/2
	R8X16-6384	24VDC	Cont.	145	2.8@1/8"	1.5@3/4"	2	1/2
	R8X16-6385	24VDC	Int.	24	7@1/8"	4@3/4"	2	1/2
	R12X12-6211	12VDC	Cont.	41	6.5@1/8"	1.2@5/8"	1 1/2	3/4
	R12X12-6212	12VDC	Int.	6	20@1/8"	6@5/8"	1 1/2	3/4
	R12X12-6213	24VDC	Cont.	165	6.5@1/8"	1.2@5/8"	1 1/2	3/4
	R12X12-6214	24VDC	Int.	25	20@1/8"	6@5/8"	1 1/2	3/4
	R16X9-6221	12VDC	Cont.	36	22@1/16"	2.5@1/2"	1 1/8	1
	R16X9-6222	12VDC	Int.	8	33@1/16"	4@1/2"	1 1/8	1
	R16X9-6223	24VDC	Cont.	145	22@1/16"	2.5@1/2"	1 1/8	1
	R16X9-6224	24VDC	Int.	30	33@1/16"	4@1/2"	1 1/8	1
	R16X16-6231	12VDC	Cont.	26	21@1/8"	6.5@5/8"	2	1
	R16X16-6232	12VDC	Int.	3.8	56@1/8"	20@5/8"	2	1
	R16X16-6233	24VDC	Cont.	105	21@1/8"	6.5@5/8"	2	1
	R16X16-6234	24VDC	Int.	15	56@1/8"	20@5/8"	2	1
	R24X13-6243	24VDC	Cont.	85	50@1/8"	5@5/8"	1 5/8	1 1/2
	R24X13-6244	24VDC	Int.	14	150@1/8"	20@5/8"	1 5/8	1 1/2
	R24X19-6253	24VDC	Cont.	59	80@1/8"	8@1"	2 3/8	1 1/2
	R24X19-6254	24VDC	Int.	10	140@1/8"	32@1"	2 3/8	1 1/2

Sales Representatives in major cities. Complete catalog available upon request.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SWITCHCRAFT® INC.

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SWITCHES

Manufacturer	DIP	Lever	Pushbutton				Reed	Rocker/Paddle	Rotary		Slide	Snap Action	Thumb-wheel	Toggle	Mercury	Features										Hard-ware	Other	Type
			Positive																									
			Momentary	Action	Interlock	Push-on/Push-off			Single Section	Multi-Section						Decade	Explo. Proof	Illum.	High Volt.	Key Lock	Power	RF	Sealed	Touch	Coded			
Advanced Systems																											1B•1501	Data, Multiport
Aerospace Optics						1B•1503												●					●					
Alcoswitch	1B•1504 1B•1508		1B•1510	1B•1510		1B•1510	1B•1510	1B•1505 1B•1513	1B•1506 1B•1508		1B•1507 1B•1509			1B•1511						●	●		●		●			
AME																							●			1B•1515		
American Resch. & Engrg.	1B•1516																									1B•1518		
American Switch			1B•1519	1B•1519		1B•1519		1B•1519			1B•1519			1B•1519				●			●		●					
AMP	1B•1532									1B•1533	1B•1535														●			
Arcolectric		1B•1540	1B•1541					1B•1538			1B•1542	1B•1541						●			●							
Armtec/Daven	1B•1543								1B•1543*	1B•1543*													●		●			
Arrow Hart								1B•1571			1B•1568			1B•1569							●							
Burgess Switch												1B•1546									●		●			1B•1545		
C & K Comps.	1B•1565		1B•1565	1B•1565		1B•1565		1B•1565	1B•1565	1B•1565	1B•1565			1B•1585				●		●	●		●		●			
Carlingswitch								1B•1548						1B•1549				●			●							
Cherry			1B•1553	1B•1554		1B•1555						1B•1551	1B•1556				●	●			●		●		●	1B•1553	1B•1553	Low Torque
Chicago Lock									1B•1564	1B•1564							●			●								
Cole Instr.									1B•1567*	1B•1567*						●					●							
Crosspoint																									●	1B•1574	1B•1574	Matrix
Crouzet Controls								1B•1575					1B•1575												●			
CTS/Paso Robles	1B•1576										1B•1579																	
Dai-Ichi Shoji		1B•1583	1B•1583	1B•1583		1B•1583		1B•1583			1B•1583			1B•1583				●			●							
Dreefs Switch			1B•1587			1B•1587		1B•1585	1B•1587	1B•1587								●			●						1B•1587	Thermostat
EAO Switch			1B•1589	1B•1589	1B•1589	1B•1589						1B•1589					●	●		●	●		●					
Eaton/Cutler-Hammer			1B•1590	1B•1590		1B•1590											●	●			●		●			1B•1609		
EECO	1B•1614								1B•1614				1B•1612											●	●		1B•1615	Membrane
Electro-Mech			1B•1618	1B•1618	1B•1618	1B•1618												●			●							
Electronic Comps.			1B•1621	1B•1621		1B•1621					1B•1621							●			●							
Electro Switch									1B•1622	1B•1622		1B•1623					●			●	●		●		●		1B•1623	Detent
Fifth Dimension															1B•1624								●				1B•1624	Tilt
Gordos							1B•1625								1B•1625		●				●		●					
Gordos/Std. Grigsby									1B•1626																●			
Grayhill	1B•1629		1B•1634						1B•1636*	1B•1640*	1B•1633										●		●		●			
Hamlin							1B•1646								1B•1646		●		●		●		●					

* Mil. Spec.

Manufacturer	DIP	Lever	Pushbutton				Reed	Rocker/ Paddle	Rotary		Slide	Snap Action	Thumb-wheel	Toggle	Mercury	Features										Hard-ware	Other	Type
			Positive			Push-on/ Push-off			Single Section	Multi-Section						Decade	Explo. Proof	Illum.	High Volt.	Key Lock	Power	RF	Sealed	Touch	Coded			
			Momentary	Action	Interlock																							
Hasco Comps.							1B•1647										●						●					
Hermetic Switch							1B•1648										●		●		●		●					
Illinois Lock									2•1332											●	●						1B•1655	Locks, Dial & Shaft
Inter-Market													1B•1649												●	1B•1649	1B•1649	Indexing
Interswitch													1B•1650					●							●		1B•1650	LED Displays
ITT Jennings																			●		●	●					1B•1651	Vacuum Contactors
ITT Schadow	1B•1653		1B•1652	1B•1652	1B•1652	1B•1652												●						●				
ITW Switches			1B•1661	1B•1661				1B•1667	1B•1656*	1B•1656*	16•1658	1B•1665*						●			●		●		●			
Janco									1B•1668*	1B•1668*									●	●	●	●	●				1B•1669	Communications, Jet Engine Start
Judco				1B•1671		1B•1671		1B•1671													●							
Ledex			1B•1672	1B•1673	1B•1673	1B•1673			1B•1673	1B•1673										●	●		●	●	●		1B•1674	Surge Suppressors
Marquardt Switches			1B•1675					1B•1675			1B•1675							●			●		●				1B•1675	Keyboard; Line Voltage Selector
McGill Mfg.			1B•1676	1B•1676				1B•1676				1B•1676					●	●			●		●				1B•1676	Photoelectric Sensors
Mechanical Enterprises			1B•1677															●										
Micro Switch			1B•1700*	1B•1700*	1B•1717*	1B•1700*		1B•1695				1B•1686*		1B•1696*			●	●		●	●		●	●			1B•1679	Position Sensors
NKK Switches			1B•1723	1B•1724		1B•1724		1B•1723	1B•1730	1B•1730	1B•1726			1B•1723				●			●		●					
Oak Switch Sys.		1B•1732	1B•1733			1B•1733			1B•1732*	1B•1732*								●	●	●	●		●		●			
Omega Engineering									1B•1735																		1B•1735	Temperature; Pressure; Strain
Oslo Controls			1B•1736					1B•1737										●			●							
Otto Controls			1B•1738*	1B•1739								1B•1738*		1B•1738*			●				●						1B•1739*	Two-Position Pushbutton
Power Dynamics														1B•1740														
Pres:Air:Trol																	●				●		●				1B•1741	Pressure; Vacuum; Potentiometers
Radio Switch		1B•1743							1B•1743*	1B•1743*									●		●		●					
Shallco									1B•1744*	1B•1744*									●		●	●						
Switchcraft		1B•1750	1B•1748	1B•1749	1B•1750	1B•1748					1B•1748							●			●		●				1B•1748	Voltage Selectors
Tapeswitch																					●		●	●			1B•1753	Foot Pedal, Mat, Ribbon; Touch Actuated
Tech Labs.									1B•1754*	1B•1754*			1B•1754	1B•1755					●		●		●				1B•1754	Attenuators
Unimax Switch			1B•1756*	1B•1756*		1B•1756*						1B•1756	1B•1756				●	●		●	●		●		●			
Veetronix			1B•1757				1B•1757											●			●		●					

* Mil. Spec.

Advanced Systems Concepts, Inc.

ASCI SWITCH® FAMILY

435 North Lake Ave.,
Pasadena, CA 91101
Phone: (818) 793-8971

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Two Port Switches

ASCI has peripheral switches that allow any two peripherals to communicate with the same input device. Our 20 models are differentiated by the type of transmission desired (serial or parallel), number of lines switched per connector, and the method of control (manual, in-line data, master port, back-up through handshaking or data and remote control).

ASCI SWITCH
Advanced Systems Concepts, Inc

Four Port Switches

ASCI offers a complete line of four port switches for all kinds of peripherals. Current models include four output port expanders and four input sharers for serial or parallel transmission. We have models for intelligent handshaking, software controllable selection, and manual switching of devices.

ASCI SWITCH
Advanced Systems Concepts, Inc

Multiport Switches

ASCI's multiport switches allow anywhere from one to 32 inputs to communicate with one to 32 outputs. Devices supported range from printers and plotters up to mag tape drives. Control can either be using the in-line data stream, manual operation, remote control signals, handshaking or through a master port. Over 32 models are available.

ASCI SWITCH

Rack Mounted Switches

Any of our two or four port switches can be placed in rack mountable enclosures. Our standard racks can hold 4 of the four port modules or 8 of our two port modules. In addition, configurations are available that allow bank control of all modules in the same enclosure simultaneously.

ASCI SWITCH

Custom Configurations

In addition to our standard line ASCI also designs custom units. These units can consist of simply one of our standard products with special connectors or cabling or a complete configuration with special protocol and handshaking requirements. Since our specialty is peripheral interfacing we're sure to be able to provide the unit that will satisfy your needs.

ASCI can also satisfy your data transmission needs. Call us for information on cabling, line drivers and protocol converters.

For more information call TOLL FREE 1-800-824-7080, TELEX 701-215 (ASCI)

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SPECS? CUSTOM?
DRAWINGS? COMPATIBILITY?
LIFE TEST? SPECS?
QUOTES? DRAWINGS?
AVAILABILITY? LIFE TEST?
LOCAL SOURCE? QUOTES?
MIL SPECS? AVAILABILITY?
CUSTOM? LOCAL SOURCE?
COMPATIBILITY? MIL SPECS?
SPECS? CUSTOM?
DRAWINGS? COMPATIBILITY?
LIFE TEST? SPECS?
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AVAILABILITY? LIFE TEST?
LOCAL SOURCE? QUOTES?

Infra-Ready.

The new Vivisun 20/20 switches are ready for anything, including ANVIS night vision goggles or direct sunlight. A unique optics system eliminates the veiling glare and halo effect of conventional displays. So there is no interference with infra-red imaging. When voltages are trimmed to night vision goggle flying levels, Vivisun 20/20 switches can still be read with the unaided eye.

During the day, Vivisun 20/20 switches are readable in direct sunlight and deadface when not energized. They are also easy to install and have the lowest touch temperature and widest viewing angle in the industry. Clearly, no other Mil-Spec switch can match it. And you can specify your Vivisun 20/20 switches with these options: Dustproof/Dripproof • Split Ground • P.C. Termination • EMI. For more information, write, phone or telex today.

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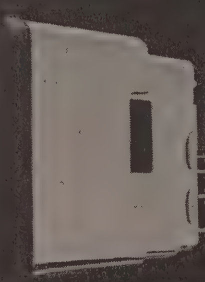
SUNLIGHT
READABLE



MIL-S-22885/90

VIVISUN 20/20™

AUGAT® ALCOSWITCH®

Quality and Innovation

DIP SERIES • AUTO-INSERTABLE

- Unique ceramic substrate allows soldering temperatures of 245°C for up to 30 seconds.
- Auto-Insertable using standard TO-116 IC insertion equipment from Amistar, Dynapert, Panasert & Universal. (ADF/ARF Series).
- Gas tight contacts (280,000 PSI).
- Allows wave soldering & aqueous or solvent cleaning without the use of tape seals.
- 2 through 10 poles.
- Matching extended and piano style actuators.
- AR Series features integral thick film pull-up resistors.
- ATT digital attenuator offers 2, 3, 4 or 5 BIT, 50, 75, 150, 500 or 600Ω unbalanced T network.

SPECIFICATIONS

Base: PBT encapsulated ceramic.
Cover and Actuator: PBT 94V-0.
Moving Contact: Gold flashed beryllium copper.
Fixed Contact & Terminal: (AD/AR), Solder coated brass
(ATT), Gold flashed brass.
Operating Force: Less than 800 grams.
Life Expectancy: 5,000 cycles.
Contact Rating: .4VA @ 20 VDC (Max).
Initial Contact Resistance: 50 milliohms maximum.
Insulation Resistance: 100 megohms min. @ 100 VDC.
Dielectric Strength: 500 VAC RMS at sea level.
Operating Temperature: −30°C to +85°C.
Storage Temperature: −45°C to +100°C.
Solder Heat Resistance: 245°C ± 5°C for 30 seconds when mounted on a .060" thick PCB.
Cleaning: Aqueous solution or solvent.

HOW TO ORDER:

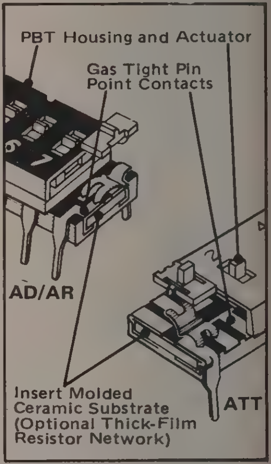
Flush Slide	Ext. Slide	Poles
ADF-02	ADE-02	2
ADF-03	ADE-03	3
ADF-04	ADE-04	4
ADF-05	ADE-05	5
ADF-06	ADE-06	6
ADF-07	ADE-07	7
ADF-08	ADE-08	8
ADF-09	ADE-09	9
ADF-10	ADE-10	10
ADP-04	ADPA-04	4
ADP-06	ADPA-06	6
ADP-08	ADPA-08	8
ADP-10	ADPA-10	10
ON	ON	

ARX–XX–XXX

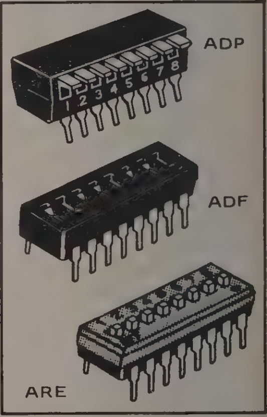
- ACTUATOR
  FLUSH =F
  EXTENDED =E
  PIANO =P
- NO. OF RESISTORS
  02, 03, 04, 05, 06, 07, 08, 09, 10
- RESISTOR VALUES
  3.3K (RED)
  10K (GREEN)

ATT–X–XXX–X

- NO. OF BITS
  2, 3, 4, 5
- IMPEDANCE
  50, 75, 150, 300, 600Ω
- db / STEPS
  B = .5 db
  C = 1
  D = 2
  E = 4
  FF = 8
  G = 16

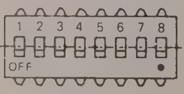

PBT Housing and Actuator
Gas Tight Pin Point Contacts
AD/AR
Insert Molded Ceramic Substrate (Optional Thick-Film Resistor Network)
ATT

AD/AR

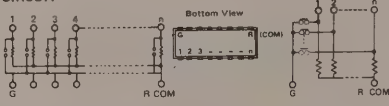


ADF, ADE, ARF, ARE, ADP, ADPA, ARP, ARPA

Poles	L(mm)	L(inch)
2	7.06	0.278
3	9.60	0.378
4	12.14	0.478
5	14.68	0.578
6	17.22	0.678
7	19.76	0.778
8	22.30	0.878
9	24.84	0.978
10	27.38	1.078

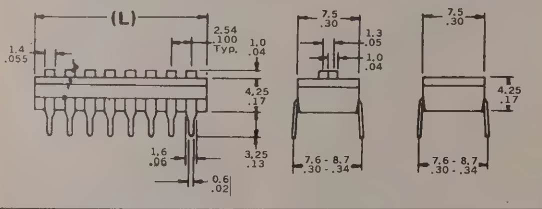

1 2 3 4 5 6 7 8
OFF

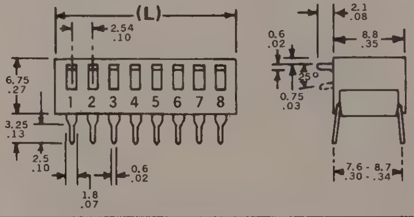
CIRCUIT


1 2 3 4 n
G
R COM
Bottom View
(COM)
1 2 3
G
1 2 n
R COM

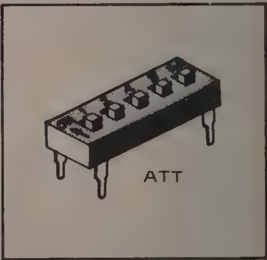
AR RESISTOR NETWORK

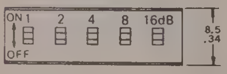
Rated Power	Resistance	Tolerance	Max. Voltage
125mW	3.3kΩ (Red) 10kΩ (Green)	± 5% @ 85°C	24V


(L)
2.54 .100 Typ.
1.0 .04
1.4 .055
4.25 .17
1.6 .06
3.25 .13
0.6 .02
7.5 .30
1.3 .05
1.0 .04
7.6 - 8.7 .30 - .34
7.5 .30
4.25 .17
7.6 - 8.7 .30 - .34


(L)
2.54 .10
6.75 .27
1 2 3 4 5 6 7 8
3.25 .13
2.5 .10
0.6 .02
1.8 .07
2.1 .08
8.8 .35
0.6 .02
15°
0.75 .03
7.6 - 8.7 .30 - .34

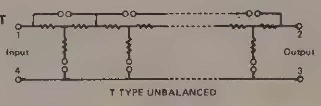
ATT

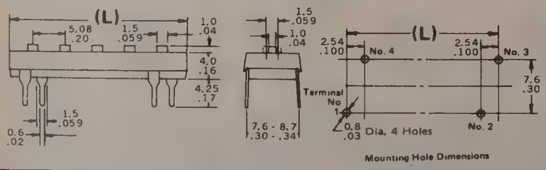



ON 1 2 4 8 16dB
OFF
8.5 .34

Type	L(mm)	L(in.)	(L)(mm)	(L)(in.)
2 BIT	12.08	0.476	7.62	.30
3 BIT	17.16	0.676	12.70	.50
4 BIT	22.24	0.876	17.78	.70
5 BIT	27.32	1.076	22.86	.90

CIRCUIT


1
2
Input
Output
4
3
T TYPE UNBALANCED


(L)
5.08 .20
1.5 .059
1.0 .04
4.0 .16
4.25 .17
1.5 .059
0.6 .02
1.5 .059
1.0 .04
7.6 - 8.7 .30 - .34
(L)
2.54 .100
No. 4
2.54 .100
No. 3
7.6 .30
Terminal No 1
0.8 .03 Dia. 4 Holes
No. 2
Mounting Hole Dimensions

ATT RESISTOR NETWORK

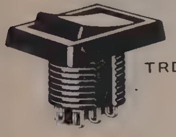
Case Color	Impedance	Frequency	Range Tolerance	Rated Input Power
Red	50 Ω	30MHz	.5-2db ± .05 db	50mW
Orange	75 Ω	5MHz	3-9db ± .10db	
Green	150 Ω	1MHz	10-15db ± .15db	
Blue	300 Ω	500kHz	16-24db ± .20db	
Black	600 Ω	200kHz	25-30db ± .35db	
			31db ± .50db	

For price information contact factory.

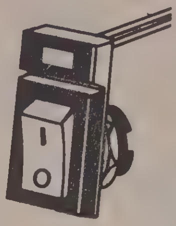
Dept. EEM, 1551 Osgood St., No. Andover, MA 01845 USA Tel: (617) 685-4371/TWX: 710 342-0552

AUGAT® ALCOSWITCH®

Quality and Innovation


TRD23N-1

TRD23P-2


TRD13D-1
(Lighted)

The TRD Series of Rocker/Paddle Switches is the latest in subminiaturization from ALCOSWITCH. Featuring all-plastic construction, 15/32" diameter mounting and all around low profile, the 3 amp @ 120VAC rated switch is ideal for portable and hand held applications.

SPECIFICATIONS: Contact Rating: 3A @ 120VAC (Silver), 0.4VA @ 20VDC (Gold); **Initial Contact Resistance:** 20 milliohms max. **Insulation Resistance:** 1,000 megohms min.; **Dielectric Strength:** 600 volts.; **Life Expectancy:** 100,000 cycles mechanical, 25,000 cycles at full rated load.; **Seal:** Terminals are epoxy sealed.

— TRD SERIES AVAILABILITY CHART —

	SERIES	T R D		PRICE 1-99	PRICE 500-999
PRODUCT SELECTION	POLE OPTIONS	1 ONE POLE		2.45	1.82
		2 TWO POLE		3.70	2.75
	RATING OPTIONS	1 0.5VA (Gold) 3 3 AMP (Silver)		N.C.	N.C.
	FUNCTION OPTIONS	D S.P. N D.P. ON-ON	PRICE PER POLE	N.C.	N.C.
		E S.P. P D.P. ON-OFF-ON		.35	.26
		F S.P. R D.P. ON-(ON) (ON) = Momentary		.30	.22
		G S.P. S D.P. (ON)-OFF-(ON)		.45	.33
		H S.P. T D.P. ON-OFF-(ON)		.45	.33
	STYLE OPTIONS	1 ROCKER 2 PADDLE		N.C.	N.C.
	ACTUATOR COLOR	0 BLACK 2 RED 6 BLUE 9 WHITE		N.C.	N.C.
	TERMINAL OPTIONS	WL WIRELUG — (Gold or Silver, depends on rating)		N.C.	N.C.
		WW WIRE WRAP — (Available in Gold only)		.30	.22
		QC .110" QUICK-CONNECT (Available May, 1984)		.15	.11
	MOUNTING OPTIONS	☐ 15/32" DIA. ROUND HOLE (Standard)		N.C.	N.C.
		5 1/2" SQUARE HOLE, SNAP-IN (Available May, 1984)		.15	.11
	LED ADAPTOR	L BLACK, MATTE FINISH (WITHOUT L.E.D.)		.25	.18
	LED COLOR	2 RED 4 YELLOW 5 GREEN		.60	.38

NOTE: CUSTOM BEZEL AND ACTUATOR COLORS AVAILABLE ON REQUEST,
STANDARD BEZEL COLOR AND L.E.D. ADAPTOR COLOR IS BLACK.

— HOW TO SPECIFY —

	Model			Pole	Rating	Function	Style	Color	Terminal		Mount	L.E.D.	Color
EXAMPLE:	T	R	D	1	3	D	1	0	W	L	5	L	2

HARDWARE: MOUNTING HARDWARE INCLUDES THE FOLLOWING:
(1) 5/8" HEX NUT, (1) 15/32" INTERNAL TOOTH LOCKWASHER
(EXCEPT WHEN THE SQUARE HOLE MOUNT IS SPECIFIED).

— STANDARD PRODUCT LISTING —

MODEL	POLE	RATING	FUNCTION	STYLE	COLOR	TERMINATION	PRICE 1-99	PRICE 500-999
TRD	1	1	D	1	0	WL	2.45	1.82
TRD	1	1	E	1	0	WL	2.80	2.07
TRD	1	3	D	1	0	WL	2.45	1.82
TRD	1	3	E	1	0	WL	2.80	2.07
TRD	2	1	N	1	0	WL	3.70	2.75
TRD	2	1	P	1	0	WL	4.25	3.15
TRD	2	3	N	1	0	WL	3.70	2.75
TRD	2	3	P	1	0	WL	4.25	3.15
TRD	1	1	D	2	0	WL	2.45	1.82
TRD	1	1	E	2	0	WL	2.80	2.07
TRD	1	3	D	2	0	WL	2.45	1.82
TRD	1	3	E	2	0	WL	2.80	2.07
TRD	2	1	N	2	0	WL	3.70	2.75
TRD	2	1	P	2	0	WL	4.25	3.15
TRD	2	3	N	2	0	WL	3.70	2.75
TRD	2	3	P	2	0	WL	4.25	3.15

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AUGAT® ALCOSWITCH®

Rotary Switches

Quality and Innovation

MRS SERIES MINIATURE ROTARY SWITCHES

MRS Series 30° and 36° miniature rotary switches are rated 150 ma @ 115 VAC. Terminals are permanently molded into DAP base. A choice of 1, 2, or 3 poles with adjustable stops up to twelve positions. The MRSE is nonadjustable with an internal O-ring shaft-to-bushing seal and also an outer seal for protection in wet environments. The suffix "S" indicates long shaft and the suffix "PC" indicates printed circuit mounting. Suffix "C" indicates continuous rotation. Suffix "X" indicates shorting (make-before-break) contacts.

Alcoswitch No.	Poles	Positions	Net Each, Lots of 1-99	100-499	500-999
MRS-1-10C	1	1–10	$ 6.45	$ 4.45	$3.74
MRS-1-10C-PC	1	1–10	6.20	4.28	3.60
MRS-1-10	1	2–10	6.95	4.80	4.03
MRS-1-10-PC	1	2–10	6.70	4.62	3.89
MRS-1-12C	1	1–12	6.50	4.49	3.77
MRS-1-12C-PC	1	1–12	6.30	4.35	3.65
MRS-1-12	1	2–12	7.00	4.83	4.06
MRS-1-12-PC	1	2–12	6.75	4.66	3.92
MRS-2-5	2	2–5	8.25	5.69	4.79
MRS-2-5-PC	2	2–5	8.10	5.59	4.70
MRS-2-6	2	2–6	8.30	5.73	4.81
MRS-2-6-PC	2	2–6	8.20	5.66	4.76
MRS-3-3	3	2–3	8.80	6.07	5.10
MRS-3-3-PC	3	2–3	8.70	6.00	5.05
MRS-3-4	3	2–4	8.85	6.11	5.13
MRS-3-4-PC	3	2–4	8.80	6.07	5.10
MRS-1-10CS	1	1–10	6.45	4.45	3.74
MRS-1-10CS-PC	1	1–10	6.20	4.28	3.60
MRS-1-10S	1	2–10	6.95	4.80	4.03
MRS-1-10S-PC	1	2–10	6.70	4.62	3.89
MRS-1-12CS	1	1–12	7.00	4.83	4.06
MRS-1-12CS-PC	1	1–12	6.75	4.66	3.92
MRS-1-12S	1	2–12	8.25	5.69	4.79
MRS-1-12S-PC	1	2–12	8.10	5.59	4.70
MRS-2-5S	2	2–5	8.25	5.69	4.79
MRS-2-5S-PC	2	2–5	8.10	5.59	4.70
MRS-2-6S	2	2–6	8.30	5.73	4.81
MRS-2-6S-PC	2	2–6	8.20	5.66	4.76
MRS-3-3S	3	2–3	8.80	6.07	5.10
MRS-3-3S-PC	3	2–3	8.70	6.00	5.05
MRS-3-4S	3	2–4	8.85	6.11	5.13
MRS-3-4S-PC	3	2–4	8.80	6.07	5.10
MRS-1-10-RA	1	2–10	13.15	9.07	7.63
MRS-1-10G-RA	1	2–10	14.90	10.28	8.64
MRS-2-5RA	2	2–5	14.30	9.87	8.29
MRS-2-5G-RA	2	2–5	16.20	11.18	9.40
MRSE-1-10	1	10*	7.55	5.21	4.38
MRSE-1-10-PC	1	10*	7.30	5.04	4.23
MRSE-1-12	1	12*	7.60	5.24	4.41
MRSE-1-12-PC	1	12*	7.35	5.07	4.26
MRSE-2-5	2	5*	8.90	6.14	5.16
MRSE-2-5-PC	2	5*	8.70	6.00	5.05
MRSE-2-6	2	6*	8.90	6.14	5.16
MRSE-2-6-PC	2	6*	8.80	6.07	5.10
MRSE-3-3	3	3*	9.40	6.49	5.45
MRSE-3-3-PC	3	3*	9.35	6.45	5.42
MRSE-3-4	3	4*	9.45	6.52	5.48
MRSE-3-4-PC	3	4*	9.40	6.49	5.45

*Not adjustable

DR SERIES ENCODED ROTARY DIP SWITCHES

Rotary DIP switches have internal sealing to allow wave soldering and immersion cleaning. Screwdriver, knob, and shaft types are available in both upright and right angle versions. Contact Rating: 0.4 VA at 20 VDC. Initial Contact Resistance: 50 milliohms max. at 2 VDC. Insulation Resistance: 1000 megohms min. at 100 VDC. Life Expectancy: 20,000 cycles min.

Alcoswitch No.#	Circuit Description	Characters	Net Each, Lots of 1-24	26-49	50-99	100-249
DRD-10	BCD	0–9	$2.45	$1.96	$1.72	$1.57
DRD-10C	BCD Comp.	0–9	2.45	1.96	1.72	1.57
DRD-16	BC	0–9 & A–F	2.75	2.20	1.93	1.76
DRD-16C	BC Comp.	0–9 & A–F	2.75	2.20	1.93	1.76
DRD-10-RA	BCD	0–9	2.95	2.36	2.07	1.89
DRD-10C-RA	BCD Comp.	0–9	2.95	2.36	2.07	1.89
DRD-16-RA	BC	0–9 & A–F	3.25	2.60	2.28	2.08
DRD-16C-RA	BC Comp.	0–9 & A–F	3.25	2.60	2.28	2.08
DRM-10	BCD	0–9	3.10	2.48	2.17	1.98
DRM-10C	BCD Comp.	0–9	3.10	2.48	2.17	1.98
DRM-16	BC	0–9 & A–F	3.40	2.72	2.38	2.18
DRM-16C	BC Comp.	0–9 & A–F	3.40	2.72	2.38	2.18
DRM-10-RA	BCD	0–9	3.60	2.88	2.52	2.30
DRM-10C-RA	BCD Comp.	0–9	3.60	2.88	2.52	2.30
DRM-16-RA	BC	0–9 & A–F	3.90	3.12	2.73	2.50
DRM-16C-RA	BC Comp.	0–9 & A–F	3.90	3.12	2.73	2.50
DRS-10	BCD	0–9	4.65	3.72	3.26	2.98
DRS-10C	BCD Comp.	0–9	4.65	3.72	3.26	2.98
DRS-16	BC	0–9 & A–F	4.95	3.96	3.47	3.17
DRS-16C	BC Comp.	0–9 & A–F	4.95	3.96	3.47	3.17
DRS-10-RA	BCD	0–9	5.15	4.12	3.61	3.30
DRS-10C-RA	BCD Comp.	0–9	5.15	4.12	3.61	3.30
DRS-16-RA	BC	0–9 & A–F	5.45	4.36	3.82	3.49
DRS-16C-RA	BC Comp.	0–9 & A–F	5.45	4.36	3.82	3.49
DRW-10	BCD	0–9	2.85	2.28	2.00	1.82
DRW-10C	BCD Comp.	0–9	2.85	2.28	2.00	1.82
DRW-16	BC	0–9 & A–F	3.15	2.52	2.21	2.02
DRW-16C	BC Comp.	0–9 & A–F	3.15	2.52	2.21	2.02
DRW-10RA	BCD	0–9	3.45	2.76	2.42	2.21
DRW-10C-RA	BCD Comp.	0–9	3.45	2.76	2.42	2.21
DRW-16-RA	BC	0–9 & A–F	3.75	3.30	2.63	2.40
DRW-16C-RA	BC Comp.	0–9 & A–F	3.75	3.30	2.63	2.40

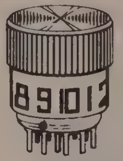
#Actuator color code: **10**, red; **10C**, orange; **16**, black; **16C**, white.

ALCOSWITCH
MRSB
2 1 10 9 8

MRSB

ALCOSWITCH
MRSB
2 1 10 9 8

MRSB-K



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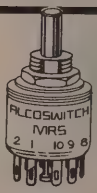
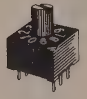


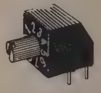
MRS

DRD

DRD-RA



DRM



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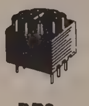

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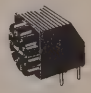

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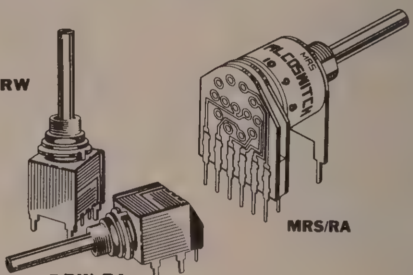

DRW

MRS/RA

DRW-RA

MRSB SERIES PROGRAMMABLE

These 30° and 36° rotary switches are rated 150 ma @ 115 VAC. All models in this series are completely sealed, allowing flow soldering and submersible defluxing without the need for caps, disposable covers, etc. Standard MRSB switches have screwdriver adjust; "K" and "U" versions have built-on aluminum knobs for compactness and ease of operation. The "U" version also allows switching position to be read from edge of PC board. MRSB switches are identical to the standard MRS Series in size and operational features. Models with an "X" suffix have shorting (make-before-break) contacts. All models in this series are non-adjustable.

Alcoswitch No.	Poles	Positions	Net Each, Lots of 1-99	100-499	500-999
MRSB-1-10-PC	1	10	$ 9.35	$ 6.45	$5.42
MRSB-2-5-PC	2	5	10.75	7.42	6.24
MRSB-3-3-PC	3	3	11.40	7.87	6.61
MRSB-1-10K-PC	1	10	11.15	7.69	6.47
MRSB-2-5K-PC	1	10	12.60	8.69	7.31
MRSB-3-3K-PC	3	3	13.20	9.11	7.66
MRSB-1-10U-PC	1	10	13.20	9.11	7.66
MRSB-2-5U-PC	2	5	14.45	9.97	8.38

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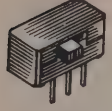
AUGAT® ALCOSWITCH®

Quality and Innovation

SLIDE & ROCKER SWITCHES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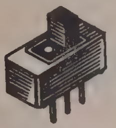
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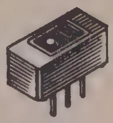
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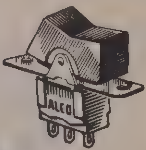
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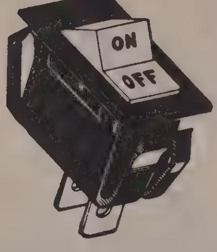
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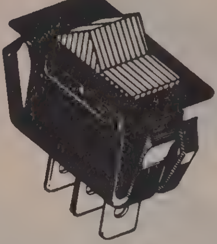
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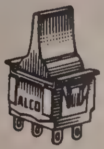
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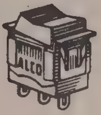
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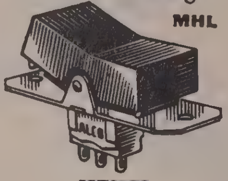
MRL-30

MINIATURE PC SLIDE SWITCHES

Instrument grade miniature slide switches designed for printed circuit board mounting. Primarily for use in programming, test apparatus and other instrumentation applications. All models available in SPDT and DPDT. Rated at 2 amps @ 230 VAC and 4 amps @ 115 VAC. "**G**" suffix indicates gold plated terminals.

Alcoswitch No. MSSA-	Description	Net Each, Lots of			
		1-24	26-49	50-99	100-249
104D	1 Pole, 2 Pos., upright	$1.95	$1.66	$1.56	$1.46
104D-1	1 Pole, 2 Pos., flush	1.95	1.66	1.56	1.46
104D-RA	1 Pole, 2 Pos., right ang.	2.05	1.74	1.64	1.54
101DG-WW	1 Pole, 1 Pos., wire wrap	2.30	1.96	1.84	1.73
104E	1 Pole, 2 Pos., upright	2.35	2.00	1.88	1.76
104E-1	1 Pole, 2 Pos., flush	2.35	2.00	1.88	1.76
104E-RA	1 Pole, 2 Pos., right ang.	2.45	2.08	1.96	1.84
101EG-WW	1 Pole, 2 Pos., wire wrap	2.70	2.30	2.16	2.03
204N	2 Pole, 2 Pos., upright	2.85	2.42	2.28	2.14
204N-1	2 Pole, 2 Pos., flush	2.85	2.42	2.28	2.14
204N-RA	2 Pole, 2 Pos., right ang.	3.00	2.55	2.40	2.25
201NG-WW	2 Pole, 2 Pos., wire wrap	3.55	3.02	2.84	2.66
204P	2 Pole, 2 Pos., upright	3.45	2.93	2.76	2.59
204P-1	2 Pole, 2 Pos., flush	3.45	2.93	2.76	2.59
204P-RA	2 Pole, 2 Pos., right ang.	3.60	3.06	2.88	2.70
201PG-WW	2 Pole, 2 Pos., wire wrap	4.15	3.53	3.32	3.11

GREEN SERIES

MLD SERIES ROCKER AND PADDLE SWITCHES

Miniature rocker or lever switches with 6 Amp current carrying capacity. Mounts without hardware with clips. Case material is high temperature DAP. Gold flash contacts and terminals. Actuators available in red, black, grey, green, blue, orange or yellow. Please specify.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MLD-106D	SPDT	On-none-on	$3.00	$2.55	$2.40	$2.25
MLD-106E	SPDT	On-off-on	3.55	3.02	2.84	2.66
MLD-106F	SPDT	On-none-(on)	3.65	3.10	2.92	2.74
MLD-206N	DPDT	On-none-on	3.95	3.36	3.16	2.96
MLD-206P	DPDT	On-off-on	4.55	3.87	3.64	3.41
MLD-206R	DPDT	On-none-(on)	4.65	3.95	3.72	3.49

-70 indicates rocker type; **-80** indicates lever type.

GREEN SERIES

MINIATURE ROCKERS AND PADDLES

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MRL-106D30/40	SPDT	On-none-on	$3.10	$2.64	$2.48	$2.33
MRL-106E30/40	SPDT	On-off-on	3.60	3.06	2.88	2.70
MRL-106F30/40	SPDT	On-none-on†	3.75	3.19	3.00	2.81
MRL-206N30/40	DPDT	On-none-on	4.00	3.40	3.20	3.00
MRL-206P30/40	DPDT	On-off-on	4.60	3.91	3.68	3.45
MRL-206R30/40	DPDT	On-none-on†	4.70	4.00	3.76	3.53
MRL-306D30/40	3PDT	On-none-on	6.45	5.48	5.16	4.84
MRL-406N30/40	4PDT	On-none-on	8.15	6.93	6.52	6.11

-30 denotes rocker type; **-40** denotes lever type.

GREEN SERIES

MHL MINIATURE ROCKER WITH MOUNTING BRACKET

Small rocker actuator mounted on basic MT Toggle Switch body.

MHL-106D(*)	SPDT	On-none-on	$3.10	$2.64	$2.48	$2.33
MHL-106F(*)	SPDT	On-none-on†	3.75	3.19	3.00	2.81
MHL-206N(*)	DPDT	On-none-on	4.00	3.40	3.20	3.00
MHL-206R(*)	DPDT	On-none-on†	4.70	4.00	3.76	3.53
MHL-306D(*)	3PDT	On-none-on	6.45	5.48	5.16	4.84
MHL-306F(*)	3PDT	On-none-on†	7.10	6.04	5.68	5.33
MHL-406N(*)	4PDT	On-none-on	8.15	6.93	6.52	6.11
MHL-406R(*)	4PDT	On-none-on†	8.90	7.57	7.12	6.68

†Indicates momentary position. * Specify color: **0**—Black; **2**—Red; **5**—Green; **6**—Blue; **8**—Gray; **9**—White.

Alcoswitch No.	Description	Net Each, Lots of			
		10 Min.	20-90	100-490	500-990
378	Lamp: 6.3 V, .2 A	$0.58	$0.52	$0.46	$0.43
362	Lamp: 14 V, .08 A	.58	.52	.46	.43
399	Lamp: 28 V, .04 A	.56	.50	.45	.41

ROCKER AND PADDLE SWITCHES

Compact miniature rocker and paddle switches mount without hardware. Snap-fit into cutouts in panels. Will carry loads up to 10 Amps at 125 VAC. Select from a wide assortment to suit your application. Special legends available on quantity orders.

SINGLE-POLE ROCKER—XR1 SERIES

Alcoswitch No.	Application	Net Each, Lots of			
		1-24	26-49	50-99	100-499
XR110A-	On-none-off	$1.60	$1.12	$0.85	$0.72
XR110D-	On-none-on	1.60	1.12	.85	.72
XR110E-	On-off-on	1.60	1.12	.85	.72
XR110F-	On-none-on*	1.90	1.33	1.01	.86

SINGLE-POLE PADDLE—XP1 SERIES

XP110A-	On-none-off	$1.60	$1.12	$0.85	$0.72
XP110D-	On-none-on	1.60	1.12	.85	.72
XP110E-	On-off-on	1.60	1.12	.85	.72
XP110F-	On-none-on*	1.90	1.33	1.01	.86

DOUBLE-POLE ROCKER—XR2 SERIES

XR210K	One-none-off	$2.75	$1.93	$1.46	$1.24
XR210N	On-none-on	2.75	1.93	1.46	1.24
XR210P	On-off-on	2.75	1.93	1.46	1.24
XR210R	On-none-on*	3.40	2.38	1.80	1.53

SINGLE-POLE LIGHTED ROCKER—XRL1 SERIES

XRL-110A-	On-none-off	$3.40	$2.38	$1.80	$1.53

SINGLE-POLE LIGHTED PADDLE—XPL1 SERIES

XPL-110A-	On-none-off	$3.40	$2.38	$1.80	$1.53

DOUBLE-POLE LIGHTED ROCKER—XRL2 SERIES

XRL-210A-	On-none-off	$3.75	$2.63	$1.99	$1.69
XRL-210D-	On-none-on	3.90	2.73	2.07	1.76
XRL-210F-	On-none-on*	4.25	2.98	2.25	1.91

*Momentary.

To identify the switch being ordered, it is necessary to specify colors by adding the appropriate code number suffix shown below:
00—Black body, Black actuator.
02—Black body, Red actuator.
09—Black body, White actuator.
90—White body, Black actuator.
92—White body, Red actuator.

For lighted models, add color code number:
04—Black body, Amber lens
99—White body, Clear lens
004—Black body, Black lever, Amber lens
024—Black body, Red lever, Amber lens
094—Black body, White lever, Amber lens
909—White body, Black lever, Clear lens
929—White body, Red lever, Clear lens

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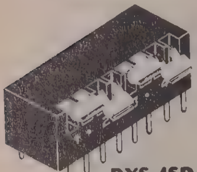
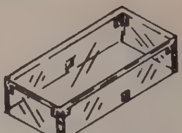
AUGAT® ALCOSWITCH®

DIP & KEYLOCK SWITCHES

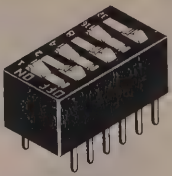
Quality and Innovation



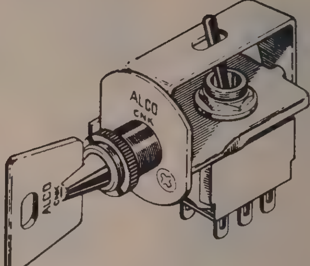
DYS-4SD



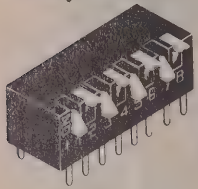
DSS-C



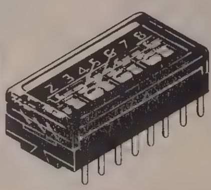
DBS-6



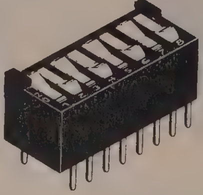
CNK



DYS-8



DLS-8



DSS-8

DIP SERIES DUAL IN-LINE MOUNTING

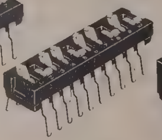
DIP switches provide high reliability at reasonable cost. All models are designed for soldering onto PC boards or may be optionally used with standard DIP sockets. Terminals and contacts are beryllium copper with gold plated over nickel to assure dependable service for low-energy level use. The low-profile DLS and DLS-SD models have molded-in terminals; all other types have epoxy sealed bases for protection during the soldering operation. The DLS and DLS-SD models are supplied with a protective cover having an "actuator lock" feature that prevents accidental operation and protects the inner mechanism during cleaning cycles. These covers are also available as an option for the DSS models.

Alco-switch No.	Type	Lever	Net Each, Lots of			
			1-24	26-49	50-99	100-249
DSS-4	4PST	Rocker	$3.25	$2.93	$2.76	$2.60
DSS-6	6PST	Rocker	3.70	3.33	3.15	2.96
DSS-7	7PST	Rocker	4.10	3.69	3.49	3.28
DSS-8	8PST	Rocker	4.36	3.92	3.71	3.49
DSS-10	10PST	Rocker	4.90	4.41	4.17	3.92
DSS-C*	Protective Cover		.15	.14	.13	.12
DLS-4	4PST	Slide	3.15	2.84	2.68	2.52
DLS-6	6PST	Slide	3.55	3.20	3.02	2.84
DLS-8	8PST	Slide	4.25	3.83	3.61	3.40
DLS-10	10PST	Slide	4.80	4.32	4.08	3.84
DYS-4	4PST	Piano	3.60	3.24	3.06	2.88
DYS-6	6PST	Piano	4.10	3.69	3.49	3.28
DYS-8	8PST	Piano	4.70	4.23	4.00	3.76
DYS-10	10PST	Piano	5.20	4.68	4.42	4.16
DYS-2SD	(2) N.O.-N.C.	Piano	3.85	3.47	3.27	3.08
DYS-3SD	(3) N.O.-N.C.	Piano	4.30	3.87	3.66	3.44
DYS-4SD	(4) N.O.-N.C.	Piano	5.05	4.55	4.29	4.04
DYS-5SD	(5) N.O.-N.C.	Piano	5.60	5.04	4.76	4.48

*Specify size: (4), (6), (7), (8) or (10).

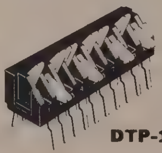
DIP SWITCHES FOR WAVE SOLDERING AND AUTO-CLEANING

DT-02



DT-10

DTP-02



DTP-10

No tape seal required—allows extended actuators. Self-cleaning design allows exposure to dirt and contaminants without failing. Contact Rating: 1 amp at 24 VDC without switching, 100 mA at 5 VDC with switching. Initial Contact Resistance: 30 milli-ohms, max. Operating Temperature Range: −30° C to +85° C. Life Expectancy: 10,000 cycles.

Alco-Switch No.	Type	Lever Type	Net Each, Lots of			
			1-99	100-499	500-999	1000 Up
DT-02	2PST	Top	$1.30	$1.04	$0.91	$0.85
DT-04	4PST	Top	1.45	1.16	1.02	.94
DT-06	6PST	Top	1.60	1.28	1.12	1.04
DT-08	8PST	Top	1.80	1.44	1.26	1.17
DT-10	10PST	Top	2.05	1.64	1.44	1.33
DTP-02	2PST	Side	1.75	1.40	1.23	1.14
DTP-04	4PST	Side	1.90	1.52	1.33	1.24
DTP-06	6PST	Side	2.05	1.64	1.44	1.33
DTP-08	8PST	Side	2.25	1.80	1.58	1.46
DTP-10	10PST	Side	2.50	2.00	1.75	1.63

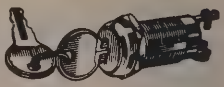
SAFETY KEYSWITCHES

Compact, high quality keyswitches for safety where unintentional switching could be hazardous. Keys removable from any position. Mount in ⅜" hole in panels up to ¼" thick. Anti-rotation device prevents movement after mounting. Available with 6 or 10 Amp switches.

Alcoswitch No.	Contacts	Action	Net Each, Lots of			
			1-24	26-49	50-99	100-249
CNK-106D	SPDT	On-none-on	$ 6.75	$ 5.74	$5.40	$5.06
CNK-106F	SPDT	On-none-on†	7.40	6.29	5.92	5.55
CNK-206N	DPDT	On-none-on	7.65	6.50	6.12	5.74
CNK-206R	DPDT	On-none-on†	8.35	7.10	6.68	6.26
CNK-306D	3PDT	On-none-on	10.10	8.59	8.08	7.58
CNK-406N	4PDT	On-none-on	11.85	10.07	9.48	8.89
CNK§	Keyswitch adapter unit		3.85	3.27	3.08	2.89
CNK-Key	Extra key for CNK		.80	.68	.64	.60
CNK-2-106D	SPDT	On-none-on	6.75	5.74	5.40	5.06
CNK-206N	DPDT	On-none-on	7.40	6.29	5.92	5.55
CNK-306D	3PDT	On-none-on	10.10	8.59	8.08	7.58
CNK-406N	4PDT	On-none-on	11.85	10.07	9.48	8.89
CNK-2§	Keyswitch adapter unit		3.95	3.36	3.16	2.96
CNK-2-Key	Extra key for CNK-2		.70	.60	.56	.53

†Momentary position.
§Net Each, Lots of: 1–9, 11-19, 20–99, 100–499.

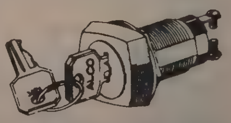
KEYLOCK SWITCH



Roller-type mechanical action with positive contact. Choice of 25 keys. Rated 5 A resistive, 115 VAC; 15 A. 24 VDC. Flatted ¾" diameters barrel fits panels to ¾" thick.

Alcoswitch No.	Description	Net Each, Lots of			
		1-9	11-19	20-99	100-499
SWK-12	SPST Off or On	$7.20	$6.48	$6.12	$5.54
SWK-12-1	SPST Off	7.20	6.48	6.12	5.54
SWK-12-3	SPST On	7.20	6.48	6.12	5.54
SWK-12K	Single key for SWK-12	1.15	1.09	1.01	.92
SWK-13-1	Rmv. key/Off Pos.	4.80	4.32	4.08	3.70
SWK-13-2	Rmv. key/Off or On Pos.	4.80	4.32	4.08	3.70
SWK-13-3	Rmv. key/On Pos.	4.80	4.32	4.08	3.70
SWK-23-1	Rmv. key/Off Pos. Mom.	5.00	4.50	4.25	3.85
SWK-23-3	Rmv. key/On Pos. Mom.	5.00	4.50	4.25	3.85
SWK-13K	Single key for SWK-13/-23	.80	.76	.70	.64

DESIGNER SERIES KEYLOCK SWITCHES



New SKF, SKM and SKT keylocks available with reed contacts as well as multipole options. Appealing square flange design plus built-in detent and square bow keys. Available in 1.0 VA, 3 amp or 4 amp ratings. A wide variety available; information on request.

Alcoswitch No.	Contacts	Action	Net Each, Lots of			
			1-9	11-19	20-99	100-249
SKF-13-1	SPST	Off-on	$5.00	$4.50	$4.25	$3.85
SKF-13-2	SPST	Off-on	5.00	4.50	4.25	3.85
SKF-13-3	SPST	On-off	5.00	4.50	4.25	3.85
SKF-23-1	SPST	Off-on†	5.20	4.68	4.42	4.00
SKF-23-3	SPST	On-on†	5.20	4.68	4.42	4.00

†Momentary position.

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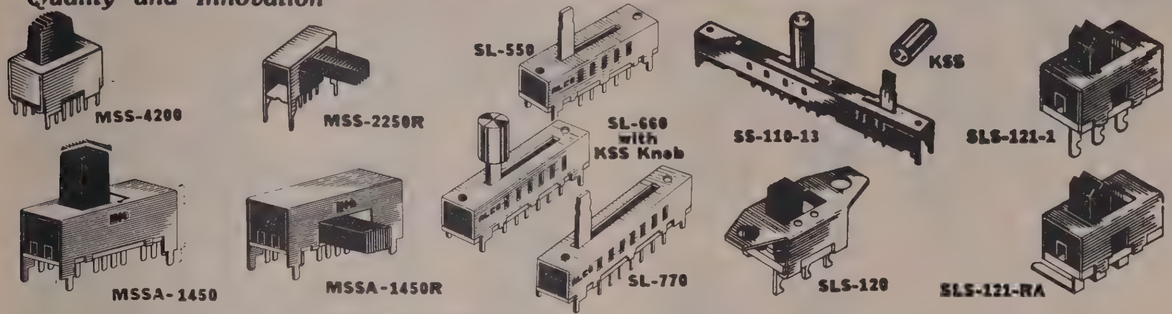
AUGAT® ALCOSWITCH®

Slide Switches

Quality and Innovation



MINIATURE PRINTED CIRCUIT SLIDE SWITCHES

Mount directly to PC board. Rated 300 mA, 125 VAC. Life, 15,000 cycles at rated load. Silver-plated contacts except where noted gold (gold-plated nickel); movable contacts beryllium plated brass. MSS-4300, -6200, and larger sizes, 4-40 screw holes; others tab.

Alco-switch No. MSS-	Con-tacts	Description	Net Each, Lots of 1-24	26-99	100-499	500-999
1200R	SPDT	Right angle	$0.95	$0.67	$0.57	$0.49
1200RG	SPDT	Right angle, gold	1.30	.91	.78	.68
1300	SP3T	Upright	1.00	.70	.60	.52
1300R	SP3T	Right angle	1.10	.77	.66	.57
1400	SP4T	Upright	1.10	.77	.66	.57
2200	DPDT	Upright	.95	.67	.57	.49
2200G	DPDT	Upright, gold	1.45	1.02	.87	.75
2220	DPDT	Upright, .197″ lever	.95	.67	.57	.49
2220G	DPDT	Upright, .197″ lever, gold	1.45	1.02	.87	.75
2225	DPDT	Upright, .250″ lever	.95	.67	.57	.49
2225G	DPDT	Upright, .250″ lever, gold	1.45	1.02	.87	.75
2250	DPDT	Upright, long lever	.95	.67	.57	.49
2250G	DPDT	Upright, long lever, gold	1.45	1.02	.87	.75
2250R	DPDT	Right angle, long lever	1.00	.70	.60	.52
2250RG	DPDT	Rt. angle, lg. lever, gold	1.50	1.05	.90	.78
4200	4PDT	Upright	1.10	.77	.66	.57
4200G	4PDT	Upright, gold	2.35	1.65	1.41	1.22
4250	4PDT	Upright, long lever	1.15	.81	.69	.60
4200R	4PDT	Right angle	1.35	.95	.81	.70
4200RG	4PDT	Right angle, gold	2.55	1.79	1.53	1.33
4300	4P3T	Upright	1.50	1.05	.90	.78
4300G	4P3T	Upright, gold	3.30	2.31	1.98	1.72
4335	4P3T	Upright, .365″ lever	1.60	1.12	.96	.83
4300R	4P3T	Right angle	1.70	1.19	1.02	.88
4300RG	4P3T	Right angle, gold	3.40	2.38	2.04	1.77
4350R	4P3T	Right angle, long lever	1.75	1.23	1.05	.91
4350RG	4P3T	Rt. angle. lg. lever, gold	3.45	2.42	2.07	1.79
6200	6PDT	Upright	1.50	1.05	.90	.78
6200G	6PDT	Upright, gold	4.10	2.87	2.46	2.13
6300	6P3T	Upright	1.80	1.26	1.08	.94
6300G	6P3T	Upright, gold	5.20	3.64	3.12	2.70
6350	6P3T	Upright, long lever	1.85	1.30	1.11	.96
6350R	6P3T	Right angle, long lever	1.90	1.33	1.14	.99
8300	8P3T	Upright	2.45	1.72	1.47	1.27
10300	10P3T	Upright	2.70	1.89	1.62	1.40
12300	12P3T	Upright	3.10	2.17	1.86	1.61

MSSA PC SLIDE SWITCHES

Expanded line of 1, 2, 3 and 4 pole PC mountable slide switches. Rated 300 mA at 125 VAC. Life Expectancy, 15,000 cycles at rated load. Available in vertical and right-angle models. Switches feature positive wiping and have "Make-Before-Break" action. Contacts are silver or gold plated.

MSSA-			1-24	26-49	50-99	100-249
1350	SP3T	Upright	$1.30	$1.04	$0.98	$0.88
1350G	SP3T	Upright, gold	1.95	1.56	1.46	1.33
1350R	SP3T	Right angle	1.40	1.12	1.05	.95
1350RG	SP3T	Right angle, gold	2.05	1.64	1.54	1.39
1450	SP4T	Upright	1.40	1.12	1.05	.95
1450G	SP4T	Upright, gold	2.05	1.64	1.54	1.39
1450R	SP4T	Right angle	1.50	1.20	1.13	1.02
1450RG	SP4T	Right angle, gold	2.15	1.72	1.61	1.46
2350	DP3T	Upright	1.50	1.20	1.13	1.02
2350G	DP3T	Upright, gold	2.80	2.24	2.10	1.90
2350R	DP3T	Right angle	1.60	1.28	1.20	1.09
2350RG	DP3T	Right angle, gold	2.90	2.32	2.18	1.97
2450	DP4T	Upright	1.65	1.32	1.24	1.12
2450G	DP4T	Upright, gold	2.95	2.36	2.21	2.01
2450R	DP4T	Right angle	1.75	1.40	1.31	1.19
2450RG	DP4T	Right angle, gold	3.05	2.44	2.29	2.07
3350	3P3T	Upright	1.80	1.44	1.35	1.22
3350G	3P3T	Upright, gold	3.75	3.00	2.81	2.55
3350R	3P3T	Right angle	1.90	1.52	1.42	1.29
3350RG	3P3T	Right angle, gold	3.85	3.08	2.89	2.62
3450	3P4T	Upright	1.95	1.56	1.46	1.33
3450G	3P4T	Upright, gold	3.90	3.12	2.93	2.65
3450R	3P4T	Right angle	2.05	1.64	1.54	1.39
3450RG	3P4T	Right angle, gold	4.00	3.20	3.00	2.72
4350	4P3T	Upright	1.95	1.56	1.46	1.33
4350G	4P3T	Upright, gold	4.55	3.64	3.41	3.09
4350R	4P3T	Right angle	2.05	1.64	1.54	1.39
4350RG	4P3T	Right angle, gold	4.65	3.72	3.49	3.16
4450	4P4T	Upright	2.15	1.72	1.61	1.46
4450G	4P4T	Upright, gold	4.75	3.80	3.56	3.23
4450R	4P4T	Right angle	2.25	1.80	1.69	1.53
4450RG	4P4T	Right angle, gold	4.85	3.88	3.64	3.30

SL SERIES MULTI-POSITION SLIDE SWITCH WITH PC TERMINALS

Designed specifically for PC applications. Save space, installation time and wiring errors. Substitute for rotary switches and other ideal uses. Feature a ball detent for positive tactile feel. Contacts are self-cleaning and terminals are sealed for added protection. Internal construction is similar to the MSS Series.

Alcoswitch No.	Type	Net Each, Lots of 1-24	26-99	100-499	500-999
SL-220	2 Positions	$1.30	$0.91	$0.78	$0.68
SL-330	3 Position	1.40	.98	.84	.73
SL-550	5 Position	1.65	1.16	.99	.86
SL-660	6 Position	1.85	1.30	1.11	.96
SL-770	7 Positions	2.00	1.40	1.20	1.04
SL-880	8 Positions	2.20	1.54	1.32	1.14

SS SERIES SLIDE SWITCHES

Designed for printed circuit boards. Offer operational versatility, high density, light weight, and a broad variety of control functions. Rated to carry 300 mA at 30 VDC. Make before break. Have silver contacts, sealed terminals. For use in matrix applications, adjustable voltage dividers, x-y positioning, and others.

Alcoswitch No.	Description	Net Each, Lots of 1-24	26-49	50-99	100-249
SS-110-13	Single pole, 10+3 pos.	$3.30	$2.64	$2.48	$2.24
SS-111	Single pole, 11 positions	2.65	2.12	1.99	1.80
SS-24	Double pole, 4 positions	1.80	1.44	1.35	1.22

KSS KNOBS

Alcoswitch No.	Description	Net Each, Lots of 1-24	26-49	50-99	100-499
KSS-1A	Natural, small, less hairline	$0.38	$0.36	$0.33	$0.32
KSS-1B	Black, small, less hairline	.38	.36	.33	.32
KSS-2A	Natural, large, less hairline	.38	.36	.33	.32
KSS-2B	Black, large less hairline	.38	.36	.33	.32
KSS-3A	Natural, large, double hairline	.43	.41	.38	.36
KSS-3B	Black, large, double hairline	.43	.41	.38	.36
KSS-20	Natural Aluminum	.32	.30	.28	.27

SLS BOBBIN CONTACT MINIATURE SLIDE SWITCHES

New family of SLS Bobbin Contact switches provide improved tactile feel. More positive detent. Rated 250 mA at 125 VAC; 150 mA at 12 VDC. Silver plated contacts and terminals.

Alcoswitch No.	Description	Net Each, Lots of 1-99	101-499	500-999
SLS-121-PC	SPDT, w/o tabs, w/PC terminals	$0.70	$0.53	$0.46
SLS-121-RA	SPDT, w/o tabs, w/right angle term.	.80	.60	.52
SLS-131-PC	SP3P, w/o tabs, w/PC terminals	.95	.71	.62
SLS-131-RA	SP3P, w/o tabs, w/right angle term.	1.10	.83	.72
SLS-141-PC	SP4P, w/o tabs, w/PC terminals	1.25	.94	.81
SLS-141-RA	SP4P, w/o tabs, w/right angle term.	1.35	1.01	.88
SLS-151-PC	SP5P, w/o tabs, w/PC terminals	1.50	1.13	.98
SLS-151-RA	SP5P, w/o tabs, w/right angle term.	1.60	1.20	1.04
SLS-121-1	SPDT, w/o tabs, w/PC terminals	.70	.53	.46
SLS-121	SPDT, w/tabs, panel mounted	.70	.53	.46

SLS MINIATURE SLIDE SWITCHES

Economical miniature slide switch, 5/16″ wide and approximately ¾″ long. Rated at 0.5 amps @ 125 VAC except 121M series, 0.3 amps @ 125 VAC; -130 and -240 series, .25 amps @ 125 VAC.

SLS-120	SPDT, w/Tabs	$0.65	$0.49	$0.42
SLS-120-1	SPDT, w/o Tabs	.65	.49	.42
SLS-220	DPDT, w/Tabs	.80	.60	.52
SLS-220-1	DPDT, w/o Tabs	.80	.60	.52
SLS-240-PC-A	DP4P, w/o Tabs, w/PC terminals	1.45	1.09	.94

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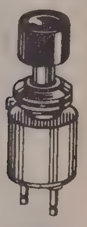
AUGAT® ALCOSWITCH®

PUSHBUTTON SWITCHES

Quality and Innovation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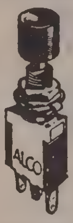
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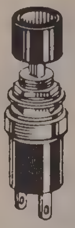
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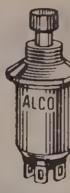
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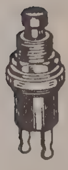
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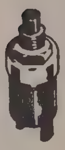
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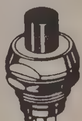
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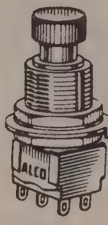
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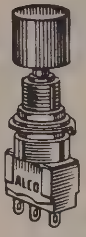
MPA-106

MSP SERIES MINIATURE PUSHBUTTON SWITCHES

MSP-105, MSP-205—Snap action. Rated 6 A, 125 VAC. Solid silver contacts and terminals. Bushing ¼"-40 with keyway. Black phenolic case. Life, 25,000 cycles. **MSP-103**—Economy, low pressure operation. Rated 1 A, 125 VAC. Silver-plated brass contacts and terminals. Plunger travel, .098". Bushing ¼"-40. Diameter .408". **MSPS-103C**—Similar to MSP-103, but smaller diameter, .310". Rated 0.5 A at 125 VAC.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	25-49	50-99	100-249
MSP-103B	SPST	N.C., (Black)	1.55	1.32	1.24	$1.16
MSP-103C-2	SPST	N.O., (Red)	1.65	1.40	1.32	1.24
MSP-103C	SPST	N.O., (Black)	1.55	1.32	1.24	1.16
MSP-103C-B	SPST	N.O., (Red)	1.55	1.32	1.24	1.16

Alcoswitch No.	Contacts	Application	Net Each, Lots of		
			1-99	100-499	500-999
MSP-105D	SPDT	Push on-off	$3.55	$2.80	$2.59
MSP-105F	SPDT	Momentary	3.55	2.80	2.59
MSP-205N	DPDT	Push on-off	4.60	3.63	3.36
MSP-205R	DPDT	Momentary	4.60	3.63	3.36
MSPS-103B	SPST	N.C., (Black)	.85	.67	.62
MSPS-103C	SPST	N.O., (Red)	.85	.67	.62
MSPS-103C-B	SPST	N.O., (Black)	.85	.67	.62

BUTTONS FOR MSP SERIES

Alcoswitch No.	Description	Net Each, Lots of			
		1-24	26-49	50-99	100-499
C-12	Plastic button	$0.25	$0.23	$0..21	$0.19
C-13	Large plastic button	.30	.27	.25	.23
C-14	Small chrome button	.25	.23	.21	.19
C-14L	Large chrome button	.30	.27	.25	.23

MPB SERIES MINIATURE PUSHBUTTON SWITCHES

MPB-103 miniature momentary pushbuttons have over-travel to provide 3 A @ 125 VAC rating. Normally open types have snap-on .395" dia. button; normally closed types have black button.

Alcoswitch No.	Contacts	Description	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MPB-103B	SPST	N.C.	$1.90	$1.62	$1.52	$1.43
MPB-103C	SPST	N.O.	1.90	1.62	1.52	1.43

MSPF SERIES MOMENTARY PUSHBUTTON

Series features large button and 15-32 body. Allows choice of front or rear panel mounting. Unique contact design allows self-leveling, assuring minimum contact resistance. All models have epoxy seals on terminals. Choice of button color.

Alcoswitch No.	Contacts	Description	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MSPF-101B	SPST	N.C. (Black)	$2.10	$1.79	$1.68	1.58
MSPF-101C	SPST	N.O. (Red)	2.10	1.79	1.68	1.58
MSPF-101BC	2 Ckt.	N.O./N.C.*	2.55	2.17	2.04	1.91

*Specify color: 0—Black; 2—Red; 6—Blue; 9—White.

MAGNETIC REED PUSHBUTTON SWITCHES

SPST momentary for data processing equipment; ceramic magnets eliminate springs. Contacts are glass-encapsulated reeds for long life; plunger is keyed and non-rotating; metal case withstands abuse. Rated 100 mA at 50 VDC; resistance, 100 milliohms. Contact bounce, 1 msec; plunger travel, ⁵⁄₆₄". Oper. force, 2 oz. Life, 10 million cycles.

Alcoswitch No.	Description	Net Each, Lots of				
		1-24	25-49	50-99	100-499	500-999
MSPM-101B*	NC; solder lugs	$5.65	$5.09	$4.80	$4.52	$4.24
MSPM-101B*	NO; solder lugs	5.65	5.09	4.80	4.52	4.24
MSPM-101BP*	NC; .110" terminal	5.80	5.22	4.93	4.64	4.35
MSPM-101BS*	NO; .110" terminal	5.45	4.91	4.63	4.36	4.09
MSPM-101BS-1*	Push-pull	5.45	4.91	4.63	4.36	4.09
MSPM-101C-1†	Push-pull	5.65	5.09	4.80	4.52	4.24
MSPM-101C†	NC; solder lug	5.65	5.09	4.80	4.52	4.24
MSPM-101CP†	NO; solder lug	5.80	5.22	4.93	4.64	4.35
MSPM-101CS†	NC; PC terminal	5.45	4.91	4.63	4.36	4.09
MSPM-101CS-1†	NO; PC terminal	5.45	4.91	4.63	4.36	4.09

*Supplied with C-22 black button. †Supplied with C-22 red button. MSPM Series also accept C23 cap.

GREEN SERIES

MUSTANG PUSHBUTTONS

¹⁵⁄₃₂" bushing with solder lug terminals. PC suffix for PC terminals.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MPG-106D	SPDT	Push on/off	$4.70	$4.00	$3.76	$3.53
MPG-106F	SPDT	Momentary	4.70	4.00	3.76	3.53
MPG-206N	DPDT	Push on/off	5.70	4.85	4.56	4.28
MPG-206R	DPDT	Momentary	5.70	4.85	4.56	4.28
MPG-306D	3PDT	Push on/off	7.30	6.21	5.84	5.48
MPG-306F	3PDT	Momentary	7.30	6.21	5.84	5.48
MPG-406N	4PDT	Push on/off	9.45	8.03	7.56	7.09
MPG-206N-PC	DPDT	Push on/off	5.85	4.97	4.68	4.39
MPG-206R-PC	DPDT	Momentary	5.85	4.97	4.68	4.39

Supplied with Black C-9 cap only.

SUBMINIATURE PUSHBUTTON SWITCHES

Subminiature pushbutton switch with one piece bushing and case construction. Current Rating: 3 amps @ 125 VAC D & F Series, 1 amp @ 125 VAC B & C Series. Supplied with black cap, C5.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	26-49	50-99	100-249
MPA-103B	SPST	N. C. Mom.	$1.80	$1.53	$1.44	$1.35
MPA-103C	SPST	N. O. Mom	1.80	1.53	1.44	1.35
MPA-103D	SPDT	Push on/off	3.20	2.72	2.56	2.40
MPA-103F	SPDT	Momentary	3.20	2.72	2.56	2.40
C-5	Small plastic cap blk, red, grn. or wht.		.11	.10	.09	.08
C-8	Large plastic cap blk, red, grn, or wht.		.12	.11	.10	.09

GREEN SERIES

MINIATURE PUSHBUTTONS

Supplied with black C-22 button.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-99	100-499	500-999	
MPA-106D	SPDT	Push on/off	$3.60	$2.84	$2.63	
MPA-106F	SPDT	Momentary	3.60	2.84	2.63	
MPA-206N	DPDT	Push on/off	4.65	3.67	3.39	
MPA-206R	DPDT	Momentary	4.65	3.67	3.39	
MPA-306D	3PDT	Push on/off	6.20	4.90	4.53	
MPA-306F	3PDT	Momentary	6.20	4.90	4.53	
MPA-406N	4PDT	Push on/off	8.35	6.60	6.10	
MPA-406R	4PDT	Momentary	8.35	6.60	6.10	
C-9	Colored cap—red, blue, pink, yel. or wht.		.15	.14	.13	.11

GREEN SERIES

MINIATURE WATERPROOF PUSHBUTTONS

"O" rings inside bushing and at panel.

Alcoswitch No.	Contacts	Application	Net Each, Lots of			
			1-24	26-49	50-99	100-499
MPE-106D	SPDT	Push on/off	$4.40	$3.74	$3.52	$3.30
MPE-106F	SPDT	Momentary	4.40	3.74	3.52	3.30
MPE-206N	DPDT	Push on/off	5.40	4.59	4.32	4.05
MPE-206R	DPDT	Momentary	5.40	4.59	4.32	4.05
MPE-306D	3PDT	Push on/off	6.95	5.91	5.56	5.21
MPE-306F	3PDT	Momentary	6.95	5.91	5.56	5.21
MPE-406N	4PDT	Push on/off	9.45	8.03	7.56	7.09
MPE-406R	4PDT	Momentary	9.45	8.03	7.56	7.09

PLASTIC BUTTONS FOR MPA AND MPE SERIES

Alcoswitch No.	Description	Net Each, Lots of			
		1-24	26-49	50-99	100-499
C-22†	Small button	$0.20	$0.18	$0.16	$0.15
C-23†	Large button	.25	.23	.20	.19
KG-22AB	Grooved, black top	$0.50	$0.46	$0.45	$0.43
KG-22AR	Grooved, red top	.50	.46	.45	.43
KG-22AG	Grooved, green top	.50	.46	.45	.43

†Specify Red, Black, Green, Blue, Orange or Ivory.

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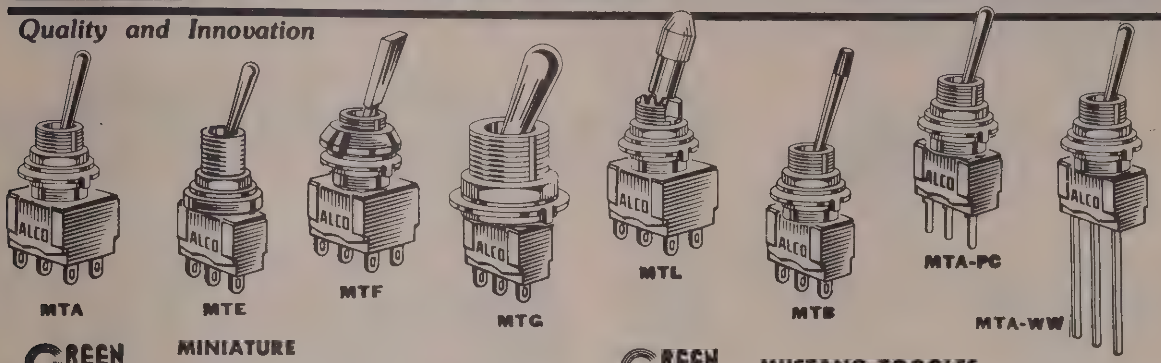
AUGAT® ALCOSWITCH®

SUBMINIATURE TOGGLE SWITCHES

Quality and Innovation



GREEN SERIES

MINIATURE TOGGLE SWITCHES

All ALCO Green Series miniature switches have molded-in terminals which prevent solder, flux and other contaminants from entering the contact area. All contacts are fine silver. Contacts and terminals have gold finish to inhibit oxidation, prolong shelf life, and facilitate soldering. Green diallyl phthalate case withstands high temperatures. All toggle types are U.L. listed and have anti-push-in lever captivation to prevent accidental damage. All types have ¼"-40 high torque bushings, except MTG series; MTG types have ¹⁵⁄₃₂"-32 bushings. Rated 6 amps at 125 VAC, 3 amps at 250 VAC.

GREEN SERIES

MINIATURE BAT HANDLE TOGGLES

Terminals accept two #20 AWG wires.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-99	100-499	500-999
MTA-106D	SPDTI	On-none-on	$2.45	$1.94	$1.79
MTA-106E	SPDT	On-off-on	3.00	2.37	2.19
MTA-106F	SPDT	On-none-on†	3.10	2.45	2.26
MTA-106G	SPDT	On†-off-on†	3.20	2.53	2.34
MTA-106H	SPDT	On-off-on†	3.20	2.53	2.34
MTA-206N	DPDT	On-none-on	3.35	2.65	2.45
MTA-206P	DPDT	On-off-on	3.95	3.12	2.88
MTA-206R	DPDT	On-none-on†	4.05	3.20	2.96
MTA-206S	DPDT	On†-off-on†	4.15	3.28	3.03
MTA-206T	DPDT	On-off-on†	4.15	3.28	3.03
MTA-206PA	DPDT	On-on-on	4.80	3.79	3.50
MTA-206SA	DPDT	On†-on-on†	5.00	3.95	3.65
MTA-206TA	DPDT	On-on-on†	5.00	3.95	3.65
MTA-306D	3PDT	On-none-on	5.80	4.58	4.23
MTA-306E	3PDT	On-off-on	6.30	4.98	4.60
MTA-306F	3PDT	On-none-on†	6.45	5.10	4.71
MTA-306H	3PDT	On-off-on†	6.55	5.17	4.78
MTA-406N	4PDT	On-none-on	7.50	5.93	5.48
MTA-406P	4PDT	On-off-on	8.05	6.36	5.88
MTA-406PA	4PDT	On-on-on	9.55	7.54	6.97

GREEN SERIES

MINIATURE WATERPROOF TOGGLES

Bat handle, "O" ring seals inside bushing and at panel. Solder lug terminals.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-24	26-49	50-99	100-249
MTE-106D	SPDT	On-none-on	$3.10	$2.64	$2.48	$2.33
MTE-106E	SPDT	On-off-on	3.60	3.06	2.88	2.70
MTE-106F	SPDT	On-none-on†	3.75	3.19	3.00	2.81
MTE-106G	SPDT	On†-off-on†	3.85	3.27	3.08	2.89
MTE-106H	SPDT	On-off-on†	3.85	3.27	3.08	2.89
MTE-206N	DPDT	On-none-on	4.00	3.40	3.20	3.00
MTE-206P	DPDT	On-off-on	4.60	3.91	3.68	3.45
MTE-206PA	DPDT‡	On-on-on	5.45	4.63	4.36	4.09
MTE-206R	DPDT	On-none-on†	4.70	4.00	3.76	3.53
MTE-206S	DPDT	On†-off-on†	4.80	4.08	3.84	3.60
MTE-206T	DPDT	On-off-on†	4.80	4.08	3.84	3.60
MTE-306D	3PDT	On-none-on	6.40	5.44	5.12	4.80
MTE-306E	3PDT	On-off-on	6.95	5.91	5.56	5.21
MTE-406N	4PDT	On-none-on	8.15	6.93	6.52	6.11
MTE-406P	4PDT	On-off-on	8.70	7.40	6.96	6.53

GREEN SERIES

MINIATURE FLAT HANDLE TOGGLES

Flat lever type has matte chrome finish. Solder lug terminals.

MTF-106D	SPDT	On-none-on	$3.25	$2.76	$2.60	$2.44
MTF-106E	SPDT	On-off-on	3.80	3.23	3.04	2.85
MTF-106F	SPDT	On-none-on†	3.90	3.32	3.12	2.93
MTF-106G	SPDT	On†-off-on†	4.00	3.40	3.20	3.00
MTF-106H	SPDT	On-off-on†	4.00	3.40	3.20	3.00
MTF-206N	DPDT	On-none-on	4.15	3.53	3.32	3.11
MTF-206P	DPDT	On-off-on	4.75	4.04	3.80	3.56
MTF-206R	DPDT	On-none-on†	4.85	4.12	3.88	3.64
MTF-206S	DPDT	On†-off-on†	5.00	4.25	4.00	3.75
MTF-206T	DPDT	On-off-on†	5.00	4.25	4.00	3.75
MTF-206PA	DPDT	On-on-on	5.60	4.76	4.48	4.20
MTF-106SA	DPDT	On†-on-on†	5.85	4.97	4.68	4.39
MTF-306D	3PDT	On-none-on	6.60	5.61	5.28	4.95
MTF-406N	4PDT	On-none-on	8.30	7.06	6.64	6.23

†Indicates momentary position.

GREEN SERIES

MUSTANG TOGGLES

¹⁵⁄₃₂" bushing, solder lug terminals.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-24	26-49	50-99	100-249
MTG-106D	SPDT	On-none-on	$3.50	$2.98	$2.80	$2.63
MTG-106E	SPDT	On-off-on	4.05	3.44	3.24	3.04
MTG-106F	SPDT	On-none-on†	4.15	3.53	3.32	3.11
MTG-106G	SPDT	On†-off-on†	4.25	3.61	3.40	3.19
MTG-106H	SPDT	On-off-on†	4.25	3.61	3.40	3.19
MTG-206N	DPDT	On-none-on	4.45	3.78	3.56	3.34
MTG-206P	DPDT	On-off-on	5.00	4.25	4.00	3.75
MTG-206R	DPDT	On-none-on†	5.15	4.38	4.12	3.86
MTG-206S	DPDT	On†-off-on†	5.25	4.46	4.20	3.94
MTG-206PA	DPDT‡	On-on-on	5.90	5.02	4.72	4.43
MTG-206N-PC	DPDT	On-none-on	4.55	3.87	3.64	3.41
MTG-306D	3PDT	On-none-on	6.85	5.82	5.48	5.14
MTG-306E	3PDT	On-off-on	7.40	6.29	5.92	5.55
MTG-406N	4PDT	On-none-on	8.60	7.31	6.88	6.45
MTG-406P	4PDT	On-off-on	9.15	7.78	7.32	6.86

GREEN SERIES

MINIATURE LOCKING TOGGLES

Lever lock toggle must be pulled out to operate. Solder lug terminals.

MTL-106D	SPDT	On-none-on	$ 4.20	$3.57	$3.36	$3.15
MTL-106E	SPDT	On-off-on†	4.75	4.04	3.80	3.56
MTL-206N	DPDT	On-none-on	5.15	4.38	4.12	3.86
MTL-206P	DPDT	On-off-on	5.70	4.85	4.56	4.28
MTL-206PA	DPDT‡	On-on-on	6.60	5.61	5.28	4.95
MTL-206S	DPDT	On†-off-on†	5.95	5.06	4.76	4.46
MTL-306D	3PDT	On-none-on	7.55	6.42	6.04	5.66
MTL-406N	4PDT	On-none-on	9.30	7.91	7.44	6.98
MTL-406PA	4P3T	On-on-on	11.35	9.65	9.08	8.51

†Momentary positions. ‡Usable as SP3T; wiring on request.

GREEN SERIES

MINIATURE BATON LEVER TOGGLES

Stylish 0.6" long baton having black plastic tip. Solder lug terminals.

MTB-106D	SPDT	On-none-on	$2.60	$2.21	$2.08	$1.95
MTB-106E	SPDT	On-off-on	3.15	2.68	2.52	2.36
MTB-106F	SPDT	On-none-on†	3.25	2.76	2.60	2.44
MTB-106G	SPDT	On†-off-on†	3.35	2.85	2.68	2.51
MTB-206N	DPDT	On-none-on	3.50	2.98	2.80	2.63
MTB-206P	DPDT	On-off-on	4.10	3.49	3.28	3.08
MTB-206T	DPDT	On-off-on†	4.30	3.66	3.44	3.23
MTB-306D	3PDT	On-none-on	5.95	5.06	4.76	4.46
MTB-406N	4PDT	On-none-on	7.65	6.50	6.12	5.74

GREEN SERIES

MINIATURE TOGGLE SWITCHES WITH PC/AND WIRE WRAP TERMINALS

PC terminals are 0.250" long; WW types have 0.031" x 0.050" x 0.740" long terminals.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-99	100-499	500-999
MTA-106D-PC	SPDT	On-none-on	$2.50	$1.98	$1.83
MTA-106E-PC	SPDT	On-off-on	3.00	2.37	2.19
MTA-106F-PC	SPDT	On-none-on†	3.15	2.49	2.30
MTA-106G-PC	SPDT	On†-off-on†	3.25	2.57	2.37
MTA-106H-PC	SPDT	On-off-on†	3.25	2.57	2.37
MTA-206N-PC	DPDT	On-none-on	3.45	2.73	2.52
MTA-206P-PC	DPDT	On-off-on	4.05	3.20	2.96
MTA-206R-PC	DPDT	On-none-on†	4.15	3.28	3.03
MTA-206S-PC	DPDT	On†-off-on†	4.25	3.36	3.10
MTA-206T-PC	DPDT	On-off-on†	4.25	3.36	3.10
MTA-206PA-PC	DPDT	On-on-on	4.90	3.87	3.58
MTA-306D-PC	3PDT	On-none-on	5.95	4.70	4.34
MTA-306E-PC	3PDT	On-off-on	6.50	5.14	4.75
MTA-306F-PC	3PDT	On-none-on†	6.60	5.21	4.82
MTA-306H-PC	3PDT	On-off-on†	6.70	5.29	4.89
MTA-406N-PC	4PDT	On-none-on	7.70	6.08	5.62
MTA-406P-PC	4PDT	On-off-on	8.25	6.52	6.02
MTA-406PA-PC	4PDT	On-on-on	9.75	7.70	7.12
MTA-106D-WW	SPDT	On-none-on	2.75	2.17	2.01
MTA-106E-WW	SPDT	On-off-on	3.30	2.61	2.41
MTA-206N-WW	DPDT	On-none-on	4.00	3.16	2.92
MTA-206P-WW	DPDT	On-off-on	4.60	3.63	3.36
MTA-306D-WW	3PDT	On-none-on	6.75	5.33	4.93
MTA-406N-WW	4PDT	On-none-on	8.80	6.95	6.42

*With white cap. †Momentary positions. ‡Usable as SP3T; wiring on request. §Rocker. IUL Listed E46765.

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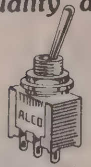
AUGAT® ALCOSWITCH®

Quality and Innovation

TT & TSS PC MOUNTABLES



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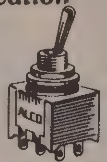

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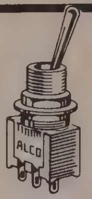

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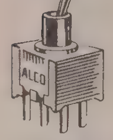

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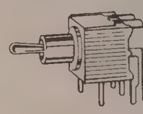

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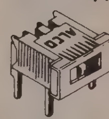

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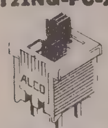

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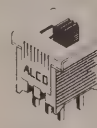

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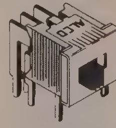

TSS21NG-RA

SERIES TT AND TTE 3A SUBMINIATURE TOGGLE SWITCHES WITH LUG TERMINALS

Series TT and **TTE** subminiature toggle switches with silver contacts; rated 3 A @ 125 VAC or 28 VDC; gold flashed solder lug terminals. Choice of ¼-40 or 10-48 threaded bushings. These tiny instrument grade toggle switches can be mounted only ⅜″ apart on panel. Uniform 0.1″ spacing between all terminals and mounting studs permits mounting on standard "perf" boards. **TTE** models have watertight bushings and panel seals.

Alcoswitch No.	Contacts	Description	Net Each, Lots of 1-24	26-49	50-99	100-249
TT13A-2T	SPST	On-none-off	$2.30	$1.96	$1.84	$1.73
TT13D-2T	SPDT	On-none-on	2.15	1.83	1.72	1.61
TT13E-2T	SPDT	On-off-on	2.70	2.30	2.16	2.03
TT23K-2T	DPST	On-none-off	3.40	2.89	2.72	2.55
TT23N-2T	DPDT	On-none-on	3.10	2.64	2.48	2.33
TT13P-2T	DPDT	On-off-on	3.70	3.15	2.96	2.78
TT13A-3T	SPST	On-none-off	2.30	1.96	1.84	1.73
TT13D-3T	SPDT	On-none-on	2.15	1.83	1.72	1.61
TT13E-3T	SPDT	On-off-on	2.70	2.30	2.16	2.03
TT23K-3T	DPST	On-none-off	3.40	2.89	2.72	2.55
TT23N-3T	DPDT	On-none-on	3.10	2.64	2.48	2.33
TT23N-3T	DPDT	On-off-on	3.70	3.15	2.96	2.78
TT23PA-3T	DPDT	On-on-on	3.90	3.32	3.12	2.93
TT13A-4T	SPST	On-none-off	2.75	2.34	2.20	2.06
TT13D4T	SPDT	On-none-on	2.40	2.04	1.92	1.80
TT13E-4T	SPDT	On-off-on	2.95	2.51	2.36	2.21
TT23K-4T	DPST	On-none-off	3.70	3.15	2.96	2.78
TT23N-4T	DPDT	On-none-on	3.35	2.85	2.68	2.51
TT23P-4T	DPDT	On-off-on	3.95	3.36	3.16	2.96
TT23PA-4T	DPDT	On-on-on	4.15	3.53	3.32	3.11
TT13A-4T¼ †	SPST	On-none-off	2.55	2.17	2.04	1.91
TT13D-4T¼ †	SPDT	On-none-on	2.55	2.17	2.04	1.91
TT13E-4T¼ †	SPDT	On-off-on	3.10	2.64	2.48	2.33
TT23K-4T¼ †	DPST	On-none-off	3.85	3.27	3.08	2.89
TT23N-4T¼ †	DPDT	On-none-on	3.50	2.98	2.80	2.63
TT23P-4T¼ †	DPDT	On-off-on	4.10	3.49	3.28	3.08
TT13A-6T	SPST	On-none-off	2.65	2.25	2.12	1.99
TT13D-6T	SPDT	On-none-on	2.45	2.08	1.96	1.84
TT13E-6T	SPDT	On-off-on	3.00	2.55	2.40	2.25
TT23K-6T	DPST	On-none-off	3.75	3.19	3.00	2.81
TT23N-6T	DPDT	On-none-on	3.40	2.89	2.72	2.55
TT23P-6T	DPDT	On-off-on	4.00	3.40	3.20	3.00
TT23PA-6T	DPDT	On-on-on	4.20	3.57	3.36	3.15
TT13A-6T¼ †	SPST	On-none-off	2.70	2.30	2.16	2.03
TT13D-6T¼ †	SPDT	On-none-on	2.50	2.13	2.00	1.88
TT13E-6T¼ †	SPDT	On-off-on	3.05	2.59	2.44	2.29
TT23K-6T¼ †	DPST	On-none-off	3.80	3.23	3.04	2.85
TT23N-6T¼ †	DPDT	On-none-on	3.45	2.93	2.76	2.59
TT23P-6T¼ †	DPDT	On-off-on	4.05	3.44	3.24	3.04
TT23PA-6T¼ †	DPDT	On-on-on	4.25	3.61	3.40	3.19
TTE13D-9T¼ †	SPDT	On-none-on	3.10	2.64	2.48	2.33
TTE13E-9T¼ †	SPDT	On-off-on	3.60	3.06	2.88	2.70
TTE23N-9T¼ †	DPDT	On-none-on	4.05	3.44	3.24	3.04
TTE23P-9T¼ †	DPDT	On-off-on	4.60	3.91	3.68	3.45
TT13A-0T¼ †	SPST	On-none-off	2.45	2.08	1.96	1.84
TT13D-9T¼ †	SPDT	On-none-on	2.30	1.96	1.84	1.73
TT13E-9T¼ †	SPDT	On-off-on	2.85	2.42	2.28	2.14
TT23K-9T¼ †	DPST	On-none-off	3.55	3.02	2.84	2.66
TT23N-9T¼ †	DPDT	On-none-on	3.25	2.76	2.60	2.44
TT23P-9T¼ †	DPDT	On-off-on	3.85	3.27	3.08	2.89
TT23PA-9T¼ †	DPDT	On-on-on	4.05	3.44	3.24	3.04

†¼-40 threaded bushing. §10-48 threaded bushing.

SERIES TSS SUBMINIATURE SLIDE SWITCHES WITH PC OR RIGHT ANGLE PC TERMINALS

Instrument grade subminiature slide switches; gold plated terminals, spaced for 0.1″ PC grids. Choice of 0.11″ extended or flush actuators. **-PC** types have straight PC terminals; **-RA** types, right-angle PC terminals. 1 or 2 actuators optional on double pole versions.

Alcoswitch No.	Contacts	Description	Net Each, Lots of 1-24	26-49	50-99	100-249
TSS11AG-PC	SPST	On-none-off	$2.75	$2.34	$2.20	$2.06
TSS11DG-PC	SPDT	On-none-on	2.50	2.13	2.00	1.88
TSS11EG-PC	SPDT	On-off-on	2.95	2.51	2.36	2.21
TSS11KG-PC	DPST	On-none-off	4.00	3.40	3.20	3.00
TSS11NG-PC	DPDT	On-none-on	3.60	3.06	2.88	2.70
TSS11PG-PC	DPDT	On-off-on	4.25	3.61	3.40	3.19
TSS11PAG-PC	DPDT	On-on-on	4.65	3.95	3.72	3.49
TSS11AG-1-PC	SPST	On-none-off	2.75	2.34	2.20	2.06
TSS11DG-1-PC	SPDT	On-none-on	2.50	2.13	2.00	1.88
TSS11EG-1-PC	SPDT	On-off-on	2.95	2.51	2.36	2.21
TSS11KG-1-PC	DPST	On-none-off	4.00	3.40	3.20	3.00
TSS11NG-1-PC	DPDT	On-none-on	3.60	3.06	2.88	2.70
TSS11PG-1-PC	DPDT	On-off-on	4.25	3.61	3.40	3.19
TSS11PAG-1-PC	DPDT	On-on-on	4.65	3.95	3.72	3.49
TSD21AAG-PC	2XSPST	On-none-off	4.40	3.74	3.52	3.30
TSD21DDG-PC	2XSPDT	On-none-on	4.00	3.40	3.20	3.00
TSD21EEG-PC	2XSPDT	On-off-on	4.85	4.12	3.88	3.64
TSD21AAG-1-PC	2XSPST	On-none-off	4.40	3.74	3.52	3.30
TSD21DDG-1-PC	2XSPDT	On-none-on	4.00	3.40	3.20	3.00
TSD21EEG-1-PC	2XSPDT	On-off-on	4.85	4.12	3.88	3.64
TSS11DG-RA	SPDT	On-none-on	2.80	2.38	2.24	2.10
TSS11EG-RA	SPDT	On-off-on	3.20	2.72	2.56	2.40
TSS21NG-RA	DPDT	On-none-on	4.35	3.70	3.48	3.26
TSS21PG-RA	DPDT	On-off-on	5.00	4.25	4.00	3.75
TSS21PAG-RA	DPDT	On-on-on	5.40	4.59	4.32	4.05
TSS11DG-1-RA	SPDT	On-none-on	2.80	2.38	2.24	2.10
TSS11EG-1-RA	SPDT	On-off-on	3.20	2.72	2.56	2.40
TSS21NG-1-RA	DPDT	On-none-on	4.35	3.70	3.48	3.26
TSS21PG-1-RA	DPDT	On-off-on	5.00	4.25	4.00	3.75
TSS21PAG-1-RA	DPDT	On-on-on	5.40	4.59	4.32	4.05
TSD21DDG-RA	2XSPDT	On-none-on	4.75	4.04	3.80	3.56
TSD21EEG-RA	2XSPDT	On-off-on	5.65	4.80	4.52	4.24
TSD21DDG-RA	2XSPDT	On-none-on	4.75	4.04	3.80	3.56
TSD21EEG-RA	2XSPDT	On-off-on	5.65	4.80	4.52	4.24

SERIES TT SUBMINIATURE TOGGLE SWITCHES WITH PC AND RIGHT ANGLE PC TERMINALS

"World's Smallest" PC mounted toggle switches; gold plated contacts. Terminals spaced for 0.1″ PC grids. Available with short 0.210″ long toggle and unthreaded 0.186″ bushing or 0.413″ long toggle and ¼-40 threaded bushing. **-PC** types have upright PC terminals; **-RA** types, right-angle PC terminals; **-WW** types, 0.590″ extended PC terminals.

TT11AG-PC-1	SPST	On-none-off	$2.20	$1.87	$1.76	$1.65
TT11DG-PC-1	SPDT	On-none-on	2.05	1.74	1.64	1.54
TT11EG-PC-1	SPDT	On-off-on	2.55	2.17	2.04	1.91
TT21KG-PC-1	DPST	On-none-off	3.30	2.81	2.64	2.48
TT21NG-PC-1	DPDT	On-none-on	3.00	2.55	2.40	2.25
TT21PG-PC-1	DPDT	On-off-on	3.55	3.02	2.84	2.66
TT21PAG-PC-1	DPDT	On-on-on	3.80	3.23	3.04	2.85
TT11AG-PC-9T¼ †	SPST	On-none-off	2.45	2.08	1.96	1.84
TT11DG-PC-9T¼ †	SPDT	On-none-on	2.30	1.96	1.84	1.73
TT11EG-PC-9T¼ †	SPDT	On-off-on	2.85	2.42	2.28	2.14
TT21KG-PC-9T¼ †	DPST	On-none-off	3.55	3.02	2.84	2.66
TT21NG-PC-9T¼ †	DPDT	On-none-on	3.25	2.76	2.60	2.44
TT21PG-PC-9T¼ †	DPDT	On-off-on	3.85	3.27	3.08	2.89
TT21PAG-PC-9T¼ †	DPDT	On-on-on	4.05	3.44	3.24	3.04
TT11DG-WW-2T §	SPDT	On-none-on	2.50	2.13	2.00	1.88
TT11EG-WW-2T §	SPDT	On-off-on	3.05	2.59	2.44	2.29
TT21NG-WW-2T §	DPDT	On-none-on	3.85	3.27	3.08	2.89
TT21PG-WW-2T §	DPDT	On-off-on	4.40	3.74	3.52	3.30
TT11DG-RA-1 *	SPDT	On-none-on	2.35	2.00	1.88	1.76
TT11EG-RA-1 *	SPDT	On-off-on	2.90	2.47	2.32	2.18
TT21NG-RA-1 *	DPDT	On-none-on	3.80	3.23	3.04	2.85
TT21PG-RA-1 *	DPDT	On-off-on	4.35	3.70	3.48	3.26
TT21PAG-RA-1 *	DPDT	On-on-on	4.55	3.87	3.64	3.41
TT11DG-RA-9T¼ †	SPDT	On-none-on	2.65	2.25	2.12	1.99
TT11EG-RA-9T¼ †	SPDT	On-off-on	3.15	2.68	2.52	2.36
TT21NG-RA-9T¼ †	DPDT	On-none-on	4.05	3.44	3.24	3.04
TT21PG-RA-9T¼ †	DPDT	On-off-on	4.60	3.91	3.68	3.45
TT21PAG-RA-9T¼	DPDT	On-on-on	4.85	4.12	3.88	3.64
TT11DG-VRA-1*	SPDT	On-none-on	2.50	2.13	2.00	1.88
TT11EG-VRA-1*	SPDT	On-off-on	3.05	2.59	2.44	2.29
TT21NG-VRA-1*	DPDT	On-none-on	3.95	3.36	3.16	2.96
TT21PG-VRA-1*	DPDT	On-off-on	4.50	3.83	3.60	3.38
TT11AG-PC-9T¼-ES †	SPST	On-none-off	3.10	2.64	2.48	2.33
TT11DG-PC-9T¼-ES †	SPDT	On-none-on	2.95	2.51	2.36	2.21
TT11EG-PC-9T¼-ES †	SPDT	On-off-on	3.45	2.93	2.76	2.59
TT21KG-PC-9T¼-ES †	DPST	On-none-off	4.30	3.66	3.44	3.23
TT21NG-PC-9T¼-ES †	DPDT	On-none-on	4.00	3.40	3.20	3.00
TT21PG-PC-9T¼-ES †	DPDT	On-off-on	4.55	3.87	3.64	3.41
TT21PAG-PC-9T¼-ES †	DPDT	On-on-on	4.80	4.08	3.84	3.60

*.186 dia. unthreaded bushing. †¼-40 threaded bushing. §10-48 threaded bushing.

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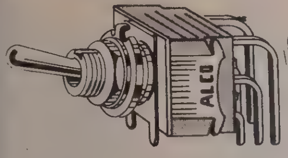
AUGAT® ALCOSWITCH® SUBMINIATURE TOGGLE & ROCKER SWITCHES

Quality and Innovation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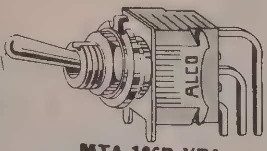
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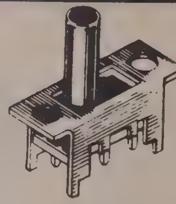
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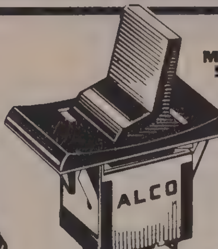
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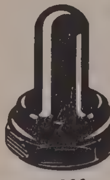
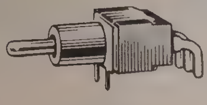
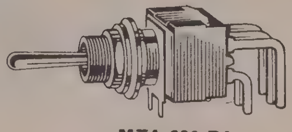
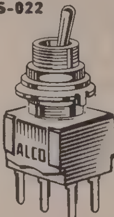
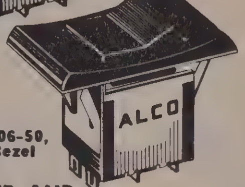

B-226


MTM-RA-SPDT


MTA-206-RA


MTM-PC


MDS-206-50, SFL Bezel

GREEN SERIES

MINIATURE SHORT LEVER TOGGLE

0.27″ long toggle. PC terminals and ¼-40 threaded bushing.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-24	26-49	50-99	100-249
MTM-106D-PC	SPDT	On-none-on	$2.50	$2.13	$2.00	$1.88
MTM-106E-PC	SPDT	On-off-on	3.00	2.55	2.40	2.25
MTM-206N-PC	DPDT	On-none-on	3.45	2.93	2.76	2.59
MTM-206P-PC	DPDT	On-off-on	4.05	3.44	3.24	3.04
MTM-206PA-PC	DPDT‡	On-on-on	4.90	4.17	3.92	3.68
MTM-306D-PC	3PDT	On-none-on	5.95	5.06	4.76	4.46
MTM-406N-PC	4PDT	On-none-on	7.70	6.55	6.16	5.78

†Momentary positions. ‡Usable as SP3T; wiring on request.

GREEN SERIES

MINIATURE RIGHT-ANGLE SWITCHES WITH PC TERMINALS

MTM-RA types have 0.27″ long toggle and unthreaded bushing. **MTA-RA** and **MTA-VRA** types have 0.41″ long toggle and ¼-40 threaded bushing. All three types have right-angle PC terminals.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-24	26-49	50-99	100-249
MTM-106D-RA	SPDT	On-none-on	$3.10	$2.64	$2.48	$2.33
MTM-106E-RA	SPDT	On-off-on	3.60	3.06	2.88	2.70
MTM-106F-RA	SPDT	On-none-on†	3.75	3.19	3.00	2.81
MTM-206N-RA	DPDT	On-none-on	4.60	3.91	3.68	3.45
MTM-206P-RA	DPDT	On-off-on	5.20	4.42	4.16	3.90
MTM-206R-RA	DPDT	On-none-on†	5.30	4.51	4.24	3.98
MTM-106D-VRA	SPDT	On-none-on	3.10	2.64	2.48	2.33
MTM-106E-VRA	SPDT	On-off-on	3.60	3.06	2.88	2.70
MTM-106F-VRA	SPDT	On-none-on†	3.75	3.19	3.00	2.81
MTM-206N-VRA	DPDT	On-none-on	4.60	3.91	3.68	3.45
MTM-206P-VRA	DPDT	On-off-on	5.20	4.42	4.16	3.90
MTM-206R-VRA	DPDT	On-none-on†	5.30	4.51	4.24	3.98

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-99	100-499	500-999
MTA-106D-RA	SPDT	On-none-on	3.00	2.37	2.19
MTA-106E-RA	SPDT	On-off-on	3.55	2.80	2.59
MTA-106F-RA	SPDT	On-none-on†	3.65	2.88	2.66
MTA-206N-RA	DPDT	On-none-on	4.55	3.59	3.32
MTA-206P-RA	DPDT	On-off-on	5.15	4.07	3.76
MTA-206R-RA	DPDT	On-none-on†	5.25	4.15	3.83
MTA-106D-VRA	SPDT	On-none-on	3.00	2.37	2.19
MTA-106E-VRA	SPDT	On-off-on	3.55	2.80	2.59
MTA-106F-VRA	SPDT	On-none-on†	3.65	2.88	2.66
MTA-206N-VRA	DPDT	On-none-on	4.55	3.59	3.32
MTA-206P-VRA	DPDT	On-off-on	5.15	4.07	3.76
MTA-206R-VRA	DPDT	On-none-on†	5.25	4.15	3.83

†Momentary positions. Color caps available. Specify model and color. See Hardware.

SPLASHPROOF SEALS

Seals are made for toggle and pushbutton switching applications. They protect against contaminants such as dirt, gas and liquids. Flexible neoprene is black with choice of black or nickel mount.

Alcoswitch No.	Mount Color	Size	Net Each, Lots of 1-24	26-49	50-99	100-249
B-1048	Black	10-48 Toggle	$1.15	$1.06	$0.98	$0.91
B-210	Nickel	¼-40 Toggle	1.35	1.24	1.15	1.07
B-221	Black	¼-40 Toggle	1.35	1.24	1.15	1.07
B-1440	Black	¼-40 Toggle	1.25	1.15	1.06	.99
B-588	Nickel	15/32-32 Toggle	1.45	1.33	1.23	1.15
B-226	Black	15/32-32 Toggle	1.45	1.33	1.23	1.15
B-1532	Black	15/32-32 Toggle	1.35	1.24	1.15	1.07
BP-1048	Black	10-48 Pushbutton	1.20	1.10	1.02	.95
BP-190	Nickel	¼-40 Pushbutton	1.35	1.24	1.15	1.07
BP-201	Black	¼-40 Pushbutton	1.35	1.24	1.15	1.07
BP-1440	Black	¼-40 Pushbutton	1.25	1.15	1.06	.99
BP-589	Nickel	15/32-32 Pushbutton	1.45	1.33	1.23	1.15
BP-590	Black	15/32-32 Pushbutton	1.45	1.33	1.23	1.15
BP-1532	Black	15/32-32 Pushbutton	1.45	1.33	1.23	1.15

MINIATURE ROCKER AND PADDLE WITH SNAP-IN MOUNTING

Designed to snap into a rectangular panel cutout. No mounting hardware is required. Mod-styled levers are accentuated by use of attractive mating bezels. Choice of colors available. Features same as MST Series.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-24	26-49	50-99	100-249
MDS-106D	SPDT	On-none-on	$3.00	$2.55	$2.40	$2.25
MDS-106E	SPDT	On-off-on	3.55	3.02	2.84	2.66
MDS-106F	SPDT	On-none-on†	3.70	3.15	2.96	2.78
MDS-206N	DPDT	On-none-on	3.95	3.36	3.16	2.96
MDS-206P	DPDT	On-off-on	4.55	3.87	3.64	3.41
MDS-206R	DPDT	On-none-on†	4.65	3.95	3.72	3.49

*Specify color: (0)—Black; (2)—Red; (8)—Gray; (9)—White. †Momentary position.

CST SERIES TOGGLE SWITCHES

Low-cost baton lever toggles. DPDT, 3 mA at 125 VAC.

Alcoswitch No.	Description	Net Each, Lots of 1-24	26-49	50-99	100-249
CST-022	DPDT	$1.40	$1.19	$1.12	$1.05
CST-022-1	DPDT	1.40	1.19	1.12	1.05
CST-022N	DPDT	1.50	1.28	1.20	1.13
CST-022S	DPDT	1.50	1.28	1.20	1.13
CST-022RN	DPDT	1.60	1.36	1.28	1.20
CST-023N	DP3T	1.65	1.40	1.32	1.24
CST-023SA	DP3T	1.70	1.45	1.36	1.28
CST-023TA	DP3T	1.70	1.45	1.36	1.28
CST-042N	4PDT	1.90	1.62	1.52	1.43
CST-042S	4PDT	1.95	1.66	1.56	1.46
CST-042RS	4PDT	1.90	1.62	1.52	1.43
CST-043N	4P3T	2.00	1.70	1.60	1.50
CST-043SA	4P3T	2.05	1.74	1.64	1.54
CST-043TA	4P3T	2.10	1.79	1.68	1.58
CST-062N	6P2T	2.30	1.96	1.84	1.73
CST-062S	6P2T	2.30	1.96	1.84	1.73

MST MINIATURE TOGGLE SWITCHES

Slim, bat handle toggle switches for miniature applications with limited back-of-panel clearance. Terminals and contacts are solid silver (center terminal, copper with silver plate). Case material, black phenolic resin; ¼-40 threaded bushing. Rated 6 amps at 125 VAC. Offering high capacity for small size, SPDT and DPDT types have life cycle of over 80,000 on-off operations; 3PDT and 4PDT, over 20,000. High voltage barriers between terminals and contacts; 1 piece body.

Alcoswitch No.	Contacts	Application	Net Each, Lots of 1-99	100-499	500-999
MST-105D	SPDT‡	On-none-on	$2.30	$1.82	$1.68
MST-105E	SPDT	On-off-on	3.00	2.37	2.19
MST-105F	SPDT	None-on-on†	3.10	2.45	2.26
MST-105G	SPDT	On†-off-on†	3.20	2.53	2.34
MST-105H	SPDT	On-off-on†	3.20	2.53	2.34
MST-115D*	SPDT	On-none-on	2.45	1.94	1.79
MST-205N	DPDT‡	On-none-on	3.20	2.53	2.34
MST-205P	DPDT	On-off-on	3.95	3.12	2.88
MST-205PA	DPDT‡	On-on-on	4.80	3.79	3.50
MST-205R	DPDT	None-on-on†	4.05	3.20	2.96
MST-205S	DPDT	On†-off-on†	4.15	3.28	3.03
MST-205SA	DPDT‡	On†-on-on†	5.00	3.95	3.65
MST-205T	DPDT	On-off-on†	4.15	3.28	3.03
MST-205TA	DPDT‡	On-on-on†	5.00	3.95	3.65
MST-215N*	DPDT	On-none-on	3.35	2.65	2.45
MST-305D	3PDT	On-none-on	5.50	4.35	4.02
MST-305E	3PDT	On-off-on	6.30	4.98	4.60
MST-305F	3PDT	None-on-on†	6.45	5.10	4.71
MST-305H	3PDT	On-off-on†	6.55	5.17	4.78
MST-315D*	3PDT	On-none-on	5.80	4.58	4.23
MST-405N	4PDT	On-none-on	7.15	5.65	5.22
MST-415N	4PDT	On-none-on	7.50	5.93	5.48

*Supplied with white cap.

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AUGAT® ALCOSWITCH®

POWER ROCKER SWITCHES & PUSHBUTTON SWITCHES

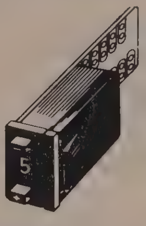
Quality and Innovation

BI-DIRECTIONAL PUSHBUTTON CODE SWITCHES

PICO, SMC and DPS families of bi-directional pushbutton code switches feature instrument grade design. All have heavy gold contacts and life expectancies in excess of one million operations. Mounting clips are integral parts of the end plates. Panel area per switch: PICO, 0.3″W × 0.59″H; SMC, 0.3″W × 0.95″H; DPS8, 0.315″W × 0.95″H; DPS9, 0.35″W × 1.3″H; DPS10, 0.393″W × 1.3″H. Matte black housing, black wheels with white numerals.

Model	Description
PICO-111-AL	Decimal Code (1-of-10)
PICO-131-AK	1-2-4-8 BCD Code
PICO-137-AK	BCD Complement Code
PICO-301-AK	Hexadecimal
PICO-400-AK	SPDT 2-Position Repeating
PICO-A	.100″ Spacer
PICO-P	End Mounting Plates, Molded Clip
B5LS	Connector, 5 contacts
SMC-111-AK	Decimal Code, (1-of-10)
SMC-131-AK	1-2-4-8 BCD Code
SMC-131-AL-AL/D	BCD, Extended PCB for diodes
SMC-137-AK	1-2-4-8 BCD Complement Codes
SMC-137-AL/D	BCD Complement, Ext. PCT
SMC-301-AK	Hexadecimal (16 Positions)
SMC-400-AK	SPDT 2-Positions Repeating
SMC-A	.100″ Spacer, with Mounting Clips
SMC-P/K	End Mounting Plates, Molded Clips
B9LS	Connector, 9 contacts, PC Terminals
B11LS	Connector, 11 contacts, PC Terminals
DPS8-111-AK	Decimal Code (1-of10)
DPS8-131-AK	1-2-4-8 BCD Code
DPS8-137-AK	BCD Complement Code
DPS8-301-AK	Hexadecimal (16 Positions)
DPS8-400-AK	SPDT, Repeating
DPS8-P/W	End Mounting Plate, Flanged
B-9LS	Connector, 9 Contacts, PC Terminals
B-11LS	Connector, 11 Contacts, PC Term.
DPS9-111-AK	Decimal Code (1-of-10)
DPS9-131-AK	1-2-4-8 BCD Code
DPS9-137-AK	BCD Complement Code
DPS9-301-AK	Hexadecimal (16 Positions)
DPS9-400-AK	SPDT, Repeating
DPS9/10-P	End Mounting Plate, Molded Clips
B12LS	Connector, 12 Contacts, PC Term.
DPS10-111-AK	Decimal Code (1-of-10)
DPS10-131-AK	1-2-4-8 BCD Code
DPS10-137-AK	BCD Complement Code
DPS10-301-AK	Hexadecimal (16 Positions)
DPS10-400-AK	SPDT, Repeating
DPS9/10-P	End Mounting Plate, Molded Clip

	1-9	10-99	100-249	250-499
PICO-111-AL	$6.90	$5.52	$5.18	$5.04
PICO-131-AK	6.40	5.12	4.80	4.67
PICO-137-AK	6.40	5.12	4.80	4.67
PICO-301-AK	7.90	6.32	5.93	5.77
PICO-400-AK	5.90	4.72	4.43	4.31
PICO-A	.50	.40	.38	.37
PICO-P	.95	.76	.71	.69
B-5LS	1.95	1.56	1.46	1.42
SMC-111-AK	6.10	4.88	4.58	4.45
SMC-131-AK	6.10	4.88	4.58	4.45
SMC-131-AL/D	6.75	5.40	5.06	4.93
SMC-137-AK	6.10	4.88	4.58	4.45
SMC-137-AL/D	6.75	5.40	5.06	4.93
SMC-301-AK	7.10	5.68	5.33	5.18
SMC-400-AK	5.90	4.72	4.43	4.31
SMC-A	.50	.40	.38	.37
SMC-PK	.95	.76	.71	.69
B-9LS	2.25	1.80	1.69	1.64
B-11LS	2.50	2.00	1.88	1.83
DPS8-111-AK	4.75	3.80	3.56	3.47
DPS8-131-AK	4.75	3.80	3.56	3.47
DPS8-137-AK	4.75	3.80	3.56	3.47
DPS8-301-AK	5.75	4.60	4.31	4.20
DPS8-400-AK	4.25	3.40	3.19	3.10
DPS8-P/W	.95	.76	.71	.69
B-9LS	2.25	1.80	1.69	1.64
B-11LS	2.50	2.00	1.88	1.83
DPS9-111-AK	4.25	3.40	3.19	3.10
DPS9-131-AK	4.25	3.40	3.19	3.10
DPS9-137-AK	4.25	3.40	3.19	3.10
DPS9-301-AK	5.45	4.36	4.09	3.98
DPS9-400-AK	4.00	3.20	3.00	2.92
DPS9/10-P	1.00	.80	.75	.73
B-12LS	2.50	2.00	1.88	1.83
DPS10-111-AK	4.25	3.40	3.19	3.10
DPS10-131-AK	4.25	3.40	3.19	3.10
DPS10-137-AK	4.25	3.40	3.19	3.10
DPS10-301-AK	5.45	4.36	4.09	3.98
DPS10-400-AK	4.00	3.20	3.00	2.92
DPS9/10P	1.00	.80	.75	.73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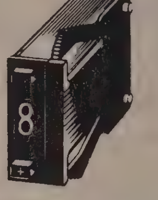
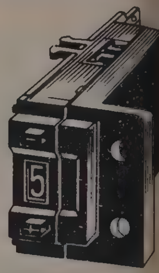
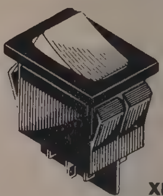

SMC-131AK


DPS8-111-AK

XR116


XRM-210N-09

SPST 16 A ROCKER SWITCHES

Model	Rocker	Indicator or Imprint	Legend	Bezel
XR116A00-2	Black	Red (1)	None	Black
XR116A02 + ON-OFF	Red	White (2)	ON-OFF	Black
XR116A09 + 01	White	Black (2)	Bar/Circle	Black
XR116A00-2 + ON-OFF	Black	Red (3)	ON-OFF	Black
XR116A00-2 + 01	Black	Red (3)	Bar/Circle	Black

SPST 16A LIGHTED ROCKER SWITCHES

XRL116A02	Red	120V neon (4)	None	Black

(1) Double-shot molded indicator is visible when contacts are closed.
(2) Imprinted legend is hot stamped on one-color rocker.
(3) Legend, and indicator visible when contacts are closed, are double-shot molded.
(4) Series resistor built in. Lamp circuit is between terminals 2 & 3.

	1-9	10-99	100-249	250-499
XR116A00-2	1.60	1.12	.85	.72
XR116A02 + ON-OFF	1.60	1.12	.85	.72
XR116A09 + 01	1.60	1.12	.85	.72
XR116A00-2 + OFF-ON	1.60	1.12	.85	.72
XR116A00-2 + 01	1.60	1.12	.85	.72
XR116A02	2.20	1.54	1.17	.99

XRM-210N-09

XRM Series switches snap-mount into rectangular panel holes measuring 0.51″ × 0.76″. Bezels & rockers have matte finish. Contact rating: 10A @ 125VAC, 5A @ 250VAC, 28VDC. UL Listed, VDE approved. Specify 2-digit color code: bezel, then rocker: 0 = Black, 9 = White. (e.g. -0.9 = black bezel with white rocker). Suffix -01 = bar and circle imprint on rocker to indicate ON and OFF positions.

Model	Type	◢	◣
XRM-110D	SPDT	On	On
XRM-110F	SPDT	On	(On)
XRM-210N	DPDT	On	On
XRM-210R	DPDT	On	(On)

	1-9	10-99	100-249	250-499
XRM110D	1.95	1.37	1.03	.88
XRM110F	2.25	1.58	1.19	1.01
XRM210N	3.10	2.17	1.64	1.40
XRM210R	3.50	2.45	1.86	1.58

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AME SWITCH SEALS

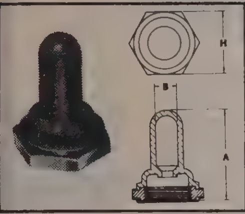
Backed by over 25 years of engineering solutions — for an ever-changing and demanding market.

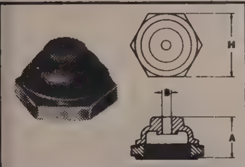
The wide demand for custom-molded panel and switch seals, threaded inserts bonded to rubber, O-rings, boots and seals, etc., translated is really a demand for talent and know-how to handle the engineering and molding of particularly thorny or unusual custom requirements that frequently plague industry. AME meets the demand. . . with experience, service and unique production techniques.

CUSTOM ENGINEERED PRECISION MOLDED ELASTOMERS

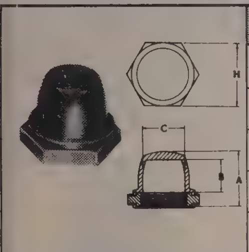
- Color filters for incandescent lamps
- Rubber to metal bonding
- Clear silicone products
- Self-sealing hex nuts
- Self-sealing washers
- Extrusions
- O-rings
- Boots
- Gaskets
- Seals
- Conductive rubber
- Die cutting

TOGGLE SWITCH SEALS

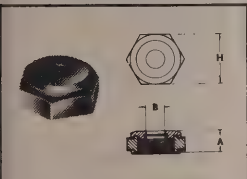
	Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	H	Material Specifications
	1100	M5423/01-01	15⁄32-32 UNS-2B	in.	.86	.22	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 50 Gray
				mm	(21.84)	(5.59)	(15.88)	
	1102	None	15⁄32-32 UNS-2B	in.	.86	.22	.625 Hex	
				mm	(21.84)	(5.59)	(15.88)	
	1103	None	15⁄32-32 UNS-2B	in.	.90	.22	.625 Hex	Nut-Brass, Rubber-Neoprene, 50 Durometer Black
				mm	(22.86)	(5.59)	(15.88)	
	1105	M5423/05-01	¼-40 UNS-2B	in.	.50	.064	.375 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 30 Gray
				mm	(12.70)	(1.63)	(9.53)	

	Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	H	Material Specifications
	1101	M5423/02-01	15⁄32-32 UNS-2B	in.	.40	.09	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 50 Gray
				mm	(10.16)	(2.29)	(15.88)	
	1104	None	⅝-24 UNEF-2B	in.	.75	.09	.812 Hex	
				mm	(19.05)	(2.29)	(20.62)	
	1106	M5423/11-01	¼-40 UNS-2B	in.	.25	.05	.375 Hex	
				mm	(6.35)	(1.27)	(9.53)	

PUSH BUTTON SWITCH SEALS

	Part Number	Equiv. Military Part Number	Thread Size	Unit	A	B	C	H	Material Specifications
	2100	M5423/07-01	15⁄32-32 UNS-2B	in.	.55	.32	.42	.625 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 60 Gray
				mm	(13.97)	(8.13)	(10.67)	(15.88)	
	2101	None	½-32 UNS-2B	in.	.46	.29	.41	.750 Dia.	
				mm	(11.68)	(7.37)	(10.41)	(19.05)	
	2102	M5423/07-02	15⁄32-32 UNS-2B	in.	.72	.48	.42	.625 Hex	
				mm	(18.29)	(12.19)	(10.67)	(15.88)	
	2103	M5423/10-01	¼-32 UNEF-2B	in.	.31	.20	.19	.375 Hex	
				mm	(7.87)	(5.08)	(4.83)	(9.53)	
	2104	M5423/10-02	¼-40 UNS-2B	in.	.31	.20	.19	.375 Hex	
				mm	(7.87)	(5.08)	(4.83)	(9.53)	

ROTARY SWITCH & POTENTIOMETER SEALS

	Part Number	Equiv. Military Part Number	Thread Size	Unit	A	Size of Shaft B	H	Material Specifications
	3100	M5423/09-02	⅜-32 UNEF-2B	in.	.22	.250	.500 Hex	Nut-Brass, Nickel Plated, Rubber-Silicone per ZZ-R-765 Class III, Grade 60 Gray
				mm	(5.59)	(6.35)	(12.70)	
	3101	M5423/09-01	⅜-32 UNEF-2B	in.	.22	.125	.500 Hex	
				mm	(5.59)	(3.18)	(12.70)	
	3102	M5423/09-04	15⁄32-32 UNS-2B	in.	.22	.250	.625 Hex	
				mm	(5.59)	(6.35)	(15.88)	

MANY OTHER SIZES AND TYPES AVAILABLE

ressure capabilities: Internal Pressure
1 Atmosphere, 15 psi (103.4 kPa)
External Pressure
2 Atmospheres, 30 psi (206.8 kPa)

or Part #1106 — Internal pressure
.7 Atmosphere, 10 psi (69 kPa)
External pressure
1.4 Atmospheres, 20 psi (138 kPa)

ndurance: Exceeds 100,000 actuations (depending on environment).

Jseful life: 20 years to unlimited (depending on nvironment).

witch Seals are designed and manufactured to neet or exceed applicable military specifications.

Switch Seals

An elastomeric boot which seals, thus protecting a switch and internal components against hazardous foreign elements. AME's one piece switch seal is constructed of a flexible rubber boot element bonded during molding to a threaded metal insert that fully encapsulates the switch and bushing to the panel.

This assembly replaces the panel mounting nut and seals the mounting hole making it watertight. It protects against moisture, oil, dirt, dust, most solvents, many acids (see elastomer selection guide).

Switch seals provide vibration resistant mounting and act as double insulation with no interference to switch movement.

CAST URETHANE & SILICONE

AME supplies cast urethane and silicone products precision engineered to meet your most demanding requirements.

If you need high tensile/tear strength, excellent resistance to abrasion and high impact capability, our cast urethane is ideally suited for the job. Superb temperature resistance to the damaging sub-zero cold or searing heat extremes is found in the cast silicone custom engineered by AME Corporation.

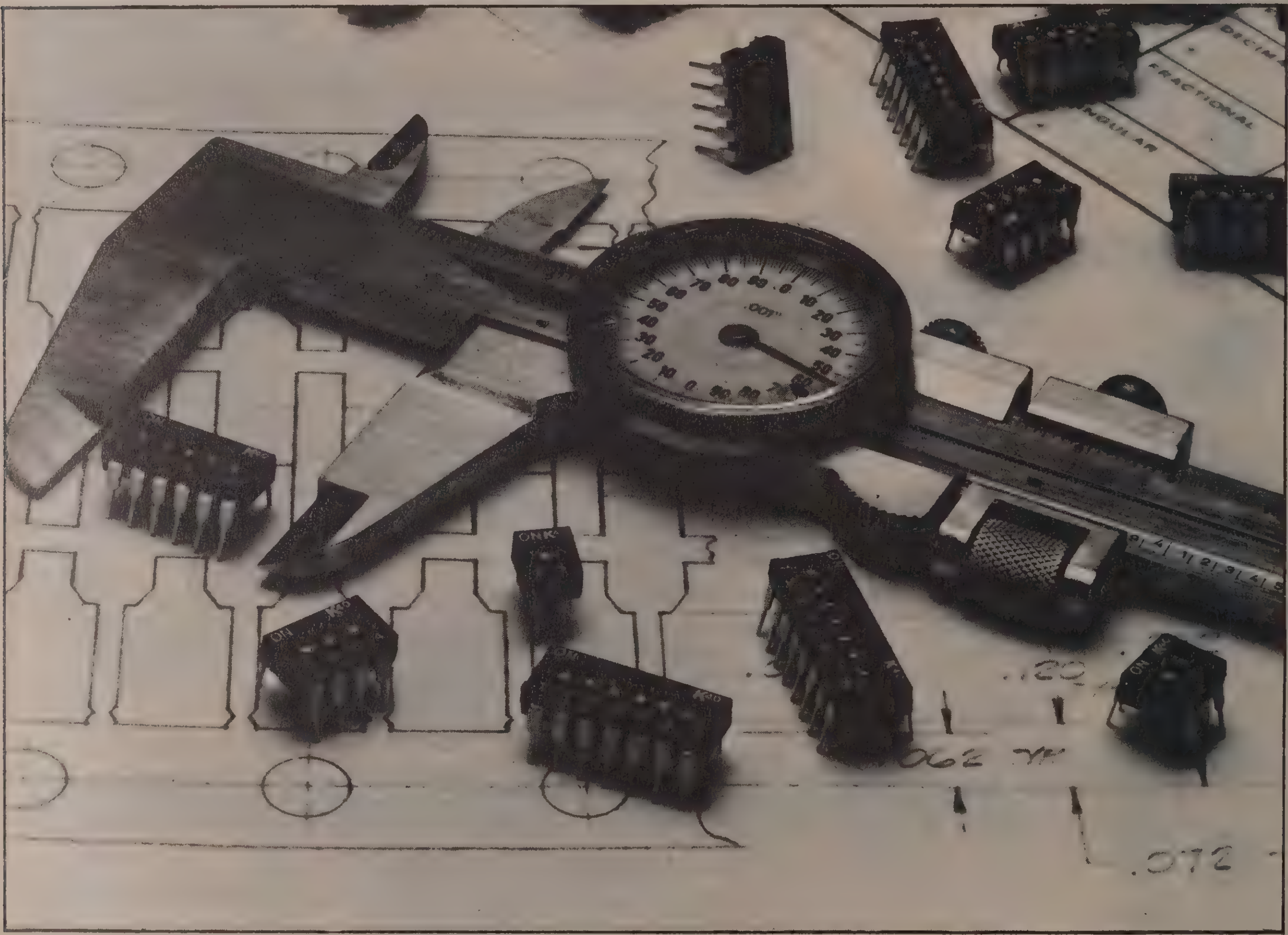
AME AME CORPORATION

Dept. EM, 101 E. Main St.
P.O. Box 191
Little Falls, NJ 07424
(201) 256-3939

SWITCH SEALS

AMERICAN RESEARCH & ENGINEERING

DIP SWITCHES



MACHINE INSERTABLE

SAVINGS FROM AUTOMATIC INSERTION

LOWEST PROFILE AVAILABLE

SAME SIZE AS AN IC PACKAGE

BIFURCATED SLIDE CONTACTS

FOR LOW, LOW, CONTACT RESISTANCE.

FLUSH SWITCH ACTUATORS

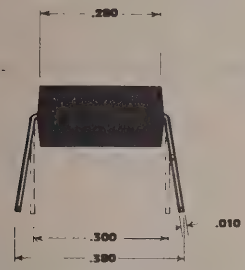
PREVENTS ACCIDENTAL SWITCHING

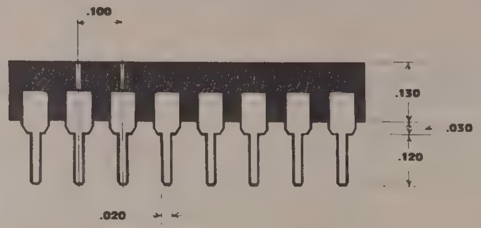
TAPED SEALED SWITCH ACTUATORS

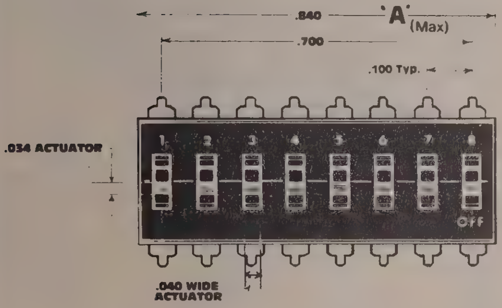
PREVENTS CONTAMINATION DURING ASSEMBLY

3-84

SPECIFICATIONS







SPST-FLUSH ACTUATORS

"A" OVERALL DIMENSION	NUMBER OF SWITCH POSITIONS	PART NUMBER
.840	8	K40 8S
.740	7	K40 7S
.640	6	K40 6S
.540	5	K40 5S
.440	4	K40 4S
.340	3	K40 3S
.240	2	K40 2S
.140	1	K40 1S

ELECTRICAL

Contact Resistance	
Initial, max.	20 Milliohms
After 2000 actuation, max.	80 Milliohms
Current and Voltage Ratings, max.	
Switching	100 mA @ 20 VDC
Non-switching	100 mA @ 50 VDC
Insulation Resistance, initial	1000 meg Ω 500 VDC
Dielectric Withstanding Voltage, min.	500 VDC
Capacitance, max., between adjacent switches	5 Picofarads

ENVIRONMENTAL

Temperature Rating	
Operating	- 40° C to + 100° C
Storage	- 60° C to + 125° C
Humidity	95% RH, 40° C for 96 Hours
Vibration	Per MIL-STD-202, Method 204B
Shock	Per MIL-STD-202, Method 213C
Solderability	Per MIL-STD-202, Method 208
Mechanical Life	2000 Actuations, 80 Milliohms, Max.

PHYSICAL

Housing	30% Glass Filled 6/6 Nylon (UL 94VO)
Lead Frame Contacts	Brass, 10 Microinch Gold Over 50 Microinch Nickel at Contact Points
Leads	Available in Solder Plating or Gold Flash Plating
Slide Contacts	Beryllium Copper, 10 Microinch Gold Over 100 Microinch Nickel

Note: Certified test reports are available. Ask your K40 contact person for a copy.

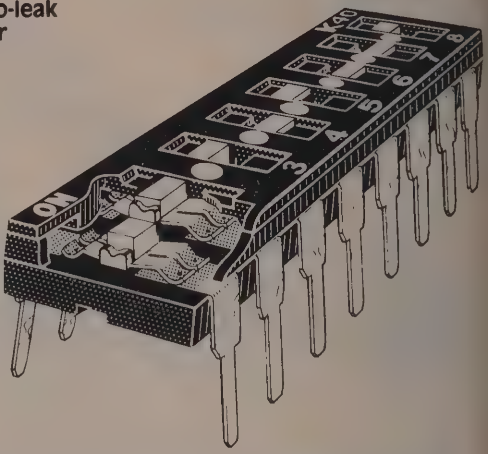
CONSTRUCTION DETAILS

Lowest profile dip switch in the world! Same size as a standard integrated circuit package, allowing _automatic insertion_ with existing equipment.

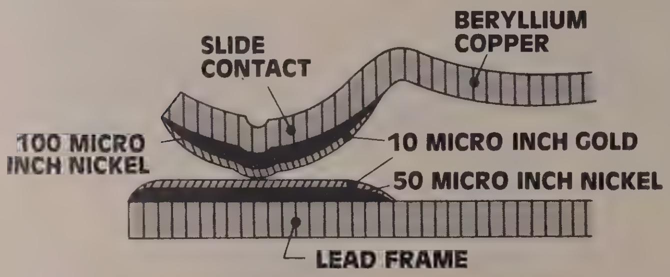
The lead frame is molded into the housing to provide a one piece, no-leak construction. The cover is ultrasonically welded to the housing after the switch is assembled. The top is sealed with easily removable tape.

Slides are bifurcated, lowering contact resistance and improving contact reliability since there are *two independent,* gold plated, *contacts at each switch point.*

Slides are also available in a non-bifurcated, cross-bar contact configuration, providing the same low contact resistance as the bifurcated version.

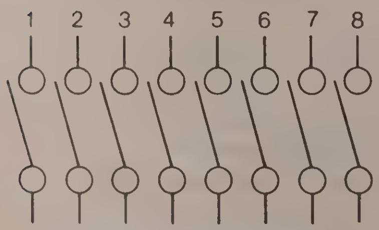

K40
ON
1
2
3
4
5
6
7
8

Every one of the switch contact surfaces on the main lead frame are gold plated with 10 micro inch of gold over 50 micro inch of nickel.


BERYLLIUM COPPER
SLIDE CONTACT
100 MICRO INCH NICKEL
10 MICRO INCH GOLD
50 MICRO INCH NICKEL
LEAD FRAME

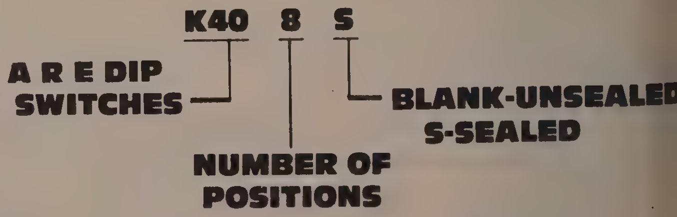
Slides are made from beryllium copper, heat tempered to a full hardness, plated with 100 micro inch nickel and then spot gold plated 10 micro inch deep at all the contact points.

TYPICAL CIRCUIT DIAGRAM

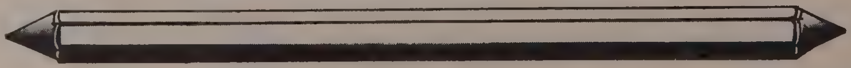


SINGLE POLE SINGLE THROW 8 SECTION ASSEMBLY WITH SWITCHES IN OPEN POSTION

PART NUMBER IDENTIFICATION


K40 8 S
A R E DIP SWITCHES
NUMBER OF POSITIONS
BLANK-UNSEALED
S-SEALED

ACTUATING TOOL



(Actual Size)

PART NUMBER AT/2— A NON-METALLIC ACTUATOR FOR EASY SWITCHING IN PRODUCTION OR TESTING.

Your Primary Source for highest quality and fastest deliveries the world over.

ASC

American Switch Corp.

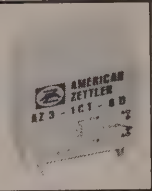
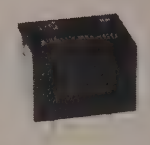
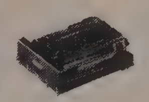
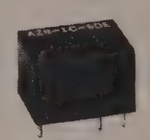
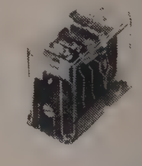
- *Subminiature Toggle, Pushbutton, Rocker and Lever switches*
- *Snap-in mount Toggle and Pushbutton switches, illuminated or non-illuminated*
- *Dry circuit ratings and up to 6 Amps, 125 VAC or 3 Amps, 250 VAC*
- *UL and CSA ratings available*
- *Panel and printed circuit mounting*
- *Ask for our complete line catalog and a prototype sample*
- *Fast response, short lead-times, competitive prices*

Made in USA by ASC

AMERICAN SWITCH CORP. / 134 WATER STREET, WAKEFIELD, MASS. 01880 AREA (617) 246-1007 TWX 710-348-6756

GENERAL PURPOSE RELAYS

On the following pages you'll find summary specifications for our most popular relays. For additional technical information on these relays, or those marked (*), which are not covered here, call (800) 854-8474. In California call (714) 660-1670. For ordering information, call our local sales office listed in the eem yellow section.

							
SERIES		**AZ 3**	**AZ 4**	**AZ 7**	**AZ 8**	**AZ 230***	**AZ 420**
FEATURES		-Ultra High Sensitivity -Wide Switching Range -Rugged Construction	-Subminiature Size -Low Cost -Rugged Construction	-Meets FCC 1500V Surge Requirement -Low Profile -High Sensitivity -Ag-Pd Contacts Available	-High Sensitivity -Subminiature Size -Low Cost -Wide Switching Range	-High Switching Capability, 20A -Compact Size -Rugged Construction	-Versatile Contact Configurations -Wide Switching Range -High Sensitivity -Long Life
SEALED		No	Yes	Yes	Yes	No	Yes
CONTACTS	**FORM**	1 Form C	1 Form C	2 and 4 Form C	1 Form C	1 Form C	1-6 Form C Forms A, B, & D available
	RATING (RESISTIVE)	3A @ 30 VDC or 120 VAC 5A @ 30 VDC or 120 VAC 10A @ 30 VDC or 120 VAC	3A @ 30 VDC or 120 VAC 5A @ 30 VDC or 120 VAC	2A @ 30 VDC 0.5A @ 125 VAC	3A @ 30 VDC or 200 VAC 6A @ 30 VDC or 300 VAC	20A @ 12 VDC 16A @ 26 VDC or 115 VAC	2A @ 28 VDC or 115 VAC 3A @ 30 VDC or 115 VAC 7.5A @ 30 VDC or 115 VAC
COIL VOLTAGE		6, 12, 24, 48V (DC)	5, 6, 9, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 9, 12, 24, 48V (DC)	5, 6, 12, 24, 48, 110V (DC)	3 thru 115V (DC)
OPERATING POWER AT PICK UP VOLTAGE		3 & 5A Contact: 50 to 70 mW 10A Contact: 150 mW	230 mW	2 Pole: 190 mW 4 Pole: 310 mW	90 to 210 mW	360 mW	Standard: 450 to 850 mW Sensitive: 40 mW per pole 25 mW per pole available
DIELECTRIC STRENGTH		1500 Vrms Contact to Contact: 750 Vrms	Contact to Contact: 1750 Vrms Contact to Coil: 1500 Vrms	1000 Vrms Across Contact Gap: 750 Vrms Contact to Coil: 1500 Vrms	Contact to Contact: 750 Vrms Contact to Coil: 2000 Vrms	Contact to Contact: 1000 Vrms Contact to Coil: 2500 Vrms	Between All Points: 1000 Vrms 1500 Vrms Versions Available
TYPICAL LIFE OPERATIONS	**ELECTRICAL**	2×10^5 (at rated load)	10^5 (at rated load)	5×10^6 — 1A/30 VDC 10^6 — 2A/30 VDC	(LD) 10^5 — 3A/120 VAC 5×10^5 — 3A/24 VDC (HD) 10^5 — 6A/24 VDC or 120 VAC	10^5 (at rated load)	1×10^8 — 10 mA/6 VDC 1.5×10^6 — 2A/28 VDC or 115 VAC 2×10^5 — 5A/28 VDC or 115 VAC 1×10^5 — 7.5A/28VDC or 115 VAC
	MECHANICAL	5×10^6	10^7	10^8	2×10^7	10^7	10^8
MAXIMUM SIZE IN INCHES L x W x H		1.210 x 0.750 x 1.190	0.866 x 0.635 x 0.640	1.200 x 0.826 x 0.458 (Min.) 1.200 x 0.965 x 0.458 (Max.)	0.830 x 0.630 x 0.560	1.375 x 0.735 x 1.187	0.940 x 0.735 x 1.230 (Min.) 1.395 x 0.735 x 1.230 (Max.)
TERMINALS	**PC**	X	X	X	X	X	X
	SOLDER/ PLUG-IN	—	—	—	—	—	X
UL, CSA, VDE		UL/CSA	UL	UL/CSA	UL/CSA	UL/CSA	UL/CSA

All listed data are for the type with the minimum number of contacts.
For more detailed information, request individual data sheets.

"It's a better relay"

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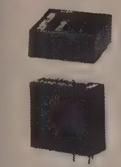
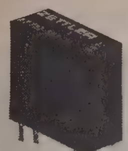
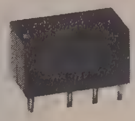
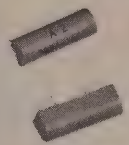
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

FROM AMERICAN ZETTLER

							
AZ 690	**AZ 730**	**AZ 820**	**AZ 830**	**AZ 2530/2531***	**10**	**30**	**60**
-High Dielectric Strength, 4000 Vrms -Complete List of International Approvals -10 Amp Switching Capability in Compact Size	-High Dielectric Strength, 4000 Vrms -Complete List of International Approvals -8 Amp Switching Capability in Compact Size	-Meets FCC 1500V Surge Requirement -Bifurcated Ag-Pd Contacts -Low Profile -Dip Package	-Meets FCC Part 68.302 and 68.304 -Polarized Coil -Dip Package -Bifurcated Contacts -Pd-Ag Contacts Available	-Low Profile -High Insulation Resistance -High Sensitivity -Long Life	-Encapsulated Reed -Dip Package -Stable Contact Resistance	-Encapsulated Reed -SIP Package -Stable Contact Resistance -Low Cost	-Encapsulated Reed -Stable Contact Resistance -Low Cost -Versatile Contact Configurations
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 Form A, B or C	2 Form A, B or C	2 Form C	2 Form C	1 and 2 Form C	1 and 2 Form A 1 Form C	1 Form A and C	1-6 Form A 1-4 Form C
10A @ 30 VDC or 200 VAC ¼ HP 120 VAC Motor Load	8A @ 30 VDC or 180 VAC ⅛ HP 120 VAC Motor Load	2.0A @ 15 VDC or 30 VAC 1.0A @ 30 VDC or 60 VAC 0.5A @ 60 VDC or 120 VAC	2.0A @ 30 VDC or 60 VAC 1.0A @ 60 VDC or 120 VAC 0.5A @ 120 VDC or 240 VAC	2A @ 26 VDC 1A @ 115 VAC	1 and 2 Form A—10W 1 Form C — 3W	1 Form A — 10W 1 Form C — 3W	1-6 Form A — 10W 1-4 Form C — 3W
5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24V (DC)	5, 6, 12, 24, 48V (DC)	5, 6, 12, 24, 48V (DC)
Standard Coils: 350 mW Sensitive Coils: 250 mW	Standard Coils: 350 mW Sensitive Coils: 250 mW	250 mW	Standard: 200 mW Sensitive: 100 mW	Standard 1 Form C: 125 mW Sensitive 1 Form C: 85 mW Standard 2 Form C: 270 mW	1 Form A: 29 mW 1 Form C: 80 mW 2 Form A: 73 mW	1 Form A: 29 mW 1 Form C: 80 mW	29 to 482 mW
Coil to Contact: 4000 Vrms Between Open Contact: 1000 Vrms	Coil to Contact: 4000 Vrms Contact to Contact: 2500 Vrms Between Open Contacts: 1000 Vrms	1500 Vrms Between Open Contacts: 500 Vrms	Between Open Contacts: 1000 Vrms Between Contact Sets: 1000 Vrms Contact to Coil: 1500 Vrms	Contact to Contact: 500 Vrms Contact to Coil: 500 Vrms	Across Open Contact: 200 VDC Coil to Contact: 1000 VDC	Across Open Contact: 500 VDC Coil to Contact: 1000 Vrms	Across Contact Gap: 300 VDC All Other Points: 500 VDC
10^5 — 10A/30 VDC 2×10^5 — 10A/115 VAC or 8A/220 VAC	10^5 — 8A/30 VDC 2×10^5 — 8A/115 VAC or 6A/220 VAC	5×10^5 — 1A/30 VDC 2×10^5 — 0.5A/120 VAC	5×10^5 — 2A/30 VDC 1A/125 VAC 2×10^6 — 1A/30 VDC 0.5A/125 VAC	10^6 — 1A/26 VDC or 0.5A/115 VAC 2×10^5 — 2A/26 VDC or 1A/115 VAC	Form A — 10^7 Form C — 5×10^6	Form A — 10^7 Form C — 5×10^6	Form A — 10^7 Form C — 5×10^6
3×10^7	3×10^7	10^7	10^8	10^7	Form A — 10^8 Form C — 10^7	Form A — 10^8 Form C — 10^7	Form A — 2×10^8 Form C — 5×10^7
SLIMPAK - 1.110 x 0.476 x 1.030 THINPAK - 1.110 x 1.030 x 0.441	1.110 x 0.496 x 1.030	0.820 x 0.420 x 0.455	0.787 x 0.390 x 0.366	1.090 x 0.593 x 0.445 (Min.) 1.090 x 0.888 x 0.445 (Max.)	0.750 x 0.310 x 0.275	1.000 x 0.340 x 0.375	1.125 x 0.360 x 0.350 (Min.) 1.175 x 0.910 x 0.375 (Max.)
X	X	X	X	X	X	X	X
—	—	—	—	—	—	—	—
UL/CSA/VDE	UL/CSA/VDE	UL/CSA	UL/CSA	UL/CSA	—	—	—

"It's a better relay"

AMERICAN ZETTLER, INC.

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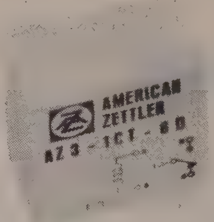
SERIES AZ 3

SPDT Contacts to 10 Amps

L: 1.21″
W: 0.75″
H: 1.19″



FEATURES

- Compact Size
- Coils to 48 VDC
- Contacts Rated at 3, 5, or 10 Amps
- Life Expectancy 200,000 Operations
- PC Board Mounting
- UL File #E43203; CSA File #LR 36664

Contact Arrangement:	SPDT (1 Form C)
Contact Rating:	Noninductive load
Light Duty:	Max. switched power: 90 W or 360 VA Max. switched current: 3 Amps Max. switched voltage: 150 VDC or VAC
Medium Duty:	Max. switched power: 150 W or 600 VA Max. switched current: 5 Amps Max. switched voltage: 150 VDC or VAC
Heavy Duty:	Max. switched power: 280 W or 1200 VA Max. switched current: 10 Amps Max. switched voltage: 150 VDC or VAC
Contact Material:	Light Duty: Silver-Nickel, gold plated Medium Duty: Silver-Nickel alloy Heavy Duty: Silver-Nickel alloy
Operate Time:	20 ms at nominal coil voltage (typical)
Release Time:	20 ms at nominal coil voltage (typical)
Dielectric Strength:	1500 Vrms; 750 Vrms contact to contact
Coil Power	
At Pick Up Voltage (typical):	Light and Medium Duty: 70 mW Heavy Duty: 150 mW
Max. Continuous Dissipation:	2 W at 20°C (68°F) ambient
Life Expectancy:	Mechanical: 5 million operation Electrical: Light Duty: 2x10⁵ @ 3 A, 28 VDC/120 VAC Medium Duty: 2x10⁵ @ 5 A, 28 VDC/120 VAC Heavy Duty: 2x10⁵ @ 10 A, 28 VDC/120 VAC

RELAY ORDERING DATA

STANDARD RELAYS: LIGHT DUTY TYPE (3 Amp Contact)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	20	350	4.8	AZ 3-1-C-6D	2.65
12	40	1,400	9.6	AZ 3-1C-12D	2.65
24	80	5,600	19.2	AZ 3-1C-24D	2.75
48	157	21,500	38.4	AZ 3-1C-48D	3.40

STANDARD RELAYS: MEDIUM DUTY TYPE (5 Amp Contact)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	20	350	4.8	AZ 3-1CH-6D	2.85
12	40	1,400	9.6	AZ 3-1CH-12D	2.85
24	80	5,600	19.2	AZ 3-1CH-24D	2.95
48	157	21,500	38.4	AZ 3-1CH-48D	3.60

STANDARD RELAYS: HEAVY DUTY TYPE (10 Amp Contact)

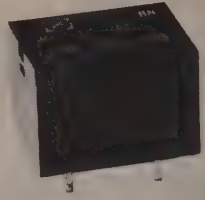
COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
6	14	164	4.8	AZ 3-1CT-6D	3.05
12	28	660	9.6	AZ 3-1CT-12D	3.05
24	54	2,500	19.2	AZ 3-1CT-24D	3.15
48	107	9,900	38.4	AZ 3-1CT-48D	3.80

1. All values at 20°C

SERIES AZ 4

SPDT Up to 5 Amp Contacts

L: 0.866″
W: 0.635″
H: 0.640″



FEATURES

- Subminiature Size
- DC Coils to 48 VDC
- PC Board Terminals
- Extremely Low Cost
- 3 and 5 Amp Contacts
- Rugged Construction for High Reliability
- UL File #E43203.
- Epoxy Sealed for Automatic Wave Soldering

Contact Arrangement:	SPDT (1 Form C)
Contact Rating:	Noninductive load
Light Duty:	Max. switched power: 90 W or 360 VA Max. switched current: 3 Amps Max. switched voltage: 60 VDC or 250 VAC
Heavy Duty:	Max. switched power: 150 W or 600 VA Max. switched current: 5 Amps Max. switched voltage: 60 VDC or 250 VAC
Contact Material:	Light Duty: Silver Alloy Heavy Duty: Silver cadmium oxide
Life Expectancy:	Mechanical: 10 million operations Electrical: 10⁵ operations at rated load
Contact Resistance (typical):	50 milliohms initially
Operate Time:	6 ms at nominal coil voltage (typical)
Release Time:	2 ms at nominal coil voltage (typical)
Dielectric Strength:	Contact to contact: 750 Vrms Contact to coil: 1500 Vrms
Coil Power	
At Pick Up Voltage (typical):	230 mW
Max. Continuous Dissipation:	1.6 W @ 20°C (68°F) ambient

RELAY ORDERING DATA

LIGHT DUTY: 3 Amp Contact — Unsealed Version

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	6.5	70	4.0	AZ 4-1C-5D	2.00
6	7.8	100	4.8	AZ 4-1C-6D	2.00
12	15.6	400	9.6	AZ 4-1C-12D	2.00
24	31.2	1,600	19.2	AZ 4-1C-24D	2.00
48	62.4	6,400	38.4	AZ 4-1C-48D	2.45

LIGHT DUTY: 3 Amp Contact — Sealed Version

5	6.5	70	4.0	AZ 4-1C-5DE	2.55
6	7.8	100	4.8	AZ 4-1C-6DE	2.55
12	15.6	400	9.6	AZ 4-1C-12DE	2.55
24	31.2	1,600	19.2	AZ 4-1C-24DE	2.55
48	62.4	6,400	38.4	AZ 4-1C-48DE	3.00

HEAVY DUTY. 5 Amp Contact — Unsealed Version

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	6.5	70	4.0	AZ 4-1CH-5D	2.20
6	7.8	100	4.8	AZ 4-1CH-6D	2.20
12	15.6	400	9.6	AZ 4-1CH-12D	2.20
24	31.2	1,600	19.2	AZ 4-1CH-24D	2.20
48	62.4	6,400	38.4	AZ 4-1CH-48D	2.65

HEAVY DUTY: 5 Amp Contact — Sealed Version

5	6.5	70	4.0	AZ 4-1CH-5DE	2.75
6	7.8	100	4.8	AZ 4-1CH-6DE	2.75
12	15.6	400	9.6	AZ 4-1CH-12DE	2.75
24	31.2	1,600	19.2	AZ 4-1CH-24DE	2.75
48	62.4	6,400	38.4	AZ 4-1CH-48DE	3.55

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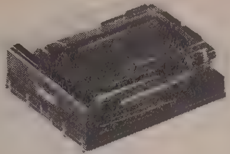
SERIES AZ 7

DPDT, 4PDT Dry Circuit to 2 Amp Contacts

UL CSA



2 POLE	4 POLE
L: 1.200″	L: 1.200″
W: 0.826″	W: 0.965″
H: 0.458″	H: 0.458″

FEATURES

- Low Profile For Compact Board Spacing
- DC Coils to 48 VDC
- Life Expectancy to 100 Million Operations
- Standard PC 0.2″ Grid Spacing
- Contact Resistance Less Than 50 Millioms
- Welded Bifurcated Contacts
- Both Form C and Form D Contacts Available
- Epoxy Sealed "Process-Proof" Version Available
- UL File #E43203; CSA File #LR36664
- Meets FCC 1500V Surge Requirement

Contact Arrangement: DPDT (2 Form C) bifurcated
4PDT (4 Form C) bifurcated
Form D also available

Contact Rating: Noninductive load — Form C contact
2 Amp @ 30 VDC
0.5 Amp @ 125 VAC

Contact Material: Fine silver, gold clad
Other material available upon request

Life Expectancy: Mechanical: 100 million operations

Electrical:	Unsealed	Sealed
1 A @ 26 VDC	5x10⁶ ops	10⁶ ops
2 A @ 26 VDC	10⁶ ops	2x10⁵ ops

Contact Resistance: 50 milliohms initially
200 milliohms at end of life

Operate Time: 10 ms at nominal coil voltage (typical)

Release Time: 4 ms at nominal coil voltage (typical)

Dielectric Strength (initial): 1000 Vrms; 1000 Vrms across contact gap; 1500 Vrms contact to coil

Coil Power
At Pick Up Voltage (typical): 2 pole: 190 mW
4 pole: 310 mW
Max. Continuous Dissipation: 1.6 W @ 20°C (68°F) ambient
1.2 W @ 40°C (105°F) ambient

RELAY ORDERING DATA

STANDARD RELAYS: 2 FORM C (DPDT) CONTACTS (Unsealed)					
COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	11	90	3.6	AZ 7-2C-5D	4.65
6	13	137	4.2	AZ 7-2C-6D	4.65
12	26	500	8.4	AZ 7-2C-12D	4.65
24	52	2,000	16.8	AZ 7-2C-24D	4.65
48	97	7,000	33.6	AZ 7-2C-48D	5.15
STANDARD RELAYS: 2 FORM C (DPDT) CONTACTS (Sealed)					
5	11	90	4.0	AZ 7-2C-5DE	5.25
6	13	137	4.8	AZ 7-2C-5DE	5.25
12	26	500	9.6	AZ 7-2C-12DE	5.25
24	52	2,000	19.2	AZ 7-2C-24DE	5.25
48	97	7,000	38.4	AZ 7-2C-48DE	5.85

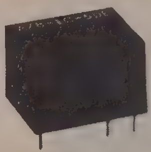
STANDARD RELAYS: 4 FORM C (4PDT) CONTACTS (Unsealed)					
COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	8	53	3.6	AZ 7-4C-5D	5.60
6	11	90	4.2	AZ 7-4C-6D	5.60
12	21	330	8.4	AZ 7-4C-12D	5.60
24	40	1,200	16.8	AZ 7-4C-24D	5.60
48	72	4,200	33.6	AZ 7-4C-48D	6.20
STANDARD RELAYS: 4 FORM C (4PDT) CONTACTS (Sealed)					
5	8	53	4.0	AZ 7-4C-5DE	6.20
6	11	90	4.8	AZ 7-4C-6DE	6.20
12	21	330	9.6	AZ 7-4C-12DE	6.20
24	40	1,200	19.2	AZ 7-4C-24DE	6.20
48	72	4,200	38.4	AZ 7-4C-48DE	6.90

SERIES AZ 8

Epoxy Sealed SPDT Up to 6 Amps

UL CSA

L: 0.83″
W: 0.63″
H: 0.56″



FEATURES

- Subminiature Size
- Coils to 48 VDC
- Epoxy Sealed for Automatic Wave Soldering
- Contacts Rated at 3 or 6 Amps
- Life Expectancy to 20 Million Operations
- Extremely Low Cost
- UL File #E44211; CSA File #LR36664
- Suitable for Class B Applications

Contact Arrangement: SPDT (1 Form C)

Contact Rating: Noninductive load
Light Duty: Max. switched power: 100 W or 600 VA
Max. switched current: 3 Amps
Max. switched voltage: 30 VDC/300 VAC
U.L. Rating: 2 A @ 28 VDC or 120/300 VAC; ⅛ HP @ 120 VAC; Standard Pilot Duty @ 120/240 VAC
Heavy Duty: Max. switched power: 170 W or 1800 VA
Max. switched current: 6 amps
Max. switched voltage: 30 VDC/300 VAC
U.L. Rating: 6 A @ 28 VDC or 120/300 VAC; ⅛ HP @ 120 VAC; Standard Pilot Duty @ 120/240 VAC

Contact Material: Light Duty: Fine silver, gold plated
Heavy Duty: Silver nickel, gold plated

Life Expectancy: Mechanical: 20 million operations
Electrical:
Light Duty: 1x10⁵ — 3 A 120 VAC
5x10⁵ — 3 A 24 VDC
Heavy Duty: 1x10⁵ — 6 A 24 VDC or 120 VAC

Operate Time: 5 ms at nominal coil voltage (typical)

Release Time: 3 ms at nominal coil voltage (typical with no coil suppression)

Dielectric Strength: 750 Vrms contact to contact
2000 Vrms contact to coil

Coil Power
At Pick Up Voltage (typical): Standard version: 210 mW
Sensitive version: 110 mW
Max. Continuous Dissipation: 1.5 W @ 20°C (68°F) ambient
Temperature Rise: 75°C per Watt (typical)

RELAY ORDERING DATA

STANDARD RELAYS: LIGHT DUTY (3 Amp Contact)							
COIL SPECIFICATIONS				Unsealed		Epoxy Sealed	
Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price	Order Number	List Price
5	8.3	56	3.25	AZ 8-1C-5D	2.35	AZ 8-1C-5DE	2.65
6	9.9	80	3.90	AZ 8-1C-6D	2.35	AZ 8-1C-6DE	2.65
12	19.8	320	7.80	AZ 8-1C-12D	2.35	AZ 8-1C-12DE	2.65
24	39.6	1280	15.60	AZ 8-1C-24D	2.45	AZ 8-1C-24DE	2.75
48	79.2	3800	28.80	AZ 8-1C-48D	2.85	AZ 8-1C-48DE	3.15
STANDARD RELAYS: HEAVY DUTY (6 Amp Contact)							
5	8.3	56	3.25	AZ 8-1CH-5D	2.50	AZ 8-1CH-5DE	2 80
6	9.9	80	3.90	AZ 8-1CH-6D	2.50	AZ 8-1CH-6DE	2.80
12	19.8	320	7.80	AZ 8-1CH-12D	2.50	AZ 8-1CH-12DE	2.80
24	39.6	1280	15.60	AZ 8-1CH-24D	2.60	AZ 8-1CH-24DE	2.90
48	79.2	3800	28.80	AZ 8-1CH-48D	3.00	AZ 8-1CH-48DE	3.30
SENSITIVE RELAYS: LIGHT DUTY (3 Amp Contact)							
5	9.8	80	3.25	AZ 8-1C-5DS	2.55	AZ 8-1C-5DSE	2.85
6	11.7	110	3.90	AZ 8-1C-6DS	2.55	AZ 8-1C-6DSE	2.85
12	23.4	440	7.80	AZ 8-1C-12DS	2.55	AZ 8-1C-12DSE	2.85
24	46.8	1780	15.60	AZ 8-1C-24DS	2.65	AZ 8-1C-24DSE	2.95
SENSITIVE RELAYS: HEAVY DUTY (6 Amp Contact)							
5	9.8	80	3.25	AZ 8-1CH-5DS	2.70	AZ 8-1CH-5DSE	3.00
6	11.7	110	3.90	AZ 8-1CH-6DS	2.70	AZ 8-1CH-6DSE	3.00
12	23.4	440	7.80	AZ 8-1CH-12DS	2.70	AZ 8-1CH-12DSE	3.00
24	46.8	1780	15.60	AZ 8-1CH-24DS	2.80	AZ 8-1CH-24DSE	3.10

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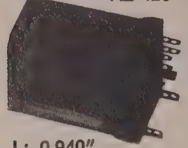
SERIES AZ 420

Up to 6 PDT or 8 PST Dry Circuit thru 10 Amp Contacts

AZ 420

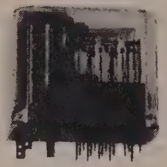


L: 0.940"
W: 0.735"
H: 1.230"

AZ 421

L: 1.172"
W: 0.735"
H: 1.230"

AZ 431



L: 1.395"
W: 0.735"
H: 1.230"

FEATURES

- International Standard Type
- Occupies Less Than One Cubic Inch of Space
- Life Expectancy More Than 100 Million Operations
- Coils to 115V — DC or AC
- Current and Voltage Sensitive Coils Available
- Dry Circuit, 2 Amp, 5 Amp, or 10 Amp Contacts
- Form A, B, C and D Contacts Available
- Solder/plug in or PC Terminals
- Hydrogen Annealed Iron Magnetic Circuit
- Molded Comb Eliminates Phenolic Dust Inside Relay
- Balanced Spring-held Armature Allows Dependable Operation in Any Position
- Round Core and Larger Coil Volume Provide More Pull Force
- UL File #E43203; CSA File #LR36664; VDE 0110 Gr. A

Contact Arrangement:	2, 4, or 6 Form C; 6 or 8 Form A or B; 2 or 4 Form D available
Contact Rating:	Noninductive load — U.L. Rating
Code: WL	Fine silver, gold plated 3 Amp at 26 VDC or 115 VAC
Code: WH	Silver cadmium oxide, gold plated 7.5 Amp at 26 VDC or 115 VAC
Code: 10L, 40L	Fine silver, gold plated 2 Amp at 26 VDC; 1 Amp at 115 VAC
Life Expectancy:	Mechanical operations: 100 million Electrical: 1x10^6 at 2 A, 30 VDC or 120 VAC (Code WL) 1x10^5 at 5 A, 30 VDC or 120 VAC (Code WH)
Contact Resistance:	50 milliohms initially (typical)
Operate Time (typical):	10 ms at nom. coil voltage
Release Time (typical):	3 ms at nom. coil voltage with no coil suppression
Dielectric Strength (initial):	1000 Vrms between all points 1500 Vrms versions available
Coil Power	
At Pick Up Power (typical):	40 mW per pole (sensitive version) 25 mW per pole available
Max. Continuous Dissipation:	2.6 W @ 20°C (68°F) ambient 2.0 W @ 40°C (105°F) ambient
Temperature Rise:	30°C (86°F) per Watt (typical)

CONTACTS RATED 2 AMPS — FINE SILVER GOLD PLATED

COIL SPECIFICATONS						
Nom. Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-4WL	AZ 428-15-4WL	5.50
12 DC	9.0	185	DPDT	AZ 420-1011-4WL	AZ 428-1011-4WL	5.50
24 DC	18.0	700	DPDT	AZ 420-70-4WL	AZ 428-70-4WL	5.50
48 DC	36.0	2.5K	DPDT	AZ 420-56-4WL	AZ 428-56-4WL	5.50
115 DC	86.0	15K	DPDT	AZ 420-035-4WL	AZ 428-035-4WL	7.60
6 DC	4.5	52	4PDT	AZ 421-15-1WL	AZ 429-15-1WL	6.45
12 DC	9.0	185	4PDT	AZ 421-1011-1WL	AZ 429-1011-1WL	6.45
24 DC	18.0	700	4PDT	AZ 421-70-1WL	AZ 429-70-1WL	6.45
48 DC	36.0	2.5K	4PDT	AZ 421-56-1WL	AZ 429-56-1WL	6.45
115 DC	86.0	15K	4PDT	AZ 421-035-1WL	AZ 429-035-1WL	8.55
6 DC	4.5	25	6PDT	AZ 431-18-1WL	AZ 439-18-1WL	9.80
12 DC	9.0	90	6PDT	AZ 431-13-1WL	AZ 439-13-1WL	9.80
24 DC	18.0	430	6PDT	AZ 431-80-1WL	AZ 439-80-1WL	9.80
48 DC	36.0	1.8K	6PDT	AZ 431-06-1WL	AZ 439-06-1WL	9.80
115 DC	86.0	9K	6PDT	AZ 431-04-1WL	AZ 439-04-1WL	11.35

CONTACTS RATED 5 AMPS — SILVER CADMIUM

COIL SPECIFICATIONS					
Nominal Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-4WH	5.80
12 DC	9.0	185	DPDT	AZ 420-1011-4WH	5.80
24 DC	18.0	700	DPDT	AZ 420-70-4WH	5.80
48 DC	36.0	2.5K	DPDT	AZ 420-56-4WH	5.80
115 DC	86.0	15K	DPDT	AZ 420-035-4WH	7.90
6 DC	4.5	52	4PDT	AZ 421-15-1WH	7.05
12 DC	9.0	185	4PDT	AZ 421-1011-1WH	7.05
24 DC	18.0	700	4PDT	AZ 421-70-1WH	7.05
48 DC	36.0	2.5K	4PDT	AZ 421-56-1WH	7.05
115 DC	86.0	15K	4PDT	AZ 421-035-1WH	9.15
6 DC	4.5	25	6PDT	AZ 431-18-1WH	10.70
12 DC	9.0	90	6PDT	AZ 431-13-1WH	10.70
24 DC	18.0	430	6PDT	AZ 431-80-1WH	10.70
48 DC	36.0	1.8K	6PDT	AZ 431-06-1WH	10.70
115 DC	86.0	9K	6PDT	AZ 431-04-1WH	12.05

Epoxy Sealed Versions Available

HARDWARE

Poles	Socket	List Price	Retaining Clip	List Price	Ground Clip	List Price
2	ST 140-A1	1.10	ST 140-1	0.18	ST 140-2	0.27
4	ST 141-A1	1.40	ST 141-1	0.18	ST 140-2	0.27
6	ST 345-A1	1.90	ST 345-1	0.19	ST 140-2	0.27

Gold Plating Available Upon Request

BIFURCATED CONTACTS RATED 2 AMPS — FINE SILVER GOLD PLATED

COIL SPECIFICATONS						
Nom. Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	Solder Plug-in Terminals Order Number	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 420-15-40L	AZ 428-15-40L	6.45
12 DC	9.0	185	DPDT	AZ 420-1011-40L	AZ 428-1011-40L	6.45
24 DC	18.0	700	DPDT	AZ 420-70-40L	AZ 428-70-40L	6.45
48 DC	36.0	2.5K	DPDT	AZ 420-56-40L	AZ 428-56-40L	6.45
115 DC	86.0	15K	DPDT	AZ 420-035-40L	AZ 428-035-40L	8.55
6 DC	4.5	52	4PDT	AZ 421-15-10L	AZ 429-15-10L	8.10
12 DC	9.0	185	4PDT	AZ 421-1011-10L	AZ 429-1011-10L	8.10
24 DC	18.0	700	4PDT	AZ 421-70-10L	AZ 429-70-10L	8.10
48 DC	36.0	2.5K	4PDT	AZ 421-56-10L	AZ 429-56-10L	8.10
115 DC	86.0	15K	4PDT	AZ 421-035-10L	AZ 429-035-10L	10.20
6 DC	4.5	25	6PDT	AZ 431-18-10L	AZ 439-18-10L	12.20
12 DC	9.0	90	6PDT	AZ 431-13-10L	AZ 439-13-10L	12.20
24 DC	18.0	430	6PDT	AZ 431-80-10L	AZ 439-80-10L	12.20
48 DC	36.0	1.8K	6PDT	AZ 431-06-10L	AZ 439-06-10L	12.20
115 DC	86.0	9	6PDT	AZ 431-04-10L	AZ 439-04-10L	13.80

CONTACTS RATED 5 AMPS — SILVER CADMIUM

COIL SPECIFICATIONS					
Nominal Voltage (Volts)	Must Operate (VDC)	Resistance (Ohms)	Contacts	PC Terminals Order Number	List Price
6 DC	4.5	52	DPDT	AZ 428-15-4WH	5.80
12 DC	9.0	185	DPDT	AZ 428-1011-4WH	5.80
24 DC	18.0	700	DPDT	AZ 428-70-4WH	5.80
48 DC	36.0	2.5K	DPDT	AZ 428-56-4WH	5.80
115 DC	86.0	15K	DPDT	AZ 428-035-4WH	7.90
6 DC	4.5	52	4PDT	AZ 429-15-1WH	7.05
12 DC	9.0	185	4PDT	AZ 429-1011-1WH	7.05
24 DC	18.0	700	4PDT	AZ 429-70-1WH	7.05
48 DC	36.0	2.5K	4PDT	AZ 429-56-1WH	7.05
115 DC	86.0	15K	4PDT	AZ 429-035-1WH	9.15
6 DC	4.5	25	6PDT	AZ 439-18-1WH	10.70
12 DC	9.0	90	6PDT	AZ 439-13-1WH	10.70
24 DC	18.0	430	6PDT	AZ 439-80-1WH	10.70
48 DC	36.0	1.8K	6PDT	AZ 439-06-1WH	10.70
115 DC	86.0	9K	6PDT	AZ 439-04-1WH	12.05

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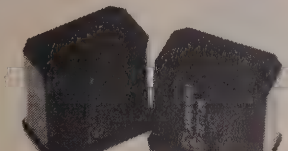
SERIES AZ 2420

DPDT or 4PDT
Dry Circuit to 7.5 Amp Contacts



2 POLE
L: 0.980″
W: 0.750″
H: 1.200″

4 POLE
L: 1.210″
W: 0.750″
H: 1.200″

FEATURES

- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Life Expectancy to 100 million operations
- Current and Voltage Sensitive Coils available
- Dry Circuit, 3 Amp, or 7.5 Amp Contacts
- UL File #E43203; CSA File #LR 36664

Contact Arrangement: DPDT (2 Form C)
4PDT (4 Form C)

Contact Rating: Noninductive Load — U.L. Rating
Dry Circuit Version: 2 A @ 28 VDC or 115 VAC
Light Duty Version: 3 A @ 28 VDC or 115 VAC
Heavy Duty Version: 7.5 A @ 28 VDC or 115 VAC

Contact Materials: Dry Circuit: Fine silver, gold plated
Light Duty: Fine silver, gold plated
Heavy Duty: SCO, gold plated

Contact Resistance: 50 milliohms max. initially

Life Expectancy: Mechanical: 500 million operations
Electrical:
Standard coils: 1.5 x 10^6 @ 2 A, 28 VDC or 115 VAC for light duty versions
2 x 10^5 @ 5 A, 28 VDC or 115 VAC for heavy duty versions

Operate Time: (typical) 10 ms at nominal coil voltage

Release Time: (typical) 3 ms at nominal coil voltage with no coil suppression

Dielectric Strength: 1500 Vrms coil to contact
1000 Vrms all other points

Coil Power: (typical) At Pick Up Power
Standard Version: 450 mW
Sensitive Version: 80 mW @ 2 pole;
180 mW @ 4 pole

Max. Continuous Dissipation: 2.6 W @ 20°C (68°F) ambient
2.0 W @ 40°C (105°F) ambient

Temperature Rise: 30°C (86°F per watt (typical)

Coil Temperature: Max. 105°C (220°F)

RELAY ORDERING DATA

A. TWO POLE (DPDT) — DRY CIRCUIT CONTACTS

COIL SPECIFICATIONS				ORDER NUMBER		
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance ±10%	Solder/Plug-in Terminals	PC Terminals	List Price
1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-40LUS	AZ 2428-15-40LUS	7.45
12	9.0	19	185	AZ 2420-1011-40LUS	AZ 2428-1011-40LUS	7.45
24	18.0	37	700	AZ 2420-70-40LUS	AZ 2428-70-40LUS	7.45
48	36.0	70	2500	AZ 2420-56-40LUS	AZ 2428-56-40LUS	7.45
115	86.0	170	15000	AZ 2420-035-40LUS	AZ 2428-035-40LUS	9.75
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-40LUS	AZ 2428-V10-40LUS	8.55
12	9.0	41	800	AZ 2420-V70-40LUS	AZ 2428-V70-40LUS	8.55
24	18.0	81	3200	AZ 2420-V50-40LUS	AZ 2428-V50-40LUS	8.55
48	36.0	104	13000	AZ 2420-V04-40LUS	AZ 2428-V04-40LUS	10.65
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-40LUS	AZ 2428-C07-40LUS	8.55
18	5.4 mA	70	2500	AZ 2420-C56-40LUS	AZ 2428-C56-40LUS	8.55
29	4.1 mA	102	5000	AZ 2420-C045-40LUS	AZ 2428-C045-40LUS	9.65
51	2.4 mA	170	15000	AZ 2420-C035-40LUS	AZ 2428-C035-40LUS	10.65

B. TWO POLE (DPDT) — LIGHT DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-4WLUS	AZ 2428-15-4WLUS	6.95
12	9.0	19	185	AZ 2420-1011-4WLUS	AZ 2428-1011-4WLUS	6.95
24	18.0	37	700	AZ 2420-70-4WLUS	AZ 2428-70-4WLUS	6.95
48	36.0	70	2500	AZ 2420-56-4WLUS	AZ 2428-56-4WLUS	6.95
115	86.0	170	15000	AZ 2420-035-4WLUS	AZ 2428-035-4WLUS	9.05
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-4WLUS	AZ 2428-V10-4WLUS	7.90
12	9.0	41	800	AZ 2420-V70-4WLUS	AZ 2428-V70-4WLUS	7.90
24	18.0	81	3200	AZ 2420-V50-4WLUS	AZ 2428-V50-4WLUS	7.90
48	36.0	104	13000	AZ 2420-V04-4WLUS	AZ 2428-V04-4WLUS	10.00
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-4WLUS	AZ 2428-C07 4WLUS	7.90
18	5.4 mA	70	2500	AZ 2420-C56-4WLUS	AZ 2428-C56-4WLUS	7.90
29	4.1 mA	102	5000	AZ 2420-C045-4WLUS	AZ 2428-C045 4WLUS	9.00
51	2.4 mA	170	15000	AZ 2420-C035-4WLUS	AZ 2428-C035-4WLUS	10.00

C. TWO POLE (DPDT) — HEAVY DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2420-15-4WLUS	AZ 2428-15-4WHUS	7.25
12	9.0	19	185	AZ 2420-1011-4WHUS	AZ 2428-1011-4WHUS	7.25
24	18.0	37	700	AZ 2420-70-4WHUS	AZ 2428-70-4WHUS	7.25
48	36.0	70	2500	AZ 2420-56-4WHUS	AZ 2428-56-4WHUS	7.25
115	86.0	170	15000	AZ 2420-035-4WHUS	AZ 2428-035-4WHUS	9.35
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	20	200	AZ 2420-V10-4WHUS	AZ 2428-V10-4WHUS	8.15
12	9.0	41	800	AZ 2420-V70-4WHUS	AZ 2428-V70-4WHUS	8.15
24	18.0	81	3200	AZ 2420-V50-4WHUS	AZ 428-V50-4WHUS	8.15
48	36.0	104	13000	AZ 2420-V04-4WHUS	AZ 2428-V04-4WHUS	10.30
3. SENSITIVE DC CURRENT VERSION						
12	8.5 mA	44	1000	AZ 2420-C07-4WHUS	AZ 2428-C07-4WHUS	8.15
18	5.4 mA	70	2500	AZ 2420-C56-4WHUS	AZ 2428-C56-4WHUS	8.15
29	4.1 mA	102	5000	AZ 2420-C045-4WHUS	AZ 2428-C045-4WHUS	9.30
51	2.4 mA	170	15000	AZ 2420-C035-4WHUS	AZ 2428-C035-4WHUS	10.30

D. FOUR POLE (4PDT) — DRY CIRCUIT CONTACTS

COIL SPECIFICATIONS				ORDER NUMBER		
Nominal Coil VDC	Must Operate VDC	Max. Continuous VDC	Coil Resistance ±10%	Solder/Plug-in Terminals	PC Terminals	List Price
1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-10LUS	AZ 2429-15-10LUS	9.25
12	9.0	19	185	AZ 2421-1011-10LUS	AZ 2429-1011-10LUS	9.25
24	18.0	37	700	AZ 2421-70-10LUS	AZ 2429-70-10LUS	9.25
48	36.0	70	2500	AZ 2421-56-10LUS	AZ 2429-56-10LUS	9.25
115	86.0	170	15000	AZ 2421-035-10LUS	AZ 2429-035-10LUS	11.35
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-10LUS	AZ 2429-V12-10LUS	10.50
12	9.0	30	450	AZ 2421-V80-10LUS	AZ 2429-V80-10LUS	10.50
24	18.0	61	1800	AZ 2421-V05-10LUS	AZ 2429-V05-10LUS	10.50
48	36.0	124	7500	AZ 2421-V40-10LUS	AZ 2429-V40-10LUS	11.85
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-10LUS	AZ 2429-C07-10LUS	10.50
30	8.3 mA	70	2500	AZ 2421-C56-10LUS	AZ 2429-C56-10LUS	10.50
44	6.2 mA	102	5000	AZ 2421-C045-10LUS	AZ 429-C045-10LUS	11.85
75	3.5 mA	170	15000	AZ 2421-C035-10LUS	AZ 2429-C035-10LUS	12.60

E. FOUR POLE (4PDT) — LIGHT DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-1WLUS	AZ 2429-15-1WLUS	8.00
12	9.0	19	185	AZ 2421-1011-1WLUS	AZ 2429-1011-1WLUS	8.00
24	18.0	37	700	AZ 2421-70-1WLUS	AZ 2429-70-1WLUS	8.00
48	36.0	70	2500	AZ 2421-56-1WLUS	AZ 2429-56-1WLUS	8.00
115	86.0	170	15000	AZ 2421-035-1WLUS	AZ 2429-035-1WLUS	10.10
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-1WLUS	AZ 2429-V12-1WLUS	9.20
12	9.0	30	450	AZ 2421-V80-1WLUS	AZ 2429-V80-1WLUS	9.20
24	18.0	61	1800	AZ 2421-V05-1WLUS	AZ 2429-V05-1WLUS	9.20
48	36.0	124	7500	AZ 2421-V40-1WLUS	AZ 2429-V40-1WLUS	10.70
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-1WLUS	AZ 2429-C07-1WLUS	9.20
30	8.3 mA	70	2500	AZ 2421-C56-1WLUS	AZ 2429-C56-1WLUS	9.20
44	6.2 mA	102	5000	AZ 2421-C045-1WLUS	AZ 2429-C045-1WLUS	10.60
75	3.5 mA	170	15000	AZ 2421-C035-1WLUS	AZ 2429-C035-1WLUS	11.30

F. FOUR POLE (4PDT) — HEAVY DUTY CONTACTS

1. STANDARD DC VOLTAGE VERSION						
6	4.5	10	52	AZ 2421-15-1WHUS	AZ 2429-15-1WHUS	8.65
12	9.0	19	185	AZ 2421-1011-1WHUS	AZ 2429-1011-1WHUS	8.65
24	18.0	37	700	AZ 2421-70-1WHUS	AZ 2429-70-1WHUS	8.65
48	36.0	70	2500	AZ 2421-56-1WHUS	AZ 2429-56-1WHUS	8.65
115	86.0	170	15000	AZ 2421-035-1WHUS	AZ 2429-035-1WHUS	10.75
2. SENSITIVE DC VOLTAGE VERSION						
6	4.5	15	110	AZ 2421-V12-1WHUS	AZ 2429-V12-1WHUS	9.85
12	9.0	30	450	AZ 2421-V80-1WHUS	AZ 2429-V80-1WHUS	9.85
24	18.0	61	1800	AZ 2421-V05-1WHUS	AZ 2429-V05-1WHUS	9.85
48	36.0	124	7500	AZ 2421-V40-1WHUS	AZ 2429-V40-1WHUS	11.30
3. SENSITIVE DC CURRENT VERSION						
19	13 mA	44	1000	AZ 2421-C07-1WHUS	AZ 2429-C07-1WHUS	9.85
30	8.3 mA	70	2500	AZ 2421-C56-1WHUS	AZ 2429-C56-1WHUS	9.85
44	6.2 mA	102	5000	AZ 2421-C045-1WHUS	AZ 2429-C045-1WHUS	11.20
75	3.5 mA	170	15000	AZ 2421-C035-1WHUS	AZ 2429-C035-1WHUS	11.95

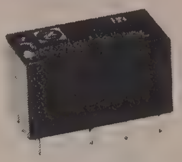
1. All values at 20°C.
2. Other coil resistances and sensitivities available. See Series AZ 420 Data Sheet or contact factory.
3. Other contact materials available. Contact factory.
4. Relay will pull in with less than "must operate" value.

"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 820

DPDT, Up to 2 Amps Bifurcated Contact



DIP PACKAGE
L: 0.820″
W: 0.420″
H: 0.455″

FEATURES

- Low Profile for Compact Board Spacing
- DC Coils to 48 VDC
- Life Expectancy to 10 Million Operations
- Standard PC 0.1″ Grid Terminal Spacing
- Fits Standard 16 Pin IC Socket
- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Meets FCC Requirements for Open Contacts
- UL File #E43203; CSA File #LR 36664

Contact Arrangement:	DPDT (2 Form C) Bifurcated Contact
Contact Rating:	Noninductive load Max. switched power: 30 W or 60 VA Max. switched current: 2 Amps Max. switched voltage: 150 VDC or VAC
Contact Material:	Silver palladium, gold plated
Life Expectancy:	Mechanical: 10 million operations Electrical: 5x10^5 @ 1 A, 30 VDC 2x10^5 @ 0.5 A, 120 VAC
Dielectric Strength (initial):	1200 Vrms; 500 Vrms between open contacts
Contact Resistance (typical):	50 milliohms initially 200 milliohms at end of life
Operate Time:	5 ms at nominal coil voltage (typical)
Release Time:	2 ms at nominal coil voltage (typical with no coil suppression)
Coil Power	
At Pick Up Voltage (typical):	250 mW
Max. Continuous Dissipation:	1.05 mW @ 20°C (68°F) ambient 0.84 W @ 40°C (105°F) ambient
Temperature Rise:	95°C per Watt (typical)

RELAY ORDERING DATA

STANDARD RELAYS: 2 FORM C (DPDT)

COIL SPECIFICATIONS					
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	6.8	45	3.7	AZ 820-2C-5DE	3.50
6	8.2	66	4.5	AZ 820-2C-6DE	3.50
12	16.4	280	9.0	AZ 820-2C-12DE	3.50
24	32.4	1,070	18.0	AZ 820-2C-24DE	3.50
48	61.5	4,000	36.0	AZ 820-2C-48DE	3.75

SERIES AZ 830

DPDT to 2 Amps, Bifurcated Contacts Polarized

DIP PACKAGE
L: 0.788″
W: 0.390″
H: 0.386″

FEATURES

- Low Profile for Compact Board Spacing
- DC Coils to 48 VDC
- High Sensitivity, 100 mW Pick-up
- Life Expectancy to 100 Million Operations
- High Switching Capacity, 60W, 125 VA
- Fits Standard 16 Pin IC Socket
- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Meet FCC Part 68.302 Lightning Surge
- Meet FCC Part 68.304 1000V Dielectric
- UL File #E43203; CSA File #LR 36664

Contact Arrangement:	DPDT (2 Form C) Bifurcated Contact
Contact Rating:	Noninductive load Max. switched power: 60 W at 125 VA Max. switched current: 2 Amps Max. switched voltage: 220 VDC or 250 VAC
UL Rating:	2 amp @ 30 VDC 1 amp @ 120 VAC
Contact Material:	Silver alloy, gold clad Silver palladium, gold clad available
Life Expectancy:	Mechanical: 100 million operations Electrical: 5 x 10^5 @ 2 A, 30 VDC or 1 A, 125 VAC 2 x 10^6 @ 1 A, 30 VDC or .5 A, 125 VAC
Contact Resistance:	50 milliohms initially (typical) 200 milliohms at end of life
Operate Time:	3 ms at nominal coil voltage (typical)
Release Time:	2 ms at nominal coil voltage (typical)
Dielectric Strength: (Initial)	1000 Vrms between contact sets 1000 Vrms across contacts 1500 Vrms contacts to coil
Coil Power: (typical)	At Pick-up Voltage Standard Version: 200 mW Sensitive Version: 100 mW
Max. Continuous Dissipation:	1.35 W @ 20°C (68°F) ambient 1.05 W @ 40°C (105°F) ambient
Temperature Rise:	72°C per watt (typical)

RELAY ORDERING DATA

STANDARD COILS

Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	7.5	62.5	3.5	AZ 830-2C-5DE	3.80
6	9.0	90	4.2	AZ 830-2C-6DE	3.80
12	18.0	360	8.4	AZ 830-2C-12DE	3.80
24	36.0	1,440	16.8	AZ 830-2C-24DE	3.90
48	72.0	5,760	33.6	AZ 830-2C-48DE	4.25

SENSITIVE COILS

Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
5	10	125	3.5	AZ 830-2C-5DSE	4.30
6	12	180	4.2	AZ 830-2C-6DSE	4.30
12	24	720	8.4	AZ 830-2C-12DSE	4.30
24	48	2,880	16.8	AZ 830-2C-24DSE	4.40
48	96	11,520	33.6	AZ 830-2C-48DSE	4.75

1. All values at 20°C.
2. Relay has fixed coil polarity.

"It's a better relay"

AMERICAN ZETTLER, INC.
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 690

Single Pole — 10 Amp
High Dielectric — 4000 Vrms
Complete International Approvals

: 1.100″
W: 1.030″
: 0.441″

AZ 694

L: 1.100″
W: 0.476″
H: 1.030″

AZ 692
AZ 693 (0.1″ Grid)

FEATURES

- Isolation Spacing Greater Than 8mm
- Dielectric Strength 4000 Vrms Coil to Contact
- Approvals/Standards Include UL, CSA, VDE, IEC, CEE, SEMKO
- Single Pole — Forms A, B, C Available
- 10 Amp Switching
- Life Expectancy to 30 Million Operations
- Thinpak Version Less Than .500″ High
- Slimpak™ Version Saves Board Space
- Epoxy Sealed Version for Automatic Wave Soldering and Cleaning
- UL File #E44211; CSA File #LR36664; VDE4120-4940-4001/A1

Contact Arrangement:	SPDT (1 Form C); other forms optional
Contact Rating:	Noninductive load Max. switched power: 300 W or 2000 VA Max. switched current: 10 Amp, 64 Amp for 2 msec Max. switched voltage: 150 VDC or 250 VAC U.L. Rating: 10 Amp @ 24 VDC or 115 VAC ¼ HP 120 VAC Motor Load
Contact Material:	Silver cadmium oxide
Life Expectancy:	Mechanical: 30 million operations Electrical: 10^5 @ 10 Amp, 30 VDC $2x10^5$ @ 10 Amp, 115 VAC or 8 Amp 220 VAC
Contact Resistance:	100 milliohms max. initially 200 milliohms at end of life
Operate Time:	6 ms at nominal coil voltage (typical)
Release Time:	4 ms at nominal coil voltage (typical wtih no coil suppression)
Coil Power:	
At Pick Up Voltage (typical):	Standard Coil: 350 mW Sensitive Coil: 250 mW
Max. Continuous Dissipation:	1.9 W @ 20°C (68°F) ambient 1.45 W @ 40°C (105°F) ambient
Temperature Rise:	42°C (108°F) per Watt (typical)
Coil Temperature:	Max. 105°C (220°F)
Dielectric Strength (initial):	4000 Vrms Coil to Contact 1000 Vrms between open contact

RELAY ORDERING DATA: Single Pole .138 spacing

STANDARD RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 692-125-2*	4.25	AZ 2692-125-2*	5.25
6	10	58	4.2	AZ 692-112-2	4.25	AZ 2692-112-2	5.25
12	19	215	8.4	AZ 692-08-2	4.25	AZ 2692-08-02	5.25
24	35	740	16.8	AZ 692-560-2	4.25	AZ 2692-560-2	5.25
48	74	3200	33.6	AZ 692-04-2	4.75	AZ 2692-04-2	5.75

SENSITIVE RELAYS. 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 692-118-52*	4.50	AZ 2692-118-52*	5.50
6	12	80	4.2	AZ 692-010-52	4.50	AZ 2692-010-52	5.50
12	24	330	8.4	AZ 692-071-52	4.50	AZ 2692-071-52	5.50
24	45	1200	16.8	AZ 692-052-52	4.50	AZ 2692-052-52	5.50
48	89	4700	33.6	AZ 692-518-52	5.00	AZ 2692-518-52	6.00

* Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

HARDWARE ORDERING DATA

Description	Order Numer	Price	Description	Order Number	Price
Socket	ST 482-U1	1.60	Retainer	ST 482-2	0.25

RELAY ORDERING DATA: Single Pole Thinpak

STANDARD RELAYS. 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 694-125-2*	4.75	AZ 2694-125-2*	6.00
6	10	58	4.2	AZ 694-112-2	4.75	AZ 2694-112-2	6.00
12	19	215	8.4	AZ 694-08-2	4.75	AZ 2694-08-2	6.00
24	35	740	16.8	AZ 694-560-2	4.75	AZ 2694-560-2	6.00
48	74	3200	33.6	AZ 694-04-2	5.25	AZ 2694-04-2	6.50

SENSITIVE RELAYS. 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 694-118-52*	5.25	AZ 2694-118-52*	6.50
6	12	80	4.2	AZ 694-010-52	5.25	AZ 2694-010-52	6.50
12	24	330	8.4	AZ 694-071-52	5.25	AZ 2694-071-52	6.50
24	45	1200	16.8	AZ 694-052-52	5.25	AZ 2694-052-52	6.50
48	89	4700	33.6	AZ 694-518-52	5.75	AZ 2694-518-52	7.00

Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

RELAY ORDERING DATA: Single Pole .100 spacing

STANDARD RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	8	38	3.5	AZ 693-125-2*	4.50	AZ 2693-125-2*	5.50
6	10	58	4.2	AZ 693-112-2	4.50	AZ 2693-112-2	5.50
12	19	215	8.4	AZ 693-08-2	4.50	AZ 2693-08-2	5.50
24	35	740	16.8	AZ 693-560-2	4.50	AZ 2693-560-2	5.50
48	74	3200	33.6	AZ 693-04-2	5.00	AZ 2693-04-2	6.00

SENSITIVE RELAYS: 1 Form C

COIL SPECIFICATIONS				ORDER NUMBER			
Nominal Coil VDC	Max. Continuous VDC	Coil Resistance Ohms ±10%	Must Operate VDC	Unsealed	List Price	Sealed	List Price
5	9	47	3.5	AZ 693-118-52*	5.00	AZ 2693-118-52*	6.00
6	12	80	4.2	AZ 693-010-52	5.00	AZ 2693-010-52	6.00
12	24	330	8.4	AZ 693-071-52	5.00	AZ 2693-071-52	6.00
24	45	1200	16.8	AZ 693-052-52	5.00	AZ 2693-052-52	6.00
48	89	4700	33.6	AZ 693-518-52	5.50	AZ 2693-518-52	6.50

* Substitute "4 or 54", "6 or 56" in place of "2 or 52" to indicate 1 Form A and 1 Form B respectively.

HARDWARE ORDERING DATA

Description	Order Number	List Price	Description	Order Number	List Price
Socket	ST 483-U1	1.60	Retainer	ST 482-2	0.25

INTERNATIONAL APPROVALS

PASSED INTERNATIONAL ELECTRICAL CODE IEC 380

• Germany:	VDE 0860/8.81 paragraphs 10, 14 VDE 0806/8.81 paragraphs 7, 11, 15, 16, 29 VDE 0631/9.77 paragraphs 9, 12, 14 VDE 0730/T. 1/3.72 paragraph 22 VDE 0435/9.72 (with production monitoring)
• Sweden:	SEMKO 43-95771/1-2 SEMKO 43-95765/1-2
• Norway:	NEMKO 55938/M 54234 T
• Finland:	SEIT 050471-01
• Switzerland:	SEV D 3.31/98
• U.S.A.:	UL File E44211
• Canada:	CSA File LR 36664-12

"It's a better relay"

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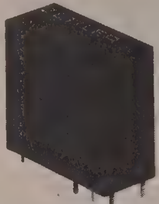
16881 Hale Avenue, Irvine, California 92714 (714) 660-1670 • Telex 67-8472

SERIES AZ 730

Double Pole — 8 Amp
High Dielectric — 4000 Vrms
Complete International Approvals



L: 1.110″
W: 0.496″
H: 1.030″

FEATURES

- Dielectric Strength 4000 Vrms Coil to Contact
- Isolation Spacing Greater Than 8mm
- Approvals/Standards Include UL, CSA, VDE, IEC, CEE, SEMKO
- Double Pole — Forms A, B, C Available
- 8 Amp Switching
- Life Expectancy to 30 Million Operations
- Slimpak™ Version Saves Board Space
- Epoxy Sealed Version for Automatic Wave Soldering and cleaning
- UL File #E44211; CSA File #LR36664; VDE4120-4940-4002/A1

Contact Arrangement:	DPDT (2 Form C); other forms optional
Contact Rating:	Noninductive load Max. switched power: 240 W or 1500 VA Max. switched current: 8 Amp, 51 Amp for 2 ms Max. switched voltage: 150 VDC or 250 VAC U.L. Rating: 8 Amp @ 24 VDC or 115 VAC 1/8 HP 120 VAC Motor Load
Contact Material:	Silver cadmium oxide
Life Expectancy:	Mechanical: 30 million operations Electrical: 10^5 @ 8 Amp 30 VDC $2x10^5$ @ 8 Amp 115 VAC or 6 Amp 220 VAC
Contact Resistance:	100 milliohms max. initially 200 milliohms at end of life
Operate Time:	8 ms at nominal coil voltage (typical)
Release Time:	4 ms at nominal coil voltage (typical with no coil suppression)
Dielectric Strength:	4000 Vrms contacts to coil 2500 Vrms contact to contact 1000 Vrms between open contact
Coil Power:	
At Pick Up Voltage (typical):	Standard Coil: 350 mW Sensitive Coil: 250 mW
Max. Continuous Dissipation:	1.9 W @ 20°C (68°F) ambient 1.45 W @ 40°C (105°F) ambient
Temperature Rise:	42°C (108°F) per Watt (typical)
Coil Temperature:	Max. 105°C (220°F)

RELAY ORDERING DATA

STANDARD COILS

Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Unsealed Order Number	Unsealed List Price	Sealed Order Number	Sealed List Price
5	8	38	3.5	AZ 732-125-2	5.30	AZ 2732-125-2	6.30
6	10	58	4.2	AZ 732-112-2	5.30	AZ 2732-112-2	6.30
12	19	215	8.4	AZ 732-08-2	5.30	AZ 2732-08-2	6.30
24	35	740	16.8	AZ 732-560-2	5.30	AZ 2732-560-2	6.30
48	74	3200	33.6	AZ 732-04-2	5.80	AZ 2732-04-2	6.80

SENSITIVE COILS

Nom. Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Unsealed Order Number	Unsealed List Price	Sealed Order Number	Sealed List Price
5	9	47	3.5	AZ 732-118-52	5.60	AZ 2732-118-52	6.60
6	11	70	4.2	AZ 732-509-52	5.60	AZ 2732-509-52	6.60
12	21	270	8.4	AZ 732-521-52	5.60	AZ 2732-521-52	6.60
24	43	1100	16.8	AZ 732-053-52	5.60	AZ 2732-053-52	6.60
48	86	4400	33.6	AZ 732-510-52	6.10	AZ 2732-510-52	7.10

HARDWARE

Socket	List Price	Retaining Clip	List Price
ST 484-U1	1.80	ST 482-2	0.25

SERIES AZ 2530

Epoxy Sealed SPDT

L: 1.090″
W: 0.593″
H: 0.445″

AZ2530-08-2
24VDC

FEATURES

- Epoxy Sealed for Automatic Wave Soldering and Cleaning
- Low Profile for Compact Board Spacing
- High Sensitivity, 80 mW Pick-up
- UL File #E43203; CSA File #LR 36664

Contact Arrangement:	SPDT (1 Form C)
Contact Rating:	Noninductive load **Standard Version**
Light Duty:	Max. switched power: 30 W or 100 VA Max. switched current: 2.0 A Max. switched voltage: 125 VDC or VAC U.L. Rating: 1 Amp @ 26 VDC 0.5 Amp @ 115 VAC
Medium Duty:	Max. switched power: 50 W or 200 VA Max. switched current: 3.0 A Max. switched voltage: 125 VDC or VAC U.L. Rating: 2 Amp @ 26 VDC 1 Amp @ 115 VAC **Sensitive Version**
Light Duty:	Max. switched power: 15 W or 50 VA Max. switched current: 1 A Max. switched voltage: 26 VDC or 115 VAC
Medium Duty:	Max. switched power: 25 W or 100 VA Max. switched current: 1.5 A Max. switched voltage: 26 VDC or 115 VAC U.L. Approvals pending
Contact Material:	
Light Duty:	Fine silver, gold plated
Medium Duty:	Silver cadmium oxide
Life Expectancy:	Mechanical: 10 million operations Electrical: Standard Coils 1 x 10^6 @ 1 A, 26 VDC or 0.5 A, 115 VAC for light duty versions 2 x 10^5 @ 2 A, 26 VDC or 1 A, 115 VAC for medium duty versions Sensitive Coils 2 x 10^5 @ 0.5 A, 26 VDC or 50 VAC for light duty versions 2 x 10^5 @ 1 A, 26 VDC or 50 VAC for medium duty versions
Coil Power:	
At Pick Up Voltage (typical):	Standard, light duty type: 125 mW Sensitive, light duty type: 80 mW Standard, medium duty type: 250 mW Sensitive, medium duty type: 80 mW
Max. Continuous Dissipation:	1.6 W @ 20°C (68°F) ambient 1.2 W @ 40°C (105°F) ambient
Temperature Rise:	55°C (130°F) per Watt (typical)
Coil Temperature:	Max. 105°C (220°F)

RELAY ORDERING DATA

COIL SPECIFICATIONS Nominal Coil VDC	Max. Continuous VDC	Coil Resistance ±10%	Must Operate VDC	Order Number	List Price
STANDARD RELAYS. Light Duty Type (1 Amp Contact)					
5	9.5	64	3.75	AZ 2530-12-1	3.85
6	11.0	90	4.5	AZ 2530-11-1	3.85
12	21.0	310	9.0	AZ 2530-08-1	3.85
24	37.0	950	18.0	AZ 2530-06-1	4.10
48	80.0	4,500	36.0	AZ 2530-04-1	4.80
100	143.0	14,000	75.0	AZ 2530-03-1	6.95
STANDARD RELAYS: Medium Duty Type (2 Amp Contact)					
5	7.1	35	3.75	AZ 2530-14-2	3.95
6	9.5	47	4.5	AZ 2530-13-2	3.95
12	17.0	200	9.0	AZ 2530-09-2	3.95
24	37.0	950	18.0	AZ 2530-06-2	4 35
48	66.0	3,000	36.0	AZ 2530-045-2	4.95
100	143.0	14,000	75.0	AZ 2530-03-2	7.20
SENSITIVE RELAYS. Light Duty Type (0.5 Amp Contact)					
5	21	310	16.0	AZ 2530-08-51	5.00
12	42	1,250	8.5	AZ 2530-56-51	5.20
24	66	3,000	6.1	AZ 2530-45-51	6 55
48	143	14,000	2.7	AZ 2530-03-51	7.30
SENSITIVE RELAYS: Medium Duty Type (1 Amp Contact)					
5	21	310	16.0	AZ 2530-08-52	5.20
12	42	1,250	8.9	AZ 2530-56-52	5.35
24	66	3,000	6.1	AZ 2530-45-52	6.80
48	143	14,000	2.7	AZ 2530-03-52	7.50

2 Form C (DPDT) Series AZ 2531 also available.

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SERIES 10

DIP REED RELAY
SPST, SPDT, DPST
3W & 10W Contacts

L: 0.750″
W: 0.310″
H: 0.275″

FEATURES

- 8 Pin Dual-in-line Package
- Form A and C Contacts
- DC Coils to 24 VDC
- Available with or without diode

Contact Rating: (Resistive Load)	**1 Form A (SPST-NO)** 10 W DC max. switched power 0.5 A max. switched current 1.5 A max. carrying current 100 VDC max. switched voltage
	2 Form A (DPST-NO) 3 W DC max. switched power 0.2 A max. switched current 0.5 A max. carrying current 28 VDC max. switched voltage
	1 Form C (SPDT) 3 W DC max. switched power 0.25 A max. switched current 0.5 A max. carrying current 28 VDC max. switched voltage
Life Expectancy: (Resistive Load)	**Form A Contacts** 10 x 10⁶ at rated load 200 x 10⁶ at low level
	Form C Contacts 5 x 10⁶ at rated load 50 x 10⁶ at low level
Contact Resistance:	200 milliohms max. initially
Dielectric Strength:	200 VDC across open contact 1000 VDC coil to contact
Operate Time: (typical)	0.25 ms at nom. coil voltage
Release Time: (typical)	0.25 ms at nom. coil voltage
Coil Temperature:	105°C (220°F) max.

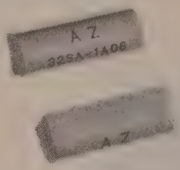
RELAY ORDERING DATA

Contact Configuration	Nominal Coil VDC	Coil Resistance ±10%	Must Operate VDC	Min. Drop-out VDC	American Zettler Part Number			
					Without Diode	List Price	With Diode	List Price
1 Form A (SPST-NO)	5	500	3.8	1.0	12045-1A05	3.50	12046-1A05	4.00
Max. Load: 10 Watt	6	500	4.0	0.5	12045-1A06	3.50	12046-1A06	4.00
Max. Current: 0.5 Amp	12	500	8.0	1.0	12045-1A12	3.50	12046-1A12	4.00
Max. Voltage: 100 VDC	24	2150	16.0	2.0	12045-1A24	4.00	12046-1A24	4.50
2 Form A (SPST-NO)	5	200	3.8	1.0	11098-2A05	6.00	11123-2A05	6.50
Max. Load: 3 Watt	6	200	4.0	1.0	11098-2A06	6.00	11123-2A06	6.50
Max. Current: 0.11 Amp	12	500	8.0	2.0	11098-2A12	6.00	11123-2A12	6.50
Max. Voltage: 28 VDC	24	2150	16.0	4.0	11098-2A24	6.30	11123-2A24	6.80
1 Form C (SPDT)	5	200	4.0	0.5	11042-1C05	7.15	11044-1C05	7.85
Max. Load: 3 Watt	6	80	4.0	0.5	11042-1C06	7.15	11044-1C06	7.85
Max. Current: 0.25 Amp	12	500	8.0	1.0	11042-1C12	7.20	11044-1C12	7.90
Max. Voltage: 28 VDC	24	2000	16.0	2.0	11042-1C24	8.20	11044-1C24	8.90

1. All values at 20°C.
2. Relay orientation is any position.

SERIES 30

REED RELAY
SPST, SPDT
3W and 10W Contacts



L: 1.000″
W: 0.340″
H: 0.375″

FEATURES

- SIP — .200″ Grid
- Form A and Form C Contacts
- Contacts Rated at 3W and 10W
- DC Coils to 48 VDC
- Rugged Molded Case
- Epoxy Encpsulated Package
- Maximum Performance at Minimum Cost
- High Quality Switch Insures Stable Contact Resistance

Contact Rating: (Resistive Load)	**1 Form A (SPST — NO)** 10 W DC Max. switched power 0.5 A Max. switched current 1 A Max. carrying current 200 VDC Max. switched voltage
	1 Form C (SPDT) 3 W DC Max. switched power 0.25 A Max. switched current 0.5 A Max. carrying current 28 VDC Max. switched voltage
Life Expectancy: (Resistive Load)	**Form A Contact** 10 x 10⁶ at rated load 100 x 10⁶ at low level
	Form C Contact 5 x 10⁶ at rated load 50 x 10⁶ at low level
Contact Resistance:	200 milliohms max. initially
Dielectric Strength:	500 VDC across open contact 1000 VRMS coil to contact
Operate Time: (Typical)	Form A: 0.5 ms at nom. coil voltage Form C: 0.5 ms at nom. coil voltage
Release Time: (Typical)	Form A: 0.1 ms at nom. coil voltage Form C: 0.5 ms at nom. coil voltage
Coil Temperature:	105°C (220°F) max.

RELAY ORDERING DATA

A. 1 Form A (SPST - NO)
Maximum Load: 10W Maximum Voltage: 200 VDC
Maximum Current: 0.5A Grid: .200″ x .400″ x .200″

Nominal Coil VDC	Max. Coil VDC	Coil Resistance ±10%	Must Operate VDC	Min. Dropout VDC	American Zettler Part Number	List Price
5	8	500	3.8	0.5	32SA-1A05	2.25
6	8	125	3.8	0.5	32SA-1A06	2.05
12	16	500	8.0	1.0	32SA-1A12	2.25
24	32	2,000	16.0	2.0	32SA-1A24	2.35
48	64	8,000	32.0	4.0	32SA-1A48	3.60

All Values at 20°C

B. 1 Form C (SPDT)
Maximum Load: 3W Maximum Voltage: 28 VDC
Maximum Current: 0.25A

Nominal Coil VDC	Max. Coil VDC	Coil Resistance ±10%	Must Operate VDC	Min. Dropout VDC	American Zettler Part Number	List Price
5	8	200	4.0	0.5	31SA-1C05	4.40
6	8	125	4.0	0.5	31SA-1C06	4.40
12	16	500	8.0	1.0	31SA-1C12	4.40
24	32	2,000	16.0	2.0	31SA-1C24	4.75

All Values at 20°C

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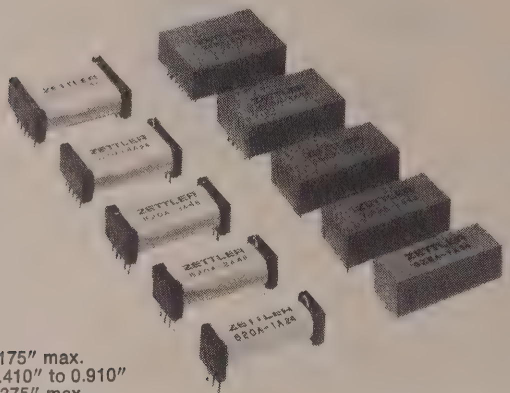
SERIES 60

REED RELAY
Contacts to 6 Form A, 4 Form C
3W & 10W Contacts



L: 1.175″ max.
W: 0.410″ to 0.910″
H: 0.375″ max.

FEATURES

- Form A and Form C Contacts
- Contcts Rated at 3W and 10W
- DC Coils to 48 VDC
- Unsealed or Epoxy Encapsulated Versions Available
- Maximum Performance at Minimum Cost
- High Quality Switch Insures Stable Contact Resistance

Contact Rating: (Resistive Load)	**Form A (1, 2, 3, 4, 6 poles)** 10 W DC max. switched power 0.5 A max. switched current 2 A max. carrying current 200 VDC max. switched voltage
	Form C (1, 2, 3, 4 poles) 3 W DC max. switched power 0.25 A max. switched current 1 A max. carrying current 28 VDC max. switched voltage
Life Expectancy: (Resistive Load)	**Form A Contact** 10 x 10^6 at rated load 200 x 10^6 at low level
	Form C Contact 5 x 10^6 at rated load 50 x 10^6 at low level
Contact Resistance:	200 milliohms max. initially
Dielectric Strength:	300 VDC across contact gap 500 VDC all other points
Operate Time: (typical)	**Form A:** 0.5 ms at nominal coil voltage **Form C:** 0.5 ms at nominal coil voltage
Release Time: (typical)	**Form A:** 0.1 ms at nominal coil voltage **Form C:** 0.5 ms at nominal coil voltage
Coil Temperature:	Max. 120°C (249°F)

RELAY ORDERING DATA

Contact Configuration	Nominal Coil Voltage	Coil Resistance ±10%	Must Operate VDC	Min. Drop-out VDC	American Zettler Part Number			
					Open	List Price	Sealed	List Price
1 Form A (SPST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VAC	5	500	3.8	0.5	620A-1A05	2.40	62SA-1A05	3.15
	6	125	4.0	0.5	620A-1A06	2.40	62SA-1A06	3.15
	12	500	8.0	1.0	620A-1A12	2.40	62SA-1A12	3.15
	24	2,000	16.0	2.0	620A-1A24	2.65	62SA-1A24	3.35
	48	8,000	32.0	4.0	620A-1A48	4.50	62SA-1A48	5.15
2 Form A (DPST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	200	3.8	0.5	620A-2A05	3.55	62SA-2A05	4.15
	6	110	4.0	0.5	620A-2A06	3.55	62SA-2A06	4.15
	12	440	8.0	1.0	620A-2A12	3.55	62SA-2A12	4.15
	24	1,750	16.0	2.0	620A-2A24	4.05	62SA-2A24	4.35
	48	7,000	32.0	4.0	620A-2A48	5.70	62SA-2A48	6.10
3 Form A (3PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	200	3.8	0.5	620A-3A05	4.90	62SA-3A05	5.50
	6	85	4.0	0.5	620A-3A06	4.90	62SA-3A06	5.50
	12	340	8.0	1.0	620A-3A12	4.90	62SA-3A12	5.50
	24	1,350	16.0	2.0	620A-3A24	5.25	62SA-3A24	5.85
	48	5,400	32.0	4.0	620A-3A48	7.00	62SA-3A48	7.65
4 Form A (4PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	120	3.8	0.5	620A-4A05	6.15	62SA-4A05	6.40
	6	60	4.0	0.5	620A-4A06	6.15	62SA-4A06	6.40
	12	250	8.0	1.0	620A-4A12	6.15	62SA-4A12	6.40
	24	1,000	16.0	2.0	620A-4A24	6.45	62SA-4A24	6.70
	48	4,000	32.0	4.0	620A-4A48	8.00	62SA-4A48	8.50
6 Form A (6PST-NO) Max. Load: 10 Watt Max. Current: 0.5 Amp Max. Voltage: 200 VDC	5	70	3.8	0.5	620A-6A05	8.20	62SA-6A05	8.65
	6	35	4.0	0.5	620A-6A06	8.20	62SA-6A06	8.65
	12	135	8.0	1.0	620A-6A12	8.20	62SA-6A12	8.65
	24	550	16.0	2.0	620A-6A24	8.50	62SA-6A24	8.85
	48	2,200	32.0	4.0	620A-6A48	10.00	62SA-6A48	10.65
1 Form C (SPDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	5	500	3.8	0.5	610A-1C05	6.45	61SA-1C05	6.80
	6	125	4.0	0.5	610A-1C06	6.45	61SA-1C06	6.80
	12	500	8.0	1.0	610A-1C12	6.45	61SA-1C12	6.80
	24	2,000	16.0	2.0	610A-1C24	6.65	61SA-1C24	7.05
	48	8,000	32.0	4.0	610A-1C48	8.50	61SA-1C48	8.90
2 Form C (DPDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	5	200	3.8	0.5	610A-2C05	11.30	61SA-2C05	11.80
	6	80	4.0	0.5	610A-2C06	11.30	61SA-2C06	11.80
	12	310	8.0	1.0	610A-2C12	11.30	61SA-2C12	11.80
	24	1,250	16.0	2.0	610A-2C24	11.60	61SA-2C24	12.15
	48	5,000	32.0	4.0	610A-2C48	13.35	61SA-2C48	13.90
3 Form C (3PDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 28 VDC	6	45	4.0	0.5	610A-3C06	16.80	61SA-3C06	17.30
	12	175	8.0	1.0	610A-3C12	16.80	61SA-3C12	17.30
	24	700	16.0	2.0	610A-3C24	17.10	61SA-3C24	17.65
	48	2,800	32.0	4.0	610A-3C48	18.50	61SA-3C48	19.05
4 Form C (4PDT) Max. Load: 3 Watt Max. Current: 0.25 Amp Max. Voltage: 200 VDC	6	30	3.8	0.5	610A-4C06	22.30	61SA-4C06	23.80
	12	125	8.0	1.0	610A-4C12	22.30	61SA-4C12	23.80
	24	500	16.0	2.0	610A-4C24	22.50	61SA-4C24	24.15
	48	2,000	32.0	4.0	610A-4C48	24.25	61SA-4C48	25.80

All values at 20°C.

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Advent Electronics, Inc. (317) 872-4910
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Hutch & Son, Inc. (812) 425-7201
Meunier Electronics (317) 635-3511

IOWA
Deeco, Inc. (319) 365-7551

KANSAS
C. Tennant, Sons & Co. (913) 441-1801

KENTUCKY
Peerless Electronic Equipment Co., Inc. (502) 637-7674

LOUISIANA
AFG Electronic Supply (504) 368-9696
Wm. B. Allen Supply Co., Inc. (504) 525-8222
Industrial Electronic Supply (318) 222-9459
Radio Parts, Inc. (504) 581-5959
Ralph's Electronics Supply (318) 233-0105
Southern Radio Supply Co., Inc. (504) 524-2343

MARYLAND
Capitol Radio Wholesalers, Inc. (301) 881-2270
Harco Electronics, Inc. (301) 838-7990
MS Electronics, Inc. (301) 340-6400
Powell Electronics (301) 621-4070
Whitney Distributors, Inc. (301) 944-8080

MASSACHUSETTS
Abbott Electronics, Inc. (617) 935-2040
ACI Electronics (617) 935-7230
ADD Electronics (617) 478-4200
AFCOM (617) 935-3200
Aved Electronics, Inc. (617) 657-8310
Controller Service and Sales Co. (617) 269-1300
Cronin Electronics (617) 449-0500
Future Electronics Corporation (617) 366-2400
Glynn Electronics—(617) 947-4262
Heilind Electronics (617) 272-5610
Impact Sales Co. (617) 821-1500
In-Stock Products Co. (617) 964-6200
J. V. Electronics (617) 273-4300
Land Electronics Supply Co., Inc. (617) 592-2220
March Electronics (617) 899-4220
Pilgrim Electronics (617) 251-8746
Powell Electronics/NE (617) 366-6100
QPL Electronics (617) 891-0460
Rush Industries (617) 729-5800
Semtex Industrial Corp. (617) 935-2466
Vantage Electronics Corporation (617) 894-8690
You Do It Electronics (617) 449-1005

MICHIGAN
Northern Wire & Cable, Inc. (313) 589-0510
RM Electronics Co., Inc. (616) 531-9300
RS Electronics (313) 525-1155
RS Electronics (616) 241-3483
S-F Electronic Supply, Inc. (616) 459-0216
Shand Electronics, Inc. (313) 743-8940

MINNESOTA
Electronic Center, Inc. (612) 371-5200
Gopher Electronics Co. (612) 483-3322
Stark Elec. Supply, Inc. (612) 332-1325

MISSISSIPPI
Hooper Electronic Supply (601) 762-9383

MISSOURI
Electronic Supply Co., Inc. (816) 931-0250
Franklin Electronics (314) 993-5333
Lectronix Inc. (314) 946-6424
Olive Electronics, Inc. (314) 426-4500
Van Sickle Radio Electronics, Inc. (314) 621-5000

NEBRASKA
Scott Electronics Supply Corp. (402) 466-8221

NEVADA
CRW, Inc. (702) 451-5490

NEW HAMPSHIRE
C & H Electronics (603) 882-1133
Yankee Electronic Supply, Inc. (603) 625-9746

NEW JERSEY
Alatec Products (201) 227-8140
Federated Purchaser (201) 272-0505
Kappe Industries, Inc. (201) 790-1999
Route Electronics 22, Inc. (201) 379-7710
State Electronics (201) 887-2550
William Electronics (201) 985-3700

NEW MEXICO
Electronic Parts Co. (505) 293-6161

NEW YORK
Ancar Electronics Supply (914) 592-7100
Brooklyn Electronics (212) 748-1300
Chief Electronics (914) 471-1300
Davis Electronics Corporation (516) 483-9200
Delmar Electronics, Inc. (516) 420-1234
Genesee Radio & Parts Co., Inc (716) 873-9661
Grimmer's Electronics (518) 374-8480
Harrison Radio Corporation (516) 293-7990
Help Electronics, Inc. (607) 729-3528
March Electronics (516) 486-6511
Masline Electronics (716) 546-5373
Peerless Radio Corporation (516) 593-2121
Rochester Radio Supply Co. (716) 454-7800
Rome Electronics, Inc. (315) 337-5400
Summit Distributors, Inc. (716) 884-3450
Wise Components, Inc. (914) 939-8600

NORTH CAROLINA
Hammond Electronics (919) 275-6391
Powell Electronics (919) 467-1212
Southeastern Electronics (919) 828-2311

OHIO
Akron Electronic Supply Co., (216) 762-8818
E.S.C.O., Inc. (513) 226-1133
Hughes-Peters, Inc. (614) 294-5351
Hughes-Peters, Inc. (513) 351-2000
LRP Electronics, Inc. (419) 228-1220
REM Electronics Supply Co., Inc. (216) 373-1300
Repco Electronics (216) 248-8900
Schuster Electric Company, Inc. (216) 425-8134
Servex Electronic Distributing, Inc. (614) 383-3117
Stotts-Friedman Company, Inc. (513) 298-5555
Target Electronics Corp. (216) 248-7930
Thompson Electronics (614) 228-6191
U.R.I. Electronics (513) 761-4030
Whitehead Electronics (614) 224-1186

OKLAHOMA
Combined Technology Companies (918) 582-8242
Electro-Enterprise (405) 478-1752
Electronic Supply Company (405) 232-5215
Radio, Inc. (918) 587-9123

PENNSYLVANIA
Allegheny Electronics (814) 946-0871
Almo Electronics Corporation (215) 698-4000
Arch Electronics Co. (215) 563-4660
Barbey Electronics (215) 376-6116
Delphi Wire and Cable (215) 534-3900
Kass Electronics Distributors (215) 449-2300
Leff Radio Parts Co. (412) 351-5000
P. A. Peters, Inc. (215) 434-5237
Peak Electronics Corporation (215) 293-9000
Powell Electronics, Inc. (215) 365-1900
Tri-Com, Inc. (215) 521-3080

RHODE ISLAND
Jabbour Electronics (401) 728-4600
Major Electronic Supply (401) 725-7400

SOUTH CAROLINA
Dixie Electronics, Inc. (803) 779-5332
Hammond Electronics (803) 233-4121
Wholesale Industrial Electronics (803) 722-2634

TENNESSEE
Curle Electronics (615) 266-4727
Electra Distributing Co. (615) 329-3971

TEXAS
Douglas Electronics (512) 883-5103
Electronic Packaging Components, Inc. (713) 447-5800
Electrotex (713) 526-3456
ESI Supply (915) 694-9657
Geophysical Supply Co. (713) 666-4100
Ideal Industrial Electronic Supply, Inc. (915) 779-6647
Industrial Electronics, Inc. (817) 731-7321
Kent Electronics Corporation (713) 780-7770
Kent Electronics Corporation (214) 669-2600
Kent Electronics Corporation (512) 834-1900
LBI Electro-optics (214) 358-4251
Powerline Products, Inc. (713) 461-9791
Solid State Electronics Co. (214) 438-5700
Swieco, Inc. (817) 335-6521
Target Electronics Industries, Inc. (214) 350-6853
Texas Connector Corp. (817) 246-0109
Texas International Cable (512) 366-3648
Wallace Electronics Co., Inc. (214) 340-0400

UTAH
Central Utah Electronics Supply (801) 373-7522
Kimball Electronics, Inc. (801) 328-2075

VERMONT
S.A.I. Semispecialists of America (802) 775-7126

VIRGINIA
Avec Electronics Corporation (804) 359-6071
Mexitronics (703) 342-4444
Priest Electronics, Inc. (804) 855-0105
Sterling Electronics (804) 226-2190

WASHINGTON
Connector World Supply (206) 767-6773
Interface Electronics Corporation (206) 872-5800
Pacific Electronics (206) 575-1050
Radar Electronic Co. Inc. (206) 282-2511

WEST VIRGINIA
State Electric Supply Co. (304) 523-7491

WISCONSIN
Electronics Industries (414) 235-8930
Fedco Electronics, Inc. (414) 922-6490
Industrial Electronics Corporation of Wisconsin (414) 276-1212
Marsh Electronics (414) 475-6000
Superior Electronic Parts Company (608) 257-1477

AMP DISTRIBUTOR MARKETING
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AMP Dual In-Line Package Switches

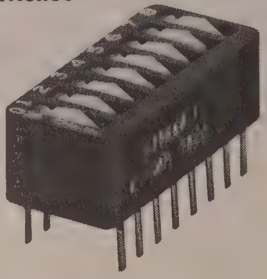
Features: ■ High Density — Low profile, compact design requires a minimum of pc board area ■ Available in standard, low profile, right angle, multipole and LED versions ■ Simple Operation — Rocker actuators instantly change program ■ Easy Mounting — Switches can be flow-soldered directly to pc board or simply inserted into DIP headers or IC packaging receptacles ■ Low profile switches available with sealing tape to keep out contaminants during assembly operations ■ Economical — Board mounted switches eliminate the need for interconnection wiring to perform switching functions ■ High Reliability — Fully enclosed design protects contact surfaces from environmental hazards. Optional transparent cover is also available ■ Versatile Application — Switches furnished in various sizes, ranging from 2 to 12 positions

Standard Switches

7000 Series, Single Pole Single Throw

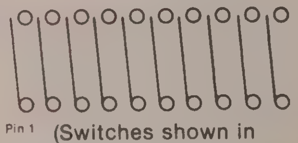
Economy Switches

7100 Series, Single Pole Single Throw



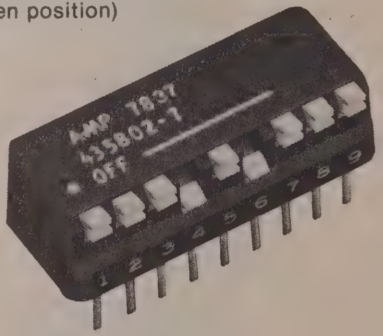
No. of Switch Positions	7000 Series Std. Profile Part No.	7000 Series Std. Profile (with Plastisol Sealant) Part No.	7000 Series Low Profile (without Tape) Part No.	7000 Series Low Profile (with Tape) Part No.	7100 Series Std. Profile Part No.	7100 Series Std. Profile (with Plastisol Sealant) Part No.
2	2-435166-9	4-435166-7	1-435626-9	3-435626-6	2-435640-9	3-435640-3
3	3-435166-0	4-435166-8	2-435626-0	3-435626-7	3-435640-0	3-435640-4
4	435166-2	4-435166-9	435626-1	3-435626-8	435640-2	3-435640-5
5	435166-3	5-435166-0	435626-2	3-435626-9	435640-3	3-435640-6
6	435166-4	5-435166-1	435626-3	4-435626-0	435640-4	3-435640-7
7	435166-1	5-435166-2	435626-4	4-435626-1	435640-1	3-435640-8
8	435166-5	5-435166-3	435626-5	4-435626-2	435640-5	3-435640-9
9	435166-6	5-435166-4	435626-6	4-435626-3	435640-6	4-435640-0
10	435166-7	5-435166-5	435626-7	4-435626-4	435640-7	4-435640-1
11	3-435166-1	5-435166-6	2-435626-1	4-435626-5	3-435640-1	4-435640-2
12	3-435166-2	5-435166-7	2-435626-2	4-435626-6	3-435640-2	4-435640-3

Contact Arrangement



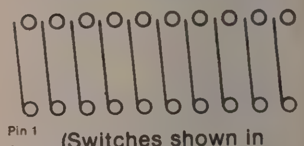
(Switches shown in open position)

7000 Series, Single Pole Single Throw Side Actuated



No. of Switch Positions	Side Actuated Part No.	Side Actuated (with Plastisol Sealant) Part No.
2	1-435802-0	1-435802-3
3	435802-2	1-435802-4
4	435802-3	1-435802-5
5	435802-4	1-435802-6
6	435802-5	1-435802-7
7	435802-6	1-435802-8
8	435802-1	435802-9
9	435802-7	1-435802-9
10	435802-8	2-435802-0
11	1-435802-1	2-435802-1
12	1-435802-2	2-435802-2

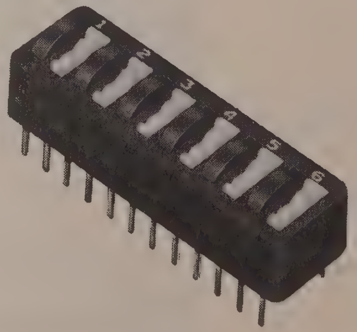
Contact Arrangement



(Switches shown in open position)

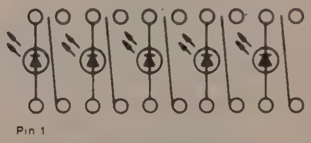
LED Switches

7200 Series, Single Pole Single Throw



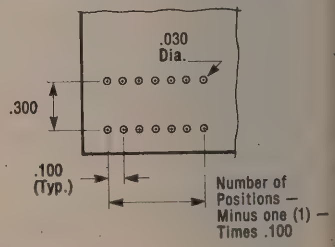
No. of Pairs	7200 Series Part No.
1	435721-1
2	435721-2
3	435721-3
4	435721-4
5	435721-5
6	435721-6

Contact Arrangement



(Switches shown in open position)

Printed Circuit Board Layout



Request Catalog No. 75-332 for complete listing

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

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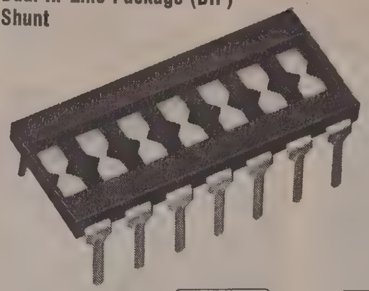
AMP Programmable Dual-in-Line (DIP) Shunt

Features: ■ Very low profile — .079 above board ■ Low cost tamper-proof programming ■ Housings made of UL recognized, 94V-0 rated, glass-filled thermoplastic polyester ■ Large current capacity — 5 amperes (one conductor) ■ Hand tool available for programming shunts ■ Cut straps can be reconnected; by solder bridging, then reopened; by use of solder wick ■ No extra space required for end-to-end mounting ■ Ideal for volume requirements of similar programs ■ Can be supplied pre-programmed

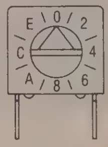
7600 Series, Programmable Dual In-Line Package (DIP) Shunt



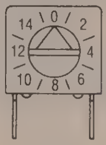
No. of Positions	7600 Series Part No.
2	435704-2
3	435704-3
4	435704-4
5	435704-5
6	435704-6
7	435704-7
8	435704-8
9	435704-9
10	1-435704-0
11	1-435704-1
12	1-435704-2

Request Catalog No. 75-332

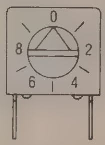
AMP Preprogrammed Printed Circuit Board Switches



Style I

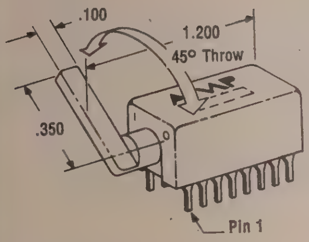


Style II

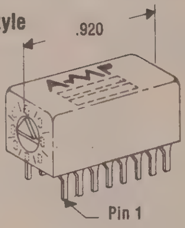


Style IV

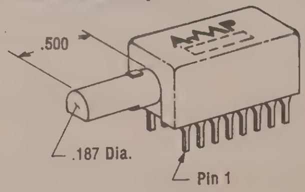
Lever Style



Screwdriver Slot Style



Extended Shaft Style



Switch Type	Actuator Slot	Stamping Legend Style	Bottom Sealed	Switch Part No.
Hexadecimal w/complement (16 Position)	Screwdriver Slot	I	No	53137-1
Hexadecimal w/complement (16 Position)	Screwdriver Slot	II	No	53137-2
Hexadecimal w/complement (16 Position)	Screwdriver Slot	I	Yes	53137-5
Hexadecimal w/complement (16 Position)	Screwdriver Slot	II	Yes	53137-6
Hexadecimal w/complement (16 Position)	Extended Shaft	None	No	54359-1
BCD w/complement (10 Position)	Screwdriver Slot	IV	No	53919-1
BCD w/complement (10 Position)	Screwdriver Slot	IV	Yes	53919-2
BCD w/complement (10 Position)	Extended Shaft	None	No	54308-1
Input/Output (2 Position)	Lever	As Illustrated	No	53921-1

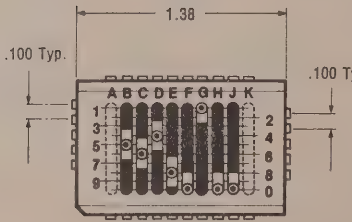
Request Catalog No. 75-332

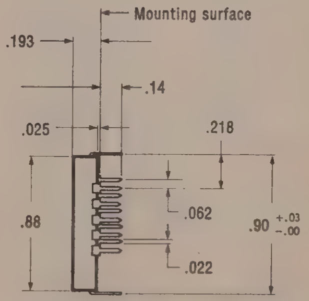
Mini-Matrix Slide Switch

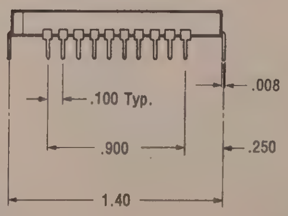
Specifications

Electrical Specifications
Contact Current Rating: Switching — 100 mA at 28 VDC, max.; 0.5 mA at 50 mVDC, min. Non-switching — 500 mA at 28 VDC, max.
Contact Resistance (Dry Circuit): Less than 100 mOhm
Insulation Resistance: 1 x 10^{10} Ohms min. at 100 VDC
Dielectric Withstanding Voltage: 300 VDC, min.
Cycle Life: 5000 detents/slide, min.

Material Specifications
Structural Plastic: UL recognized, 94V-0 rated, glass-filled thermoplastic
Column and Row Buses: Copper alloy, contact areas gold plated
Slide Springs and Contacts: Beryllium copper, gold plated







Switch Configuration	Slots Omitted*	Switch Part Number
10 x 10	—	436270-1
9 x 10	A	436270-2
8 x 10	A, K	436270-3
7 x 10	A, B, K	436270-4
6 x 10	A, B, J, K	436270-5
5 x 10	A, B, C, J, K	436270-6
4 x 10	A, B, C, H, J, K	436270-7

*Slots are omitted for unused slide locations.

Note: An 8 x 10 switch is shown here. Other Mini-Matrix Slide Switches have the same dimensions, but fewer or more slides.

Request Catalog No. 81-647

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.
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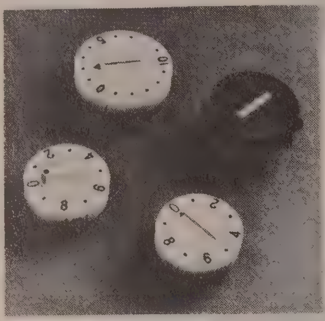
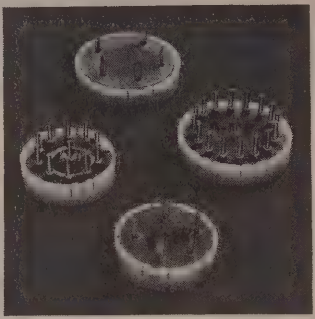
Printed Circuit Board Rotary Switches

6000 Series With Screw Driver Slot, Bar Type Knob, Thumb-wheel Actuation

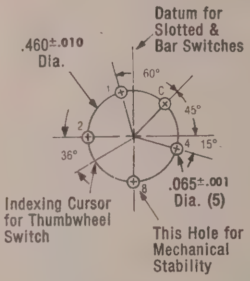




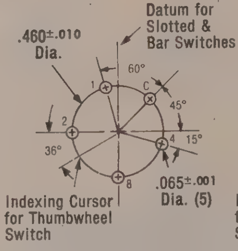
■ Compact Design — Small diameter, low profile switches are ideal for pc board mounting ■ Wide Choice of Outputs — 8 position binary coded octal, 10 position binary coded decimal, 16 position hexadecimal and 8, 10 or 16 position single pole ■ Versatile Application — Available styles include slotted version for screwdriver or coin actuation, plus bar-type knob and thumbwheel versions for hand rotation ■ Economical — Board mounting eliminates need for input/output wiring to perform switching functions ■ Positive Switching — Contacts have positive detent action; all switch positions easily identified by large readable numerals ■ Optimum Reliability — Fully enclosed design protects contact surfaces from dust, dirt and other environmental contaminants

Typical Board Hole Pattern (Switch Side)

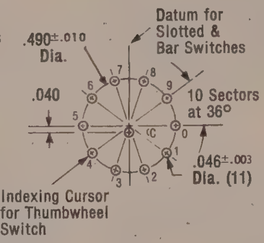
8-Position (Binary Coded Octal)


Datum for Slotted & Bar Switches
.460±.010 Dia.
60°
1
C
45°
2
4
15°
36°
8
.065±.001 Dia. (5)
Indexing Cursor for Thumbwheel Switch
This Hole for Mechanical Stability

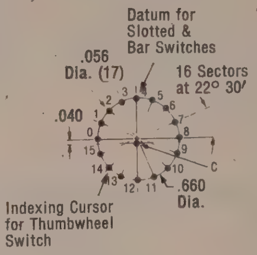
10-Position (Binary Coded Decimal)


Datum for Slotted & Bar Switches
.460±.010 Dia.
60°
1
C
45°
2
4
15°
36°
8
.065±.001 Dia. (5)
Indexing Cursor for Thumbwheel Switch

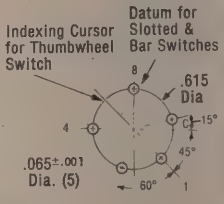
10-Position (Single Pole)


Datum for Slotted & Bar Switches
.490±.010 Dia.
7
8
6
9
.040
10 Sectors at 36°
5
C
0
4
1
3
2
.046±.003 Dia. (11)
Indexing Cursor for Thumbwheel Switch

16-Position (Single Pole)


Datum for Slotted & Bar Switches
.056 Dia. (17)
16 Sectors at 22° 30′
3
4
5
2
6
1
7
.040
0
8
15
9
14
10
C
13
12
11
.660 Dia.
Indexing Cursor for Thumbwheel Switch

16-Position (Hexadecimal)


Indexing Cursor for Thumbwheel Switch
Datum for Slotted & Bar Switches
8
.615 Dia
4
C
15°
45°
.065±.001 Dia. (5)
60°
1

8-Position BCD

Switch Position	Common to:		
	1	2	4
0			
1	●		
2		●	
3	●	●	
4			●
5	●		●
6		●	●
7	●	●	●

10-Position BCD

Switch Position	Common to:			
	1	2	4	8
0				
1	●			
2		●		
3	●	●		
4			●	
5	●		●	
6		●	●	
7	●	●	●	
8				●
9	●			●

10-Position SP

Switch Position	Common to:									
	0	1	2	3	4	5	6	7	8	9
0	●									
1		●								
2			●							
3				●						
4					●					
5						●				
6							●			
7								●		
8									●	
9										●

16-Position SP

Switch Position	Common to:															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	●															
1		●														
2			●													
3				●												
4					●											
5						●										
6							●									
7								●								
8									●							
9										●						
10											●					
11												●				
12													●			
13														●		
14															●	
15																●

16-Position HD

Dial Position	Common to:			
	1	2	4	8
0				
1	●			
2		●		
3	●	●		
4			●	
5	●		●	
6		●	●	
7	●	●	●	
8				●
9	●			●
10		●		●
11	●	●		●
12			●	●
13	●		●	●
14		●	●	●
15	●	●	●	●

Specifications

Electrical
Contact Life Expectance: 10,000 Cross Points
Contact Current Rating: 250 Milliamperes
Initial Contact Resistance (at 50 Millivolts, 20 Milliamperes): 50 Milliohms
Insulation Resistance: 1 x 10^8 Ohms
Dielectric Breakdown Voltage: 500 Volts, DC
Circuit Capacitance (at 135 KHz): 3 Picofarads

Materials

Contacts: Phosphor Bronze, Gold-over-Nickel Plated
Solder Tabs and Pins: Coded Switches — Beryllium Copper, Tin Plated Single Pole Switches — Brass, Tin Plated
Structural Parts: Polyacetal Printed Circuit Boards: Glass Epoxy

Switch Type	Screwdriver/ Coin-Actuated	Bar-Type Knob	Thumbwheel
8 BCD	435174-1	1-435174-1	2-435174-1
10 BCD	435005-1	435123-1	435128-1
10 SP	1-435097-1	2-435097-1	435097-1
16 SP	435304-1	1-435304-1	2-435304-1
16 HD	435167-1	1-435167-1	2-435167-1

Request Catalog No. 74-276

Need more details? Call AMP Customer Service at (717) 780-4400,
or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

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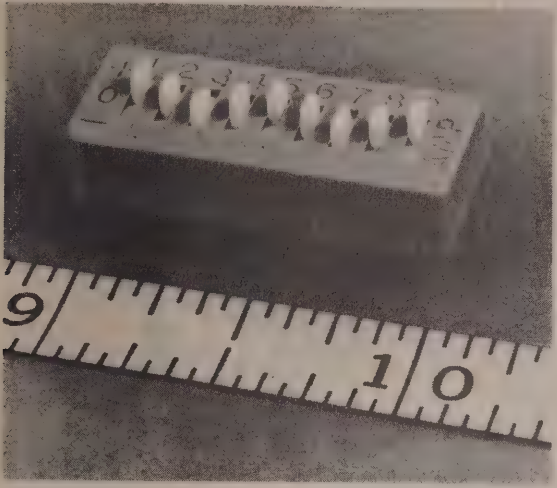
3 x 9 Slide Switch 7800 Series



Part No. 436172-2

Features

- 9-pole, double throw configuration
- Used for logic level applications or for controlling AC/DC circuits
- Nine separate 3 position slide switches
- Fits .100 x .300 [2.54 x 7.62] centerline standard DIP headers
- Can be soldered directly to pc board
- 19,683 code variations

Electrical Characteristics

Current Rating:
Nonswitching — 1.5 amperes, max. @ 50 VDC (resistive load), 40°C rise
Switching — 100 milliamperes, max. @ 5 VDC (resistive load); 25 milliamperes, max. @ 24 VDC (resistive load)

Contact Resistance, Dry Circuit:
50 milliohms, max. initial 100 milliohms, max. at end of durability

Temperature Rise (Nonswitching):
40°C, max. from ambient

Insulation Resistance:
1 x 10^{11}, min. initial
1 x 10^{9}, min. after environmental testing

Dielectric Withstanding Voltage:
500 VAC, min. @ standard atmospheric conditions

Capacitance:
5 picofarads, max.

Mechanical/Environmental Characteristics

Actuation Force:
10-40 ounces [2.78-5.56 N]

Solderability:
AMP Spec. 109-11-5

Vibration:
10-2000-10 Hz traversed in 20 minutes at .06 inch [1.52 mm] total excursion; AMP Spec. 109-21, Cond. E with 0.1 ampere applied

Shock:
50 G's @ 11 milliseconds AMP Spec. 109-26, Cond. A

Durability:
100 cycles

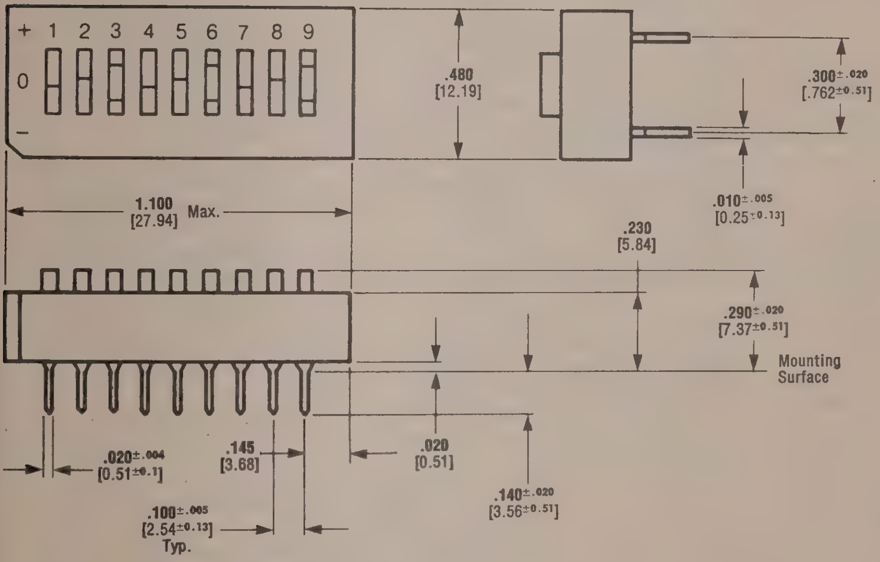
Terminal Strength:
Pull — 2 lb. [8.9 N] axial
Bend — Two 45° bend cycles

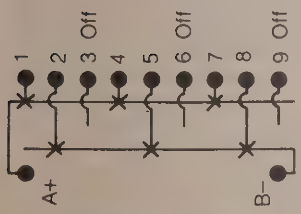
Thermal Shock:
5 nonoperating cycles @ −67°F to +225F° [−55°C to 107°C]

Humidity:
40°C and 95% RH for 96 hr.

Operating Temperature:
−40°F to +190°F
[−40°C to +88°C]

Nonoperating Temperature:
−100°F to +275°F
[−73°C to +135°C]





Contact Arrangement

Materials

Case and Base:
Polyester, glass filled

Slide:
Polyester

Spring contacts and Leads:
Copper alloy; plating in accordance with AMP Product Specification 108-7047

Request Catalog No. 80-592

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

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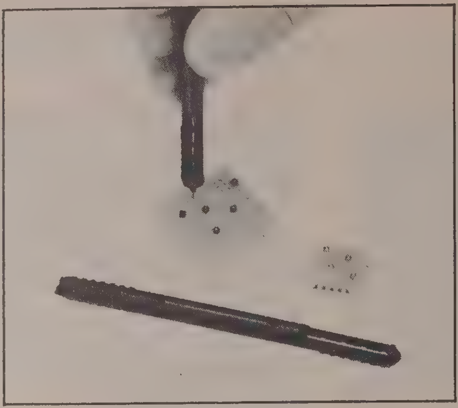
AMP Miniature Pinboards



Features: ■ Provides up to 100 crosspoints in a minimum space ■ Can be machine soldered to pc boards ■ Contact terminals and programming holes on .100 [2.54] centerlines ■ Very low profile — extends only .230 [5.84] above pc board ■ Pin program is easily discernable for rapid program checking ■ Available in 10 x 10 and 5 x 5 sizes ■ Inexpensive insertion tool makes shorting pin insertion simple and economical

Request Catalog No. 80-561

Specifications:

Electrical Characteristics

Current/Voltage (non-switching): 125 VAC or DC at 2.0 amperes, max.
Contact Resistance: 20 milliohms, max.
Insulation Resistance: 1 x 10^6 ohms, min.
Dielectric Withstanding Voltage: 500 VAC (RMS), 200 VDC
Capacitance: 10 picofarads, max.

Mechanical Characteristics

Insertion Force (shorting pins): 10 lb. max.
Extraction Force (shorting pins): 16 oz. min.

Environmental Characteristics

Operating Temperature: −32° to +158°F [−35.6° to +70°C]
Storage Temperature: −55 to +105°C

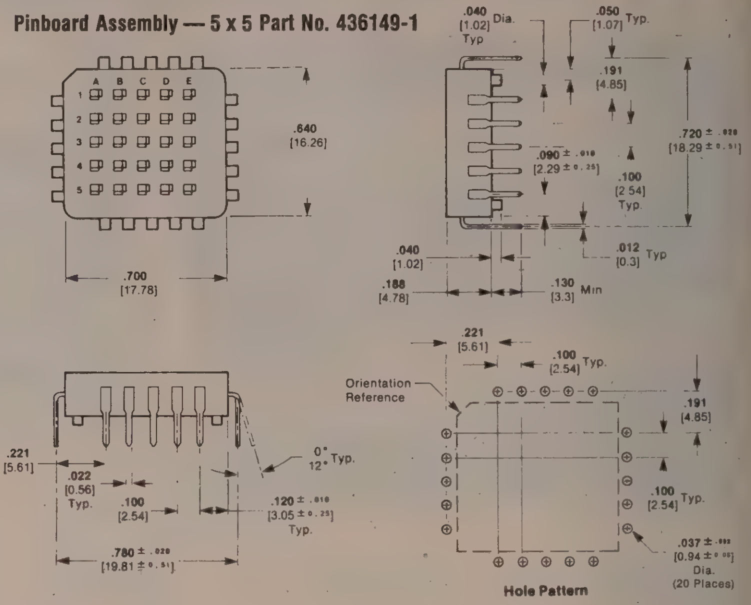
Materials

Panel: Thermoplastic Urethane
Lead Frame: Phosphor Bronze, gold over nickel plated
Shorting Pin Bodies: Brass, gold over nickel plated
Shorting Pin Insulating Caps: Glass Filled PBT

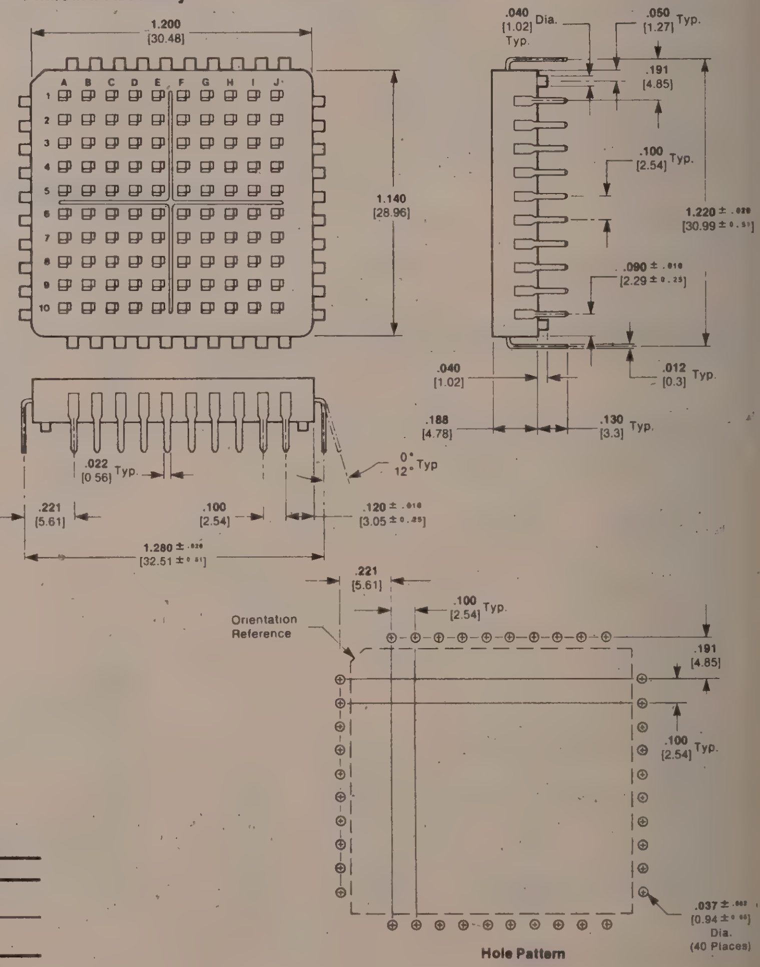
Hand Tool with Program Pins (Disposable)

Description	Part Number
Tool with 15 insulated programming pins	436147-1
Tool with 15 non-insulated programming pins	436147-2

Pinboard Assembly — 5 x 5 Part No. 436149-1


A B C D E
1 2 3 4 5
.640 [16.26]
.700 [17.78]
.040 [1.02] Dia. Typ
.050 [1.07] Typ.
.191 [4.85]
.720 ± .020 [18.29 ± 0.51]
.090 ± .010 [2.29 ± 0.25]
.100 [2.54] Typ.
.040 [1.02]
.012 [0.3] Typ
.188 [4.78]
.130 [3.3] Min
.221 [5.61]
.022 [0.56] Typ.
.100 [2.54]
0° 12° Typ.
.120 ± .010 [3.05 ± 0.25] Typ.
.780 ± .020 [19.81 ± 0.51]
.221 [5.61]
.100 [2.54] Typ.
Orientation Reference
.191 [4.85]
.100 [2.54] Typ.
.037 ± .002 [0.94 ± 0.05] Dia. (20 Places)
Hole Pattern

Pinboard Assembly — 10 x 10 Part No. 1-436149-1


1.200 [30.48]
A B C D E F G H I J
1 2 3 4 5 6 7 8 9 10
1.140 [28.96]
.040 [1.02] Dia. Typ.
.050 [1.27] Typ.
.191 [4.85]
.100 [2.54] Typ.
1.220 ± .020 [30.99 ± 0.51]
.090 ± .010 [2.29 ± 0.25]
.040 [1.02]
.012 [0.3] Typ.
.188 [4.78]
.130 [3.3] Typ.
.022 [0.56] Typ.
0° 12° Typ
.221 [5.61]
.100 [2.54]
.120 ± .010 [3.05 ± 0.25]
1.280 ± .020 [32.51 ± 0.51]
.221 [5.61]
.100 [2.54] Typ.
Orientation Reference
.191 [4.85]
.100 [2.54] Typ.
.037 ± .002 [0.94 ± 0.05] Dia. (40 Places)
Hole Pattern

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AMP INCORPORATED

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

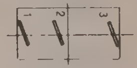
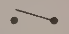
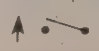
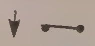
WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

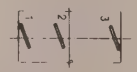
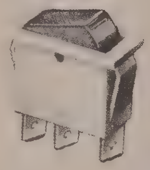
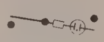
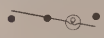
ARCOLECTRIC CORPORATION

1400 SERIES
SINGLE POLE ROCKER SWITCHES

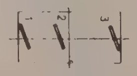
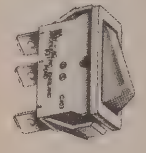
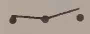
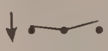
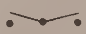
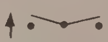
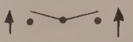
10A 250V AC Resistive
3A 250V AC Inductive
1500 and 5503 16(4)A 250V AC

Style		Terminal Numbers	Style No.
		ON/OFF	**1400 1500**
		ON/OFF Momen. on	**1401**
		ON/OFF Momen. off	**1402**

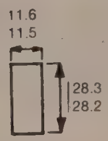
Standard body and rocker colors are black, white and red.
For other colors consult factory.

Style		Terminal Numbers	Style No.
		ON/OFF with light Flat Rocker only	**5403 5503** 100/130V
			**5403** 12V Filament light

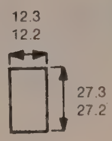
Standard body color black.
Rocker colors for 125V — red, green and amber.
Rocker colors for 12V — red, blue, green, amber and clear.

Style		Terminal Numbers	Style No.
		2-Position	**1410**
		2-Position Momentary	**1411**
		3-Position centre off	**1420**
		3-Position centre off Momentary 1-side	**1421**
		3-Position centre off Momentary 2-sides	**1422**

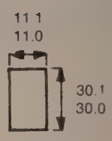
PANEL CUT-OUTS


11.6
11.5
28.3
28.2

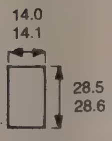
REF 'Q'


12.3
12.2
27.3
27.2

REF 'A'


11.1
11.0
30.1
30.0

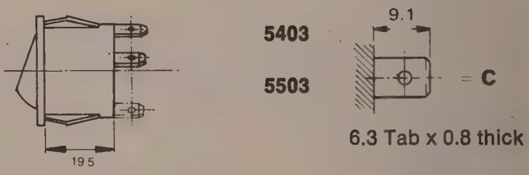
REF 'M'


14.0
14.1
28.5
28.6

REF 'R'

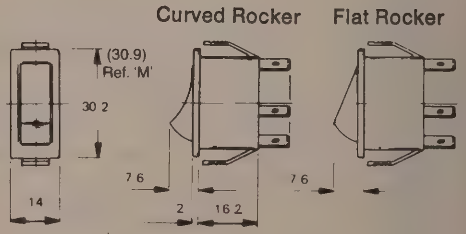
Switches for panel cut-out Ref 'R' are 'Q' size switches supplied with a special adaptor.

DIMENSIONS


19.5
5403
5503
9.1
= C
6.3 Tab x 0.8 thick

Other style terminals available. Consult factory for details.

DIMENSIONS


Curved Rocker
Flat Rocker
(30.9)
Ref. 'M'
30.2
14
7.6
2
16.2
7.6

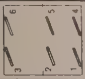
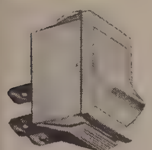
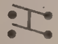
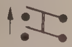
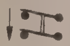
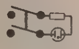
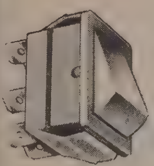
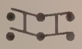
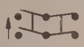
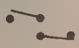
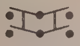
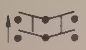
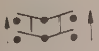
Panel thickness — .75 min., 2.5 max.

SEE OTHER "EEM" PAGES **1B•1026 - 1B•1028** FOR INDICATOR LIGHTS.

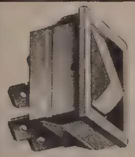
ARCOLECTRIC CORPORATION

1400 SERIES
DOUBLE POLE ROCKER SWITCHES

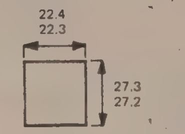
1450 Range: 10(3)A 250V AC
1553 Range: 16(4) A 250V AC

Style		Terminal Numbers	Style No.
		ON/OFF	**1450 1550**
		ON/OFF Momen. on	**1451**
		ON/OFF Momen. off	**1452**
		ON/OFF with light	**1453** **1553**
		2-Position	**1460**
		2-Position Momentary	**1461**
		Single Pole 2-Position 2-Circuit	**1462**
		3-Position centre off	**1470**
		3-Position changeover centre off Momentary 1-side	**1471**
		3-Position centre off Momentary 2 sides	**1472**

These units consist of combinations of single pole switches or single pole switches and indicator lights, assembled into a double pole size body.

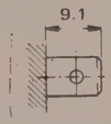
	ON/OFF Single Light Indicator	Available with 12V or 125V light. Single pole switch — 10 AMP.

PANEL CUT-OUTS



REF 'A'

TERMINATION

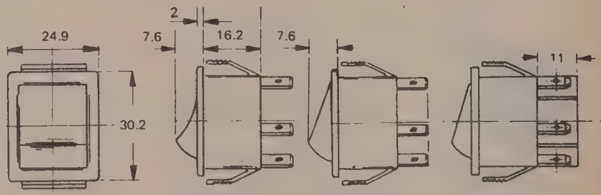


6.3 Tab x 0.8 thick

Panel thickness between .75 and 3.3mm.

Curved Rocker
'V'

Flat Rocker
'F'



Curved Rocker Flat Rocker With M441 Terminal Barrier

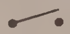
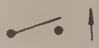
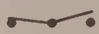
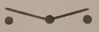
Standard rocker and body colors black, white and red.
Models 1453 and 1553 lens colors red, amber or green — voltages 125V or 250V.
For other cut-out sizes, consult factory.

SEE OTHER "EEM" PAGES 1B•1026 - 1B•1028 FOR INDICATOR LIGHTS.

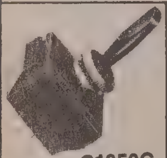
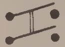
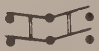
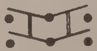
ARCOLECTRIC CORPORATION

1800 SERIES LEVER SWITCHES

SINGLE POLE 10(3)A 250V ~

Switch Type			Cat. No.
C1800N		ON/OFF	**1800**
		ON/OFF Momen. on	**1801**
C1810H		2-Position	**1810**
		3-Position centre off	**1820**

DOUBLE POLE 10(3)A 250V ~

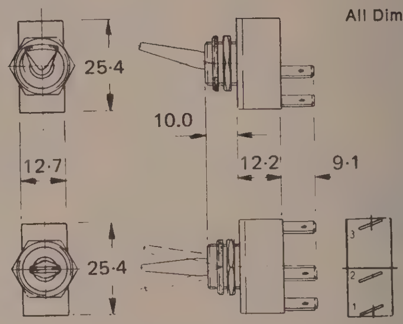
Switch Type			Cat No.
 C1850G		ON/OFF	**1850**
		2-Position	**1860**
C1860H		3-Position centre off	**1870**

The following data applies to 1800 single and double range switches:

Initial Contact Resistance: Generally less than 5 milliohms.
Insulation Resistance: Greater than 100 megohms.
Voltage Withstand: Greater than 1.5 KV.
Life Expectancy: In excess of 10,000 cycles at rated current.
For other approvals and 15 AMP version — contact factory.

DIMENSIONS

All Dimensions in mm.

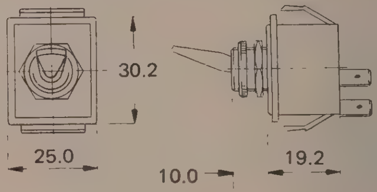


Fixing necks screwed:

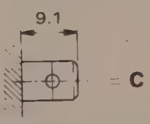
$\frac{11.79}{11.68}$ mm dia. x 32 TPI Whit.
and will fit a 12.7mm dia. panel hole.

Max. panel thickness: 3.5mm. This may be increased by omitting back nut.

DIMENSIONS

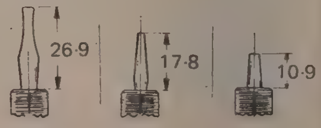


TERMINATION



6.3 Tab x 0.8 thick

LEVERS



G H N

SEE OTHER "EEM" PAGES 1B•1026 - 1B•1028 FOR INDICATOR LIGHTS.

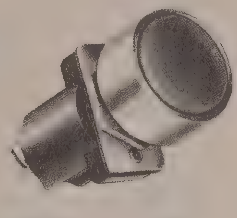
ARCOLECTRIC CORPORATION

MOMENTARY PUSHBUTTON

1 AMP 125V AC — 0.5 AMP 250V ~ AC

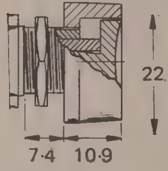
ALL .50 DIA. MTG.

C936/D1 and C938/D1
Push for ON C936/D1
Push for OFF C938/D1
Nylon Neck



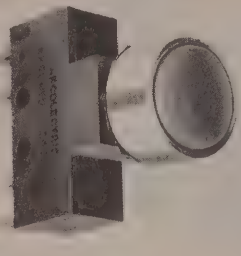
C936K and C938K
Push for ON C936K
Push for OFF C938K
Metal Neck

Dimensions in mm



SNAP-ACTION

10 AMP 125/250V AC

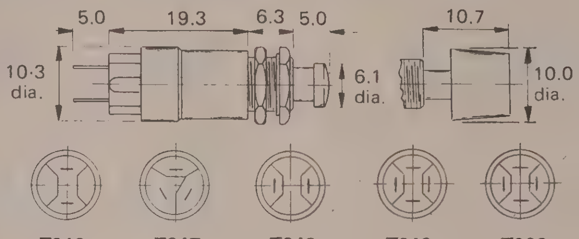


N290/K1
Normally 'CLOSED' or
normally 'OPEN' depending
on terminal connections.

900 SERIES MOMENTARY PUSH BUTTON SWITCHES 0.5A 250V AC

T919

T919L



T916 T917 T918 T919 T920

T916 Push for ON	N/O	Max. plunger movement 2.5
T917 Change-over	50 Volt only	
T918 Push for OFF	N/C	
T919 2-Circuit		
T920 Push for ON	N/O	

Fixing necks:
7.04/6.95 dia. x 40 TPI Whit.

Panel hole: 7.1 dia.
Operating pressure: 600 gr. approx.

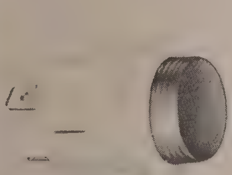
To order large button add "L" to p.n.

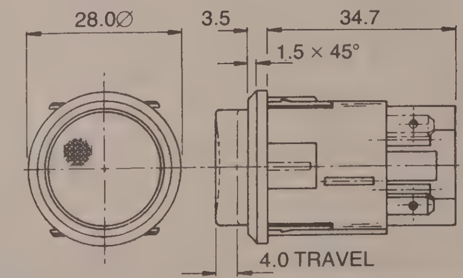
Black, Red, White, or Green.

Self-cleaning silver plated contacts.
Slow make and break action.

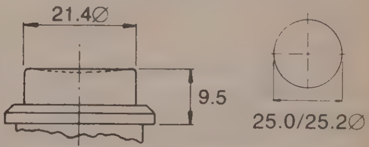
Max. panel thickness:
Both nuts 2.5. Less back nut 4.0.

7000 SERIES 16(4)A 250V AC





Range of push button switches, alternate or momentary action with or without illumination.
Snap-in fixing into panels, thickness between 0.8 and 2.0.



SINGLE POLE	7000	ON/OFF Alternate	DOUBLE POLE	7050	ON/OFF Alternate
	7001	ON/OFF Momentary		7051	ON/OFF Momentary
	7003	ON/OFF Alternate Illum.		7053	ON/OFF Alternate Illum.
	7004	ON/OFF Momentary Illum.		7054	ON/OFF Momentary Illum.

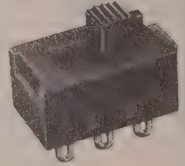
SEE OTHER "EEM" PAGES 1B•1026 - 1B•1028 FOR INDICATOR LIGHTS.

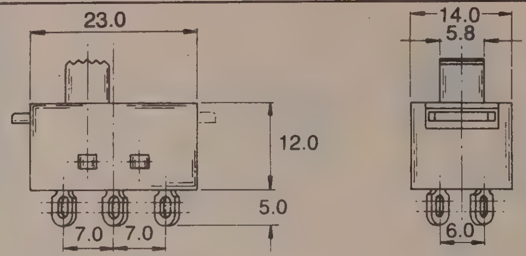
9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 65-1349

ARCOLECTRIC CORPORATION

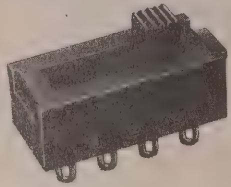
2000 SERIES
SLIDE SWITCHES 6 AMP and 12 AMP Approvals Pending

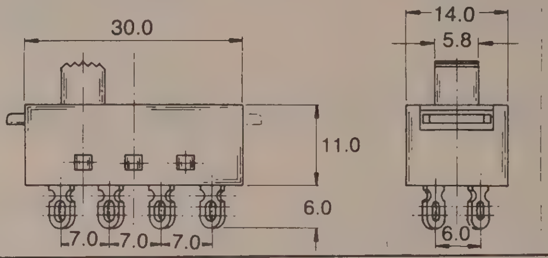
T2220A



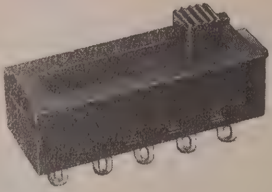

23.0
14.0
5.8
12.0
5.0
7.0
7.0
6.0

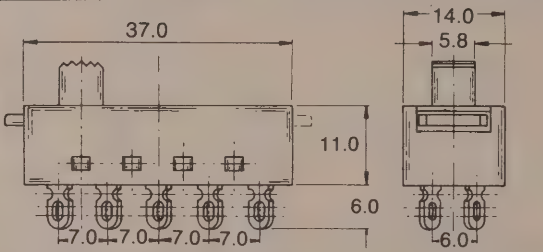
T2320A



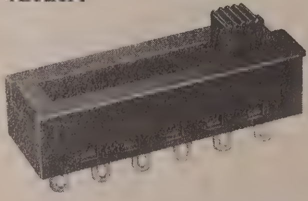

30.0
14.0
5.8
11.0
6.0
7.0
7.0
7.0
6.0

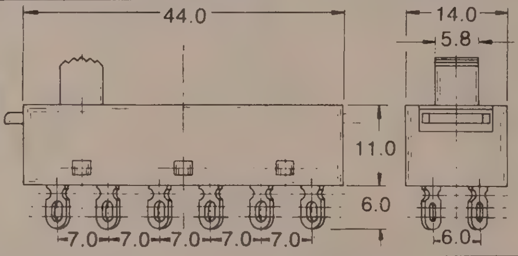
T2420A



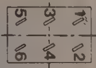

37.0
14.0
5.8
11.0
6.0
7.0
7.0
7.0
7.0
6.0

T2520A

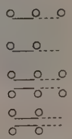


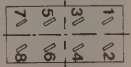

44.0
14.0
5.8
11.0
6.0
7.0
7.0
7.0
7.0
7.0
6.0

These Style Nos. are for switches with No. 0 slider. Change last figure for alternatives.

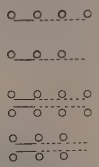


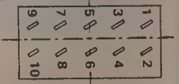
2210 2-Pos. C/O
2230 ON/OFF
2220 2-Pos C/O
2240 ON/OFF



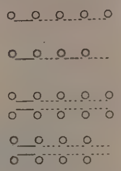


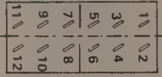
2310 3-Position
2330 3 Position Including OFF
2320 3-Position
2340 3-Position Including OFF



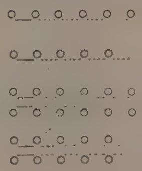

9
7
5
3
1
10
8
6
4
2

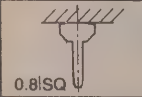
2410 4-Position SP
2430 4-Position SP Including OFF
2420 4-Position DP
2440 4-Position DP Including OFF



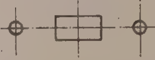

11
9
7
5
3
1
12
10
8
6
4
2

2510 5-Position SP
2530 5-Position SP Including OFF
2520 5-Position DP
2540 5-Position DP Including OFF



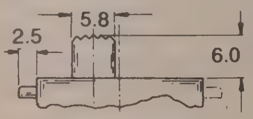


Printed Circuit Terminal 'X'

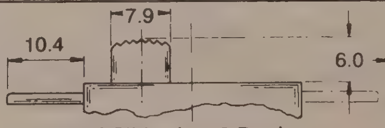


Panel Cut-out 'B'

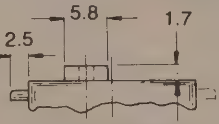
	2-Position	3-Position
Cut-out	13.3 x 6.25	22.3 x 6.25
Fixing holes	3.3 φ x 34.0	3.3 φ x 38.0



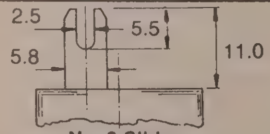
No. 0 Slider



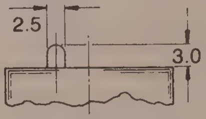
No. 1 Slider (not 2-Pos.)



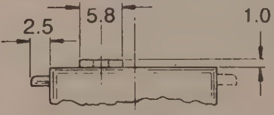
No. 2 Slider



No. 3 Slider



No. 4 Slider



No. 5 Slider

All moulded black nylon construction.

'A' (at rear of Style No.) = standard version, as illustrated.
'B' (in place of **'A'**) = flanged version, for 2-hole fixing, see small drawing **'B'**.

Solder tag terminals. When ordering with these terminals, place letter **'T'** in front of Style No.

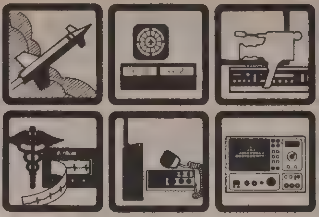
Printed circuit board terminals. When ordering with these terminals, place leter **'X'** in front of Style No. See small drawing.

SEE OTHER "EEM" PAGES **1B•1026 - 1B•1028** FOR INDICATOR LIGHTS.

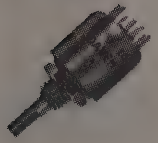
9001 CANOGA AVENUE / CANOGA PARK, CALIFORNIA 91304 / TEL. (818) 700-1933 / TELEX 65-1349

Daven

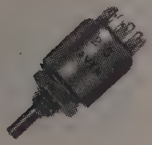
Miniature Switches



NEW!



C, G/K & 126/127 Series



NEW!

P Series

½ Inch C Series (Die Cast)

Competitively Priced

Subminiature C Series rotary switches are available in one pole, (2- to 12-position) through four pole, (2- and 3-position) types.

- ☐ Internal construction identical to military switches for long life
- ☐ Indexing: 30°, 36°, 45°, 60°
- ☐ Shorting or non-shorting
- ☐ Pin compatible with other major manufacturers

Ask for Bulletin 14/C-STD

½ Inch G/K Series

Military Approved

Subminiature G Series (sealed) and K Series (unsealed) rotary switches are available in one-pole (2- to 12-position) through four-pole (2- and 3- position) types.

- ☐ Shorting or non-shorting
- ☐ Switching capacity: up to 1 Amp
- ☐ Indexing: 30°, 36°, 45°, 60°
- ☐ QPL per MIL-S-3786/20E
- ☐ Ideally suited for high shock and vibration applications

Ask for Bulletin 14/G-K

½ Inch BCD
126/127 Series

Coded Outputs

The Series 126 is available with up to 12 positions fixed stop or continuous rotation binary coded decimal (BCD) with 30° indexing. Its complement, the Series 127, is also furnished with up to 12 positions $\overline{\text{BCD}}$.

- ☐ Gold plated contacts and terminals
- ☐ P/C and standard solder terminals
- ☐ Pin compatible with other major manufacturers
- ☐ One piece bushing and housing

Ask for Bulletin 14/126 BCD

P Series

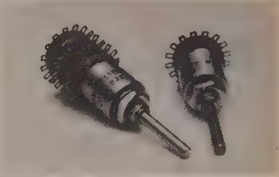
Subminiature P Series rotary switches are available in one-pole (up to 10 positions) and two-pole (up to 5 positions) types.

- ☐ Shorting or non-shorting
- ☐ Switching capacity: up to ½ Amp
- ☐ Indexing: 36°
- ☐ Printed circuit terminals
- ☐ Life: 25,000 cycles
- ☐ Sealed for wave soldering

S Series

The S Series provides up to 10 decks, 20 positions per deck (200 poles), in a miniature (¾" over terminals) bushing mounted rotary switch. Coded outputs.

Ask for Bulletins 14/S STD, 14/S BCD



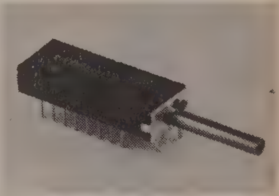
S Series

16-Pin DIPSWITCH®

Versatile 8-pole rotary switch. Application oriented features are:

- ☐ Any combination up to 8 contact closures in any shaft position
- ☐ Coded outputs
- ☐ 1.125 L x .440 W x .232 H
- ☐ 60°, 45°, 36° indexing

Also available is a 14-pin DIPSWITCH with any combination up to 6 contact closures in any shaft position.



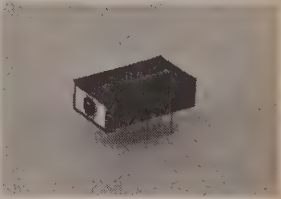
16-pin 12300 Series

8-Pin DIPSWITCH®

Versatile 4-pole, 8-pin rotary switch. Application oriented features are:

- ☐ Any combination up to 4 contact closures in any shaft position
- ☐ Coded outputs
- ☐ 35,000 cycle life @ .250 Amp
- ☐ .730 L x .440 W x .232 H
- ☐ 60°, 45°, 36° indexing

The 16, 14 and 8 pin switches are available with a bushing mounted front panel adapter.



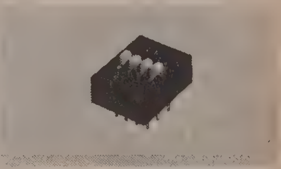
8-pin 12100 Series

Center-Off DIPSWITCH®

This 12-pin center-off DIPSWITCH provides four electrically isolated switches, each with distinct center-off positions. Switches may be simultaneously operated with our optional adapter. Low contact capacitance. Less than .5 pf.

Ask for Bulletin 18/DIP

(Covers all DIPSWITCHES including the 14-pin 11700 series not shown above.)



Center-off 12000 Series

For More Information

Many standard switches and accessories are available for immediate delivery from stock. Standard switches can be modified quickly and economically by our custom design service to meet special application requirements. Contact our sales department, or your local representative, for application assistance and prices. Detailed information is available in free bulletins as noted.

ARMTEC

Daven Components Group
Manchester Airport, Manchester, NH 03103

Armtec Industries, Inc.
Tel: (603) 669-0940 TWX: 710 220 1747

Burgess Precision Switches

BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774

F1T8

F1T8Y1

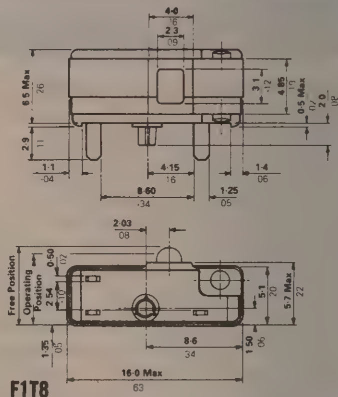
F1T8YR1

ULTRA MINIATURE MICRO SWITCHES
F1 SERIES

Low profile switches with side-protruding, gold-flashed terminals for printed circuit boards. Mounting by terminals assisted by moulded spigot. Low and standard force, changeover switching mechanisms. Contacts normally silver; add '-GP' to reference for gold. Plunger, plain lever or roller-lever may be depressed to case in overtravel.

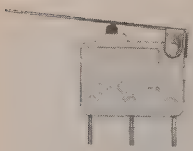
Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf	Rec. max. Rating 125/250 VAC
F1T8	Plunger	16	10	7	1.4	5	5
F12T8	Plunger	16	10	7	0.5	1.8	2
F1T8Y1	Lever	20	10	11	0.5	1.8	5
F12T8Y1	Lever	20	10	11	0.2	0.6	2
F1T8YR1	Roller-lever	19	10	16	0.5	1.8	5
F12T8YR1	Roller-lever	19	10	16	0.2	0.6	2

A variety of different lever lengths (to 2¼″) and shapes are available.


4·0
·16
2·3
·09
6·5 Max
·26
3·1
·12
4·85
·19
0·5 Max
·02
2·0
·08
2·9
·11
1·1
·04
4·15
·16
1·4
·06
8·60
·34
1·25
·05
2·03
·08
Free Position
Operating Position
0·50
·02
2·54
·10
5·1
·20
5·7 Max
·22
8·6
·34
1·35
·05
1·50
·06
16·0 Max
·63

F1T8

F4T6



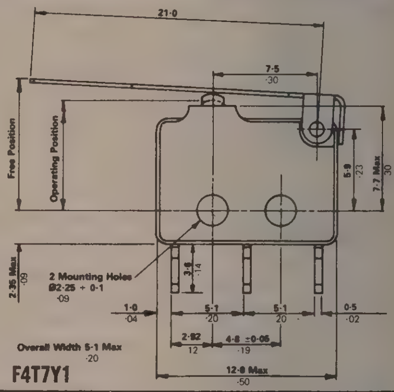
F4T7Y1

F4 SERIES

Similar to F5 Series but provided with side mounting holes. Changeover mechanism, recommended maximum rating 7 Amperes at 125/250 volts AC. Silver or gold contacts — add '-GP' to reference for the latter. Plunger, plain lever or cam-following lever actuators, all may be depressed to case in overtravel. 2 mm quick connect tab (QC in table) or solder tag terminals.

Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf
F4T6	Plunger	QC	13	5	18	1.2	4.3
F4T7	Plunger	Solder	13	5	15	1.2	4.3
F4T6Y1	Plain lever	QC	23	5	20	0.4	1.4
F4T7Y1	Plain lever	Solder	23	5	17	0.4	1.4
F4T6YC	Cam lever	QC	21	5	23	0.5	1.7
F4T7YC	Cam lever	Solder	21	5	21	0.5	1.7

MF4 Lug mounting frame for all F4 models. Switch secured without screws.


21·0
7·5
·30
Free Position
Operating Position
5·8
·23
7·7 Max
·30
2·35 Max
·09
2 Mounting Holes
Ø2·25 + 0·1
·09
3·6
·14
1·0
·04
5·1
·20
5·1
·20
0·5
·02
2·92
·12
4·8 ±0·05
·19
Overall Width 5·1 Max
·20
12·8 Max
·50

F4T7Y1

F5T8

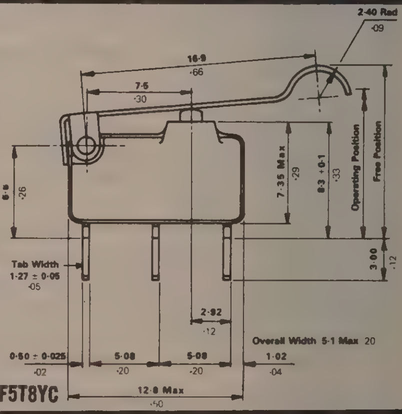
F5T8Y1

F5T8YC

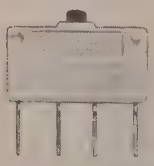
F5 SERIES

One of the world's smallest precision switches with power capabilities, the F5T8 has no mounting holes and may be mounted on a printed circuit board by means of its 5.08 mm pitched, gold-flashed, base-protruding terminal tags. Also available with plain or cam-following lever actuators. Changeover switching mechanism, recommended maximum rating 7 amperes at 125/250 volts AC resistive load. Silver contacts or add '-GP' to reference for gold. Actuators may be depressed to case in overtravel.

Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf
F5T8	Plunger	13	5	12	1.2	4.3
F5T8Y1	Plain lever	23	5	14	0.4	1.4
F5T8YC	Cam lever	21	5	15	0.5	1.7


2·40 Rad
·09
16·9
·66
7·5
·30
6·6
·26
7·35 Max
·29
8·3 ±0·1
·33
Operating Position
Free Position
3·00
·12
Tab Width
1·27 ± 0·05
·05
2·92
·12
Overall Width 5·1 Max 20
0·50 ± 0·025
·02
5·08
·20
5·08
·20
1·02
·04
12·8 Max
·50

F5T8YC



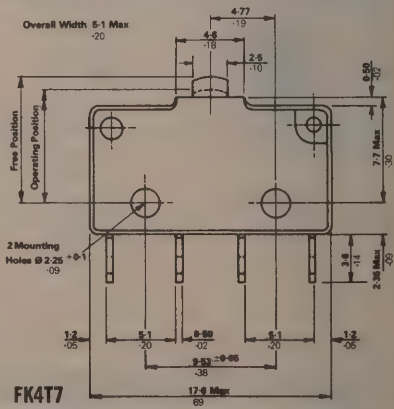
FK4T6

FK4T7Y1

FK4 SERIES

Double-break, two-circuit switches with four terminals. They are slightly smaller than V4 Series switches but have interchangeable mounting position. Lever actuators and terminals as for F4 Series. Recommended maximum rating 7 amperes, 125/250 VAC. Silver contacts, or add '-GP' to references for gold. All actuators may be depressed to case in overtravel.

Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf
FK4T6	Plunger	QC	18	5	18	1.5	5.4
FK4T7	Plunger	Solder	18	5	15	1.5	5.4
FK4T6Y1	Plain lever	QC	21	5	21	0.5	1.8
FK4T7Y1	Plain lever	Solder	21	5	18	0.5	1.8
FK4T6YC	Cam lever	QC	21	5	22	0.7	2.3
FK4T7YC	Cam lever	Solder	21	5	19	0.7	2.3


Overall Width 5·1 Max
·20
4·77
·19
4·6
·18
2·5
·10
0·50
·02
Free Position
Operating Position
7·7 Max
·30
2 Mounting
Holes Ø 2·25 +0·1
·09
3·6
·14
2·35 Max
·09
1·2
·05
5·1
·20
0·60
·02
5·1
·20
1·2
·05
9·52 ±0·05
·38
17·6 Max
·69

FK4T7

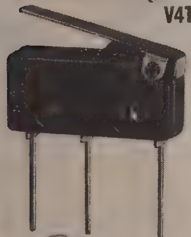
Burgess Precision Switches
BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774

V4T6

V4T7

V4T8

V4T9


V4T10Y1

V4T7YR1

SUB-MINIATURE MICRO SWITCHES
V4 SERIES

Popular sub-miniature, changeover Micro Switches. Standard and low-force mechanisms; plunger, plain lever and roller-lever actuators all capable of being depressed to the case in over-travel; four types of terminals. Contacts normally silver, but models marked * also available with gold contacts; add '-GP' to reference.

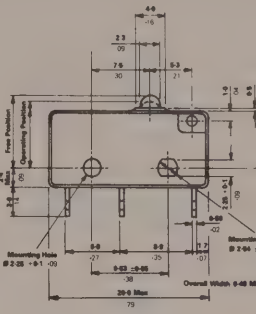
Ordering Reference	Actuator	Terminals	Dimensions L	B	H	Actuating Force N	Ozf	Rec. Max. Rating 125/250 VAC
V4T6*	Plunger	2mm QC	20	6	18	1.4	5	5
V42T6*	Plunger	2mm QC	20	6	18	0.5	1.7	2
V4T7*	Plunger	Solder	20	6	15	1.4	5	5
V42T7*	Plunger	Solder	20	6	15	0.5	1.7	2
V4T8*	Plunger	PC tab	20	6	17	1.4	5	5
V42T8*	Plunger	PC tab	20	6	17	0.5	1.7	2
V4T9*	Plunger	2.8mm QC	20	6	20	1.4	5	5
V42T9*	Plunger	2.8mm QC	20	6	20	0.5	1.7	2
V4T10	Plunger	Wire-wrap	20	6	20	1.4	5	5
V4T6Y1*	Plain lever	2mm QC	21	6	22	0.5	1.7	5
V42T6Y1*	Plain lever	2mm QC	21	6	22	0.2	0.7	2
V4T7Y1*	Plain lever	Solder	21	6	19	0.5	1.7	5
V42T7Y1*	Plain lever	Solder	21	6	19	0.2	0.7	2
V4T8Y1*	Plain lever	PC tab	21	6	21	0.5	1.7	5
V42T8Y1*	Plain lever	PC tab	21	6	21	0.2	0.7	2
V4T9Y1*	Plain lever	2.8mm QC	21	6	24	0.5	1.7	5
V42T9Y1*	Plain lever	2.8mm QC	21	6	24	0.2	0.7	2
V4T10Y1	Plain lever	Wire-wrap	21	6	24	0.5	1.7	5
V4T6YR1*	Roller lever	2mm QC	21	6	24	0.5	1.7	5
V42T6YR1	Roller lever	2mm QC	21	6	24	0.2	0.7	2
V4T7YR1*	Roller lever	Solder	21	6	21	0.5	1.7	5
V42T7YR1*	Roller lever	Solder	21	6	21	0.2	0.7	2
V4T8YR1	Roller lever	PC tab	21	6	23	0.5	1.7	5
V42T8YR1	Roller lever	PC tab	21	6	23	0.2	0.7	2
V4T9YR1	Roller lever	2.8mm QC	21	6	26	0.5	1.7	5
V42T9YR1	Roller lever	2.8mm QC	21	6	26	0.2	0.7	2
V4T10YR1	Roller lever	Wire-wrap	21	6	32	0.5	1.7	5

A variety of different lever lengths (to 2¼″) and shapes are available including cam-followers.

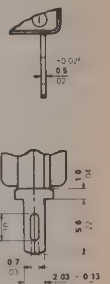
HIGH TEMPERATURE MODEL
Suitable for continuous service in temperatures up to 150°C. Otherwise as V4T7. Ordering reference: SV4T7

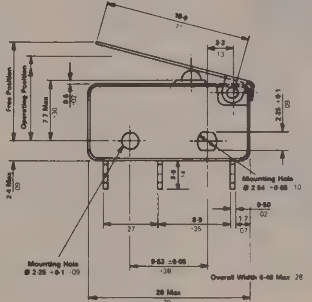
DOUBLE-POLE MODEL
Six solder tag terminals. Mounts by one M2 screw and spigot. 5 amperes max. rating. LBH = 20, 14, 24. AF = 2.2N, 8 Ozf. Ordering reference: V24T7.

TELECOMMUNICATION SWITCHES
Burgess offers an unrivaled range of gravity, add-on and other switching assemblies for the telecommunication industry. Many are based on designs featured on this page. Please apply for details.

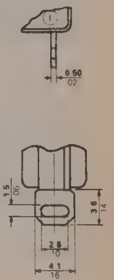


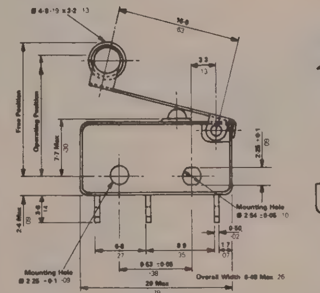
V4T7


T6

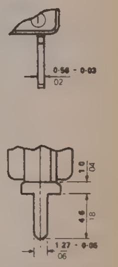


V4T7Y1


T7



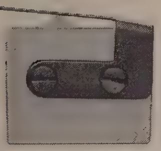
V4T7YR1


T8

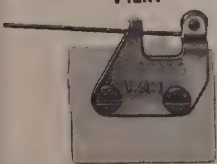
V4 AUXILIARY ACTUATORS

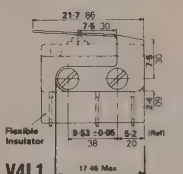
Fit all plunger actuated, single-pole V4 switches. The following references cover the actuators and mounting hardware only— the switches should be ordered separately.

Ordering Reference	For 1 or 2 V4 Switches	Type of Lever	Lever Ratio
2V4A1	2	Plain	2.5:1
2V4AR1	2	with roller	2.4:1
V4A1	1	Plain	2.5:1
V4C1	1	hinged wire	6.0:1
V4L1	1	flexing leaf	—
V4LR1	1	leaf with roller	2.0:1
V4S1	1	hinged strip	6.0:1
V4S2	1	hinged strip	13.0:1
V4SR1	1	strip with roller	4.0:1
MF3 Lug-mounting frame, suitable for all single-pole V4 switches. Switch secured in frame without screws.			

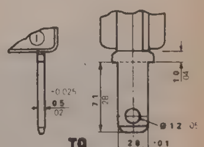

V4L1

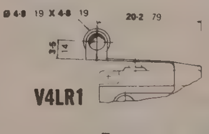
V4LR1

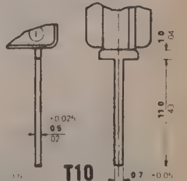

V4C1

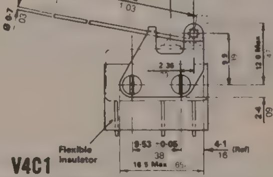


V4L1


T9


V4LR1


T10



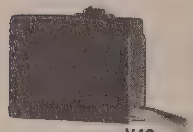
V4C1

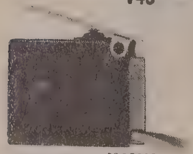
Burgess Precision Switches
BURGESS SWITCH CO., INC.
638 Anthony Trail, Northbrook, Illinois 60062
Telephone (312) 291-1760 / Telex 206774

SEALED MINIATURE MICRO SWITCHES FOR DIFFICULT ENVIRONMENTS

A range of single and multi-pole miniature and sub-miniature Micro Switches with mechanisms totally enclosed to the standard indicated by IEC Code IP67 and NEMA Type 6. Efficient sealing is proved by a pressure test. Explosion-proof models are included in the range. Single-pole switches have plunger actuators which may be used alone or with plain lever or roller-lever auxiliary actuators. Multi-pole models are available with either plunger or integral lever actuators (plain or with roller). With one exception, all models are supplied with factory fitted, PVC insulated wires.

V4SYR1


V4S

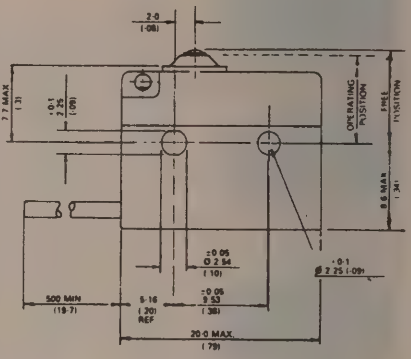

V4SY1

SINGLE POLE SUB-MINIATURE SWITCHES V4S MODELS

Glass-loaded nylon case and lid; acetal plunger; a neoprene cowl is fitted around the plunger and bonded to the lid. The well-proven Burgess V4 changeover mechanism is fitted within the enclosure. Three 16/0.2 mm p.v.c. insulated wires are potted in position. Silver contacts are standard. Temperature range −10° to +70°C and recommended maximum rating 3 amperes, 125/250 VAC. Silicone cowl/lead versions available for −50°C operation.

Ordering Reference	Actuator	Dimensions L	B	H	Actuating Force N	Ozf
V4S	Plunger	22*	7	18	2.5	9.0
V4SY1	Plain lever	22	7	23	0.9	3.2
V4SYR1	Roller lever	22	7	26	0.9	3.2

A variety of different lever lengths (to 2¼″) and shapes are available; also auxiliary actuators in single and double pole configuration. (See page 2).
* excluding cables.



V4S

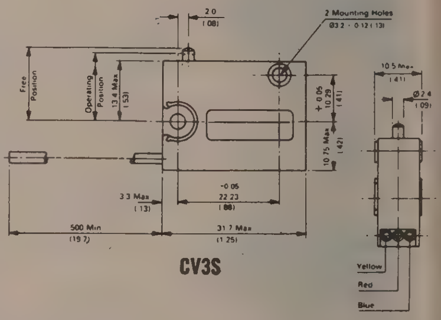
SINGLE POLE MINIATURE SWITCH CV3S MODELS

CV3S

The CV3S Micro Switch is encapsulated in a glass-loaded nylon case and provided with three cables of approximately 0.5m length. It has a protected, stainless steel plunger and will interchange with standard V3 Series Switches. All of the auxiliary actuators designed for the V3 Series may be used with the CV3S (contact Burgess for full details). The CV3S9 is a similarly constructed sealed unit but instead of cables it is fitted with open 2.8 mm quick-connect tab terminals. Recommended maximum rating 5 amperes, 125/250 VAC.

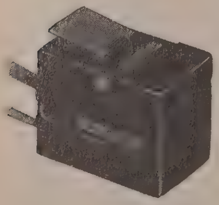
Ordering Reference	Dimensions L	B	H	Overtravel	Actuating Force N	Ozf
CV3S	32*	10	26	Depress to case	3.9	14
CV3S9	32	10	28	Depress to case	3.9	14

Integral actuators similar to those on the multiple versions also available.
* excluding cables



CV3S

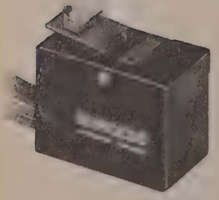
MULTI-POLE MINIATURE SWITCHES 272- & 372-MODELS

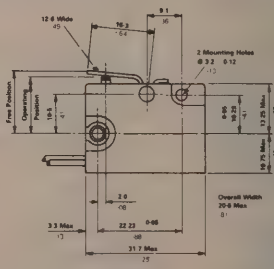

272F5Y1

Twice as wide but otherwise physically similar to single-pole switch CV3S, these multi-pole models use two or three F5T8 Ultra Miniature Micro Switches (see page 1) as their switching elements. They are adjusted individually during assembly to ensure that all operate within 0.8 mm of plunger travel. The complete units are sealed and six or nine cables approximately 0.5m in length are provided. Available actuators are plunger, wide plain lever and wide roller and lever; all may be depressed to case in overtravel. Recommended maximum rating is 5 amperes, 125/250 VAC.

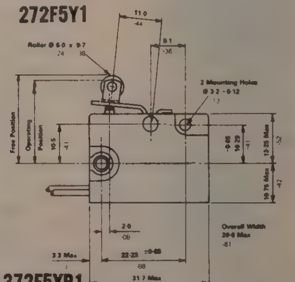
Ordering Reference	Poles	Actuator	Dimensions L*	B	H	Actuating Force N	Ozf
272F5	2	Plunger	32	21	26	4.0	14.5
272F5Y1	2	Plain lever	32	21	27	4.0	14.5
272F5YR1	2	Roller lever	32	21	34	4.0	14.5
372F5	3	Plunger	32	21	26	4.5	16.0
372F5Y1	3	Plain lever	32	21	27	4.5	16.0
372F5YR1	3	Roller lever	32	21	34	4.5	16.0

Similar models approved by BASEEFA as components with 'Type of Protection N' to BS4683, Part 3, 1972—a requirement for usage in Zone 2 hazardous areas—may be ordered by adding the prefix 'E2' to the above V3S and Multi-pole ordering references.
* excluding cables

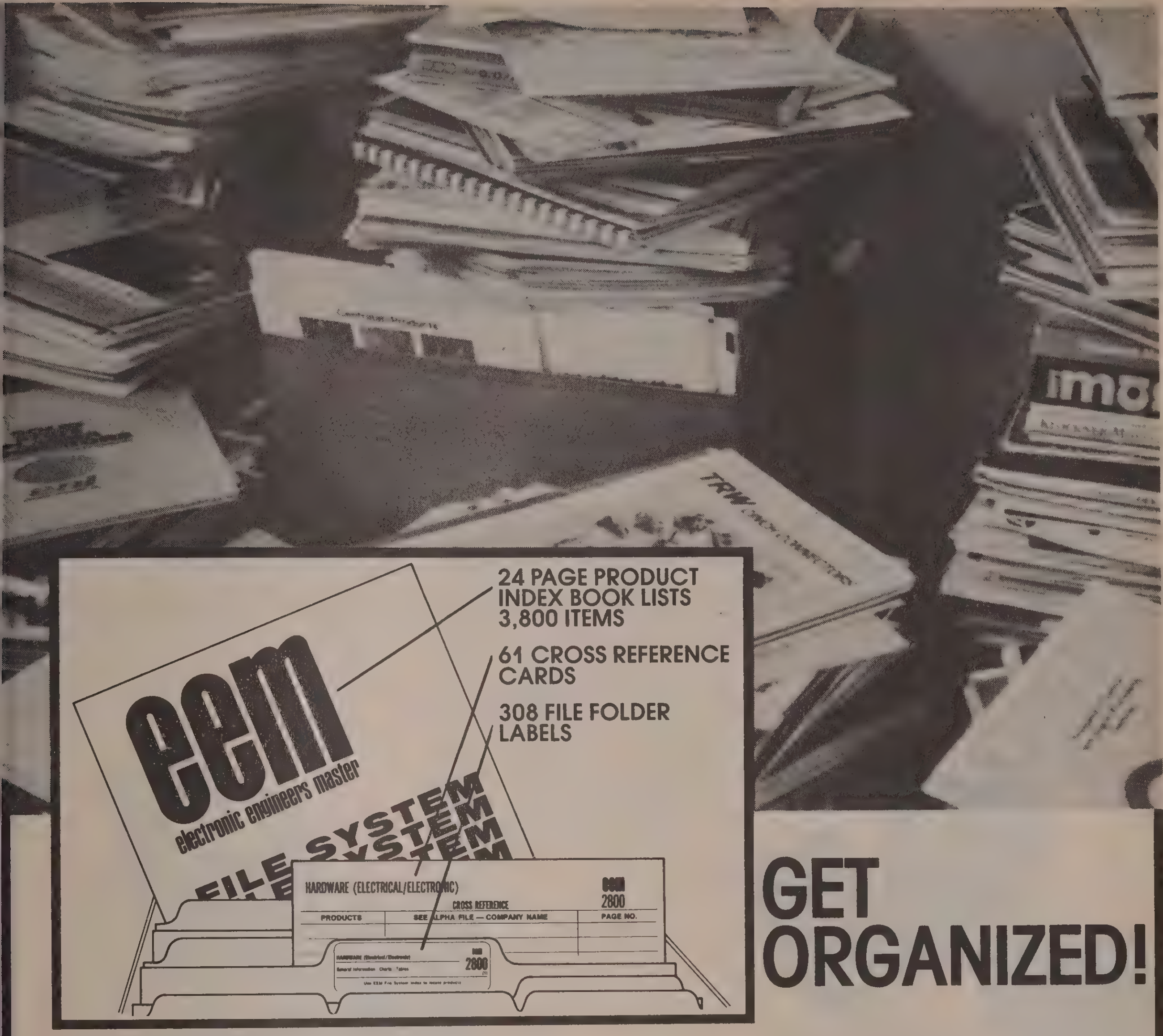

372F5YR1



272F5Y1



372F5YR1


eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
PRODUCTS
SEE ALPHA FILE — COMPANY NAME
PAGE NO.
eem
2800
TRW
imo

24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS

61 CROSS REFERENCE CARDS

308 FILE FOLDER LABELS

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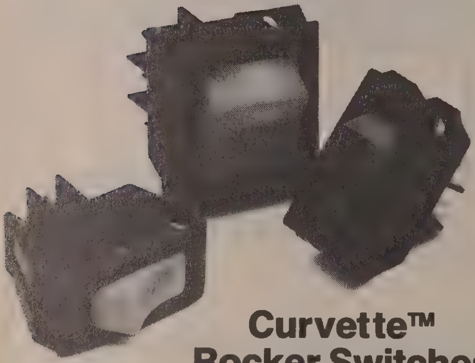
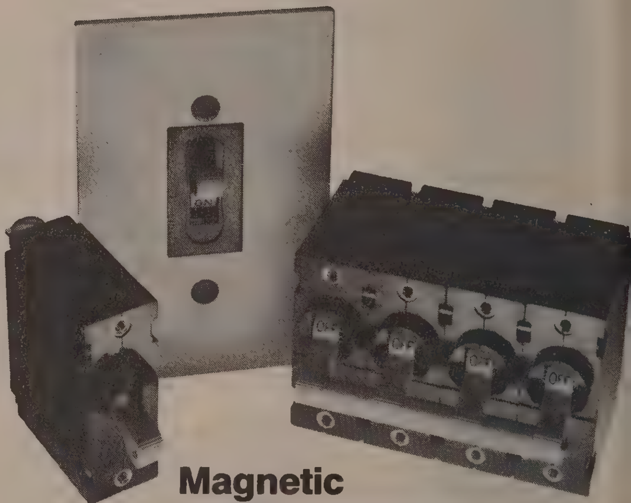


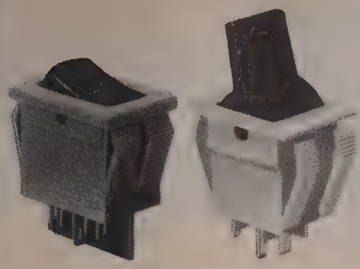
Curvette™ Rocker Switches

Our new compound curve rocker switch offers more performance and protection for the lowest cost than you'll find anywhere. Outside, Curvette's smooth compound curve bezel and glare-free matte finish blend into the panel. Inside, Curvette's switching mechanism is the toughest we've ever designed. It handles detrimental high inrush current surges without expensive silver alloy butt contacts. It's been tested successfully up to 75 amps inrush. And in most applications, Curvette's new switching mechanism also stops arcing before it starts — without expensive arc-suppressing fibre. Curvette withstands 50,000 actuations, minimum, at maximum load in high ambient temperatures. Curvette's slightly smaller size and patent pending mounting ear design let it fit snugly into any opening from .48" x 1.072" to .55" x 1.125". Curvette is UL listed and CSA approved for 16AMP 125VAC and 10AMP 250VAC; VDE approvable for 12(6) AMP 250VAC. Curvette is available in one-color, two-color and lighted (AC or DC) versions. Curvette VisiRocker™ has a second color molded in for low cost "on" indication. Also available with custom legends and in double-pole configurations.



Magnetic Circuit Breakers

Industry standard magnetic circuit breakers are available in single or multi-pole configurations, with single or multiple actuators. Available with instantaneous, ultra short, short, medium and long time delays. In series, shunt and relay trip circuits in popular ratings up to 50 amp. They're UL recognized and CSA certified. Our B Series meets the spacing requirements of VDE and IEC. Compact design uses less mounting space. With snap-on adapter, our breakers also fit larger, "standard" frame size openings. Special caps available in eight attractive colors. Well-suited for new designs or as direct replacements for competitive products.

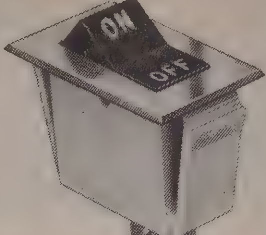


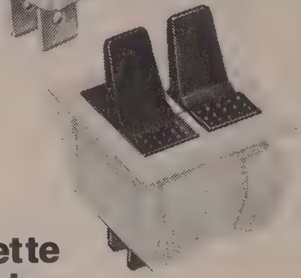
Miniature All-nylon Power Rocker/Paddle Switches

All-nylon miniature rocker and paddle switches offer high reliability, low cost, snap-in mounting, multiple circuit choices, plus ratings for power switching or low level dry circuit switching applications. These attractive switches are available in a wide variety of standard and custom-matched colors. They feature our patented self-cleaning wiping action contacts and are designed to meet European standards.

Full Size Tippette® Rocker Switches

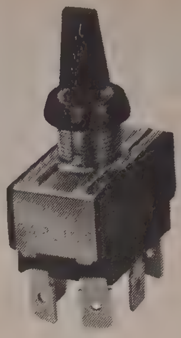
Tippette rocker switches are available in an almost endless variety of circuits, current ratings, actuator and bezel styles, mounting brackets and termination types. Other options include legend imprinting, standard or custom-matched bezel and actuator colors. Plus, our patented "Drip Dry" option is an inexpensive way of protecting switch from dirt, moisture and other contaminants. Lighted versions feature single or multiple indicator lights — available with voltages from 6VDC to 240VAC. Will be available in European-approved versions, consult factory.





Mini Tippette Switches

All-nylon low cost insulated switches are tested at full load for 100,000+ cycles. Single or double pole versions offered. All feature convenient snap-in mounting, paddle or rocker actuation. Choose from various current ratings, circuit designs, termination types, colors (standard or custom matches) and legend imprinting. Lighted versions with lamp voltages from 6VDC to 240VAC. Will be available in European-approved versions, consult factory.



Full Size Toggle Switches

These toggle switches are available in one through four poles in ratings up to 20 amps. Single and double pole switches are available with a variety of circuit, termination and actuator variations including an insulated all-nylon model. New lighted versions utilize a translucent actuator which displays three colors to indicate switch positions. Add a neoprene bushing seal that protects against dust and moisture and you have the right switch combination for marine and automotive applications. Will be available in European-approved versions, consult factory.

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CARLINGSWITCH
INNOVATION BY DESIGN

eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC	alternating current
A/D	analog to digital
ADC	analog to digital converter
ADP	automatic data processing
AF	audio frequency
AFC	automatic frequency control
ALGOL	algorithmic language
AM	amplitude modulation
AND	a logical operator
AQL	acceptable quality level
ASCII	American national standard code for information interchange
AWG	American wire guage

B

BALUN	balanced to unbalanced
BASIC	beginners' all-purpose symbolic instruction code
BCD	binary-coded decimal
BNC	baby "N" connector
BUS	basic utility system

C

CAD	computer aided design
CAM	computer aided manufacture
CATV	cable television or community antenna television
CERMET	ceramic metal element
Comm.	communications
CMOS	complementary metal-oxide semiconductor
CPS	characters per second
CPU	central processing unit

D

D/A	digital to analog
DAC	digital to analog converter
DC	direct curent
DIL	dual in-line
DIP	dual in-line package
DPM	digital panel meter
DTL	diode transistor logic

E

EDP	electronic data processing
EBCDIC	extended binary coded decimal interchange code
EEPROM	electrically erasable PROM
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPROM	electrically programmable ROM
ESR	equivalent series resistance

F

FEP	fluorinated ethylene propylene Copolymar, 200° Teflon
FET	field-effect transistor
FM	frequency modulation
FORTRAN	formula translator

G

GaAsFET	gallium arsenide field effect transistor
GPIB	general purpose interface bus

H

HF	high frequency (3 to 30 MHz)
HIPOT	test, measurement and diagnostic equipment
HLL	high level language
HV	high voltage
Hz	Hertz

I

IC	integrated circuit
IF	intermediate frequency
IO	input/output (devices)
IR	insulation resistance (or) infrared

J

JFET	junction field effect transistor
JMOS	junction metal oxide semiconductor

K

kHz	kilohertz (10^3 hertz)
KSR	keyboard send receive

L

LC	inductance capacitance
LCD	liquid crystal display
LED	light-emitting diode
LF	low frequency (30 to 300 kHz)
LSI	large scale integration
LVDT	linear velocity displacement transformer

M

MATV	master antenna television
μF	microforad
MHz	megahertz
MOS	metal oxide semiconductor
MOSFET	metal oxide semiconductor field effect transistor
MOV	metal oxide varistor
MPU	microprocessor unit
MSI	medium scale integration

N

NBS	National Bureau of Standards
NIM	nuclear instrumentation module
NOR	not OR

O

OEM	original equipment manufacturer
OR	a logical operator

P

pF	picofarad
PC	printed circuit
PCB	printed circuit board
PIN	positive-intrinsic-negative (transistor)
PLA	programmable logic array
PPI	plan position indicator
PROM	programmable read only memory
PUT	programmable unijunction transistor

Q

QAM	quadrature amplitude modulation
Q (meter)	quality-factor meter

R

RAM	random access memory
RC	resistance-capacitance
RFI	radio frequency interference
RMS	root mean square
ROM	read only memory
RF	radio frequency
RFC	radio-frequency choke
RFI	radio-frequency interference
RTD	resistance-temperature detector
RTL	resistor transistor logic
RTV	room temperature vulcanizing
RW	read/write

S

SAS	silicon asymmetrical switch
SBC	single board (micro) computer
SBS	silicon bilateral switch
SCR	silicon-controlled rectifier
SIP	single in-line package
SSI	small scale integration
SSR	solid state relay
STL	Schottky transistor logic

T

TC	temperature coefficient
TCXO	temperature compensated crystal oscillator
TFE	tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL	transistor-transistor logic
TTY	teletypewriter

U

UHF	ultra high frequency (300 MHz to 3 GHz)
UL	Underwriters Laboratory
UPS	uninterruptible power supply

V

VAC	volts (of) alternating current
VAR	volt-ampere reactive
VCR	video cassette recorder
VDC	volts (of) direct current
VHF	very high frequency
VHSIC	very high speed integrated circuit
VLF	very low frequency (3 to 30 kHz)
VLSI	very large scale integration
VRM	voice recognition module
VTVM	vacuum tube volt meter
VU	volume unit
VSWR	voltage standing wave ratio

W

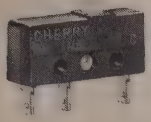
WPS	word processing software

Y

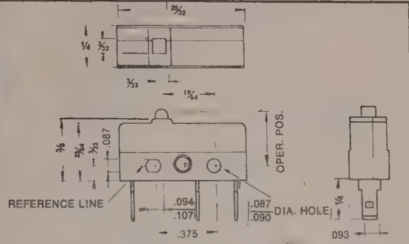
YIG	yttrium iron garnet

CHERRY Subminiature Snap Action Switches

SERIES E61 — Light Force/SERIES E62 — Standard Force

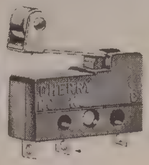


(.093 Q.C. TERMINAL)
E61-00A
E62-00A

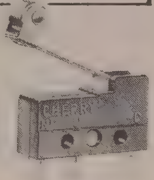

25/32
1/4
3/32
3/32
19/64
3/8
23/64
3/32
.087
OPER. POS.
REFERENCE LINE
.094
.107
.087
.090
DIA. HOLE
.375
1/4
093

(SOLDER TERMINAL)
E61-00H
E62-00H

E61-50H
E62-50H



E61-00K
E62-00K



E61-50K
E62-50K

SWITCH BODY: 25/32″ x 23/64″ x ¼″

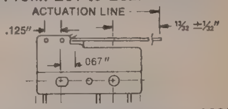
RATINGS: E61 — 5 Amps. 125/250 VAC
E62 — 10.1 Amps. 125/250 VAC — ¼ H.P. 125 VAC

Und. Lab. Inc. listed and CSA approved.

Part No.	Circuitry	Description
E61-00A	SPDT	Button, .093 Q.C. Terminals
E61-10A	SPDT	Button, Solder Terminals
E61-30A	SPDT	Button, .110 Q.C. Terminals
E61-00H	SPDT	9/32″ Actr, Std. Lever Ratio, .093 Q.C. Terminals
E61-10H	SPDT	9/32″ Actr, Std. Lever Ratio, Solder Terminals
E61-30H	SPDT	9/32″ Actr, Std. Lever Ratio, .110 Q.C. Terminals
E61-50H	SPDT	13/32″ Actr, High Lever Ratio, .093 Q.C. Terminals
E61-60H	SPDT	13/32″ Actr, High Lever Ratio, Solder Terminals
E61-80H	SPDT	13/32″ Actr, High Lever Ratio, .110 Q.C. Terminals
E61-00K	SPDT	13/64″ Roller Actr, Std. Lever Ratio, .093 Q.C. Terminals
E61-10K	SPDT	13/64″ Roller Actr, Std. Lever Ratio, Solder Terminals
E61-30K	SPDT	13/64″ Roller Actr, Std. Lever Ratio, .110 Q.C. Terminals
E61-50K	SPDT	21/64″ Roller Actr, High Lever Ratio, .093 Q.C. Terminals
E61-60K	SPDT	21/64″ Roller Actr, High Lever Ratio, Solder Terminals
E61-80K	SPDT	21/64″ Roller Actr, High Lever Ratio, .110 Q.C. Terminals

Note: To specify 10.1 Amps. merely change the Prefix E61 to E62.

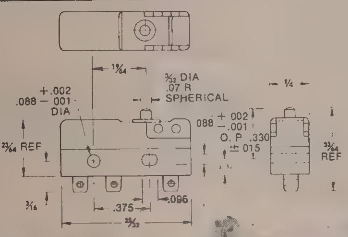
ACTUATORS — Actuator lengths are dimensioned from centerline of switch mounting hole as shown. Other actuators available on request.


ACTUATION LINE
.125″
13/32 ±1/32″
.067″

TERMINALS — Subminiature series is available with quick connect .093″ wide (mates with AMP part no. 60432-1) and .110″ wide (mates with AMP part no. 42399-2). Also available in short solder terminal .139″ wide x .125″ long.

NOTE: .093″ Quick Connect terminals are standard. To order solder terminals add 10 to suffix number. To order .110″ QC terminals add 30 to suffix number. (Example: basic E61-00A becomes E61-10A for solder terminals and E61-30A for .110″ QC terminals.

SERIES E91 — 5 Amp./Series E92 — 11 Amp.


19/64
3/32 DIA
.07 R
SPHERICAL
1/4
+.002
.088 — 001
DIA
23/64 REF
088 + 002
— .001
O. P .330
± 015
33/64
REF
3/16
.375
.096
25/32

Basic Button
—AA standard ratio
unsealed

Flat Leaf
—LB standard ratio
unsealed

—LM standard ratio
unsealed

—RB standard ratio
unsealed

—SB standard ratio
unsealed

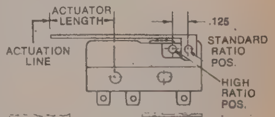
SWITCH BODY: 23/64″ x 25/32″ x ¼″

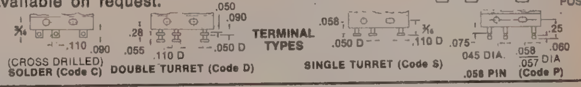
TERMINALS — Choice of Solder/Cross Drilled, Double Turret, .058″ Pin or Single Turret.

Part No.	Description
E913-C1AA	Basic
E923-C1AA	Basic
E913-C1LB	Std. Ratio Flat Leaf Act. (Act. length .285″)
E923-C1LB	Std. Ratio Flat Leaf Act. (Act. length .285″)
E913-C1LM	Std. Ratio Act. (Act. length 1.765″)
E923-C1LM	Std. Ratio Act. (Act. length 1.765″)
E913-C1RB	Std. Ratio Act. (Act. length .250″) Roller
E923-C1RB	Std. Ratio Act. (Act. length .250″) Roller
E913-C1SB	Std. Ratio Simulated Roller Act. (Act. length .245″)
E923-C1SB	Std. Ratio Simulated Roller Act. (Act. length .245″)

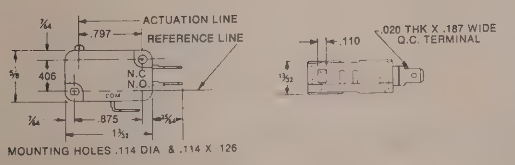
NOTE: First letter (C) in suffix signifies Solder/Cross Drilled terminal (standard). To order other terminal type substitute "C" with "D" for Double Turret, "S" for Single Turret, or "P" for .058″ Pin terminal.

ACTUATORS — Standard external hinged lever and roller actuators are available in choice of 2 pivot positions (standard ratio and high ratio). Actuator lengths are dimensioned from centerline of switch mounting hole as shown. Other actuators available on request.


ACTUATOR LENGTH
.125
ACTUATION LINE
STANDARD RATIO POS.
HIGH RATIO POS.


3/64
.110
.090
(CROSS DRILLED)
SOLDER (Code C)
.050
.090
.28
.055
.110 D
.050 D
DOUBLE TURRET (Code D)
TERMINAL TYPES
.058
3/16
.050 D
.110 D
SINGLE TURRET (Code S)
.25
.075
.060
045 DIA.
.058
.057 DIA
.058 PIN
(Code P)

MINIATURE SNAP ACTION SWITCHES SERIES E22/E23/E33/E34 (Standard Force)


ACTUATION LINE
7/64
.797
REFERENCE LINE
5/8
406
N.C
N.O.
COM
7/64
.875
25/64
1 3/32
MOUNTING HOLES .114 DIA & .114 X 126
.110
.020 THK X .187 WIDE Q.C. TERMINAL
13/32

—00A

—00H

—00K

—50P

-50H

—50K

—50HL

—50KL

SWITCH BODY: 1 3/32″ x ⅝″ x 13/32″

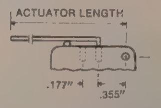
OPERATING FORCES: E22 — 75 gms. max.
E23 — 170 gms. max.
E33 — 285 gms. max.
E33 — 400 gms. max.

RATINGS: E22 — 3 Amps. 125/250 VAC.
E23 — 5 Amps. ¼ H.P. 125/250 VAC
E33 — 10 Amps. ½ H.P. 125/250 VAC
E34 — 15 Amps. ½ H.P. 125/250 VAC

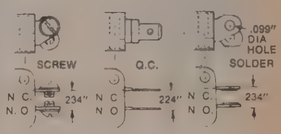
Und. Lab. Inc. listed and CSA approved.

Part No.	Circuitry	Terminal	Description
STANDARD FORCE			
E23-00A	SPDT	QC	Button
E23-10A	SPDT	Screw	Button
E23-20A	SPDT	Solder	Button
E23-00H	SPDT	QC	27/32″ Actr, Std. Ratio
E23-50H	SPDT	QC	1 13/32″ Actr, Std. Ratio
E23-70H	SPDT	Solder	1 13/32″ Actr, Std. Ratio
E23-50HL	SPDT	QC	1 9/16″ Actr, High Ratio
E23-00K	SPDT	QC	13/16″ Roller Actr, Std. Ratio
E23-10K	SPDT	Screw	13/16″ Roller Actr, Std. Ratio
E23-20K	SPDT	Solder	13/16″ Roller Actr, Std. Ratio
E23-50K	SPDT	QC	1 11/32″ Roller Actr, Std. Ratio
E23-70K	SPDT	Solder	1 11/32″ Roller Actr, Std. Ratio
E23-50KL	SPDT	QC	1½″ Roller Actr, High Ratio
E23-00P	SPDT	QC	13/16″ One-Way Roller Actr., Std. Ratio
E23-50P	SPDT	QC	1 11/32″ One-way Roller Actr, Std. Ratio
E23-50PL	SPDT	QC	1½″ One-way Roller Actr, High Ratio

ACTUATORS — Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here. Other actuators available on request.


ACTUATOR LENGTH
.177″
.355″

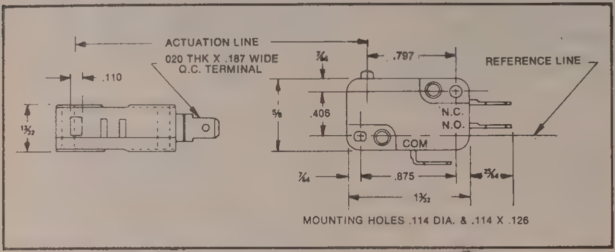
TERMINALS — Choice of Screw, Solder, or Quick Connect Terminals. .187″ wide Quick Connect terminals are standard x .020″ thick. Also available are .250″ wide x .032″ thick QC terminals. To order screw terminals add 10 to suffix number. To order solder terminals add 20 to suffix number. For example: the basic E23-00A becomes E23-10A for screw terminals and E23-20A for solder terminals.

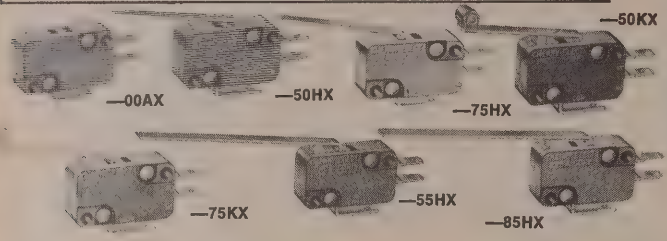

SCREW
N C.
N. O
234″
Q.C.
N C
N O
224″
.099″ DIA HOLE
SOLDER
N C.
N O.
234″

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Light Force Miniature Snap Action Switches

SERIES E22 — SERIES E23/SERIES E33 — SERIES E34 LIGHT FORCE


ACTUATION LINE
020 THK X .187 WIDE Q.C. TERMINAL
.110
13/32
7/64
.797
REFERENCE LINE
5/8
.406
N.C.
N.O.
COM
7/64
.875
25/64
1 3/32
MOUNTING HOLES .114 DIA. & .114 X .126


—50KX
—00AX
—50HX
—75HX
—75KX
—55HX
—85HX

SWITCH BODY: 1 3/32″ x 5/8″ x 13/32″

RATINGS: E22 Series — 3 Amps., 125/250 VAC
E23 Series — 5 Amps., ¼ H.P., 125/250 VAC
E33 Series — 10 Amps., ½ H.P., 125/250 VAC
E34 Series — 15 Amps., ½ H.P., 125/250 VAC

Und. Lab. Inc. listed, and CSA approved.

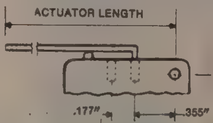
OPERATING FORCES: E22 — 15 gms. max. E33 — 75 gms. max.
E23 — 45 gms. max. E34 — 100 gms. max.

Terminal Types	S.P.D.T.
QC	E22-00AX
Screw	E22-10AX
Solder	E22-20AX

NOTE: .187″ Quick Connect terminals are standard. Normally, to order screw terminals add 10 to suffix number. To order solder terminals add 20 to suffix number. For example: The basic E22-00AX becomes E22-10AX for screw terminals and E22-20AX for solder terminals.

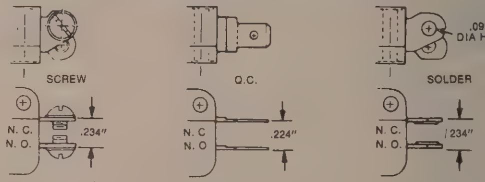
EXCEPTIONS: When ordering —55HX, —75HX, —75KX or —85HX switches, do **not** change suffix number. Simply state on order whether QC, screw or solder terminal types are desired.

ACTUATORS—Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here. Other actuators available on request.

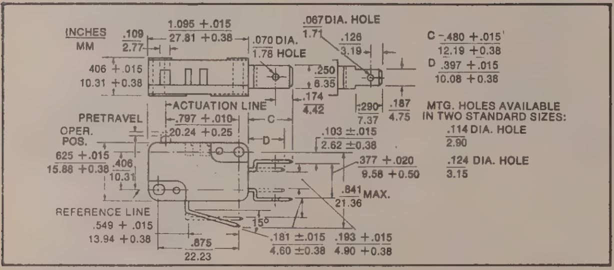

ACTUATOR LENGTH
.177″
.355″

ACTUATOR LENGTH INCHES: 1.400, 1.580, 1.340, 1.516, 2.757, 2.932.

TERMINALS — Choice of Screw, Solder, or Quick Connect Terminals. Unless otherwise specified switches are furnished with QC terminals .187 wide x .020 thick. Also available are .250 wide x .032 QC terminals.


SCREW
Q.C.
.099″ DIA HOLE
SOLDER
N. C.
N. O.
.234″
N. C
N. O
.224″
N. C.
N. O.
.234″

D4 INTERNATIONAL MINIATURE SNAP ACTION SWITCH


INCHES
MM
.109
2.77
1.095 +.015
27.81 +0.38
.070 DIA.
1.78 HOLE
.067 DIA. HOLE
1.71
.126
3.19
C .480 +.015
12.19 +0.38
D .397 +.015
10.08 +0.38
406 +.015
10.31 +0.38
.250
6.35
.174
4.42
ACTUATION LINE
.290
7.37
.187
4.75
MTG. HOLES AVAILABLE IN TWO STANDARD SIZES:
.114 DIA. HOLE
2.90
.124 DIA. HOLE
3.15
PRETRAVEL
OPER. POS.
.797 +.010
20.24 +0.25
C
D
.103 ±.015
2.62 ±0.38
625 +.015
15.88 +0.38
.406
10.31
.377 +.020
9.58 +0.50
.841
21.36
MAX.
REFERENCE LINE
.549 + .015
13.94 +0.38
15°
.875
22.23
.181 ±.015
4.60 ±0.38
.193 +.015
4.90 +0.38

SWITCH BODY: 1 3/32″ x 5/8″ x 13/32″

RATINGS: D42 — 3 Amps., 125/250 VAC
D43 — 5 Amps., ¼ H.P., 125/250 VAC**
D44 — 10 Amps., ½ H.P., 125/250 VAC
D45 — 15 Amps., ½ H.P., 125/250 VAC***

Und. Lab. Inc. listed, and CSA approved.

CONTACTS AND RATINGS

	Rating	Contact Material
SERIES (E22) D42	3 amps., 125/250 VAC	Fine Silver
SERIES (E23) D43	5 amps., ¼ H.P.,* 125/250 VAC	Silver Cadmium Oxidized
SERIES (E33) D44	10 amps, ½ H.P., 125/250 VAC	Silver Cadmium Oxidized
SERIES (E34) D45	15 amps., ½ H.P.,** 125/250 VAC	Silver Cadmium Oxidized

* VDE (Germany) rating: 6 amps. ** VDE (Germany) rating: 16 amps.

1. FOREIGN APPROVED VERSIONS

Designations:
Standard Force: Series D413, D423, D433, D443 and D453
Light Force: Series D419, D429, D439, D449 and D459

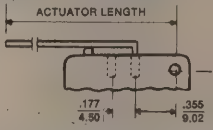
These D4 switches have foreign as well as UL/CSA approvals. They have .250″ (6.35mm) x .032″ (0.81 mm) thick "offset" terminals and metric mounting holes. They are also available with English (U.S.) mounting holes. (See drawings.)

2. U.S. VERSIONS

Designations:
Standard Force: Series D41C, D42C, D43C, D44C and D45C
Light Force: Series D41L, D42L, D43L, D44L and D45L

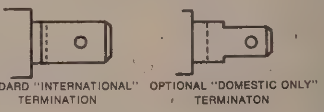
These are D4 switches with UL and CSA approvals for domestic use only. Terminals are "straight" and measure .187″ (4.75 mm) x .020″ (0.50 mm) thick. (See drawings.)

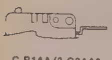
ACTUATORS: Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch upper mounting hole as shown here. Other actuators available on request.

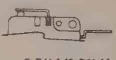

ACTUATOR LENGTH
.177
4.50
.355
9.02

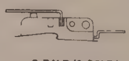
ACTUATOR LENGTH INCHES: .865, 1.400, 1.580, 2.757, .810, 1.340, 1.516, .810, 1.340.

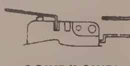
TERMINALS: Choice of two QC terminations: .250″ (6.35 mm) x .032″ (0.81 mm) thick "offset" terminals with foreign as well as UL/CSA approvals . . . or .187″ (4.75 mm) x .020″ (0.50 mm) thick with UL and CSA approval for domestic use only.

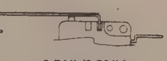

STANDARD "INTERNATIONAL" TERMINATION
OPTIONAL "DOMESTIC ONLY" TERMINATON

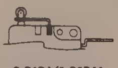

C-R1AA/3-Q3AA* (Similar to Conventional —00A)

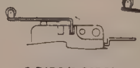

C-R1LA/3-Q3LA* (Similar to Conventional —00H)

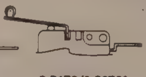

C-R1LD/3-Q3LD* (Similar to Conventional —50H)

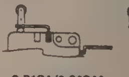

C-R1MD/3-Q3MD* (Similar to Conventional —50HL)

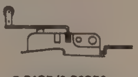

C-R1JL/3-Q3JL* (Similar to Conventional —55H)


C-R1RA/3-Q3RA* (Similar to Conventional —00K)

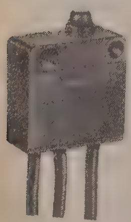

C-R1RC/3-Q3RC* (Similar to Conventional —50K)

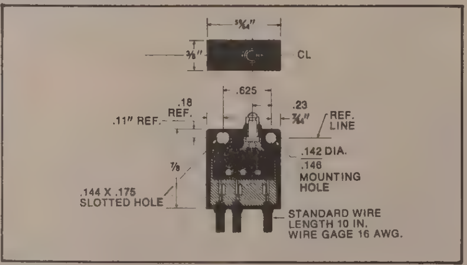

C-R1TC/3-Q3TC* (Similar to Conventional —50KL)


C-R1GA/3-Q3GA* (Similar to Conventional —00P)


C-R1GD/3-Q3GD* (Similar to Conventional —50P)

SERIES E72 WEATHERPROOF




53/64″
3/8″
CL
.625
.18 REF.
.11″ REF.
.23
3/64″
REF. LINE
.142 DIA.
.146
MOUNTING HOLE
7/8
.144 X .175 SLOTTED HOLE
STANDARD WIRE LENGTH 10 IN. WIRE GAGE 16 AWG.

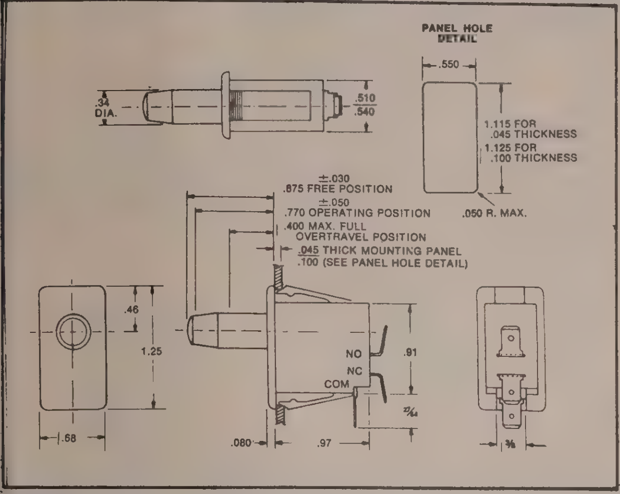
Cherry put a switch inside a switch . . . so it's water-resistant and weatherproof!

Cherry's basic E72-40A is moisture resistant. It comes with insulated, 10 inch, 16 gauge leads attached. The E72-40A is rated at 10.1 Amps., ¼ H.P. and 125/250 VAC. Listed by Underwriters' Laboratories, Inc.

The E72 series is also available with hinged external actuators, Cherry part number E72-40H.

CHERRY Panel Mount Pushbutton Switches

SERIES E69 — PANEL MOUNT PUSHBUTTON/SINGLE POLE


PANEL HOLE DETAIL
.550
1.115 FOR .045 THICKNESS
1.125 FOR .100 THICKNESS
.050 R. MAX.
.34 DIA.
.510
.540
±.030
.875 FREE POSITION
±.050
.770 OPERATING POSITION
.400 MAX. FULL OVERTRAVEL POSITION
.045 THICK MOUNTING PANEL
.100 (SEE PANEL HOLE DETAIL)
.46
1.25
NO
NC
COM
.91
.68
.080
.97
⅜

E60-00A
Basic Momentary Action
E69-40A
Short Button Momentary
E69-50A
For Auxiliary Push Button
E69-20A
Push-Pull (Reset)

E69-30A Momentary "Cheat" Interlock

E69-60A Push-Push (Alt Action)

RATING: 10 Amp, 125/250 VAC
⅓ H.P. 125/250 VAC

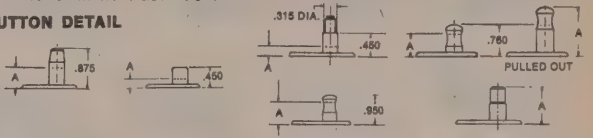
Und. Lab. Inc. listed, and CSA approved.

TERMINALS — This switch series has quick connect terminals .187″ x .020″.

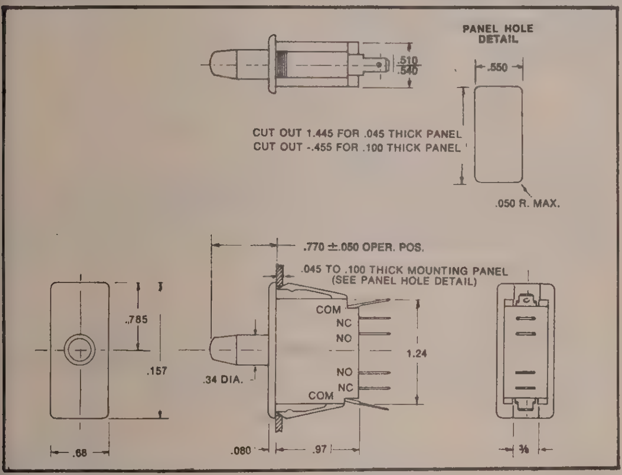
APPLICATIONS — Door and drawer light/interlock switch; test function switch; EDP and business machine starts switch; photocopy machines and other equiment requiring either manual or mechanical actuation and panel mounting.

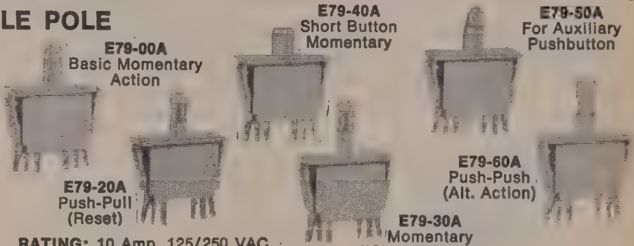
Switch E69-50A has button with special shaft to accept auxiliary push buttons for manual actuation.

BUTTON DETAIL


.315 DIA.
A
.875
.450
.450
.760
.950
PULLED OUT

SERIES E79 — PANEL MOUNT PUSHBUTTON/DOUBLE POLE


PANEL HOLE DETAIL
.550
.510
.540
CUT OUT 1.445 FOR .045 THICK PANEL
CUT OUT -.455 FOR .100 THICK PANEL
.050 R. MAX.
.770 ±.050 OPER. POS.
.045 TO .100 THICK MOUNTING PANEL (SEE PANEL HOLE DETAIL)
.785
.157
.34 DIA.
COM
NC
NO
NO
NC
COM
1.24
.68
.080
.97
⅜


E79-00A
Basic Momentary Action
E79-40A
Short Button Momentary
E79-50A
For Auxiliary Pushbutton
E79-20A
Push-Pull (Reset)
E79-60A
Push-Push (Alt. Action)
E79-30A
Momentary

"Cheat" Interlock

RATING: 10 Amp, 125/250 VAC
⅓ H.P. 125/250 VAC

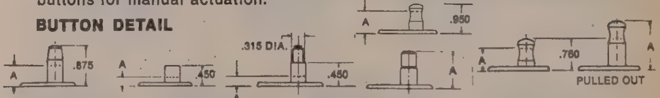
Und. Lab. Inc. listed, and CSA approved.

TERMINALS — This switch series has quick connect terminals .187″ x .020″.

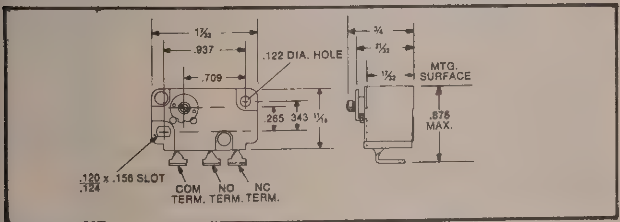
APPLICATIONS — Door and drawer light/interlock switch; test function switch; EDP and business machine start switch; photocopy machines and other equipment requiring either manual or mechanical actuation and panel mounting.

Switch E79-50A has button with special shaft to accept auxiliary push buttons for manual actuation.

BUTTON DETAIL


A
.875
.450
.315 DIA.
.450
.950
.760
PULLED OUT

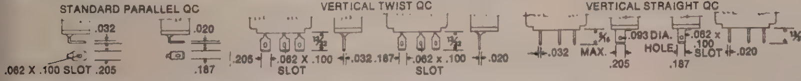
SERIES E51 — LOW TORQUE SWITCHES


1⅞₂
.937
.709
.122 DIA. HOLE
.265
343
1⅟₁₆
¾
²¹⁄₃₂
¹⁷⁄₃₂
MTG. SURFACE
.875 MAX.
.120 x .156 SLOT
.124
COM TERM.
NO TERM.
NC TERM.

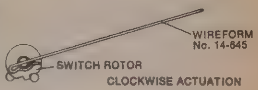
E51-00B
E51-00E
E51-50B
E51-50E
E51-60B
E51-60E

RATING: E51 — 5 Amps, 125/250 VAC
Und. Lab. Inc. listed, and CSA approved.

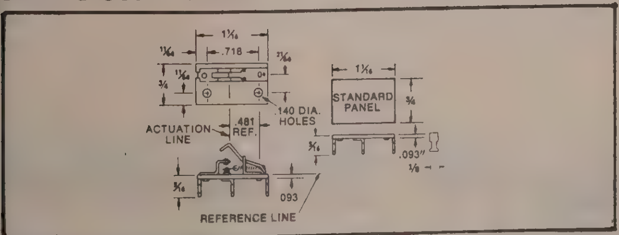
TERMINALS — All terminals are combination quick connect and solder. Several types are available as shown.

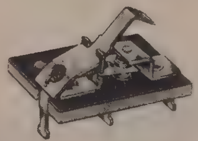

STANDARD PARALLEL QC
.032
.062 X .100 SLOT
.205
.020
.187
VERTICAL TWIST QC
¹³⁄₃₂
.205
.062 X .100 SLOT
.032
.187
.062 x .100 SLOT
.020
VERTICAL STRAIGHT QC
.032
5/16 MAX.
.093 DIA. HOLE
.205
.062 x .100 SLOT
.187
.020
¹³⁄₃₂

ACTUATORS—Wireform actuators are supplied unassembled for each E51 switch. Wireforms may be readily assembled to switch rotor as illustrated below.

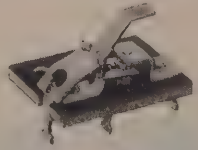

WIREFORM No. 14-645
SWITCH ROTOR
CLOCKWISE ACTUATION

SERIES S30 — MINIATURE OPEN TYPE


1⅟₁₆
¹⁵⁄₆₄
.718
²¹⁄₆₄
¾
¹⁵⁄₆₄
.140 DIA. HOLES
1⅟₁₆
STANDARD PANEL
¾
ACTUATION LINE
.481 REF.
5/16
.093″
⅛
⅜
.093
REFERENCE LINE



S30-00W

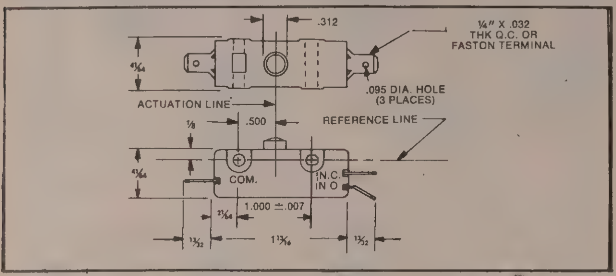


S30-20W

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY General Purpose Switches

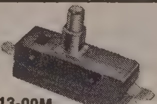
SERIES E13 — STANDARD/SERIES E14 — HIGH CAPACITY GENERAL PURPOSE


.312
¼" X .032 THK Q.C. OR FASTON TERMINAL
47/64
.095 DIA. HOLE (3 PLACES)
ACTUATION LINE
⅛
.500
REFERENCE LINE
47/64
COM.
N.C.
N O
1.000 ±.007
21/64
13/32
1 13/16
13/32

E13-00E

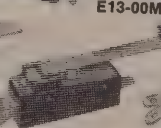
E13-00R

E13-00J


E13-00M

E13-00H

E13-50H

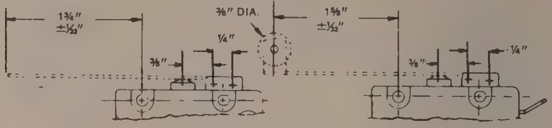

E13-00K

E13-50K

RATING: E13 — 15 Amps, 125/250 VAC
¾ H.P., 125 VAC — 1½ H.P., 250 VAC
E14 — 25 Amps, 125/250 VAC
1 H.P., 125 VAC — 2 H.P., 250 VAC

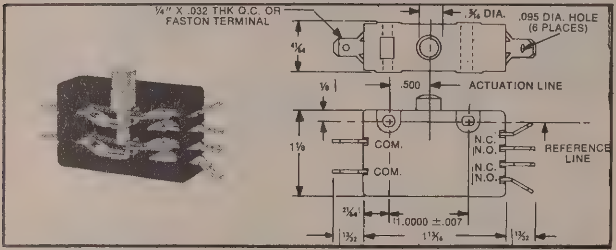
Und. Lab. Inc. listed, and CSA approved.

ACTUATORS — Many special forms and lengths of actuators are available. Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here.


1¾" ±1/32"
⅜" DIA.
¼"
⅜"
1⅝" ±1/32"
⅜"
¼"

TERMINALS — Standard ¼ inch QC terminals can be furnished with angle formed up or down on common as well as open or closed terminal. Forms include straight, 30, 45, 85 degrees up or down. Other forms can be provided at nominal extra charge.

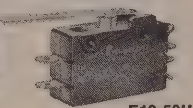
SERIES E19 — STANDARD/SERIES E20 — HIGH CAPACITY — DOUBLE POLE

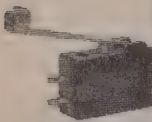

¼" X .032 THK Q.C. OR FASTON TERMINAL
3/16 DIA.
.095 DIA. HOLE (6 PLACES)
41/64
⅛
.500
ACTUATION LINE
1⅛
COM.
COM.
N.C.
N.O.
N.C.
N.O.
REFERENCE LINE
21/64
1.0000 ±.007
13/32
1 13/16
13/32

E19-00A

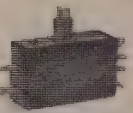
E19-00R

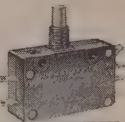
E19-00H


E19-50H


E19-00K

E19-50K

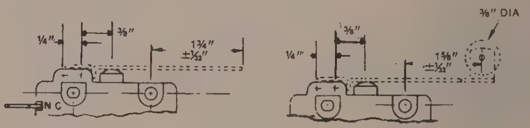

E19-00J


E19-00M

RATING: E19 — 15 Amps, 125/250 VAC
¾ H.P., 125 VAC — 1½ H.P., 250 VAC
E20 — 20 Amps, 125/250 VAC
1 H.P., 125 VAC — 2 H.P., 250 VAC

Und. Lab. Inc. listed, and CSA approved.

ACTUATORS — Many special forms and lengths of actuators are available. Standard type integral hinged lever and roller actuators are available in choice of 2 pivot positions. Actuator lengths are dimensioned from centerline of switch mounting hole as shown here.


¼"
⅜"
1¾" ±1/32"
N C
⅜"
¼"
1⅝" ±1/32"
⅜" DIA

TERMINALS — Standard ¼ inch QC terminals can be furnished with angle formed up or down on common as well as open or closed terminal. Forms include straight, 30, 45, 85 degrees up or down. Other forms can be provided at nominal extra charge.

GOLD "CROSSPOINT" CONTACT SWITCHES FOR LOW ENERGY CIRCUITS

Engineers can now take a completely new approach to switching of low energy circuits. The Gold "Crosspoint" Contact switch design provides reed switch reliability, with snap action switch precision and utility. No need for magnets and installation adjustments. The result is much lower installed cost.

Positive Snap-Action Switching of Low Energy Solid State Circuits

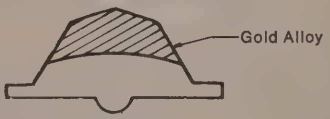
- High reliability in low level switching applications from 4 to 100 milliamperes at 4 to 30 volts
- Long Life . . . measured in millions of operations
- Initial insertion resistance far below 50 milliohms (lower than reed switches)
- Very high force per unit area (contact pressures)
- Reduced susceptibility to contact closure interference from foreign particles

RATING: 0.1 Amp, 125 VAC
Und. Lab. Inc. listed, and CSA approved.

VERSATILITY IN APPLICATION

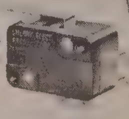
Cherry Gold "Crosspoint" Contact switches are available in a wide variety of switch types, sizes, and mountings for a broad range of electronic applications. In addition, many other configurations are available with gold crosspoint contacts.

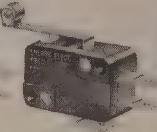
CONTACT CROSS SECTION

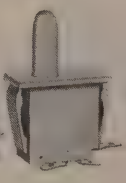


The contacts in these switches are W/E Alloy # . . .
69% Gold, 25% Silver, 6% Platinum

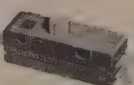
E21-00A


E21-50H


E21-50K


E68-00A

E78-00A


G13-00E

S31-20P

E53-00B

E63-00A

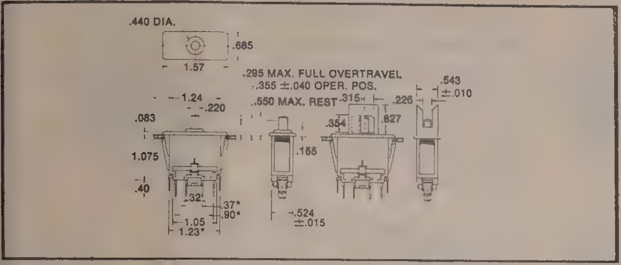
E63-00H

E63-00K

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Pushbutton Switches

SERIES F81, F82, F83 AND F84 LINE INTERRUPT SWITCHES


.440 DIA.
.685
1.57
.295 MAX. FULL OVERTRAVEL
.355 ±.040 OPER. POS.
.550 MAX. REST
.315
.226
.543 ±.010
1.24
.220
.083
.354
.627
1.075
.165
.40
.32
.37°
.90°
1.05
1.23°
.524 ±.015

Designed for worldwide safety specifications these line interrupt switches incorporate direct action, double make/double break shorting bars and 3 mm minimum contact gap. Two parallel return springs, either of which could safely break the circuit alone, give added protection. UL listed and CSA approved. Meets other international requirements.

CONTACT ARRANGEMENT

Choice of Form X, Form Y or Form Z contact arrangement is basic (A1) case or (B1) case with barrier. Form X (SPST NO DB), Form Y (SPST NC DB), Form Z (SPDT DB).

CONTACT RATINGS

F81: rated 10 Amps at 125 or 250 VAC (¾ HP at 125 VAC, 1½ HP at 250 VAC).

F82: rated 16 Amps at 125 or 250 VAC (¾ HP at 125 VAC, 1½ HP at 250 VAC).

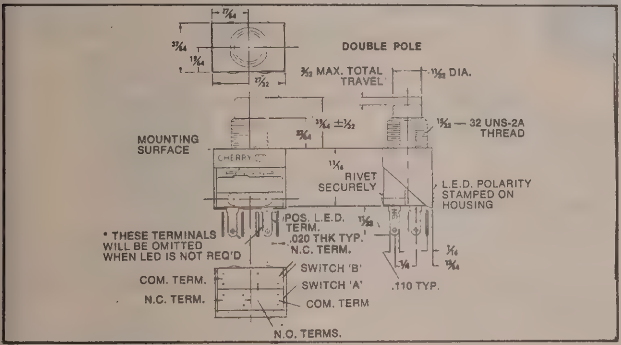
F83: gold crosspoint contacts for low energy switching. Rated 0.1 Amp at 1250 or 250 VAC.

F84: combines two different ratings in a single switch.

TERMINALS

Either 3⁄16″ (10) or ¼″ (20) male push-on terminals are standard. Others can be tooled. In most cases terminal sizes may be mixed on a switch to help minimize wiring errors.

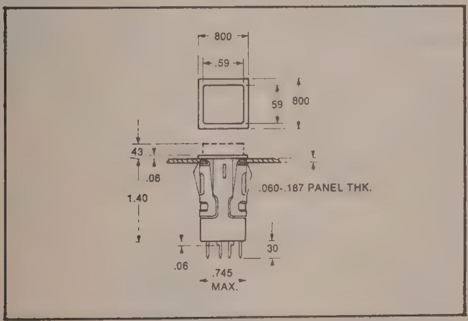
SERIES P1 FERRULE MOUNTED LIGHTED PUSHBUTTON SWITCH


27⁄64
37⁄64
19⁄64
27⁄32
DOUBLE POLE
3⁄32 MAX. TOTAL TRAVEL
11⁄32 DIA.
39⁄64 ±1⁄32
25⁄64
15⁄32 — 32 UNS-2A THREAD
MOUNTING SURFACE
CHERRY
11⁄16
RIVET SECURELY
L.E.D. POLARITY STAMPED ON HOUSING
POS. L.E.D. TERM.
11⁄32
• THESE TERMINALS WILL BE OMITTED WHEN LED IS NOT REQ'D
.020 THK TYP.
N.C. TERM.
1⁄16
1⁄4
13⁄64
SWITCH 'B'
SWITCH 'A'
COM. TERM.
N.C. TERM.
COM. TERM
.110 TYP.
N.O. TERMS.

The Series P1: An entirely new kind of pushbutton switch . . . from Cherry. Pushbutton housing holds one — or two — famous Cherry series E62 or E63 subminiature snap action switches. E62 switches are rated 10.1 Amps, 125/250 VAC — ¼ H.P., 125 VAC. E63 switches are gold crosspoint contact rated 0.1 Amp, 125 VAC for your low energy circuits. Because the P1 houses one **or** two switches, you have your choice of 10.1 Amp, 0.1 Amp — or both! — in the same pushbutton switch.

Cherry Switch Co.	Description
P162-C3RA	10.1 Amp/S.P.D.T./Red Button/L.E.D.
P162-C3BU	10.1 Amp/S.P.D.T./Black Button/No Lite
P162-D3RA	10.1 Amp/D.P.D.T./Red Button/L.E.D.
P162-D3BU	10.1 Amp/D.P.D.T./Black Button/No Lite
P163-C3RA	0.1 Amp/S.P.D.T./Red Button/L.E.D.
P163-C3BU	0.1 Amp/S.P.D.T./Black Button/No Lite
P163-D3RA	0.1 Amp/D.P.D.T./Red Button/L.E.D.
P163-D3BU	0.1 Amp/D.P.D.T./Black Button/No Lite

P4 PUSHBUTTON SWITCHES


800
.59
59
800
43
.06
1.40
.060-.187 PANEL THK.
.06
.745 MAX.
30

SWITCHES

Cherry's P4 switches are available in the popular square configuration with:

- choice of momentary or alternate action
- choice of QC or PCB terminals
- choice of 3 amp @ 125 VAC/2 Amp @ 250 VAC or 0.1 Amp @ 24 VDC
- choice of several contact arrangements

P4 SWITCH PART NUMBERS

Part Number	Contacts	Contact Action	Terminal	Contact Configuration
P4 Series — Square Non Lighted				
P41B-021C	Silver	Momentary	.110 QC	1 Form C
P43A-021C	Gold	Alt. Act.	.110 QC	1 Form C
P4 Series Square One 6.3V Incandescent Lamp Installed				
P41A-621C	Silver	Momentary	.110 QC	1 Form C
P41B-621C	Gold	Alt. Act.	.110 QC	1 Form C
P4 Series Square One 14V Incandescent Lamp Installed				
P41A-722C	Silver	Momentary	.110 QC	1 Form C
P41B-721C	Gold	Alt. Act.	.110 QC	1 Form C
P4 Series Square One 28V Incandescent Lamp Installed				
P41A-821C	Silver	Momentary	.110 QC	1 Form C
. P41B-821C	Gold	Alt. Act.	.110 QC	1 Form C

Silver Rating: 3A @ 125 VAC/2A @ 250 VAC

Gold Rating: 0.1A @ 24 VDC

- Three button styles
- Snaps into industry standard mounting hole from front of panel

Mixed ratings can be provided. P4 switches may be specified with or without lamp sockets. Sockets mate with widely accepted wedge-base T 1¾ incandescent lamps.

P4 SERIES

EXPLANATION OF PART NUMBER

1 — A — 0 — 3 — 1C

Rating
1 = 3A @ 125 VAC
2A @ 250 VAC
3 = 0.1A @ 24 VAC

Contact Action
A = Alternate Action
B = Momentary Action

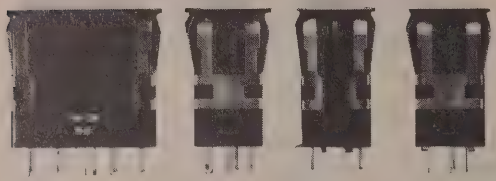
Temperature
0 = No lamp
1 = 1 lamp socket
6 = 6.3V lamp installed
7 = 14V lamp installed
8 = 28V lamp installed

Terminal
2 = .110 QC terminal
3 = .020 pin terminal

Contact Configuration
1 C = 1 Form C contact
2 C = 2 Form C contact
4 A = 4 Form A contact
8 A = 8 Form A contact

CHERRY Pushbutton and Thumbwheel

CHERRY 3-BIT ENCODER



- Up to 8 different 3-bit codes, single common
- Choice of termination
- Base keyed for foolproof P.C. board orientation
- All industry-standard available from stock

P4 Series Square 3 Bit Encoder
P43C-124A
P43C-134A

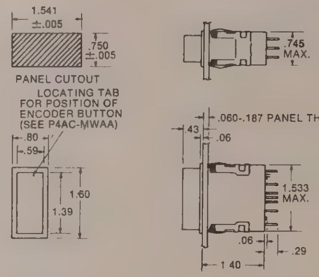
P4 Series Encoder Button Square — 3 Bit Button Only

P4AC-B3SO	.43 High Translucent

P4 Series Switch Button — Blank White

P4AB-C1WN	.19″ high
P4AB-B1WN	.43″ high
P4AB-A1WN	.32″ high

CHERRY 8-BIT ENCODER



- Up to 256 different 8-bit codes
- Dual commons for convenience on printed circuit board
- User-programmable: set code yourself for the ultimate in flexibility. Encoding instructions are supplied with 1 x 2 encoder buttons.
- Choice of termination — PCB or .110 Q.C.

P4 Standard 8-Bit Encoders

P44H-138A	8-Bit encoder body, .020 x .025 PCB terminals, empty lamp socket

P4 Series Rectangular — 8 Bit Encoder

P44H-138A	Coded (Gold) 1 lamp socket — 8 Form A .020″ pin term.

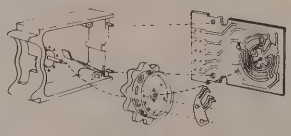
P4 Series Encoder Buttons Rectangular — Button Only

P4AC-XWAA	8 bit

THUMBWHEEL, LEVERWHEEL, PUSHWHEEL

BASIC OPERATING PRINCIPLE

A set of comb-like wiping contacts, rotated manually, shorts together predetermined combinations of traces on a stationary printed circuit board. These same traces also serve as electrical input/output lines. Here's a simplified diagram of the mechanism:



ACTUATION

Cherry offers three kinds of actuation for these rotary multi-position switches. Thumbwheel, Leverwheel and Pushwheel.

Thumbwheel
Rotate the dial directly

Leverwheel
Drive the dial by means of a lever. Convenient for fast resetting to zero position.

Pushwheel
Push one button to index the dial up . . . the other to index down.

MOUNTING

Cherry provides you with 3 mounting styles and choices. Back mount, front mount, and snap in mount.

TERMINATION

Cherry is tooled to supply terminals just right for your application.

PC BOARD

Parallel rows of holes approximately .040″ diameter.

F-PINS

Specify F-pin termination for direct mating with motherboard.

J-PINS

Specify J-pins for wire-wrap applications. More economical than F-pins.

LIGHTED SWITCHES

Cherry's T20 thumbwheel can be supplied with a socketed, replaceable lamp that requires no tools or soldering.

Cherry's T56 pushwheel is available with a permanently installed grain-of-wheat lamp. Also available with LED illumination.

COLOR

In high volume applications Cherry can provide switches in any color. Black is standard.

FINISH

Choice of glass or matte.

LEGENDS

Standard legends are spelled out in the product selection charts accompanying each catalog family.

Standard character color is white on black dial. For lighted versions, standard is black on transluscent white dial.

CLEAR PLASTIC WINDOW

DUSTPROOF THUMBWHEELS

A clear plastic window covers dial character opening for resistance to dust, dirt and moisture. Available on Cherry's T24 series and T38 series.

ASSEMBLIES AND COMBINATIONS

Within a given family size, you may gang into multi-digit assemblies, specifying any combination of standard-window switches, and spacers. Simply specify exactly the combination that fits your application. Your local distributor is available to assemble these switches.

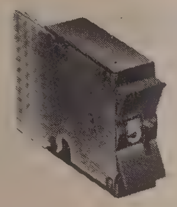
STOPS

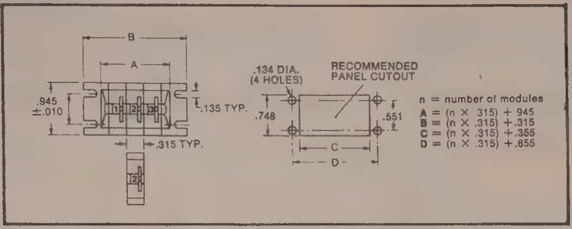
Cherry provides many standard combinations of rotation-limiting stops to help tailor our switches exactly to your application needs.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

SERIES T-50 — BACK MOUNT




B
A
.945
±.010
.135 TYP.
.315 TYP.
1
2
3
.134 DIA.
(4 HOLES)
RECOMMENDED
PANEL CUTOUT
.748
.551
C
D
n = number of modules
A = (n × 315) + 945
B = (n × .315) +.315
C = (n × .315) +.355
D = (n × .315) +.655

Available in 8, 10 and 16 positions. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation. Stops not available on 16 position.

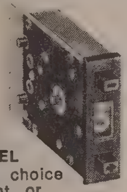
SWITCH CHARACTERISTICS:

Dielectric Strength .... 500 VAC

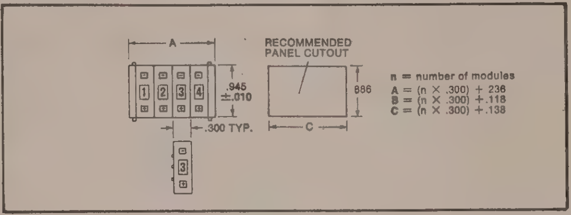
Temperature .... −40°C to +70°C

Note: Applies to all thumbwheel switches

SERIES T56 — FRONT, SNAP-IN MOUNT

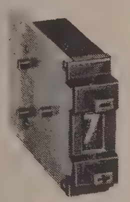


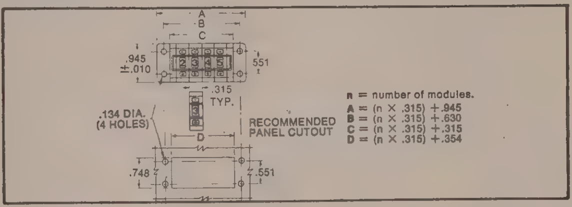
T56 PUSHWHEEL
Available with choice of incandescent or LED illumination.


A
1
2
3
4
.945
±.010
.300 TYP.
RECOMMENDED
PANEL CUTOUT
886
C
n = number of modules
A = (n × .300) + 236
B = (n × .300) +.118
C = (n × .300) +.138

Ideal for cramped control panels. Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

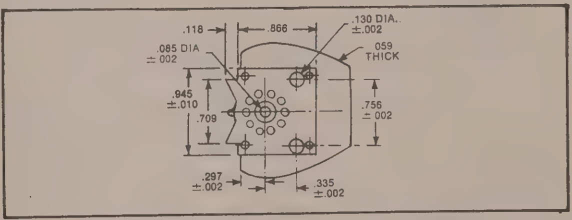
SERIES T57 — BACK MOUNT




A
B
C
.945
±.010
551
.315
TYP.
.134 DIA.
(4 HOLES)
D
RECOMMENDED
PANEL CUTOUT
.748
.551
n = number of modules.
A = (n × .315) +.945
B = (n × .315) +.630
C = (n × .315) +.315
D = (n × .315) +.354

Ideal for cramped control panels. Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

SERIES T54


.118
.866
.130 DIA..
±.002
.085 DIA
±.002
.059
THICK
.945
±.010
.709
.756
±.002
.297
±.002
.335
±.002

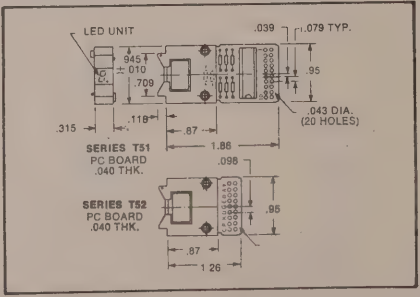
CIRCUIT BOARD MOUNT

Special elevated mounting of contact wiper set permits direct mounting of this thumbwheel on PC board without modifying the board to recess into the switch housing. Configuration, dimensions and stops information the same as Series T50.

SERIES T51 & T52 — BACK MOUNT LED INDICATING UNIT

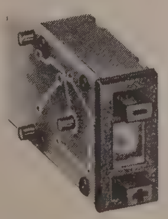
Series T51 comes with driver installed at factory.

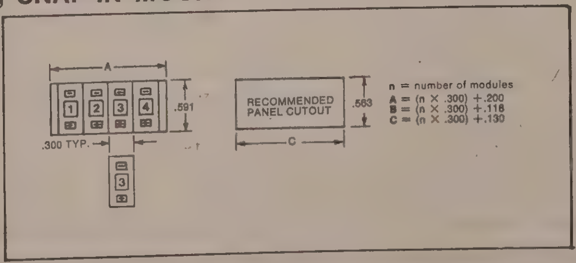
Series T52 does not include driver.


LED UNIT
.039
.079 TYP.
945
± 010
.709
.95
.043 DIA.
(20 HOLES)
.315
.118
.87
1.86
SERIES T51
PC BOARD
.040 THK.
.098
SERIES T52
PC BOARD
.040 THK.
.95
.87
1 26

A seven segment LED indicating unit in a thumbwheel type package. Features bright red, .362″ high digit that operates at logic level voltages. Can be used with any BDC type coded thumbwheel and is also available with supplementary inputs of the ripple-blanking input and blanking input/ripple blanking output type with an automatic zero blanking feature. Additional lamp test input renders possible functional control of the indicating segments. Recommended panel cutout, endcaps and spacers are the same as Series T50.

SERIES T55 — FRONT, SNAP-IN MOUNT




A
1
2
3
4
.591
.300 TYP.
3
RECOMMENDED
PANEL CUTOUT
.563
C
n = number of modules
A = (n × .300) +.200
B = (n × .300) +.118
C = (n × .300) +.130

The smallest of them all! Dustproof design. Offered in a wide variety of positions and output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

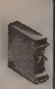
CHERRY Thumbwheel, Leverwheel, Pushwheel

HOW TO USE THIS CHART FOR ORDERING

When ordering standard Cherry Thumbwheel/Leverwheel switches or switch assemblies, please call out the applicable information as at right:

T35J-01 A 3

*Series
*Optional Pin Terminations
*J = J-pin terminations
F = F-pin terminations
Code Suffix
Finish**
Number of Switches in Assembly
**A = Gloss finish M = Matte finish

SUFFIX NO.	POS.	DESCRIPTION	READ OUT SYMBOL	INDUSTRIAL				STANDARD					MINIATURE		
				T10	L10	T11	L11	T64	T65	T71	T72	 T75	T20	L20	T24
-07	8	Binary Coded Octal (BCO)	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●	●‡	●‡
-77	8	BCO Complement Only	0-7					●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡
-27	8	BCO with decimal point on case	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡
-47	8	BCO with separate C to not true bits	0-7	●‡		●‡							●‡	●‡	
-57	8	BCO with Diode Provisions	0-7	●‡		●‡		●‡	●‡	●‡	●‡	●‡	●‡	●‡	
-17	8	1 of 8 Code	0-7	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●‡	●	●‡	●‡
-71	10	Aiken Code Modern 1-2-4-2'	0-9					●	●	●	●	●			
-70	10	Aiken Code 1-2-4-2'	0-9					●	●	●	●	●			
-02	10	Binary Coded Decimal (BCD)	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-04	10	BCD + Complement, 1 Common	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-24	10	BCD + Complement, 1 Common with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-54	10	BCD + Complement, 1 Common with Diode Provisions	0-9	●		●							●	●	
-05	10	BCD + Complement with separate Commons	0-9		●		●								
-10	10	BCD + Even Parity	0-9		●		●	●	●	●	●	●	●	●	
-30	10	BCD + Even Parity with decimal point on case	0-9		●		●	●	●	●	●	●	●	●	
-06	10	BCD + Odd Parity	0-9					●	●	●	●	●	●	●	
-26	10	BCD + Odd Parity with decimal point on case	0-9					●	●	●	●	●	●	●	
-12	10	BCD Complement Only	0-9					●	●	●	●	●	●	●	●
-45	10	BCD Make Before Break	0-9					●	●	●	●	●	●	●	
-46	10	BCD Make Before Break with Diode Provisions	0-9					●	●	●	●	●			
-32	10	BCD with black case and white wheel	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-22	10	BCD with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-25	10	BCD with separate C to not true bits with decimal point on case	0-9	●		●							●	●	
-52	10	BCD with Diode Provisions	0-9	●		●		●	●	●	●	●	●	●	
-15	10	BCD with separate C to not true bits	0-9	●		●							●	●	
-73	10	Berkley Code	0-9										●	●	
-74	10	Berkley Code with Diode Provisions	0-9										●	●	
-90	10	Complement of 7 segment indicator	0-9					●	●	●	●	●			
-75	10	Complement of 9's Complement	0-9												
-72	10	Complement of 9's Complement with Diode Provisions	0-9										●	●	
-01	10	Decimal	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-11	10	Decimal—Double Pole	0-9	●	●	●	●	●	●	●	●	●	●	●	
-69	10	Decimal Make Before Break	0-9					●	●	●	●	●	●	●	
-31	10	Decimal with black case and white wheel	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-21	10	Decimal with decimal point on case	0-9	●	●	●	●	●	●	●	●	●	●	●	●
-78	10	Decimal with Common in Middle	0-9	●		●							●	●	
-79	10	Decimal with Common in Middle with Diode Provisions	0-9												
-51	10	Decimal with Diode Provisions	0-9					●	●	●	●	●			
-49	10	Excess 3 Grey Code Negative	0-9					●	●	●	●	●			
-50	10	Excess 3 Grey Code Positive	0-9					●	●	●	●	●			
-84	10	Repeating—Double Pole	–,+										●	●	
-85	10	Repeating—Double Pole	0-1										●	●	
-86	10	Repeating—Double Pole	0-5										●	●	
-92	10	Repeating—Double Pole	0-1					●	●	●	●	●			
-93	10	Repeating—Double Pole	0-5					●	●	●	●	●			
-97	10	Repeating—Double Pole	+,–					●	●	●	●	●			
-80	10	Repeating—Single Pole	+,–	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-94	10	Repeating—Single Pole	–,+	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-95	10	Repeating—Single Pole	0-1	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-96	10	Repeating—Single Pole	0-5	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●	●
-81	10	Repeating—Single Pole with extended PCB	+,–	●‡		●‡		●	●	●	●	●			
-82	10	Repeating—Single Pole with extended PCB	0-1	●‡		●‡		●	●	●	●	●			
-83	10	Repeating—Single Pole with extended PCB	0-5	●‡		●‡		●	●	●	●	●			
-68	10	2 out of 5 Code	0-9					●	●	●	●	●	●	●	
-62	10	9's Complement of BCD	0-9										●	●	
-91	10	9's Complement of BCD with Diode Provisions	0-9										●	●	
-14	10	9's Complement of BCD + Complement	0-9												
-20	12	1 of 12 Code	0-11					●	●		●	●		●	
-61	12	1 of 12 Code	0-9 A-B					●	●		●	●		●	
-99	12	1 of 12 Code Make Before Break	0-11											●	
-60	12	4 Bit Binary	0-11	●‡		●‡		●	●		●	●	●‡	●	
-76	12	4 Bit Binary + Odd Parity	0-11											●	
-64	16	Grey Code	0-15					●	●		●	●			
-03	16	Hexidecimal (HEX)	0-15	●		●		●	●		●	●	●	●	
-13	16	Hexidecimal (HEX)	0-9 A-F	●		●		●	●		●	●	●	●	
-08	16	HEX + Complement, 1 Common	0-15	●		●		●	●		●	●	●	●	
-88	16	HEX + Complement, 1 Common	0-9 A-F	●		●		●	●		●	●	●	●	
-28	16	HEX + Complement, 1 Common with decimal point on case	0-15	●		●		●	●		●	●	●	●	
-29	16	HEX + Complement, 2 Commons with decimal point on case	0-15	●		●							●	●	
-09	16	HEX + Complement with separate Commons	0-15	●		●							●	●	
-89	16	HEX + Complement with separate Commons	0-9 A-F	●		●							●	●	
-23	16	HEX with decimal point on case	0-15	●		●		●	●		●	●	●	●	
-53	16	HEX with Diode Provisions	0-15	●		●		●	●		●	●	●	●	
-63	16	HEX with Diode Provisions	0-9 A-F	●		●		●	●		●	●	●	●	
-16	16	HEX with separate C to not true bits	0-15										●	●	
-18	16	HEX with separate C to not true bits	0-9 A-F										●	●	
-98	16	1 of 16 Code Make Before Break	0-15										●	●	

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

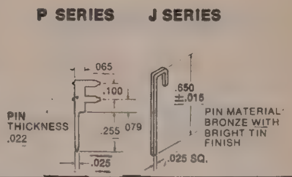
CHERRY Thumbwheel, Leverwheel, Pushwheel

COMPLETE PRODUCT LISTING

The example at left calls out a **T-35 Series** backmount Thumbwheel, with **J-pin terminations**, **10 position decimal** code, **black gloss finish**, in a **three switch assembly.**

AVAILABLE PC BOARD TERMINATIONS

All PC boards have a .040″ diameter hole to accommodate a wire for each output. Pin terminations for mother-board insertion or for wire-wrap capabilities can be applied upon request. Two types of pin terminations are available:



SUFFIX NO.	POS.	DESCRIPTION	READ OUT SYMBOL	MINIATURE				SUBMINIATURE						SUB-SUBMINIATURE	SUFFIX NO.
				T35	T38	T62	T63	T50	T51	T52	T54	T56	T57	T55	
-07	8	Binary Coded Octal (BCO)	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-07
-77	8	BCO Complement Only	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-77
-27	8	BCO with decimal point on case	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-27
-47	8	BCO with separate C to not true bits	0-7												-47
-57	8	BCO with Diode Provisions	0-7			●‡	●‡	●‡			●‡	●‡		●‡	-57
-17	8	1 of 8 Code	0-7	●‡	●‡	●‡	●‡	●‡			●‡	●‡		●‡	-17
-71	10	Aiken Code Modern 1-2-4-2′	0-9			●	●								-71
-70	10	Aiken Code 1-2-4-2′	0-9			●	●								-70
-02	10	Binary Coded Decimal (BCD)	0-9	●	●	●	●	●	●	●	●	●	●	●	-02
-04	10	BCD + Complement, 1 Common	0-9	●	●	●	●	●			●	●	●	●	-04
-24	10	BCD + Complement, 1 Common with decimal point on case	0-9	●	●	●	●	●			●	●	●	●	-24
-54	10	BCD + Complement, 1 Common with Diode Provisions	0-9												-54
-05	10	BCD + Complement with separate Commons	0-9												-05
-10	10	BCD + Even Parity	0-9			●	●								-10
-30	10	BCD + Even Parity with decimal point on case	0-9			●	●								-30
-06	10	BCD + Odd Parity	0-9			●	●								-06
-26	10	BCD + Odd Parity with decimal point on case	0-9			●	●								-26
-12	10	BCD Complement Only	0-9	●	●	●	●	●			●	●		●	-12
-45	10	BCD Make Before Break	0-9			●	●								-45
-46	10	BCD Make Before Break with Diode Provisions	0-9			●	●								-46
-32	10	BCD with black case and white wheel	0-9	●	●	●	●	●			●	●	●	●	-32
-22	10	BCD with decimal point on case	0-9	●	●	●	●	●			●	●	●	●	-22
-25	10	BCD with separate C to not true bits with decimal point on case	0-9												-25
-52	10	BCD with Diode Provisions	0-9			●	●	●			●	●		●	-52
-15	10	BCD with separate C to not true bits	0-9												-15
-73	10	Berkley Code	0-9												-73
-74	10	Berkley Code with Diode Provisions	0-9												-74
-90	10	Complement of 7 segment indicator	0-9			●	●								-90
-75	10	Complement of 9's Complement	0-9												-75
-72	10	Complement of 9's Complement with Diode Provisions	0-9												-72
-01	10	Decimal	0-9	●	●	●	●	●			●	●		●	-01
-11	10	Decimal—Double Pole	0-9			●	●								-11
-69	10	Decimal Make Before Break	0-9			●	●								-69
-31	10	Decimal with black case and white wheel	0-9	●	●	●	●	●			●	●		●	-31
-21	10	Decimal with decimal point on case	0-9	●	●	●	●	●			●	●		●	-21
-78	10	Decimal with Common in Middle	0-9												-78
-79	10	Decimal with Common in Middle with Diode Provisions	0-9												-79
-51	10	Decimal with Diode Provisions	0-9			●	●					●		●	-51
-49	10	Excess 3 Grey Code Negative	0-9			●	●								-49
-50	10	Excess 3 Grey Code Positive	0-9			●	●								-50
-84	10	Repeating—Double Pole	−,+												-84
-85	10	Repeating—Double Pole	0-1												-85
-86	10	Repeating—Double Pole	0-5												-86
-92	10	Repeating—Double Pole	0-1			●	●								-92
-93	10	Repeating—Double Pole	0-5			●	●								-98
-97	10	Repeating—Double Pole	+,−			●	●								-97
-80	10	Repeating—Single Pole	+,−	●	●	●	●	●			●	●		●	-80
-94	10	Repeating—Single Pole	−,+	●	●	●	●	●			●	●		●	-94
-95	10	Repeating—Single Pole	0-1	●	●	●	●	●			●	●		●	-95
-96	10	Repeating—Single Pole	0-5	●	●	●	●	●			●	●		●	-96
-81	10	Repeating—Single Pole with extended PCB	+,−			●	●					●			-81
-82	10	Repeating—Single Pole with extended PCB	0-1			●	●					●			-82
-83	10	Repeating—Single Pole with extended PCB	0-5			●	●					●			-83
-68	10	2 out of 5 Code	0-9			●	●								-68
-62	10	9's Complement of BCD	0-9												-62
-91	10	9's Complement of BCD with Diode Provisions	0-9												-91
-14	10	9's Complement of BCD + Complement	0-9												-14
-20	12	1 of 12 Code	0-11			●	●								-20
-61	12	1 of 12 Code	0-9 A-B			●	●								-61
-99	12	1 of 12 Code Make Before Break	0-11												-99
-60	12	4 Bit Binary	0-11			●	●					●‡			-60
-76	12	4 Bit Binary + Odd Parity	0-11												-76
-64	16	Grey Code	0-15			●	●								-64
-03	16	Hexidecimal (HEX)	0-15			●	●	●			●	●			-03
-13	16	Hexidecimal (HEX)	0-9 A-F			●	●	●			●	●			-13
-08	16	HEX + Complement, 1 Common	0-15			●	●								-08
-88	16	HEX + Complement, 1 Common	0-9 A-F			●	●								-88
-28	16	HEX + Complement, 1 Common with decimal point on case	0-15			●	●								-28
-29	16	HEX + Complement, 2 Commons with decimal point on case	0-15												-29
-09	16	HEX + Complement with separate Commons	0-15												-09
-89	16	HEX + Complement with separate Commons	0-9 A-F												-89
-23	16	HEX with decimal point on case	0-15			●	●	●			●	●			-23
-53	16	HEX with Diode Provisions	0-15			●	●					●			-53
-63	16	HEX with Diode Provisions	0-9 A-F			●	●					●			-63
-16	16	HEX with separate C to not true bits	0-15												-16
-18	16	HEX with separate C to not true bits	0-9 A-F												-18
-98	16	1 of 16 Code Make Before Break	0-15												-98

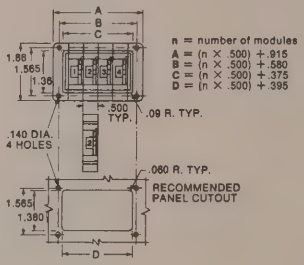
CHERRY ELECTRICAL PRODUCTS CORP.. 3600 Sunset Ave.. Waukegan. IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

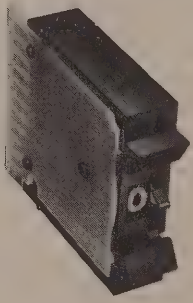
MECHANICAL CHARACTERISTICS		INDUSTRIAL				STANDARD					MINIATURE		
		T10	L10	T11	L11	T64	T65	T71	T72	T75	T20	L20	T24
ACTION	Thumbwheel	●		●		●	●	●	●	●	●		●
	Leverwheel		●		●							●	
	Pushwheel												
NUMBER OF POSITIONS	8	●‡	●‡	●‡	●‡	●	●	●	●	●	●	●‡	●‡
	10	●	●	●	●	●	●	●	●	●	●	●	●
	12	●‡		●‡		●	●		●	●	●‡	●	
	16	●		●		●	●		●	●	●	●	
	Stops Available	●	●	●	●	●	●	●	●	●	●	●	●
APPROXIMATE HEIGHT	1.88	●	●	●	●								
	1.20					●	●	●	●	●			
	1.15										●	●	●
	945												
	.590												
MOUNTING TYPE	Front/Screw			●	●								
	Front/Snap In						●		●	●			
	Front/Integral Bezel							●					
	Front/Attached to Cust PCB					●							
	Rear/Screw	●	●								●	●	●
	Rear/Attached to Cust PCB												
FINISH	(A) Gloss	●	●	●	●	●	●	●	●	●	●	●	●
	(M) Matte	●	●	●	●	●	●	●	●	●	●	●	●
TERMINATION	F Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	●
	J Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	●
MISCELLANEOUS	Dustproof												●
	Lighted									●	●		
	Wide Window	●							●		●		

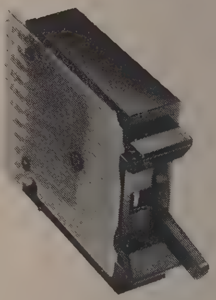
*Not Available In All Codes. Consult Factory ‡With Stops

SERIES T10 & L10 — BACK MOUNT

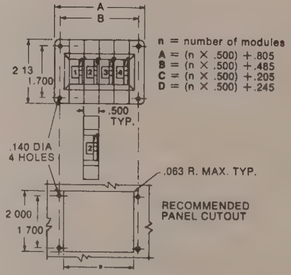

A
B
C
1.88
1.565
1.36
.500 TYP.
.09 R. TYP.
.140 DIA. 4 HOLES
.060 R. TYP.
RECOMMENDED PANEL CUTOUT
1.565
1.380
D
n = number of modules
A = (n × .500) +.915
B = (n × .500) +.580
C = (n × .500) +.375
D = (n × .500) +.395

T10 Thumbwheel available in 8, 10, 12 and 16 positions. L10 Leverwheel available in 8 and 10 positions. Both offered in a wide variety of output codes. T10 Thumbwheel can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.

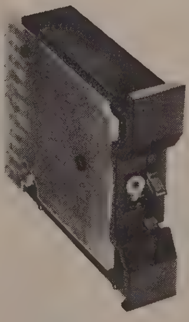

T10 THUMBWHEEL


L10 LEVERWHEEL

SERIES T11 & L11 — FRONT MOUNT


A
B
2 13
1.700
.500 TYP.
.140 DIA 4 HOLES
.063 R. MAX. TYP.
RECOMMENDED PANEL CUTOUT
2 000
1 700
n = number of modules
A = (n × .500) +.805
B = (n × .500) +.485
C = (n × .500) +.205
D = (n × .500) +.245

T11 Thumbwheel available in 8, 10, 12 and 16 positions. L11 Leverwheel available in 8 and 10 positions. Both offered in a wide variety of output codes. T11 Thumbwheel can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory to control dial rotation.


T11 THUMBWHEEL

L11 LEVERWHEEL

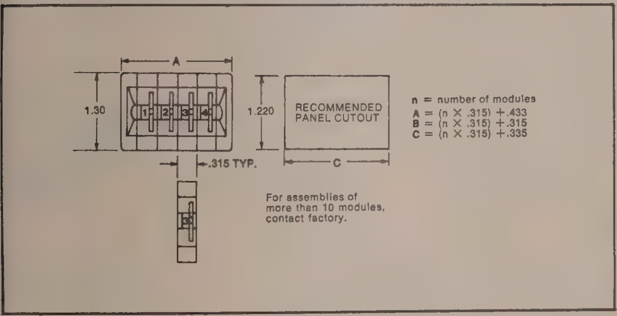
CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Thumbwheel, Leverwheel, Pushwheel

MECHANICAL CHARACTERISTICS		MINIATURE				SUBMINIATURE						SUB-SUBMINIATURE	
		T35	T38	T62	T63	T50	T51	T52	T54	T56	T57	T55	SUFFIX NO.
ACTION	Thumbwheel	●	●	●	●	●	●	●	●				
	Leverwheel												
	Pushwheel									●	●	●	
NUMBER OF POSITIONS	8	●‡	●‡	●	●	●‡			●‡	●‡		●‡	
	10	●	●	●	●	●	●	●	●	●	●	●	
	12			●	●					●			
	16			●	●	●			●	●			
	Stops Available	●	●	●	●	●			●	●		●	
APPROXIMATE HEIGHT	1.88												
	1.20												
	1.15	●	●	●	●								
	.945					●	●	●	●	●	●		
	.590											●	
MOUNTING TYPE	Front/Screw												
	Front/Snap In									●		●	
	Front Integral Bezel												
	Front/Attached to Cust. PCB												
	Rear/Screw	●	●		●	●	●	●			●		
	Rear/Attached to Cust. PCB			●					●				
FINISH	(A) Gloss	●	●										
	(M) Matte	●	●	●	●	●	●	●	●	●	●	●	
TERMINATION	F Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	
	J Pin Termination*	●	●	●	●	●	●	●	●	●	●	●	
MISCELLANEOUS	Dustproof		●										
	Lighted									●	●	●	
	Wide Window												

*Not Available In All Codes. Consult Factory ‡With Stops

SERIES T65—FRONT, SNAP-IN MOUNT

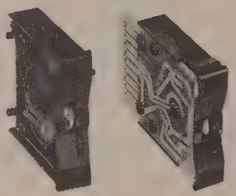

A
1.30
1
2
3
4
1.220
RECOMMENDED PANEL CUTOUT
.315 TYP.
C
n = number of modules
A = (n × .315) +.433
B = (n × .315) +.315
C = (n × .315) +.335
For assemblies of more than 10 modules, contact factory.

Available in 8, 10, 12 and 16 positions and a wide variety of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T64

Also available as Circuit Board Mount

Wheel and detent spring are mounted in case so as to elevate the contact wiper set. This permits direct mounting on PC board without modifying the board to recess into switch housing. Typically, the circuit board plugs into a chassis and the thumbwheel switch is mounted to permit presetting to circuit functions. Available in 8, 10, 12 and 16 positions. Dimensions are the same as Series T65.



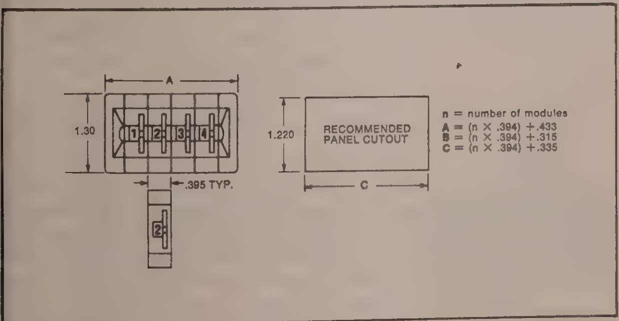
SWITCH CHARACTERISTICS:

Dielectric Strength .... 500 VAC

Temperature .... −40°C to +70°C

Note: Applies to all thumbwheel switches

SERIES T75—FRONT, SNAP-IN MOUNT


A
1.30
1
2
3
4
1.220
RECOMMENDED PANEL CUTOUT
.395 TYP.
C
n = number of modules
A = (n × .394) +.433
B = (n × .394) +.315
C = (n × .394) +.335

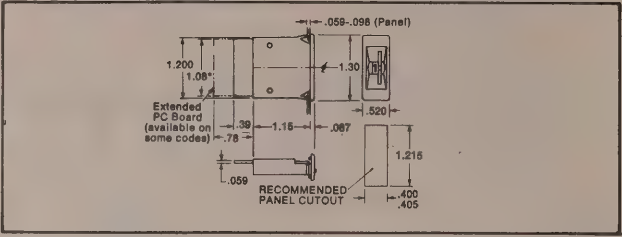
Available in 8, 10, 12 and 16 positions and a wide variety of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory in the field to control dial rotation.

Series T75 — Front Snap-In Mount is also available as Lighted Thumbwheel. Indicated by third digit of suffix. For example T75-01 "L".

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY® Thumbwheel, Leverwheel, Pushwheel

SERIES T71 — INTEGRAL BEZEL, FRONT, SNAP-IN MOUNT


.059-.098 (Panel)
1.200
1.08*
1.30
Extended PC Board (available on some codes)
.39
.78
1.16
.067
.520
1.215
.059
RECOMMENDED PANEL CUTOUT
.400
.405

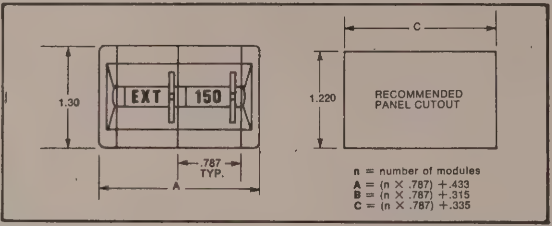
Standard code is 10 positions decimal. Also available on special order in T65 and T75 standard codes except for 12 and 16 position.

SWITCH CHARACTERISTICS:

Dielectric Strength	500 VAC
Temperature	−40°C to +70°C

Note: Applies to all thumbwheel switches

SERIES T72 — WIDE WINDOW FUNCTION SWITCH, FRONT, SNAP-IN MOUNT

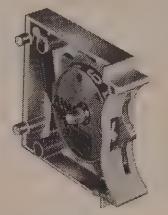

C
1.30
EXT
150
1.220
RECOMMENDED PANEL CUTOUT
.787 TYP.
A
n = number of modules
A = (n × .787) +.433
B = (n × .787) +.315
C = (n × .787) +.335

A unique variation of the Series T75, modified to provide a legend area more than three times wider than normal. Offered in a wide variety of standard legends at no extra charge. Non standard legends also available. May be used as a single unit or ganged together with any number of Series T65, T72 or T75 modules.

SERIES T63 — BACK MOUNT

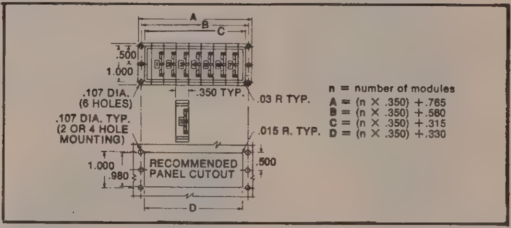
Available in 8, 10, 12 and 16 positions with a wide variety of output codes. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T62 — CIRCUIT BOARD MOUNT



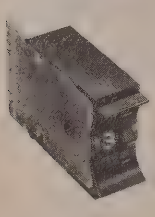
Wheel and detent spring are mounted in case so as to elevate the contact wiper set. This permits direct mounting on PC board without modifying the board to recess into switch housing. Typically, the circut board plugs into a chassis and the thumbwheel switch is mounted to permit presetting to circuit functions. Available in 8, 10, 12 and 16 positions. Dimensions are the same as Series T63.

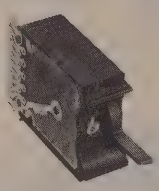
SERIES T35 & T38 — BACK MOUNT

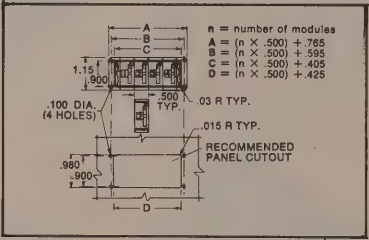

A
B
C
.500
1.000
.107 DIA. (6 HOLES)
.350 TYP.
.03 R TYP.
.107 DIA. TYP. (2 OR 4 HOLE MOUNTING)
.015 R. TYP.
1.000
.980
RECOMMENDED PANEL CUTOUT
.500
D
n = number of modules
A = (n × .350) +.765
B = (n × .350) +.560
C = (n × .350) +.315
D = (n × .350) +.330

Available in 8 and 10 positions in many output codes. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T20 & L20 — BACK MOUNT

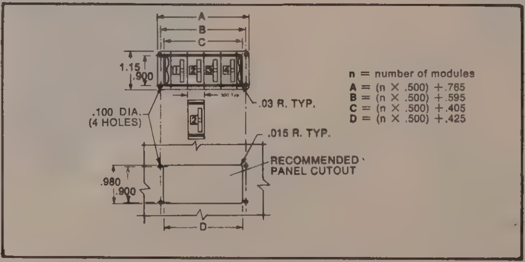





A
B
C
n = number of modules
A = (n × .500) +.765
B = (n × .500) +.595
C = (n × .500) +.405
D = (n × .500) +.425
1.15
.900
.100 DIA. (4 HOLES)
.500 TYP.
.03 R TYP.
.015 R TYP.
RECOMMENDED PANEL CUTOUT
.980
.900
D

T20 Thumbwheel and L20 Leverwheel available in 8, 10, 12 and 16 positions with widest range of output codes. Can be furnished with extended PC board to provide mounting of other components. Stops may be inserted at factory or in the field to control dial rotation.

SERIES T24 — BACK MOUNT DUSTPROOF


A
B
C
1.15
.900
.03 R. TYP.
.100 DIA. (4 HOLES)
.015 R. TYP.
RECOMMENDED PANEL CUTOUT
.980
.900
D
n = number of modules
A = (n × .500) +.765
B = (n × .500) +.595
C = (n × .500) +.405
D = (n × .500) +.425

A dustproof version of the Series T20 Thumbwheel shown on the preceding page. Clear plastic window covers dial character opening for resistance to dust and moisture. Available in 8 and 10 positions. Stops may be inserted at factory or in the field to control dial rotation.

CHERRY® Thumbwheel, Leverwheel, Pushwheel

THUMBWHEEL CONNECTORS

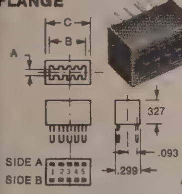
SPECIFICATIONS

Pin spacing on connectors is either .079″ or .100″, in a choice of 9 or 11 pin configuration. Available with or without mounting flanges. Flanges have elongated mounting holes (.122″ x .178″) to accept No. 4-40 or No. 4-48 machine screws.

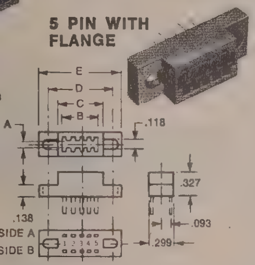
Body material: Molded Noryl

Pins: Gold flashed beryllium copper

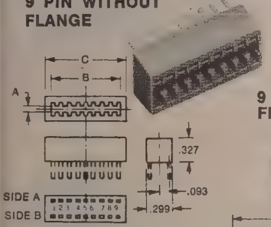
5 PIN WITHOUT FLANGE



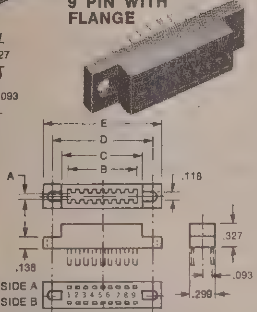
5 PIN WITH FLANGE



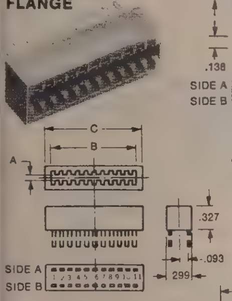
9 PIN WITHOUT FLANGE



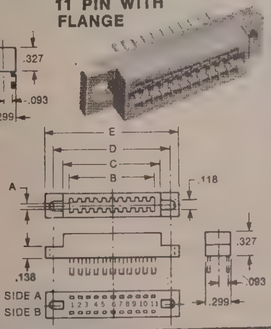
9 PIN WITH FLANGE



11 PIN WITHOUT FLANGE



11 PIN WITH FLANGE



	With and Without Flange					With Flange Only		With and Without Flange
COLOR	SWITCH SERIES	NO. OF PINS	A	B	C	D	E	PC BOARD THICKNESS
RED	T56 T56	9 11	.051 .051	.886 .886	.945 .945	1.181 1.181	1.417 1.417	.039 .039
BEIGE	T50 T50	9 11	.051 .051	.965 .965	1.024 1.024	1.260 1.260	1.496 1.496	.039 .039
GREEN	T20, 65, 75 L20	11	.071	1.146	1.205	1.441	1.677	.059
BLACK	T55	5	.051	.563	.630	.866	1.102	.039

SERIES T50 (Beige) 9 pins on .100″ centers, 11 pins on .079″ centers

TERMINATION				Number of Pins	For Use With Switch Numbers:
Solder Pins		Solder Lugs			
Without Flange	With Flange	Without Flange	With Flange		
C2BO—P101	C2BF—P103	C2BO—N101	C2BF—N103	Side A, 9 Pins	T50-02, 03, 04, 94, 95, 96
C2BO—P802	C2BF—P804	C2BO—N802	C2BF—N804	Side A, 11 Pins	T50-01
——	C2BF—P105	——	——	Side A, 9 Pins; Side B, 9 Pins.	
——	C2BF—P806	——	——	Side A, 11 Pins; Side B, 11 Pins.	

NOTE: No connector is available to fit the T51-02.

SERIES T55 (Black) All pins on .100″ centers, 5 pins per row

TERMINATION				Number of Pins	For Use With Switch Numbers:
Solder Pins		Solder Lugs			
Without Flange	With Flange	Without Flange	With Flange		
C2KO—P107	C2KF—P109	C2KO—N107	C2KF—1N09	Side A, 5 Pins	See Note
C2KF—P108	C2KF—P110	——	——	Side A, 5 Pins; Side B, 5 Pins.	See Note

NOTE: T55 connectors fit all codes except decimal.

SERIES T56 (Red) 9 pins on .100″ centers, 11 pins on .079″ centers

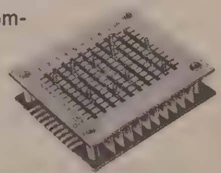
TERMINATION				Number of Pins	For Use With Switch Numbers:
Solder Pins		Solder Lugs			
Without Flange	With Flange	Without Flange	With Flange		
C2RO—P111	C2RF—P116	——	C2RF—N116	Side A, Pins 1, 3, 5, 7, 9.	T56-02, 03
C2RO—P112	C2RF—P117	——	——	Side A, Pins 1, 3, 4, 5, 6, 7, 9.	T56 02L, 03L, 12
C2RO—P113	C2RF—P118	C2RO—N113	C2RF—N118	Side A, 9 Pins	T56-02, 02L, 03, 03L, 04, 12
C2RO—P814	C2RF—P819	C2RO—N814	C2RF—N819	Side A, 11 Pins	T56-01
C2RO—P815	C2RF—P820	——	——	Side A, 11 Pins; Side B, Pins 5, 7.	T56-01L
——	C2RF—P121	——	——	Side A, 9 Pins; Side B, 9 Pins.	T56-02
——	C2RF—P822	——	——	Side A, 11 Pins; Side B, 11 Pins.	T56-01

SERIES T20, L20, T65, T75 (Green) All pins on .100″ centers, 11 pins per row maximum

TERMINATION				Number of Pins	For Use With Switch Numbers:
Solder Pins		Solder Lugs			
Without Flange	With Flange	Without Flange	With Flange		
C2GO—P123	C2GF—P126	——	——	Side A, Pins 4, 5, 6, 7, 8.	T20C-02 L20C-02 T65C-02 T75C-02
C2GO—P124	C2GF—P127	C2GO—N124	C2GF—N127	Side A, 11 Pins	T65C-01 T75C-01
C2GO—P125	C2GF—P128	——	——	Side A, 11 Pins; Side B, 11 Pins.	

MATRIX TYPE SELECTOR SWITCHES

Manual programming and switching for complex control equipment. Each of two standard types is expandable up to five modules, providing 500 to 1,000 crosspoints. Custom design available up to 2,784 crosspoints.



Electrical Capacity:

1. Make and break 48 volts DC at 0.50 Amp, 125 Volts AC at 0.15 Amp.
2. Current carrying only (no make and break) 2 Amp. AC or DC.

Insertion Resistances:

50 milliohms plus 6 milliohms per inch of printed circuit.

Note: Overall width of basic 10 x 10 and 20 x 10 Selector Switch is 3½ inches. For each 10 sliders added to the basic unit add 3 inches to overall width. A 20 slider unit measures 6½ inches wide; a 30 slider unit measures 9½ inches wide; a 40 slider unit measures 12½ inches wide and a 50 slider unit measures 15½ inches wide.

Part No.	Circuitry	Part No.	Circuitry
C10-01A	20 x 10	C10-20A	10 x 10
C10-02A	20 x 20	C10-42A	10 x 20
C10-03A	20 x 30	C10-43A	10 x 30
C10-04A	20 x 40	C10-44A	10 x 40
C10-05A	20 x 50	C10-45A	10 x 50

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Maximum Security Switch Locks for every application!

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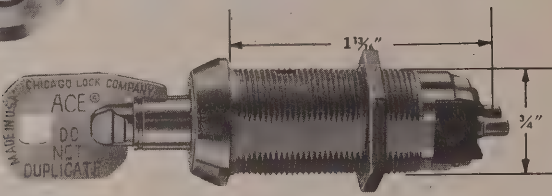
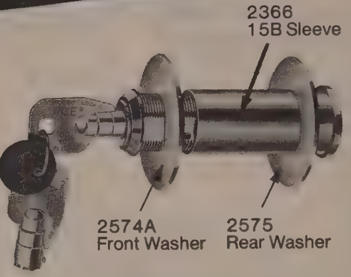
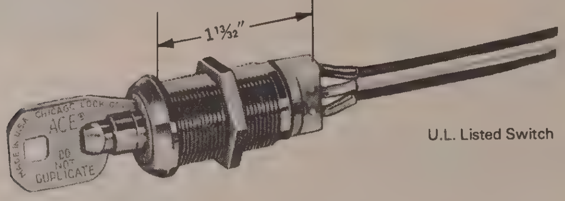
Switch Locks



No. 4073—Maintaining contact switch. Key removable "off," "on" or "off-on". Also available as 4073-70 with momentary contact switch. All brass construction. Also offered with die cast outer barrel. No. 2274-80 same as 4073 except with double bitted lock.



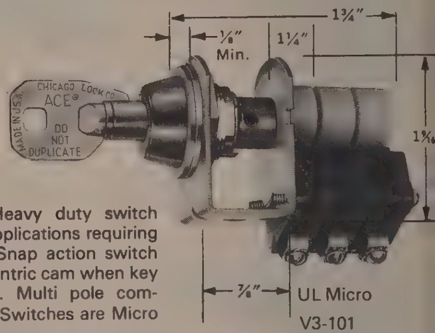
No. 3039 - SPST switc with adjustable sleev and washers; dependable wiping contacts Solder terminals. Loc all brass constructio polished chrome finis Key removable "off,' "on" or "off-on." Als available in die cas outer barrel.



U.L. Listed Switch

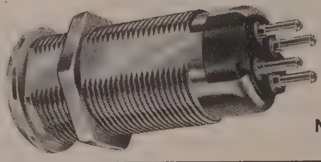
No. 4235 — Easy to mount, UL Listed switch SPDT, available with silver plated contacts and 10" wire leads. Offered without 10" leads at reduced cost. Furnished with micro-switch 1SX1-H58.

U.L. Listed Switch



No. EXA-112-3—Heavy duty switch lock designed for applications requiring UL Listed switch. Snap action switch actuated by an eccentric cam when key turned 90 degrees. Multi pole combinations available. Switches are Micro No. V3-101.

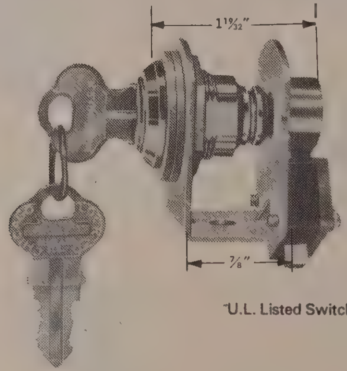
SPECIAL APPLICATION — TWO SEPARATE SPST CIRCUITS



No. 4074

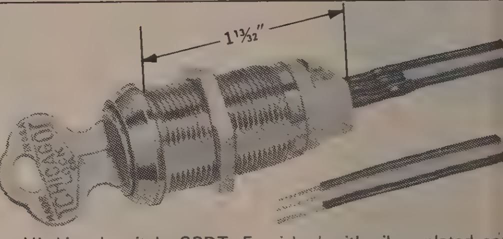
7 Pin Tumbler
ACE Ⅱ™ Mechanism.
Same as 4073 lock
except with two circuits.

Chicago double bitted switch locks



No. EXD-98
Same as EXA-112, except with double bitted cylinder. Designed for high current applications. Multiple pole combinations available. Furnished with micro-switch V3-101.

U.L. Listed Switch



No. 3535 — UL Listed switch, SPDT. Furnished with silver plated co tacts and 10" wire leads. Same as 4235 except has double bitte cylinder. Available without 10" leads at reduced cost. Furnished wi micro-switch 1SX1-H58.

Current Ratings	**Lock Numbers**
*125-250VAC, 5 AMP; 30 VDC, 3 AMP *125-250VAC, 7 AMP; 28 VDC, 7 AMP 110-120VAC, 10 AMP; 10 VDC, 10 AMP	3535, 4235 2174, 2174-70, 3039, 4073, 4073-70
125 VDC, ½ AMP	EXD-98, EXA-112†
125-250 VAC, 10 AMP	EXD-98-25
125-250 VAC — Over 10 AMP	EXD-112-25

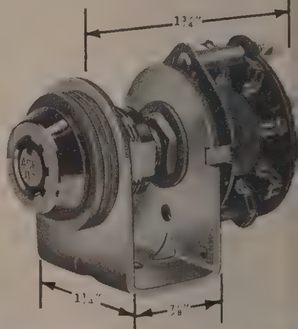
†When ordering, specify if for appliances requiring T.V. approved switches. Only available on EXD-98 or EXA-112 series.

CURRENT RATINGS for 4188 and 2242	Voltage	AC amps Resistive	DC amps Resistive
	6V	5.5	5.5
	12V	3.5	3.5
	24V	1.75	1.55
	48V	.8	.65
	115V	.23	.21

***Silver plated contacts.** **Also suited for low energy circuits.**

Switch locks with wafer type switches

No. 4188 — Key operated with bracket mounting and Ace cylinder. Switch designed for low voltage applications. Multiple poles and various throw arrangements available with stacked wafers. Available with double bitted lock No. 2242.



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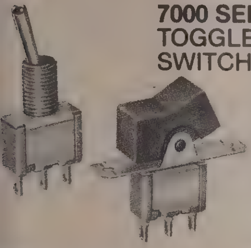
Miniature Switches



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Reliable Proven Design

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Wave Solderable

W SERIES
.025 WIRE-WRAP TOGGLE SWITCHES

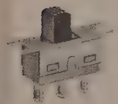
Terminal Spacing for WIRE-WRAP Boards

8020 SERIES
SNAP-ACTING MOMENTARY PUSHBUTTON SWITCHES

Light Crisp Feel

8060 SERIES
ALTERNATE ACTION & MOMENTARY PUSHBUTTON SWITCHES

Higher Current



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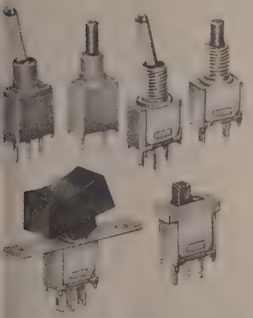
MINIATURE SLIDE SWITCHES

SP & DP With Proven Design



ET/EP/T/TP/TS SERIES
TINY SWITCHES

- ET Series Sealed Tiny Toggle Switches
- EP Series Sealed Tiny Pushbutton Switches
- T Series Tiny Toggle Switches
- TP Series Tiny Pushbutton Switches
- T Series Tiny Rocker Switches
- TS Series Tiny Slide Switches

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POWER TOGGLE, ROCKER & LEVER HANDLE SWITCHES

UL, CSA & VDE Listed

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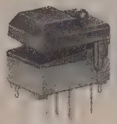
ILLUMINATED ROCKER SWITCHES

Indicator Light Available

8500 SERIES
SUBMINIATURE PUSHBUTTON SWITCHES

8600 SERIES
MICROMINIATURE PUSHBUTTON SWITCHES



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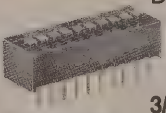
MECHANICAL PUSHBUTTON SWITCHES

Clean Modern Appearance

SS SERIES
SOLID STATE PUSHBUTTON SWITCHES

Bounce Free



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DIP SWITCHES

Wave Solderable

3/3M SERIES
THUMBWHEEL SWITCHES

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- A Series Switchlocks
- A Series Rotary Switches
- H Series Power ROTA-SLIDE® Rotary Switches
- R Series ROTA-SLIDE Switches
- F Series Miniature ROTA-SLIDE Rotary Switches
- V Series Power & Line Voltage Select Slide Switches
- S Series Slide Switches
- L Series Miniature Slide Switches
- C Series Power Rocker Switches
- J Series Rocker Switches
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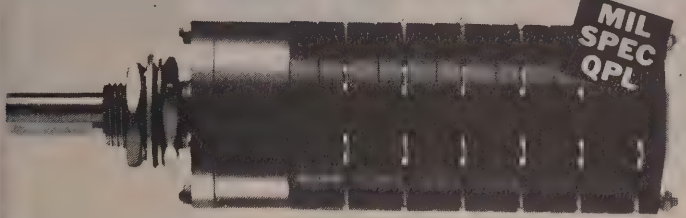
EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

COLE ROTARY SWITCHES



3600 SERIES Miniature Enclosed Rotary Switches

A new custom quality rotary switch. The 1-inch 3600 series enclosed miniature; meets MIL-S-3786. A 6 amp. switch for high-rel use in aircraft controls, electronic test equipment in harsh environments.

Quality? Roller bearing silver contacts. Custom quality? Up to 12 decks, 1 to 6 poles per deck; 30, 36, 45 deg. (8, 10 or 12 position). Options like hermetic enclosure; pre-wired to connector.

TECHNICAL DATA

Listed on QPL to MIL-S-3786, Style SR04.
Certified test reports available

Electrical

Contact Rating
Current carrying: 10 amps @ 28 VDC
Make & Break: 6 amp resistive @ 115 VAC
6 amp resistive @ 28 VDC
3 amp inductive @ 28 VDC
Dielectric Strength: 1500V RMS
Contact Resistance:
Initial .005 ohms max.
Insulation Resistance:
10^5 meg ohms min.

Mechanical

Rotational Torque: 5 in. lbs. max.
Weight: 1.7 ounces + .3 ounces/deck
Life: 100,000 cycles min. mechanical
25,000 cycle min. switching 5 amps @ 120 VAC

ORDERING INFORMATION SAMPLE CODE

36 45-204-3S

- S — Shorting Decks (Omit for Non-shorting)
- 3 — Number of Decks
- 04 — Number of Positions
- 2 — Number of Poles
- 45 — Degrees Between Positions
- 36 — Cole Basic Switch and Drawing No.

1836-110
COLE
1
10
9

1800 SERIES Half-Inch Enclosed Rotary Switches

The ultimate in a one half-inch rotary selector switch, the Cole Series 1800 is engineered to meet or exceed applicable MIL-S-3786, Style SR20 requirements.

The Series 1800 enclosed switch was designed for critical ordnance applications, and demanding usage in aircraft, medical and industrial controls and instrumentation, as well as electronic equipment.

This switch is available with 1 pole, 2 to 10 positions, and 2 pole, 2 to 5 positions.

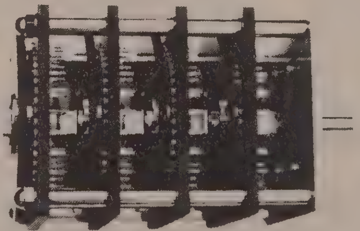
Quality construction, including materials that meet the strictest standards, allows these subminiature switches to combine high current switching capacity with constant low contact resistance. Long life and high reliability are assured by exceedingly stringent inspection and testing procedures.

Available in standard solder lug or printed circuit terminations, the Cole Series 1800 can be furnished with an internal seal. This unique Cole design option renders the switch impervious to water, contaminants and most solvents.

1800 - HEX
COLE
3 2 1 16 15

YOUR SOURCE FOR SPECIAL PURPOSE ROTARY SWITCHES

Coded Switches, for direct logic level interfacing
HALF-INCH rotaries, Hexadecimal and BCD code standard, custom codes to your requirements. These are also HI-REL switches, MIL-S-3786 performance.



Instrument Grade, Open Frame Rotary Switches

For heavier current requirements (15 amp continuous; 3 to 5 amp switching.) One MILLION cycles or better life expectancy.

COLE
INSTRUMENT CORP.

2650 S. Croddy Way Santa Ana, CA 92704
(714) 556-3100

See our rep and distributor listings.

COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

ARROW HART WASHABLE MINIATURE SWITCHES

Electrical Specifications

Class	Minimum	Maximum	Contact Option	With Approval Code 1
Low-level	10mA, 50mVAC or DC 10μA, 5VAC or DC	.4VA, 20VAC or DC	"B" Gold	Not applicable
Power	100mA, 10VAC or DC	5A, 125VAC 2A, 250VAC	"Q" Silver	UL, CSA pending
Low-level or Power (See Note below)	10mA, 50mVAC or DC 10μA, 5VAC or DC OR 100mA, 10VAC or DC	.4VA, 20VAC or DC OR 5A, 125VAC 2A, 250VAC	"G" Gold over silver	UL, CSA pending

All loads resistive	
Life:	Circuit 01: 100,000 switch operations. All other circuits: 50,000 switch operations
Initial Contact Resistance:	10 milliohms maximum @ 50 millivolts, 10 milliamps
Dielectric Strength:	1000 VRMS minimum
Insulation Strength:	1000 megohms minimum

NOTE: The advantage of gold plate on silver is that the switch can be used in low-level circuits with loads of 0.4 VA and below as well as in circuits with a maximum load of 5 amps at 125VAC. If the low-level rating is exceeded, the gold plating is removed from the contact, rendering the switch unusable at low-levels.

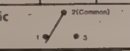
Mechanical Specifications

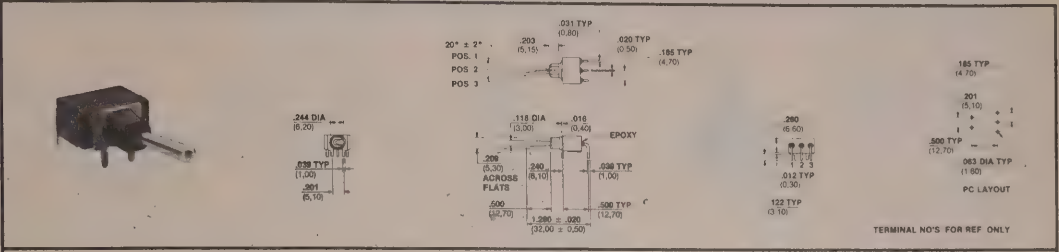
Temperature Range:	
Operating:	−20°C to +85°C (−4°F to +185°F)
Storage:	−40°C to +85°C (−40°F to +185°F)
Materials:	
Contacts:	Brass with gold (B) or silver (Q) or both (G)
Terminals:	Brass with gold (B) and (G) or silver (Q) (tin-plate available on special basis)
Housing:	Thermoplastic, high temperature UL 94VO
Bracket/Support:	Tin-plated steel
Toggle:	Chrome-plated brass
Rocker:	Nylon 6/6
Approximate Net Weight:	SP: 2.50 grams (.09 oz) DP: 3.70 grams (.13 oz)

ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

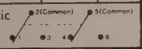
L Series Washable Toggles

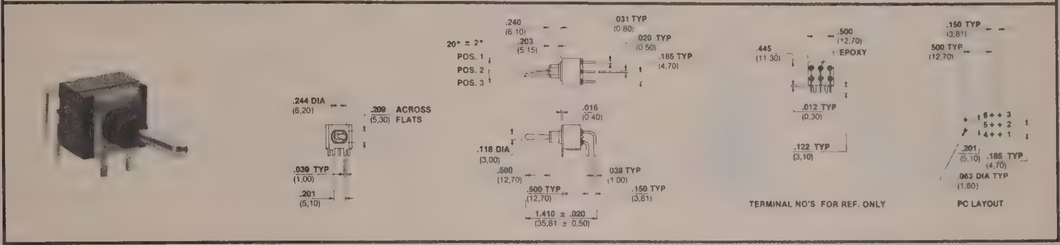
A TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010 L1030 L1050 L1070 L1080	ON ON (ON) ON ON	NONE OFF OFF OFF NONE	ON ON (ON) (ON) (ON)
Term. Conn.	2-3	OPEN	2-1
Schematic 			



.031 TYP (0,80)
20° ± 2°
.203 (5,15)
.020 TYP (0,50)
.185 TYP (4,70)
POS. 1
POS 2
POS 3
.244 DIA (6,20)
.039 TYP (1,00)
.201 (5,10)
.118 DIA (3,00)
.016 (0,40)
EPOXY
.209 (5,30) ACROSS FLATS
.240 (6,10)
.039 TYP (1,00)
.500 (12,70)
.500 TYP (12,70)
1.260 ± .020 (32,00 ± 0,50)
.260 (6,60)
1 2 3
.012 TYP (0,30)
122 TYP (3,10)
185 TYP (4,70)
201 (5,10)
.500 TYP (12,70)
063 DIA TYP (1,60)
PC LAYOUT
TERMINAL NO'S FOR REF ONLY

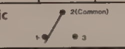
MODEL NO.	Pos 3	Pos 2	Pos 1
L2010 L2030 L2050 L2070 L2080 L2110	ON ON (ON) ON ON ON	NONE OFF OFF OFF NONE ON	ON ON (ON) (ON) (ON) ON
Term. Conn	2-3, 5-6	OPEN	2-1, 5-4
Schematic  2(Common) 5(Common) 1 3 4 6			

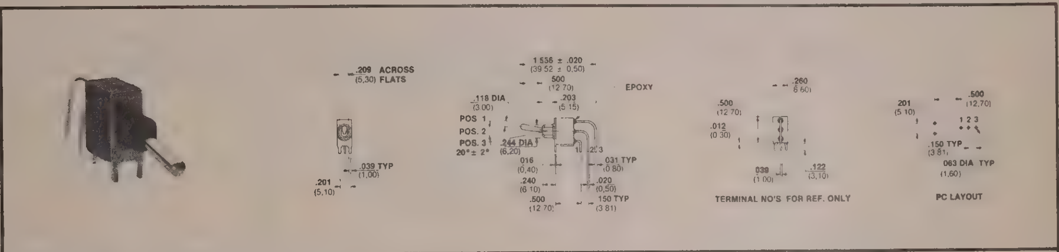


.240 (6,10)
031 TYP (0,80)
20° ± 2°
.203 (5,15)
020 TYP (0,50)
.185 TYP (4,70)
POS. 1
POS. 2
POS. 3
.244 DIA (6,20)
.209 (5,30) ACROSS FLATS
.039 TYP (1,00)
.201 (5,10)
.016 (0,40)
.118 DIA (3,00)
.500 (12,70)
039 TYP (1,00)
.500 TYP (12,70)
.150 TYP (3,81)
1.410 ± .020 (35,81 ± 0,50)
.445 (11,30)
.500 (12,70)
EPOXY
.012 TYP (0,30)
.122 TYP (3,10)
TERMINAL NO'S FOR REF. ONLY
.150 TYP (3,81)
500 TYP (12,70)
6 3
5 2
4 1
.201 (5,10)
.185 TYP (4,70)
.063 DIA TYP (1,60)
PC LAYOUT

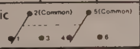
Circuit 11 Connections/Schematic on following page.

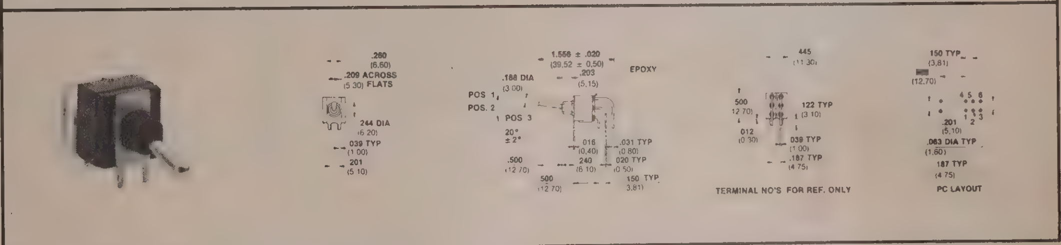
AV2 TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010 L1030 L1050 L1070 L1080	ON ON (ON) ON ON	NONE OFF OFF OFF NONE	ON ON (ON) (ON) (ON)
Term. Conn.	2-3	OPEN	2-1
Schematic 			



.209 ACROSS (5,30) FLATS
.039 TYP (1,00)
.201 (5,10)
1.556 ± .020 (39,52 ± 0,50)
500 (12,70)
EPOXY
.118 DIA (3,00)
.203 (5,15)
POS 1
POS. 2
POS. 3
20° ± 2°
.244 DIA (6,20)
1 2 3
016 (0,40)
.031 TYP (0,80)
.240 (6,10)
.020 (0,50)
.500 (12,70)
150 TYP (3,81)
.260 (6,60)
.500 (12,70)
.012 (0,30)
039 (1,00)
.122 (3,10)
TERMINAL NO'S FOR REF. ONLY
201 (5,10)
.500 (12,70)
1 2 3
.150 TYP (3,81)
063 DIA TYP (1,60)
PC LAYOUT

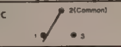
MODEL NO.	Pos 3	Pos 2	Pos 1
L2010 L2030 L2050 L2070 L2080 L2110	ON ON (ON) ON ON ON	NONE OFF OFF OFF NONE ON	ON ON (ON) (ON) (ON) ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic  2(Common) 5(Common) 1 3 4 6			

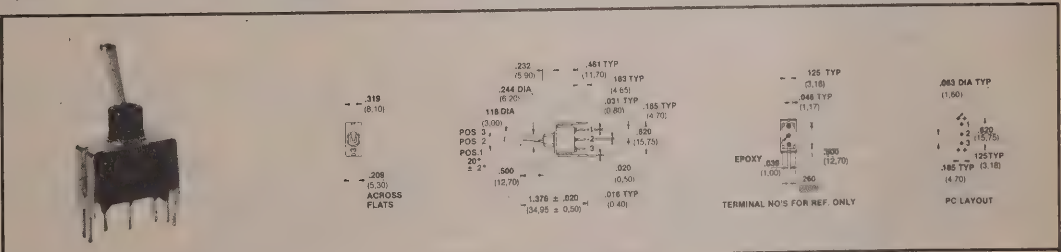


.260 (6,60)
.209 ACROSS (5,30) FLATS
244 DIA (6,20)
039 TYP (1,00)
201 (5,10)
1.556 ± .020 (39,52 ± 0,50)
EPOXY
.188 DIA (3,00)
.203 (5,15)
POS 1
POS. 2
POS 3
20° ± 2°
016 (0,40)
.031 TYP (0,80)
.500 (12,70)
240 (6,10)
020 TYP (0,50)
500 (12,70)
150 TYP 3,81)
445 (11,30)
500 12,70)
122 TYP (3,10)
012 (0,30)
039 TYP (1,00)
.187 TYP (4,75)
TERMINAL NO'S FOR REF. ONLY
150 TYP (3,81)
(12,70)
4 5 6
1 2 3
.201 (5,10)
.063 DIA TYP (1,60)
187 TYP (4,75)
PC LAYOUT

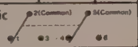
Circuit 11 Connections/Schematic on following page.

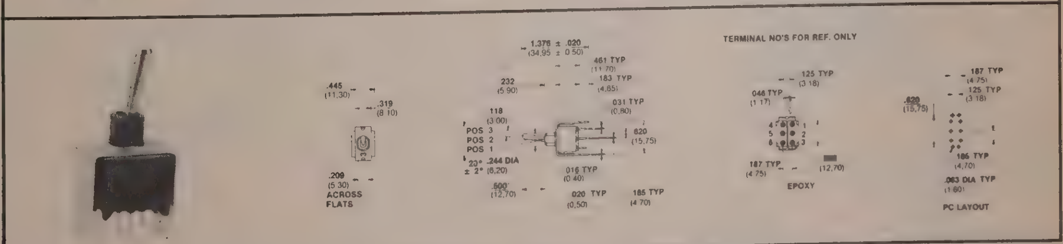
V30 TERMINATION OPTION

Switching Function			
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010 L1030 L1050 L1070 L1080	ON ON (ON) ON ON	NONE OFF OFF OFF NONE	ON ON (ON) (ON) (ON)
Term. Conn.	2-3	OPEN	2-1
Schematic 			



.319 (8,10)
.209 (5,30) ACROSS FLATS
.232 (5,90)
.461 TYP (11,70)
183 TYP (4,65)
.244 DIA (6,20)
.031 TYP (0,80)
.185 TYP (4,70)
118 DIA (3,00)
POS 3
POS 2
POS.1
20° ± 2°
1 2 3
.620 (15,75)
.500 (12,70)
.020 (0,50)
1.376 ± .020 (34,95 ± 0,50)
.016 TYP (0,40)
125 TYP (3,18)
.046 TYP (1,17)
EPOXY
.039 (1,00)
.500 (12,70)
260
TERMINAL NO'S FOR REF. ONLY
.063 DIA TYP (1,60)
.620 (15,75)
125TYP (3.18)
.185 TYP (4,70)
PC LAYOUT

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010 L2030 L2050 L2070 L2080 L2110	ON ON (ON) ON ON ON	NONE OFF OFF OFF NONE ON	ON ON (ON) (ON) (ON) ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic  2(Common) 5(Common) 1 3 4 6			



.445 (11,30)
.319 (8,10)
.209 (5,30) ACROSS FLATS
1.376 ± .020 (34,95 ± 0,50)
461 TYP (11,70)
232 (5,90)
183 TYP (4,65)
031 TYP (0,80)
118 (3,00)
POS 3
POS 2
POS 1
23° ± 2°
.244 DIA (6,20)
620 (15,75)
016 TYP (0,40)
.500 (12,70)
020 TYP (0,50)
185 TYP (4,70)
TERMINAL NO'S FOR REF. ONLY
125 TYP (3,18)
046 TYP (1,17)
4 5 6
1 2 3
187 TYP (4,75)
(12,70)
EPOXY
187 TYP (4,75)
125 TYP (3,18)
.620 (15,75)
186 TYP (4,70)
.063 DIA TYP (1,60)
PC LAYOUT

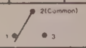
Circuit 11 Connections/Schematic on following page.

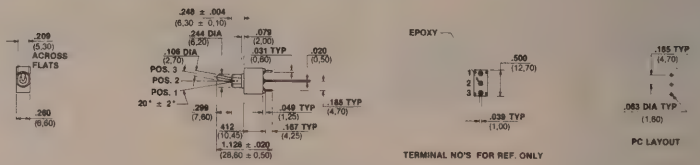
ARROW HART
COOPER INDUSTRIES
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

L Series Washable Toggles

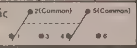
C TERMINATION OPTION **(Recommended ONLY for applications providing proper bushing support.)**

Switching Function

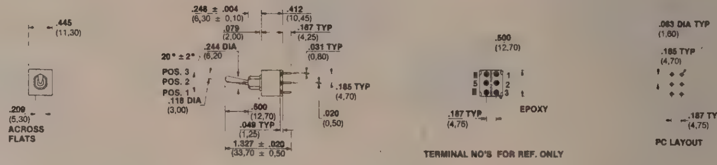
MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			



.209 (5,30) ACROSS FLATS
.260 (6,60)
.248 ± .004 (6,30 ± 0,10)
.244 DIA (6,20)
.106 DIA (2,70)
.079 (2,00)
.031 TYP (0,80)
.020 (0,50)
POS. 3
POS. 2
POS. 1
20° ± 2°
.299 (7,60)
.049 TYP (1,25)
.185 TYP (4,70)
412 (10,45)
.167 TYP (4,25)
1.128 ± .020 (28,60 ± 0,50)
EPOXY
.500 (12,70)
1
2
3
.039 TYP (1,00)
TERMINAL NO'S FOR REF. ONLY
.185 TYP (4,70)
.063 DIA TYP (1,60)
PC LAYOUT

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic			

2(Common)
5(Common)
1
3
4
6

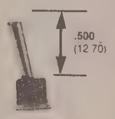


.445 (11,30)
.209 (5,30) ACROSS FLATS
.248 ± .004 (6,30 ± 0,10)
.412 (10,45)
.079 (2,00)
.167 TYP (4,25)
.244 DIA (6,20
20° ± 2°
.031 TYP (0,80)
POS. 3
POS. 2
POS. 1
.118 DIA (3,00)
.185 TYP (4,70)
.500 (12,70)
.049 TYP (1,25)
.020 (0,50)
1.327 ± .020 (33,70 ± 0,50)
.500 (12,70)
1
2
3
5
.187 TYP (4,75)
EPOXY
TERMINAL NO'S FOR REF. ONLY
.063 DIA TYP (1,60)
.185 TYP (4,70)
.187 TYP (4,75)
PC LAYOUT

Circuit 11 Connections / Schematic below.

Toggle Options

S

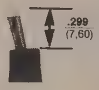


S1

Color chart below.

Plastic cap U270 may be ordered separately. Specify color per chart below. Example: U272 = Black

M



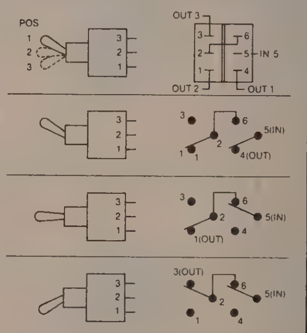
Contact/Rating Options

B Gold plate over brass.
.4VA max. @ 20VAC or DC.

Q Silver plate over brass.
5A, 125VAC
2A, 250VAC

G Gold plate over silver plate.
.4VA max. @ 20VAC or DC.
OR
5A, 125VAC
2A, 250VAC

Circuit 11 Connections/Schematic



POS
1
2
3
OUT 3
OUT 2
OUT 1
IN 5
6
4
5(IN)
4(OUT)
1(OUT)
3(OUT)

To specify switch, insert desired codes and suffixes. Write catalog number: L1010SCRV30BE* (example).
Packaging note: Add * to catalog number for 250/carton OEM packaging. Without *, packaging is 25/carton individually polybagged.

MODEL NO.

L	1	0	1	0	S		C	R	V	3	0	B	E

SERIES
L

POLES	
NO.	
SINGLE	1
DOUBLE	2

CIRCUIT				
3	2	1		
ON	—	ON	0	1
ON	OFF	ON	0	3
(ON)	OFF	(ON)	0	5
ON	OFF	(ON)	0	7
ON	—	(ON)	0	8
ON	ON	ON	1	1

APPROVALS	
TYPE	
NONE	0
(PENDING)	

ACTUATOR		
TYPE		
STD. 12.7 mm	S	
STD. w/cap	S	1
SHORT 7.6 mm	M	

BUSHING		
TYPE		
O-RING INT.	C	R

TERMINATION			
TYPE			
HORIZ. MT. 4.7 × 12.7 mm	A		
VERT. MT. 3.81 × 12.7 mm	A	V	2
SUP. BKT. 12.8 × 15.75 mm	V	3	0
STRAIGHT PC 4.7	C		
.200" spacing available. Consult factory.			

CONTACT	
TYPE	
GOLD	B
SILVER	Q
Gold/ Silver	G

SEAL	
TYPE	
EPOXY	E

COLOR (S1 Only)	
Blue	1
Black	2
Green	3
Grey	4
Yellow	5
Red	6
White	7
Orange	9

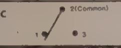
( ) indicates momentary

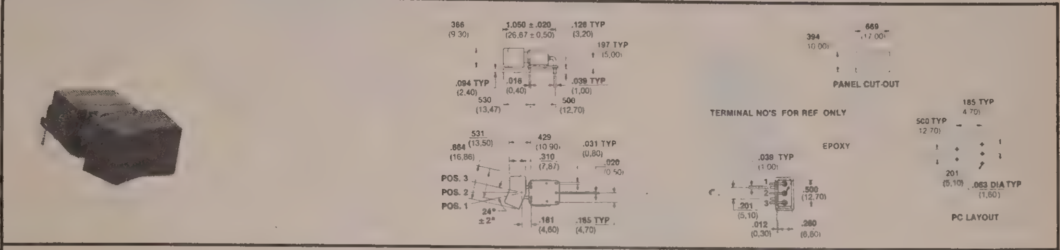
COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

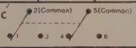
L Series Washable Rockers

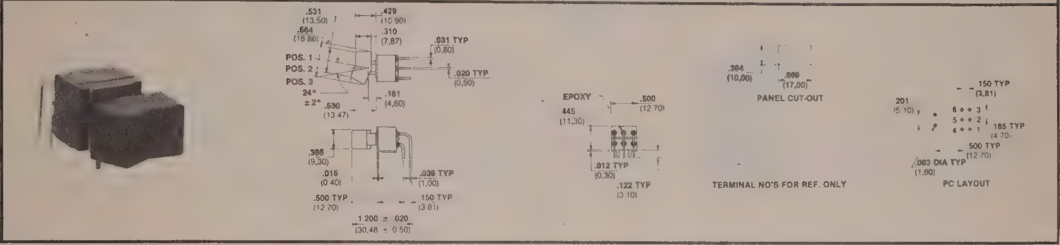
A TERMINATION OPTION

Switching Function

MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn	2-3	OPEN	2-1
Schematic			


.366 (9.30)
1.050 ± .020 (26.67 ± 0.50)
.126 TYP (3.20)
.197 TYP (5.00)
.094 TYP (2.40)
.016 (0.40)
.039 TYP (1.00)
.530 (13.47)
.500 (12.70)
.531 (13.50)
.664 (16.86)
.429 (10.90)
.310 (7.87)
.031 TYP (0.80)
.020 (0.50)
POS. 3
POS. 2
POS. 1
24° ±2°
.181 (4.60)
.185 TYP (4.70)
.394 (10.00)
.669 (17.00)
PANEL CUT-OUT
TERMINAL NO'S FOR REF ONLY
EPOXY
.039 TYP (1.00)
.201 (5.10)
.012 (0.30)
.500 (12.70)
.280 (6.80)
.185 TYP (4.70)
.500 TYP (12.70)
.201 (5.10)
.063 DIA TYP (1.60)
PC LAYOUT

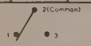
MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic	 2(Common) 5(Common) 1 3 4 6		

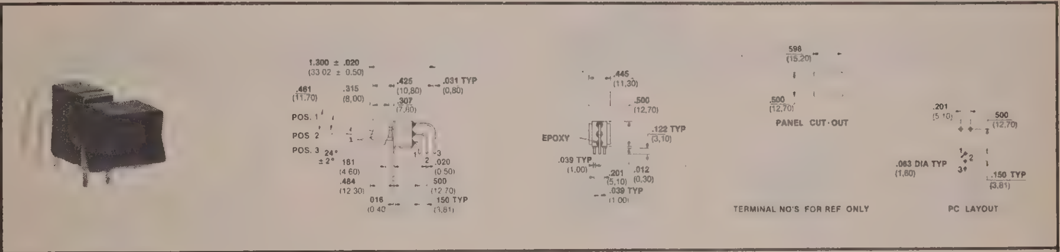

.531 (13.50)
.664 (16.86)
.429 (10.90)
.310 (7.87)
.031 TYP (0.80)
POS. 1
POS. 2
POS. 3
.020 TYP (0.50)
24° ±2°
.530 (13.47)
.181 (4.60)
.366 (9.30)
.016 (0.40)
.039 TYP (1.00)
.500 TYP (12.70)
.150 TYP (3.81)
1.200 ± .020 (30.48 ± 0.50)
.394 (10.00)
.669 (17.00)
PANEL CUT-OUT
EPOXY
.500 (12.70)
.445 (11.30)
.012 TYP (0.30)
.122 TYP (3.10)
TERMINAL NO'S FOR REF. ONLY
.150 TYP (3.81)
.201 (5.10)
.185 TYP (4.70)
.500 TYP (12.70)
.063 DIA TYP (1.60)
PC LAYOUT

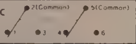
Circuit 11 Connections/Schematic on opposite page.

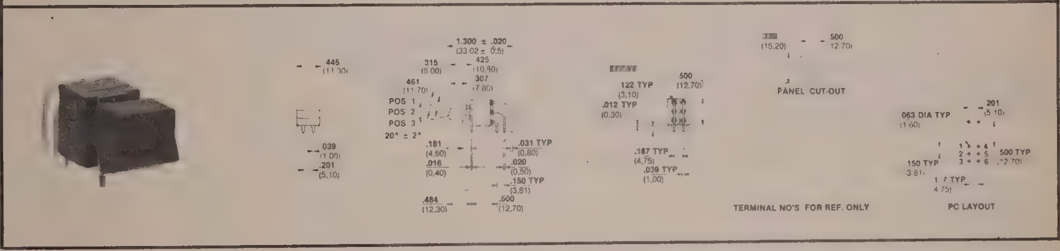
AV2 TERMINATION OPTION

Switching Function

MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			


1.300 ± .020 (33.02 ± 0.50)
.461 (11.70)
.315 (8.00)
.425 (10.80)
.307 (7.80)
.031 TYP (0.80)
POS. 1
POS 2
POS. 3
24° ±2°
.181 (4.60)
.484 (12.30)
.016 (0.40)
.020 (0.50)
.500 (12.70)
.150 TYP (3.81)
.445 (11.30)
.500 (12.70)
EPOXY
.122 TYP (3.10)
.039 TYP (1.00)
.201 (5.10)
.012 (0.30)
.039 TYP (1.00)
.598 (15.20)
.500 (12.70)
PANEL CUT-OUT
TERMINAL NO'S FOR REF ONLY
.201 (5.10)
.500 (12.70)
.063 DIA TYP (1.60)
.150 TYP (3.81)
PC LAYOUT

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic	 2(Common) 5(Common) 1 3 4 6		

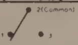

.445 (11.30)
1.300 ± .020 (33.02 ± 0.5)
.315 (8.00)
.425 (10.80)
.461 (11.70)
.307 (7.80)
POS 1
POS 2
POS 3
20° ± 2°
.039 (1.00)
.201 (5.10)
.181 (4.60)
.016 (0.40)
.031 TYP (0.80)
.020 (0.50)
.150 TYP (3.81)
.484 (12.30)
.500 (12.70)
EPOXY
.122 TYP (3.10)
.500 (12.70)
.012 TYP (0.30)
.187 TYP (4.75)
.039 TYP (1.00)
(15.20)
.500 (12.70)
PANEL CUT-OUT
TERMINAL NO'S FOR REF. ONLY
.063 DIA TYP (1.60)
.201 (5.10)
.500 TYP (12.70)
.150 TYP (3.81)
.187 TYP (4.75)
PC LAYOUT

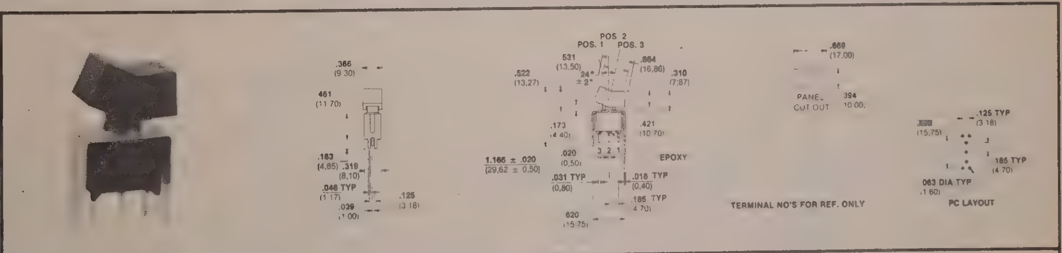
May differ from industry standard.

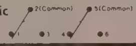
Circuit 11 Connections/Schematic on opposite page.

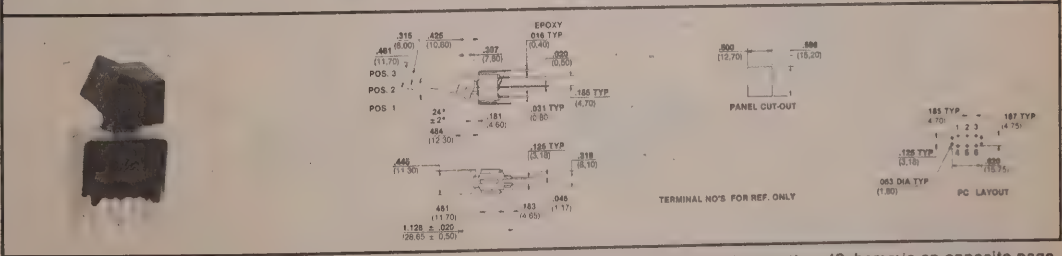
V3 TERMINATION OPTION

Switching Function

MODEL NO.	Pos 3	Pos 2	Pos 1
L1010	ON	NONE	ON
L1030	ON	OFF	ON
L1050	(ON)	OFF	(ON)
L1070	ON	OFF	(ON)
L1080	ON	NONE	(ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			


.366 (9.30)
.461 (11.70)
.183 (4.65)
.319 (8.10)
.046 TYP (1.17)
.039 (1.00)
.125 (3.18)
POS. 2
POS. 1
POS. 3
.531 (13.50)
.664 (16.86)
.522 (13.27)
24° ±2°
.310 (7.87)
.173 (4.40)
.421 (10.70)
1.166 ± .020 (29.62 ± 0.50)
.020 (0.50)
.031 TYP (0.80)
.016 TYP (0.40)
.185 TYP (4.70)
.620 (15.75)
EPOXY
.669 (17.00)
PANEL CUT OUT
.394 (10.00)
TERMINAL NO'S FOR REF. ONLY
.125 TYP (3.18)
(15.75)
.185 TYP (4.70)
.063 DIA TYP (1.60)
PC LAYOUT

MODEL NO.	Pos 3	Pos 2	Pos 1
L2010	ON	NONE	ON
L2030	ON	OFF	ON
L2050	(ON)	OFF	(ON)
L2070	ON	OFF	(ON)
L2080	ON	NONE	(ON)
L2110	ON	ON	ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic	 2(Common) 5(Common) 1 3 4 6		


.315 (8.00)
.425 (10.80)
.461 (11.70)
.307 (7.80)
EPOXY
.016 TYP (0.40)
.020 (0.50)
POS. 3
POS. 2
POS 1
.185 TYP (4.70)
24° ±2°
.181 (4.60)
.031 TYP (0.80)
.484 (12.30)
.125 TYP (3.18)
.319 (8.10)
.445 (11.30)
.461 (11.70)
.183 (4.65)
.046 (1.17)
1.126 ± .020 (28.65 ± 0.50)
.500 (12.70)
.598 (15.20)
PANEL CUT-OUT
TERMINAL NO'S FOR REF. ONLY
.185 TYP (4.70)
.187 TYP (4.75)
.125 TYP (3.18)
.620 (15.75)
.063 DIA TYP (1.60)
PC LAYOUT

Circuit 11 Connections/Schematic on opposite page.

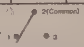
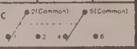
COOPER INDUSTRIES

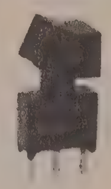
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

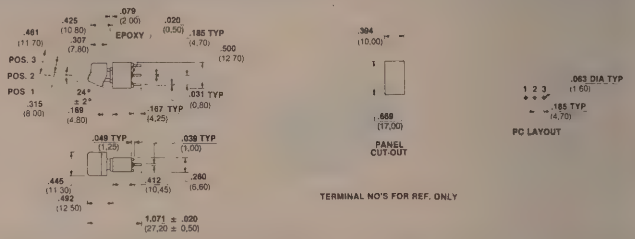
L Series Washable Rockers

C TERMINATION OPTION (Recommended ONLY for applications providing proper bushing support.)

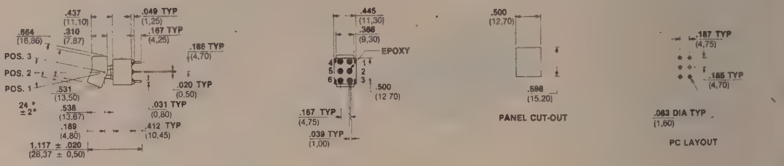
Switching Function

MODEL NO.	Pos 3	Pos 2	Pos 1
L1010 L1030 L1050 L1070 L1080	ON ON (ON) ON ON	NONE OFF OFF OFF NONE	ON ON (ON) (ON) (ON)
Term. Conn.	2-3	OPEN	2-1
Schematic			
MODEL NO.	Pos 3	Pos 2	Pos 1
L2010 L2030 L2050 L2070 L2080 L2110	ON ON (ON) ON ON ON	NONE OFF OFF OFF NONE ON	ON ON (ON) (ON) (ON) ON
Term. Conn.	2-3, 5-6	OPEN	2-1, 5-4
Schematic	 2(Common) 5(Common) 1 3 4 6		





.079
(2 00)
.425
(10 80)
.020
(0,50)
.461
(11 70)
EPOXY
.307
(7,80)
.185 TYP
(4,70)
.500
(12 70)
POS. 3
POS. 2
POS 1
24°
± 2°
.031 TYP
(0,80)
.315
(8 00)
.189
(4,80)
.167 TYP
(4,25)
.049 TYP
(1,25)
.039 TYP
(1,00)
.445
(11 30)
.412
(10,45)
.260
(6,60)
.492
(12 50)
1,071 ± .020
(27,20 ± 0,50)
.394
(10,00)
.669
(17,00)
PANEL CUT-OUT
1 2 3
.063 DIA TYP
(1 60)
.185 TYP
(4,70)
PC LAYOUT
TERMINAL NO'S FOR REF. ONLY



.437
(11,10)
.049 TYP
(1,25)
.664
(16,86)
.310
(7,87)
.167 TYP
(4,25)
.185 TYP
(4,70)
POS. 3
POS. 2
POS. 1
.531
(13,50)
.020 TYP
(0,50)
24°
±2°
.538
(13,67)
.031 TYP
(0,80)
.189
(4,80)
.412 TYP
(10,45)
1,117 ± .020
(28,37 ± 0,50)
.445
(11,30)
.366
(9,30)
EPOXY
4
5
6
1
2
3
.500
(12 70)
.187 TYP
(4,75)
.039 TYP
(1,00)
.500
(12,70)
.598
(15,20)
PANEL CUT-OUT
.187 TYP
(4,75)
.185 TYP
(4,70)
.063 DIA TYP
(1,60)
PC LAYOUT

Circuit 11 Connections / Schematic below.

Rocker Options (See drawings for dimensions.)

J	J1	J50
	Color chart below.	Color chart below.
This option is for use with rockers ordered separately.	Plastic rocker U2210 may be ordered separately. Specify color per chart below. Example: U2212 = Black	Plastic rocker U2420 may be ordered separately. Specify color per chart below. Example: U2422 = Black.

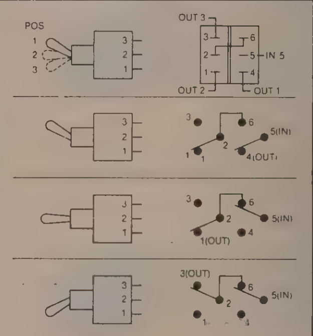
Contact/Rating Options

B Gold plate over brass.
.4VA max. @ 20VAC or DC.

Q Silver plate over brass.
5A, 125VAC
2A, 250VAC

G Gold plate over silver plate.
.4VA max. @ 20VAC or DC.
OR
5A, 125VAC
2A, 250VAC

Circuit 11 Connections/Schematic



POS
1
2
3
3
2
1
OUT 3
3
2
1
6
5
IN 5
4
OUT 2
OUT 1
3
6
5(IN)
2
1
4(OUT)
3
6
2
5(IN)
4
1(OUT)
3(OUT)
6
5(IN)
2
1
4

To specify switch, insert desired codes and suffixes. Write catalog number: L1010J1V3BE* (example).
Packaging note: Add * to catalog number for 250/carton OEM packaging. Without *, packaging is 25/carton individually polybagged.

MODEL NO.

L	1	0	1	0	J	1		V	3		B	E	

SERIES	POLES		CIRCUIT					APPROVALS		ACTUATOR				TERMINATION				CONTACT		SEAL		COLOR	
	NO.		3	2	1			TYPE		TYPE				TYPE				TYPE		TYPE		(J1 J50)	
L	SINGLE	1	ON	—	ON	0	1	NONE	0	ROCKER OPT.	J			HORIZ. MT. 4.7 × 12 7 mm	A			GOLD	B	EPOXY	E	Blue	1
	DOUBLE	2	ON	OFF	ON	0	3	(PENDING)		ROCKER 13.5 mm	J	1		VERT. MT. 3.81 × 12.7 mm	A	V	2	SILVER	Q			Black	2
			(ON)	OFF	(ON)	0	5			ROCKER 15 mm	J	5	0	SUP. BKT. 12.8 × 15.75 mm	V	3		Gold/ Silver	G			Green	3
			ON	OFF	(ON)	0	7							STRAIGHT PC 4.7	C							Grey	4
			ON	—	(ON)	0	8							. 200" spacing available. Consult factory.								Yellow	5
			ON	ON	ON	1	1															Red	6
																						White	7
																						Orange	9

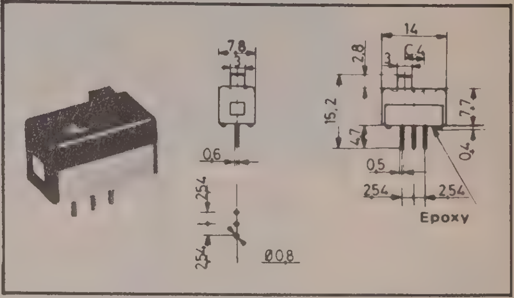
( ) indicates momentary

COOPER INDUSTRIES
ARROW HART
103 HAWTHORN STREET/HARTFORD, CT 06101/(203) 249-8471

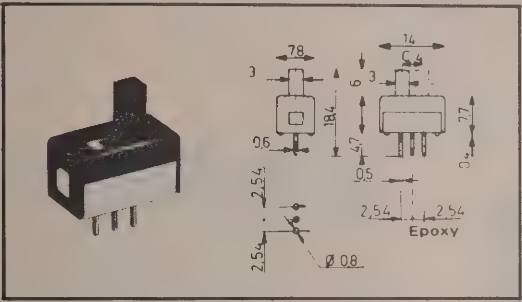
Miniature AC And DC Slide Switches K Series - Single And Double Pole

Catalog Number Selection - Single Pole
Terminal Spacing 0.100 Inch (2,54 Millimeters)

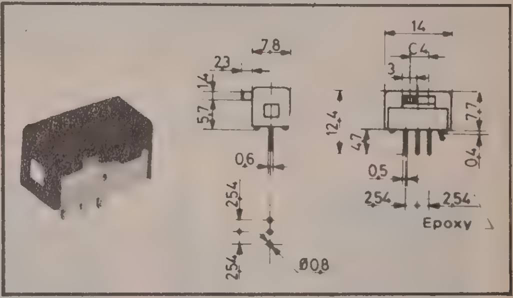
Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 100mA, 30V DC Min.: 10μA, 5V DC: 10mA, 50mV	SPDT	On — On	Slide(VS2)	Straight PC(C)	K1010VS2CBE
Max.: 4A, 125V AC; 2A, 250V AC Min.: 100mA, 10V	SPDT	On — On	Slide(VS2)	Straight PC(C)	K1010VS2CQE
		On — On	Slide(HS1)	Straight PC(C)	K1010HS1CQE
		On — On	Slide(VS3)	Straight PC(C)	K1010VS3CQE


7,8
3
14
C4
2,8
15,2
4,7
7,7
0,4
0,6
0,5
2,54
2,54
Epoxy
2,54
2,54
Ø0,8

High Slide (VS2), Straight PC(C) - Single Pole

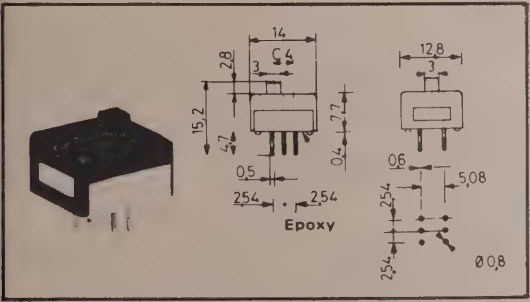

7,8
3
14
C4
6
3
18,4
4,7
7,7
0,4
0,6
0,5
2,54
2,54
2,54
Epoxy
2,54
Ø 0,8

Extra High Slide(VS3), Straight PC(C) - Single Pole


7,8
2,3
14
C4
3
5,7
12,4
4,7
7,7
0,4
0,6
0,5
2,54
2,54
Epoxy
2,54
2,54
Ø0,8

Side Slide (HS1), Straight PC(C) - Single Pole

Catalog Number Selection - Double Pole
Terminal Spacing 0.100 Inch (2,54 Millimeters)

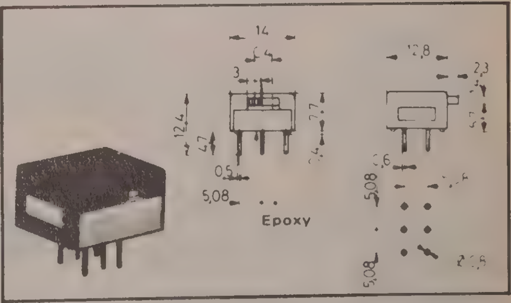

14
C4
2,8
3
15,2
4,7
7,7
0,4
0,5
2,54
2,54
Epoxy
12,8
3
0,6
5,08
2,54
2,54
Ø0,8

High Slide(VS2), Straight PC(C) - Double Pole

Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 100mA, 30V DC Min.: 10μA, 5V DC: 10mA, 50mV	DPDT	On — On	Slide(VS2)	Straight PC(C)	K2010VS2CBE
Max.: 4A, 125V AC; 2A, 250V AC Min.: 100mA, 10V	DPDT	On — On	Slide(VS2)	Straight PC(C)	K2010VS2CQE

Catalog Number Selection - Double Pole
Terminal Spacing 0.200 Inch (5,08 Millimeters)

Rating	Circuit	Action	Lever Type	Type Of Termination	Catalog Number
Max.: 4A, 125V AC 2A, 250V AC Min.: 100mA, 10V	DPDT	On — On	Slide(HS1)	Straight PC(C2)	K2010HS1C2QE


14
C4
3
12,4
4,7
7,7
0,4
0,5
5,08
Epoxy
12,8
2,3
5,7
0,6
5,08
5,08

Side Slide(HS1), Straight PC(C2) - Double Pole

CROSSPOINT

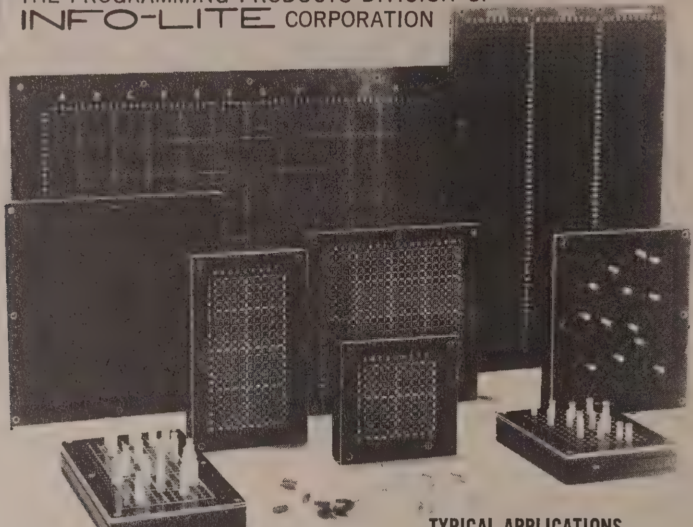
THE PROGRAMMING PRODUCTS DIVISION OF
INFO-LITE CORPORATION

PROGRAMMING PRODUCTS

MATRIX PINBOARDS

INFO-LITE has developed a most convenient, compact and economical system for reliable programming and switching • The Matrix Program Board allows a wide variety of switching/programming functions to be performed by simply inserting programming pins (shorting or diode type) into a 2 to 10 deck contact matrix • No accessorise such as "read" "write" equipment are required • Matrix Board features have lead them to be favored over such devices at patchboards, card readers, toggle and thumbwheel switches, mag/punched tape and electronic memories • The two basic uses for Matrix Program Boards are: (1) Cordless patching (input-output switching), using shorting pins; (2) Programmable diode matrices (logic memories), using diode pins • Units with up to 100 x 100 crosspoints can be supplied to meet your requirements, whether for prototype or production quantities.

See Data Sheet MB3 for detailed specifications.



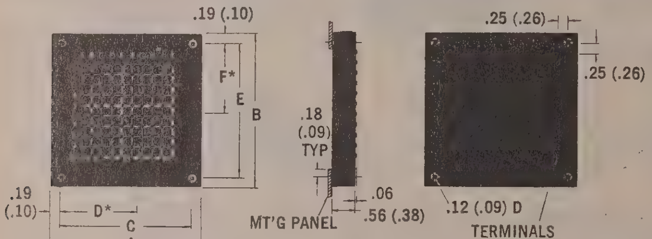
FEATURES

- Reliable closed entry contacts
- Rugged programming pins that will not beind
- Rapid and convenient method of programming/switching
- Permits insertion of components into network without soldering
- Replaces costly complex switching hardware
- Attractive and compact package
- Low capacitance for high frequency applications
- Ease of visual program checking

TYPICAL APPLICATIONS

Numeric Controlled Equipment
Logic Memories
Power Distributors
Circuit/Component Test Programmers
Lighting Systems
Code Generators
Programmable Diode Matrices
Communications Distributors
Status Indicators
Data Logging
Vending Machine Control
Thermo-Couple Selectors
Batching Programmers
Function Generators
Sequence Programmers
Pulse Code Programmers

STANDARD SPECIFICATIONS & STOCK MATRICES FOR 1000 & 2000 SERIES



* ADDITIONAL MOUNTING HOLE POSITION

Matrix Size	Dash #	2000 Series — .250" Grid						1000 Series — .130" Grid					
		A	B	C	D	E	F	A	B	C	D	E	F
10 x 10	—1	3.63	3.63	3.25	—	3.25	—	2.02	2.02	1.82	—	1.82	—
10 x 15	—2	3.63	4.93	3.25	—	4.50	—	2.02	2.67	1.82	—	2.47	—
10 x 20	—3	3.63	6.12	3.25	—	5.75	2.75	2.02	3.32	1.82	—	3.12	—
10 x 25	—4	3.63	7.38	3.25	—	7.00	3.50	2.02	3.97	1.82	—	3.77	1.82
10 x 50	—5	3.63	13.62	3.25	—	13.25	4.50	2.02	7.22	1.82	—	7.02	3.51
20 x 20	—8	6.12	6.12	5.75	2.75	5.75	2.75	3.32	3.32	3.12	—	3.12	—
25 x 25	—9	7.38	7.38	7.00	3.50	7.00	3.50	3.97	3.97	3.77	1.82	3.77	1.82
50 x 50	—10	14.4	14.1	14.0	7.00	13.75	7.00	(Currently not available)					

STANDARD SPECIFICATIONS

1 — Contact Type: Closed Entry
2 — Contact Material: Be-Cu, Alloy 25
3 — Contact Finish: a - .0002" Ag over Cu Flash
b - .00002" Min. Au over Ni Flash
4 — Contact Support Material: Silicone Rubber
5 — Contact Resistance: .040 Ohm, typ.
6 — Contact Capacitance: 1 uuf [2 uuf]/in. at 1 MHz, typ.
7 — Bussing: 1st (top) Deck Vertical; 2nd Deck Horizontal
8 — Breakdown Voltage: 1000 VRMS
9 — Current Rating: 5 [2] Amps standard; 10 [4] Amps available
10 — Terminals: Combination Taper Pin Socket/Solder Cup [Solder Cup]
11 — Panel Material: Black XX Grade Phenolic
12 — Panel Marking: Alpha-Numeric/Grid, White Epoxy Ink Screened

NOTE: Values in brackets [ ] are for 1000 Series if two values are given.

SPECIFYING PART NUMBERS

X000-X - X X

.130" GRID 1
.250" GRID 2
MATRIX SIZE (SEE TABLE)
A SCREENED FRONT PANEL
B BLANK FRONT PANEL
S SILVER CONTACT FINISH
G GOLD CONTACT FINISH

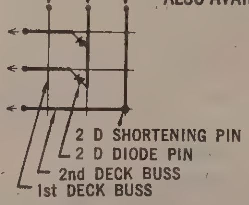
EXAMPLE: A 20 x 20, .250" grid matrix with silver contacts and blank front panel would have Part Number 2000-8-BS. U.S. Patent No. 3,631-374

Programming Pins Diode Pins 1000 Series (.13" Grid)	Specifications	
	Diode	Anode To†
1020S-CS0001/-CS0002 1020G-CS0003/-CS0004	1N4151 1N4151	Tip/Sleeve Tip/Sleeve
2000 Series (.25" Grid)	†On Std.Matrices Tip makes W/2nd Deck.	
2020S-CS0006/CS0007 2020S-CS0010/CS0011 2020G-CS0012/CS0025 2020S-CS0014/CS0024	1N270 1N4151 1N4151 1N4004	Tip/Sleeve Tip/Sleeve Sleeve/Tip Sleeve/Tip
Shorting Pins 1010G & 2010G		

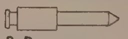
† Sold in multiples of 25 pieces.

SCHEMATIC

2 DECK MATRIX (3, 4, 6 & 8 DECK ALSO AVAILABLE)



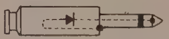
PROGRAMMING PINS



2 D SHORTENING PIN

X010X

.13" GRID 1
.25" GRID 2
S SILVER
G GOLD



2 D DIODE PIN

X020X-CSXXXX

.13" GRID 1
.25" GRID 2
SILVER S
GOLD G
DEFINES DIODE & ORIENTATION. SEE TABLE ON LEFT

* Diode orientation shown: Anode to Sleeve (1st Deck)

PROGRAM BOARD KITS IDEAL FOR BREADBOARD, PROTOTYPE AND EVALUATION

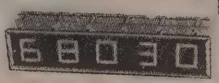
2000 SERIES KITS CT-1 Includes one 10 X 10 Matrix Board (2000-1-AS), Ten Shorting Pins (2010S) and Ten Diode Pins with 1N4151 diodes installed (2020S-CS0010): $59.00.

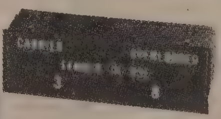
CT-2 Same as CT-1 but without diodes: $53.00.

1000 SERIES KITS CT-3 Includes one 10 X 10 Matrix Board (1000-1-AS), Ten Shorting Pins (1010S) and Ten Diode Pins with 1N4151 diodes installed (1020S-CS0001): $65.00.

OTHER INFO-LITE PRODUCTS

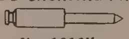
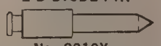
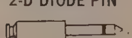
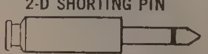
NUMERIC READOUTS





LIGHTED INDICATORS

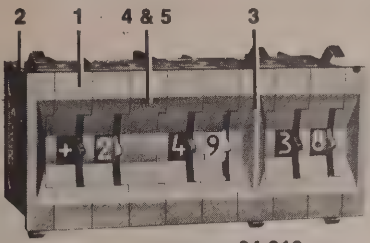
SEE EEM SECTION 2450

STANDARD PROGRAMMING PINS	
1000 SERIES 2-D SHORTING PIN  No. 1010X	2000 SERIES 2-D DIODE PIN  No. 2010X
1000 SERIES 2-D DIODE PIN  No. 1020X-CSXXXX	2000 SERIES 2-D SHORTING PIN  No. 2020X-CSXXXX

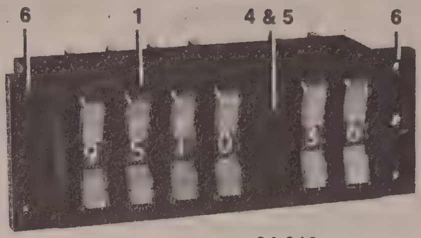
CROSSPOINT• Div. of INFO-LITE• 422 Cliff Street • Fairview, NJ 07022• (201) 941-4455•"LINKS BETWEEN MAN AND MACHINE"

Digital Switches - LED Readouts

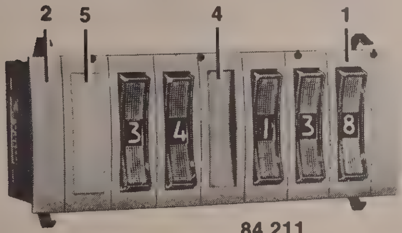
Rocker & Thumbwheel



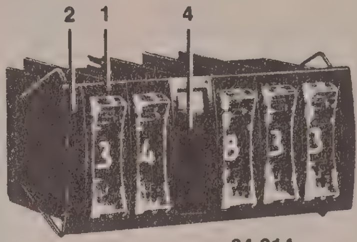
84 210
Thumbwheel Series
Panel Mount



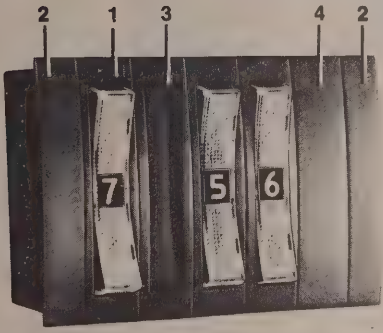
84 213
Rocker Series
Rear Mount



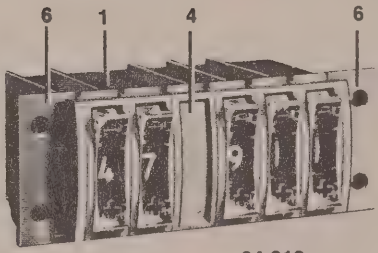
84 211
Rocker Series
Panel Mount



84 214
Rocker Series
Miniature Panel Mount



84 212
Rocker Series
Large Size Panel Mount



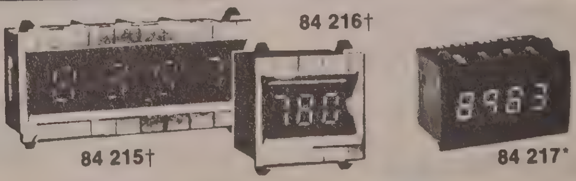
84 218
Rocker Series
Miniature Rear Mount

A Fully Modular System

1. **Basic Module:** Enables data input in coded form.
2. **End Caps:** Snap into place to complete module assembly. Complete with 4 panel clips.
3. **Separator:** Used to fit 2 switch assemblies into one unit. They come with 2 clips.
4. **Spacer:** Blank module used to replace a module assembly.
5. **Encoded "Dummy" Module:** Enables a simultaneous switching to two circuits from one digital switch. It is driven by the adjacent module via a coupling shaft.
6. **End Caps:** For rear mounting of module assembly. They come in pairs.

LED Readouts

- Compatible with Crouzet Rocker* and Thumbwheel† switches
- Easy to assemble snap-on modules
- With or without decoding/memory
- Two sizes available



84 216†
84 215†
84 217*

Crouzet

Crouzet Controls, Inc.
1083 State Parkway, Schaumburg, IL 60195
Tel: 312/843-2200 - Telex: Crouzet 206 297

CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 207 AUTO-DIP™ SWITCH

AUTOMATICALLY INSERTABLE, WAVE SOLDERABLE, BOARD WASHABLE DIP SWITCH

FEATURES

Optimized Contact System

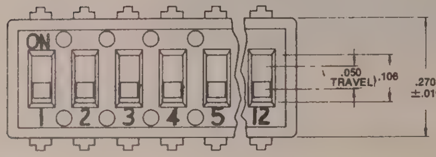
- Redundant, wiping contacts
- Contactor does not rub on plastic or deflect during actuation

Optimized Mechanical Features

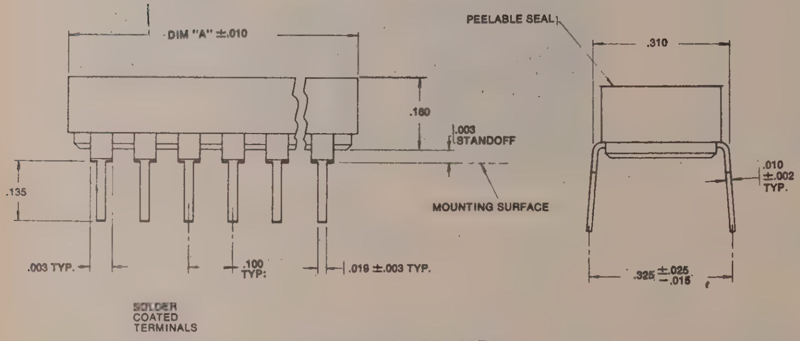
- Fully sealed to withstand insertion shock, wave solder temperatures, board washing
- Positive detent separate from contactor
- Closed windows prevent particle contamination
- .050″ actuator travel
- Molded .300″ integrated circuit package outline

Premium Materials

- Inlaid gold contacts, solder coated terminals
- Beryllium copper contactor
- 260°C housing heat deflection temperature assures contact and seal integrity after wave soldering
- All plastics rated UL 94 V-0
- Permanent laser marking

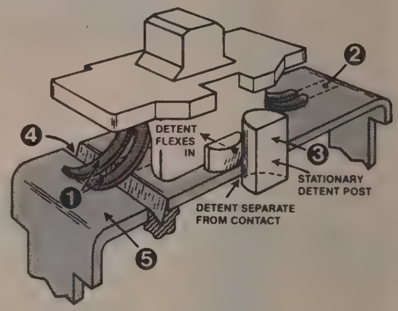


"A" Overall Dim.	No. of Switch Sections	Part No.
.258	2	207-2LPST
.358	3	207-3LPST
.458	4	207-4LPST
.558	5	207-5LPST
.658	6	207-6LPST
.758	7	207-7LPST
.858	8	207-8LPST
.958	9	207-9LPST
1.058	10	207-10LPST
1.158	11	207-11LPST
1.258	12	207-12LPST



GENERAL TOLERANCES:
Decimal dimensions ±.005″

Switch reliability that is the best ever!



1. Redundant gold inlaid contacts dramatically enhance contact reliability.
2. Positive wiping contacts assure low and consistent contact resistance. (.050″ travel)
3. Detent function separated from contacts to optimize both designs.
4. Gold contacts never abraded or contaminated by sliding over polymer surfaces. Contacts never touch a nongold surface.
5. No contactor deflection for the life of the switch. Constant contact force eliminates overstressing of contacts for greater reliability.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Contact Resistance
25 milliohms maximum initial
50 milliohms maximum at end of life

Actuation Life
2000 cycles switching
50 mA @ 6 VDC or 2 mA @ 50 mVDC

Nonswitching Rating
100 mA or 50 VDC

Insulation Resistance
1 x $10^9\Omega$ minimum between insulated terminals

Dielectric Strength
200 VAC minimum

Switch Capacitance
5 pF maximum between adjacent closed switches

Temperature Range
0 to 70°C operating
−40 to 70°C storage

Allowable Wave Solder Time
Up to 4 seconds with 260°C solder

Shock
No mechanical damage or changes of switch settings with 25 G applied for 6 milliseconds

Vibration
No mechanical damage or changes of switch settings during or after testing, when tested in 3 mutually perpendicular planes at 10-50 Hz sweep or at 60 Hz constant vibration. Amplitude .06″

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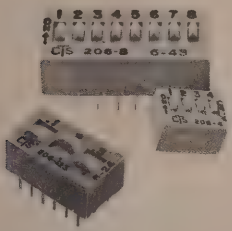
CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 206

CTS DIP PROGRAMMABLE SWITCHES


1 2 3 4 5 6 7 8
CTS 206-8 6-43
206-4

FEATURES

- Contact wiping on make and break
- Suitable for flow soldering on PC board or mounting with standard DIP sockets
- Long term contact corrosion resistance provided by gold plated contact arms
- All U.L 94V-O plastic used
- Integral terminal and contact locked into plastic base rails
- Crisp, positive slide actuators
- Types 206-02 through -10 approved to MIL-S-83504/4 upon request
- Available with flush (low profile) actuators — SPST styles

Description

From 2 thru 12 SPST; 1 thru 6 SPDT; 1 thru 6 DPST; 1, 2 or 3 DPDT and 1, 2 or 3 4PST slide switches per switch package on .100″ x .300″ DIP centers

Initial Contact Resistance

50 miliohms

Maximum Contact Resistance

100 milliohms after 10,000 cycles switching 50 mA @ 24 VDC

Maximum Non-Switching Rating

100 mA or 50 VDC

Insulation Resistance

Across open switch and between adjacent closed switches: 1 x 10⁹ ohms

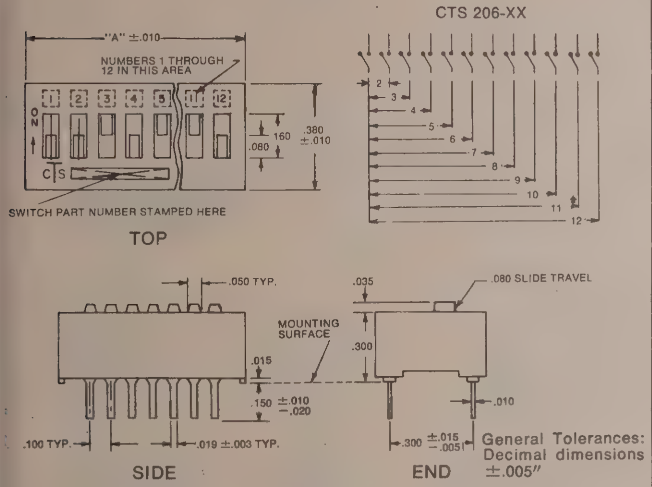
Dielectric Breakdown

Between adjacent switches minimum: 500 VDC

Switch Capacitance

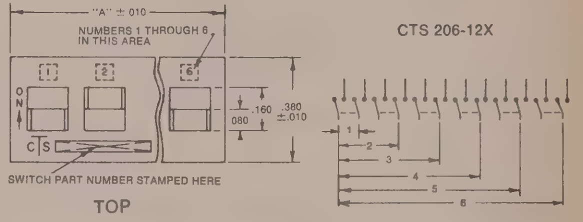
Between adjacent switches maximum: 5.0 pF

SPST


CTS 206-XX
"A" ±.010
NUMBERS 1 THROUGH 12 IN THIS AREA
1 2 3 4 5 11 12
ON
.160
.080
.380 ±.010
CTS
SWITCH PART NUMBER STAMPED HERE
TOP
2 3 4 5 6 7 8 9 10 11 12
.050 TYP.
.035
.080 SLIDE TRAVEL
MOUNTING SURFACE
.300
.015
.150 +.010 −.020
.010
.100 TYP.
.019 ±.003 TYP.
.300 +.015 −.005
SIDE
END

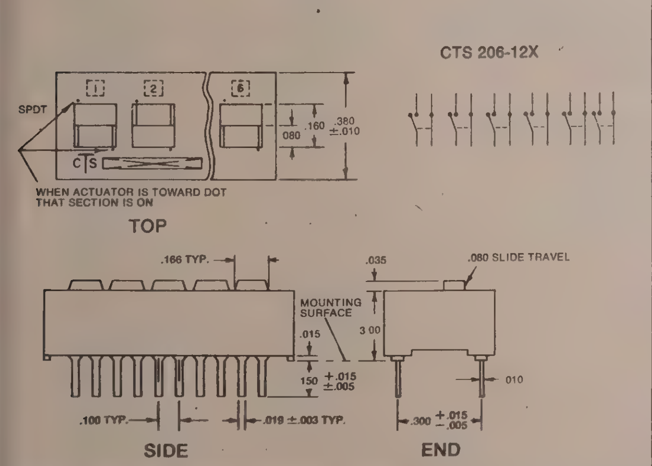
General Tolerances: Decimal dimensions ±.005″

DPST


"A" ± 010
NUMBERS 1 THROUGH 6 IN THIS AREA
1 2 6
ON
.160
080
.380 ±.010
CTS
SWITCH PART NUMBER STAMPED HERE
TOP
CTS 206-12X
1 2 3 4 5 6

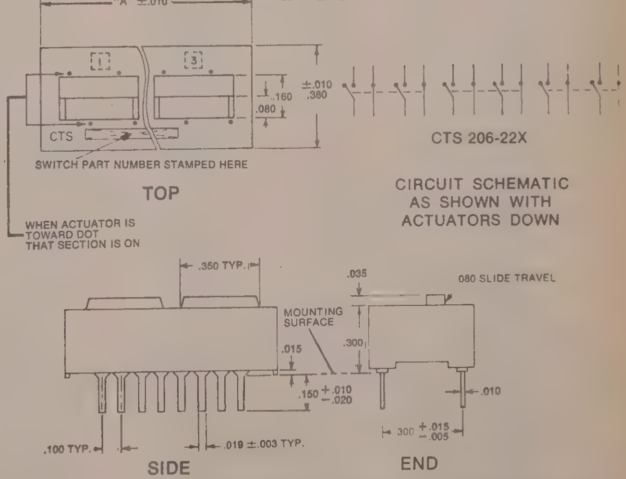
General Tolerances: Decimal dimensions ±.005″

SPDT


CTS 206-12X
1 2 6
SPDT
.160
080
.380 ±.010
CTS
WHEN ACTUATOR IS TOWARD DOT THAT SECTION IS ON
TOP
.166 TYP.
.035
.080 SLIDE TRAVEL
MOUNTING SURFACE
.015
3 00
150 +.015 ±.005
010
.100 TYP.
.019 ±.003 TYP.
.300 +.015 −.005
SIDE
END

General Tolerances: Decimal dimensions ±.005″

DPDT


"A" ±.010
1 3
.160
.080
±.010 .380
CTS
SWITCH PART NUMBER STAMPED HERE
TOP
WHEN ACTUATOR IS TOWARD DOT THAT SECTION IS ON
CTS 206-22X
CIRCUIT SCHEMATIC AS SHOWN WITH ACTUATORS DOWN
.350 TYP.
.035
080 SLIDE TRAVEL
MOUNTING SURFACE
.015
.300
.150 +.010 −.020
.010
.100 TYP.
.019 ±.003 TYP.
300 +.015 −.005
SIDE
END

General Tolerances: Decimal dimensions ±.005″

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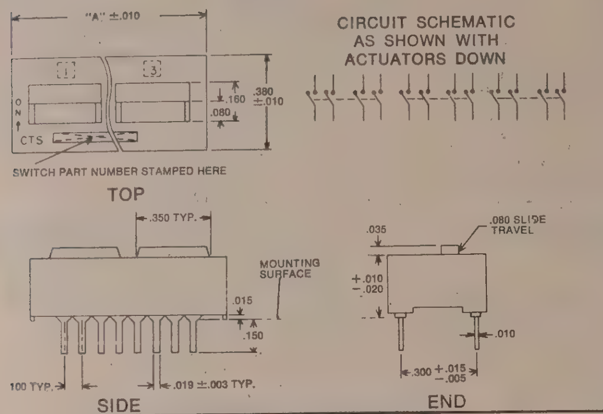
PASO ROBLES DIVISION

CTS DIP PROGRAMMABLE SWITCHES

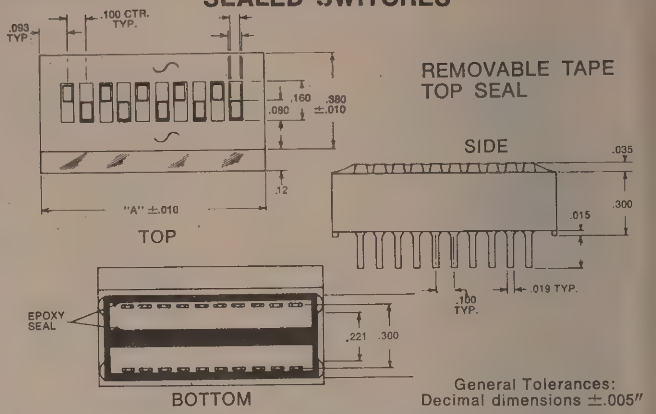
4PST

CTS 206-41X

CIRCUIT SCHEMATIC AS SHOWN WITH ACTUATORS DOWN

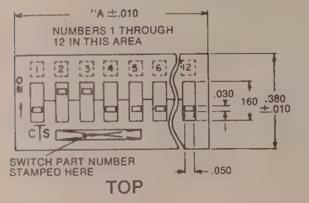

"A" ±.010
1
3
ON
CTS
.380 ±.010
.160
.080
SWITCH PART NUMBER STAMPED HERE
TOP
.350 TYP.
MOUNTING SURFACE
.015
.150
100 TYP.
.019 ±.003 TYP.
SIDE
.035
.080 SLIDE TRAVEL
+.010 −.020
.010
.300 +.015 −.005
END

SEALED SWITCHES


.093 TYP.
.100 CTR. TYP.
REMOVABLE TAPE TOP SEAL
.160
.080
.380 ±.010
.12
"A" ±.010
TOP
SIDE
.035
.300
.015
.100 TYP.
.019 TYP.
EPOXY SEAL
.221
.300
BOTTOM

General Tolerances: Decimal dimensions ±.005″

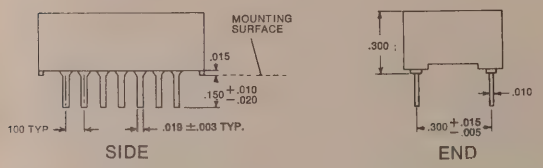
LOW PROFILE ACTUATORS


"A ±.010
NUMBERS 1 THROUGH 12 IN THIS AREA
1 2 3 4 5 6 12
ON
CTS
.030
.160
.380 ±.010
SWITCH PART NUMBER STAMPED HERE
.050
TOP

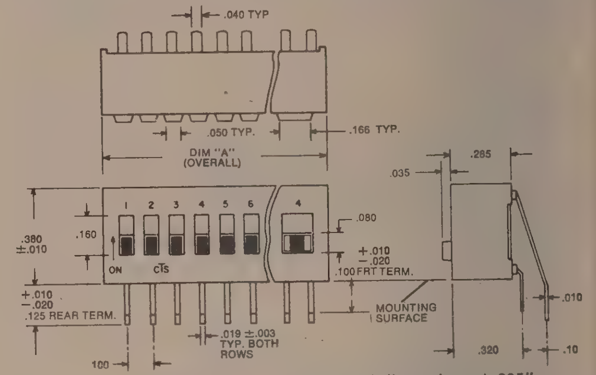
TO ORDER LOW PROFILE ACTUATOR SWITCHES

206-XXX-LP

Standard CTS Part Number — Low Profile Actuators


MOUNTING SURFACE
.015
.150 +.010 −.020
100 TYP
.019 ±.003 TYP.
SIDE
.300
.010
.300 +.015 −.005
END

RIGHT ANGLE PANEL MOUNT — 206RA


.040 TYP
.050 TYP.
.166 TYP.
DIM "A" (OVERALL)
.035
.285
1 2 3 4 5 6
4
.080
.380 ±.010
.160
ON
CTS
+.010 −.020
.100 FRT TERM.
+.010 −.020
.125 REAR TERM.
.010
MOUNTING SURFACE
.019 ±.003 TYP. BOTH ROWS
100
.320
.10

General Tolerances: Decimal dimensions ±.005″

STANDARD "OFF THE SHELF" PART NUMBERS

"A" Overall Dimension	Number of Switch Sections	Actuation	Part Number	Low Profile Bottom & Top Sealed	Both Bottom & Top Sealed	Right Angle Mount Sealed Bottom & Top
.286	2	SPST	206-2	206-2LPST	206-2ST	206-2RAST
.386	3	SPST	206-3	206-3LPST	206-3ST	206-3RAST
.486	4	SPST	206-4	206-4LPST	206-4ST	206-4RAST
.586	5	SPST	206-5	206-5LPST	206-5ST	206-5RAST
.686	6	SPST	206-6	206-6LPST	206-6ST	206-6RAST
.786	7	SPST	206-7	206-7LPST	206-7ST	206-7RAST
.886	8	SPST	206-8	206-8LPST	206-8ST	206-8RAST
.986	9	SPST	206-9	206-9LPST	206-9ST	206-9RAST
1.086	10	SPST	206-10	206-10LPST	206-10ST	206-10RAST
1.286	12	SPST	206-12	206-12LPST	206-12ST	206-12RAST
.286	1	SPDT	206-121		206-121ST	206-121RAST
.486	2	SPDT	206-122		206-122ST	206-122RAST
.686	3	SPDT	206-123		206-123ST	206-123RAST
.886	4	SPDT	206-124		206-124ST	206-124RAST
1.086	5	SPDT	206-125		206-125ST	206-125RAST
1.286	6	SPDT	206-126		206-126ST	206-126RAST
.286	1	DPST	206-211		206-211ST	206-211RAST
.486	2	DPST	206-212		206-212ST	206-212RAST
.686	3	DPST	206-213		206-213ST	206-213RAST
.886	4	DPST	206-214		206-214ST	206-214RAST
1.086	5	DPST	206-215		206-215ST	206-215RAST
1.286	6	DPST	206-216		206-216ST	206-216RAST
.486	1	DPDT	206-221		206-221ST	206-221RAST
.886	2	DPDT	206-222		206-222ST	206-222RAST
1.286	3	DPDT	206-223		206-223ST	206-223RAST
.486	1	4PST	206-411		206-411ST	206-411RAST
.886	2	4PST	206-412		206-412ST	206-412RAST
1.286	3	4PST	206-413		206-413ST	206-413RAST

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PASO ROBLES DIVISION

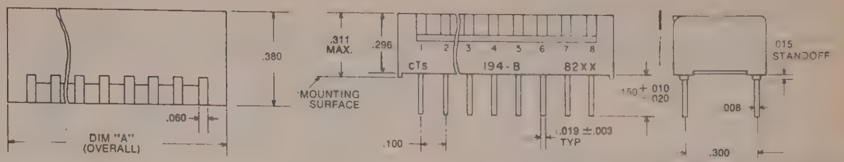
CTS SERIES 194

CTS DIP SWITCHES

1 2 3 4 5 6 7 8
ON CTS 194-8 8221

FEATURES

- Electrical switching occurs at 50% of actuator rotation angle
- Contact wiping on make and break
- Enclosed actuators shield contacts from foreign particles throughout life of switch
- The gold plated, over-center design provides positive detent action
- Reliable tape top seal optional/ bottom epoxy seal standard
- Insert molded base halves of thermoset material ensure mechanical integrity of contacts and terminals through soldering operations
- All U.L. 94 V-O plastics used


.380
.060
DIM "A" (OVERALL)
.311 MAX.
.296
MOUNTING SURFACE
1 2 3 4 5 6 7 8
CTS 194-8 82XX
.100
.019 ±.003 TYP
.150 +.010 −.020
.015 STANDOFF
.008
.300

General Tolerances: Decimal dimensions ±.005"

STANDARD "OFF THE SHELF" PART NUMBERS

"A" Overall Dimension	Number of Switch Sections	Part Number (Bottom Epoxy Seal Only)	Part Number (Bottom Epoxy Seal and Tape Top Seal)
.486	4	194-4S	194-4ST
.886	8	194-8S	194-8ST
1.086	10	194-10S	194-10ST

Description

Side actuated 4, 8 or 10 section SPST switching functions per package on .100" x .300" DIP centers

Initial Contact Resistance

50 milliohms maximum

Maximum Contact Resistance

100 milliohms after 7000 cycles switching 50 mA @ 24 VDC

Insulation Resistance

Across open switch and between adjacent closed switches: 1 x 10^9 ohms minimum

Dielectric Breakdown

Between adjacent switches minimum 500 VDC

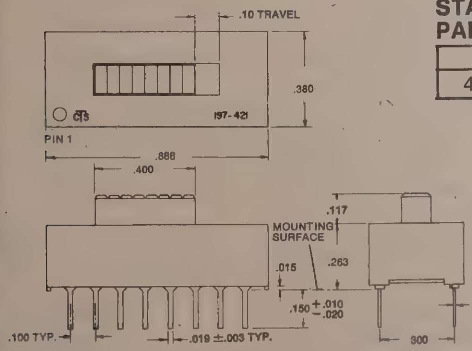
Switch Capacitance

Between adjacent switches maximum: 5.0 pF

CTS SERIES 197

FEATURES

- Designed for automatic insertion
- Integral terminal and contact locked into thermoset base rails
- Contact wiping on make and break
- Break before make contacts
- Useful in "service/operate" applications, low level signal routing, digital circuit programming, etc.
- Long term contact corrosion provided by gold plated/inlaid contacts
- All U.L. 94 V-O plastics used


.10 TRAVEL
.380
CTS 197-421
PIN 1
.886
.400
.117
MOUNTING SURFACE
.015
.263
.150 +.010 −.020
.010
.100 TYP.
.019 ±.003 TYP.
.300

Description

4PDT slide actuated switch package on .100" x .300" DIP centers

Initial Contact Resistance

50 miliohms maximum

Maximum Contact Resistance

100 milliohms after 2000 cycles switching 50 mA @ 24 VDC

Insulation Resistance

Across open switch and between adjacent closed switches: 1 x 10^9 ohms minimum

Dielectric Breakdown

Between adjacent switches minimum: 500 VDC

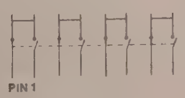
Switch Capacitance

Between adjacent switches maximum: 5.0 pF

STANDARD "OFF THE SHELF" PART NUMBERS

Function	Part Number
4 pole double throw	197-421

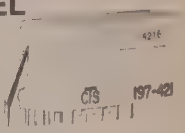
CTS 197-421

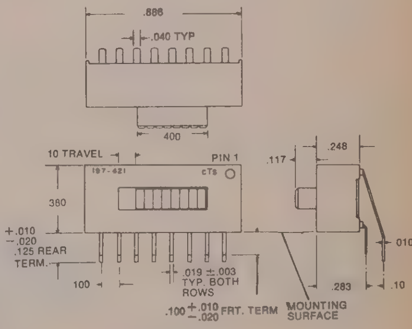


TOP VIEW

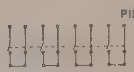
General Tolerances: Decimal dimensions ±.005"

OPTIONAL RIGHT ANGLE PANEL MOUNT STYLE 197RA




.886
.040 TYP
.400
10 TRAVEL
PIN 1
197-421
CTS
.380
+.010 −.020
.125 REAR TERM.
.100
.019 ±.003 TYP. BOTH ROWS
.100 +.010 −.020 FRT. TERM
MOUNTING SURFACE
.117
.248
.010
.283
.10

SCHEMATIC



TOP VIEW (ACTUATOR TO RIGHT)

STANDARD "OFF THE SHELF" PART NUMBER

Function	Part Number	Seal
4 pole double throw	197-421RAS	bottom

General Tolerances: Decimal dimensions ±.005"

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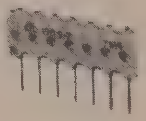
CTS® CORPORATION*

PASO ROBLES DIVISION

CTS SERIES 198

CTS PROGRAMMABLE DIP/SIP SHUNT NETWORKS



Description

Low cost matrix programming. DIPs offered in 4-24 terminal configurations: SIP's in 2-12 terminal packages

Current Rating

1.0 amp maximum

Insulation Resistance

1 x 10^{11} ohms minimum between any 2 electrically isolated terminals

Dielectric Breakdown Voltage

500 VDC minimum between any 2 electrically isolated terminals

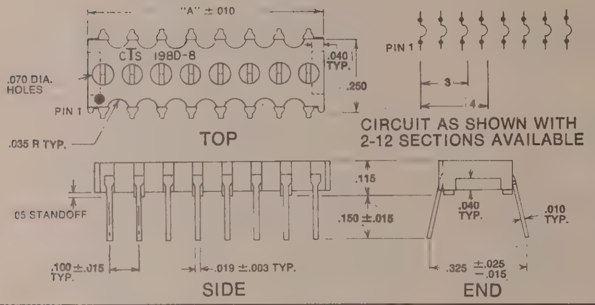
Insulation

UL recognized 94 V-O rated high temperature thermoplastic

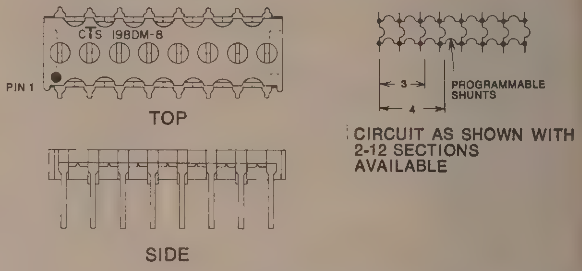
Metal Parts

Solder plated copper alloy. (Gold plated terminals optional)

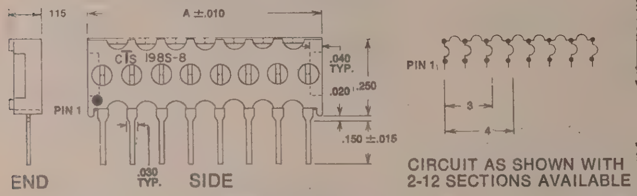
DIP TYPE 198D-8


"A" ± .010
CTS 198D-8
.070 DIA. HOLES
.040 TYP.
.250
PIN 1
.035 R TYP.
TOP
PIN 1
3
4
CIRCUIT AS SHOWN WITH 2-12 SECTIONS AVAILABLE
.05 STANDOFF
.115
.150 ±.015
.040 TYP.
.010 TYP.
.100 ±.015 TYP.
.019 ±.003 TYP.
.325 +.025 −.015
SIDE
END

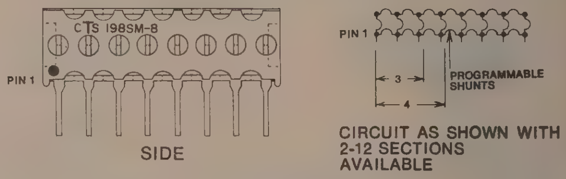
DIP TYPE 198DM-8


CTS 198DM-8
PIN 1
TOP
3
4
PROGRAMMABLE SHUNTS
CIRCUIT AS SHOWN WITH 2-12 SECTIONS AVAILABLE
SIDE

SIP TYPE 198S-8


.115
A ±.010
CTS 198S-8
.040 TYP.
.020
.250
PIN 1
.150 ±.015
.030 TYP.
END
SIDE
PIN 1
3
4
CIRCUIT AS SHOWN WITH 2-12 SECTIONS AVAILABLE

SIP TYPE 198SM-8


CTS 198SM-8
PIN 1
SIDE
PIN 1
3
4
PROGRAMMABLE SHUNTS
CIRCUIT AS SHOWN WITH 2-12 SECTIONS AVAILABLE

No. of Sections	2	3	4	5	6	7	8	9	10	11	12
"A" DIM.	.200	.300	.400	.500	.600	.700	.800	.900	1.000	1.100	1.200

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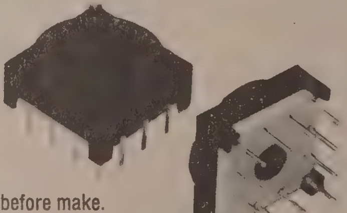
SERIES 235
Enclosed Miniature .500" Square Rotary Switches



Switch Functions:

1. Single pole, 11 positions, break before make.
2. Single pole, 11 positions, make before break.
3. Binary up to hexadecimal (0-15).
4. Other functions and combinations are available with special tooling.

Electrical and Mechanical Specifications:

1. Contact resistance varies with switch style: Typical values for 11 positions break before make. 0.1 ohm initial contact resistance, 0.15 ohm after 1000 cycles of 360° rotation.
2. Standard operating temperature range: −55°C to +85°C.
3. Rotational life: 1000 cycles of 360° rotation.
4. Wiping action on contact.
5. 360° rotation.
6. Small size: .5" x .5" square.
7. 250" profile from mounting plane to top of package.
8. Enclosed construction excludes dust and foreign material.
9. Terminal pull strength: 5 lbs. minimum.

SERIES 196
Switchable DIP Attenuator

- Reliable replacement for thumbwheel switch-type attenuators (at substantial savings)
- 75 ohm and 600 ohm unbalanced PI or T configuration networks
- .100" x .300" DIP packages
- Standard thick film ceramic modules; custom thin film modules available upon request
- Sealed bottom or top/bottom versions optional; assures contaminate-free switch operation after flow soldering and cleaning
- Standard values from .1 dB to 16 dB in increments of .1 dB to 2 dB

Electrical and Environmental Specifications
(all are absolute maximum ratings)

Electrical:	
Impedance Tolerance	±2%
Power Rating (maximum input signal)	20 dBm
Insertion Loss	.02 dB
Environmental:	
Storage Temperature	−40°C to +85°C
Operating Ambient Temperature	0°C to +70°C
Lead Temperature (soldering 10 seconds)	300°C maximum

MICROELECTRONICS DIVISION, 1201 Cumberland Avenue, West Lafayette, Indiana 47906
Post Office Box 1278, Lafayette, Indiana 47902 • Phone: (317) 463-2565, TWX: 810-342-1882

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

NEED MORE INFORMATION?

USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

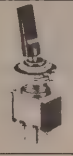
INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

MIYAMA SWITCHES by DSA

M-SERIES: HIGH QUALITY GOLD FLASH MINIATURE SWITCHES

MS-331

MS-334



MS-342

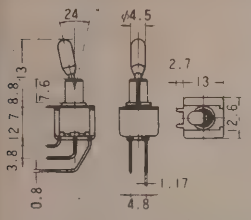
MS-344

MS-345

MS-351

MS-352

Terminals: Models available with either solder, printed circuit, right angle or vertical terminals (right angle and vertical terminals are available by special order only)



DRAWING: MS-331-F

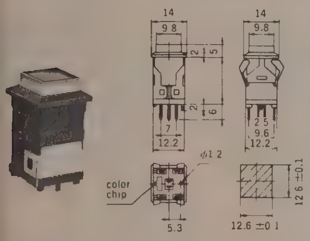
M-SERIES GENERAL RATINGS

RESISTANCE LOAD	6A 125VAC (3A 250VAC) 6A 30VDC
INDUCTIVE LOAD	6A 125VAC (POWER FACTOR 0.8) (3A 250VAC (P.F.0.8)
MECHANICAL LIFE	OVER 30,000 OPERATIONS (SWITCHING FREQUENCY 20 OPERATIONS/MINUTE)
ELECTRICAL LIFE	OVER 10,000 OPERATIONS (SAME AS ABOVE) (RATED LOAD)
INSULATION RESISTANCE	OVER 100MΩ (BY DC 500V TESTER)
VOLTAGE BREAKDOWN	AC 1000V/1 MIN (BETWEEN CONTACT & CASE)
CONTACT RESISTANCE	20mΩ MAXIMUM
AMBIENT TEMPERATURE	−10°C ~ +55°C
AMBIENT HUMIDITY	85%RH MAXIMUM

CIRCUIT	SWITCHING FUNCTION				
3P(SPDT)	A. ON - ON UL	B. ON - (ON)	C. ON - OFF - ON UL	D. ON - OFF - (ON)	E. (ON) - OFF - (ON)
6P(DPDT)	F. ON - ON UL	G. ON - (ON)	H. ON - OFF - ON UL	I. ON - OFF - (ON)	J. (ON) - OFF - (ON)

lso available in our economy line of silver plated contacts.

MIDGET ILLUMINATED PUSHBUTTON SWITCH (FOR P.C. MOUNT AND SOLDER TERMINAL)

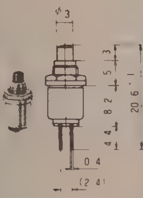


MS-800
(WITHOUT SNAP-IN PLATE)

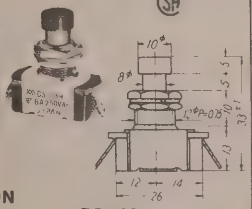
MS-810
(WITH SNAP-IN PLATE)

PUSHBUTTONS

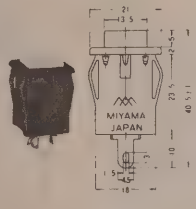
UL LISTED



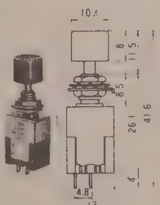
TINY PUSH-ON
MS-402



DS-139



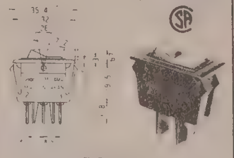
MS-078
MS-080
(WITH 6.3 VOLT LAMP)



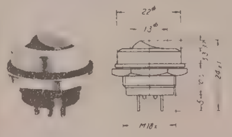
DS-195 2P
D-S-249 2P

ROCKERS

UL LISTED

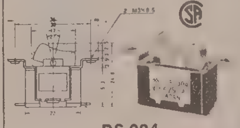


DS-322
(WITH NEON LAMP)



DS-062 (BLACK FRAME)
DS-063 (GOLD FRAME)

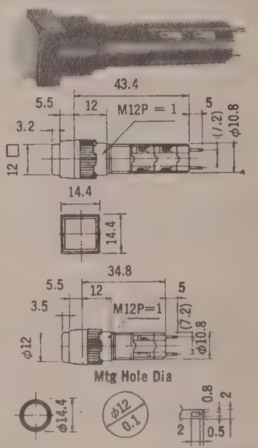
UL LISTED



DS-004

PUSHBUTTONS LED ILLUMINATED

DS-700 (ALTERNATING)
DS-710 (MOMENTARY)



BOTH MODELS ARE AVAILABLE WITH SQUARE OR ROUND SWITCH FACE.

Part No.	MS-800	MS-810	MS-402	MS-078	MS-080	DS-139	DS-195	DS-322	DS-062	DS-004	DS-700	DS-710
Model Type	Push-button Illuminated	Push-button Non-Illuminated	Push-button	Push-button with 6.3V Lamp	Push-button with 6.3V Lamp	Push-button	Push-button	Rocker with Neon Lamp	Rocker	Rocker	Push-button with LED	Push-button with LED
Rating	0.1A 30VDC	0.3A 30VDC	0.5A 125VAC	1A 125VAC	1A 125VAC	6A 250VAC	3A 125VAC	15A 125VAC	3A 750VAC	6A 250VAC	1A 250VAC	3A 125VAC
Circuit	A DPST B DPST C DPST D DPST E SPDT F SPDT	OFF-ON OFF-(ON) ON-OFF ON-(OFF) ON-ON ON-(ON)	2P(SPST)	2P(SPST)	2P(SPST)	2P(SPST)	2P(SPST)	2P(SPST)	2P(SPST) 3P(SPDT) 4P(DPST) 6P(DPDT)	2P(SPST)	(SPDT) (DPDT)	(SPDT) (DPDT)
Switching Function			(Push ON) Momentary	(Push ON) Momentary	(Push OFF) Momentary	ON-OFF Alternate	ON-OFF	ON-OFF	ON-OFF ON-ON	ON-OFF	ON-ON Alternate	ON- (ON) Momentary
Contact Resistance	2.5vDC 10mA 500mΩ (Max)		2.5VDC 1A20mΩor less	2.5VDC 1A 10mΩ or less		2.5VDC 1A 20mΩ or less				2.5VDC 10mΩ or less		
Insulation Resistance	500VDC 500mΩ (Min)			500VDC 100MΩ or more								
Voltage Breakdown	500VAC 1 Minute			1000VAC 1 Minute		1500VAC 1 Minute	1000VAC 1 Minute		1500VAC 1 Minute		1500VAC 1 Minute	1500VAC 1 Minute
Mounting Hole Dia. mm	12.6x12.6		5.2	18.5x18.5	18.5x18.5	12.5	6	28.5±0.1x 14±0.1	18	30	12	12

DSA offers a complete line of **MIYAMA** toggle switches, rocker switches, sub-miniature switches, pushbutton switches, lever switches and illuminated switches. **MIYAMA** . . . reliability and quality for over 50 years. For complete information on our wide range of products please contact: **DSA-DAI-ICHI SHOJI OF AMERICA, INC.**

150 Fifth Avenue, Suite 516, New York, NY 10011, (212) 691-9050.

eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC	alternating current
A/D	analog to digital
ADC	analog to digital converter
ADP	automatic data processing
AF	audio frequency
AFC	automatic frequency control
ALGOL	algorithmic language
AM	amplitude modulation
AND	a logical operator
AQL	acceptable quality level
ASCII	American national standard code for information interchange
AWG	American wire guage

B

BALUN	balanced to unbalanced
BASIC	beginners' all-purpose symbolic instruction code
BCD	binary-coded decimal
BNC	baby "N" connector
BUS	basic utility system

C

CAD	computer aided design
CAM	computer aided manufacture
CATV	cable television or community antenna television
CERMET	ceramic metal element
Comm.	communications
CMOS	complementary metal-oxide semiconductor
CPS	characters per second
CPU	central processing unit

D

D/A	digital to analog
DAC	digital to analog converter
DC	direct curent
DIL	dual in-line
DIP	dual in-line package
DPM	digital panel meter
DTL	diode transistor logic

E

EDP	electronic data processing
EBCDIC	extended binary coded decimal interchange code
EEPROM	electrically erasable PROM
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPROM	electrically programmable ROM
ESR	equivalent series resistance

F

FEP	fluorinated ethylene propylene Copolymar, 200° Teflon
FET	field-effect transistor
FM	frequency modulation
FORTRAN	formula translator

G

GaAsFET	gallium arsenide field effect transistor
GPIB	general purpose interface bus

H

HF	high frequency (3 to 30 MHz)
HIPOT	test, measurement and diagnostic equipment
HLL	high level language
HV	high voltage
Hz	Hertz

I

IC	integrated circuit
IF	intermediate frequency
IO	input/output (devices)
IR	insulation resistance (or) infrared

J

JFET	junction field effect transistor
JMOS	junction metal oxide semiconductor

K

kHz	kilohertz (10^3 hertz)
KSR	keyboard send receive

L

LC	inductance capacitance
LCD	liquid crystal display
LED	light-emitting diode
LF	low frequency (30 to 300 kHz)
LSI	large scale integration
LVDT	linear velocity displacement transformer

M

MATV	master antenna television
μF	microforad
MHz	megahertz
MOS	metal oxide semiconductor
MOSFET	metal oxide semiconductor field effect transistor
MOV	metal oxide varistor
MPU	microprocessor unit
MSI	medium scale integration

N

NBS	National Bureau of Standards
NIM	nuclear instrumentation module
NOR	not OR

O

OEM	original equipment manufacturer
OR	a logical operator

P

pF	picofarad
PC	printed circuit
PCB	printed circuit board
PIN	positive-intrinsic-negative (transistor)
PLA	programmable logic array
PPI	plan position indicator
PROM	programmable read only memory
PUT	programmable unijunction transistor

Q

QAM	quadrature amplitude modulation
Q (meter)	quality-factor meter

R

RAM	random access memory
RC	resistance-capacitance
RFI	radio frequency interference
RMS	root mean square
ROM	read only memory
RF	radio frequency
RFC	radio-frequency choke
RFI	radio-frequency interference
RTD	resistance-temperature detector
RTL	resistor transistor logic
RTV	room temperature vulcanizing
RW	read/write

S

SAS	silicon asymmetrical switch
SBC	single board (micro) computer
SBS	silicon bilateral switch
SCR	silicon-controlled rectifier
SIP	single in-line package
SSI	small scale integration
SSR	solid state relay
STL	Schottky transistor logic

T

TC	temperature coefficient
TCXO	temperature compensated crystal oscillator
TFE	tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL	transistor-transistor logic
TTY	teletypewriter

U

UHF	ultra high frequency (300 MHz to 3 GHz)
UL	Underwriters Laboratory
UPS	uninterruptible power supply

V

VAC	volts (of) alternating current
VAR	volt-ampere reactive
VCR	video cassette recorder
VDC	volts (of) direct current
VHF	very high frequency
VHSIC	very high speed integrated circuit
VLF	very low frequency (3 to 30 kHz
VLSI	very large scale integration
VRM	voice recognition module
VTVM	vacuum tube volt meter
VU	volume unit
VSWR	voltage standing wave ratio

W

WPS	word processing software

Y

YIG	yttrium iron garnet

Dreefs

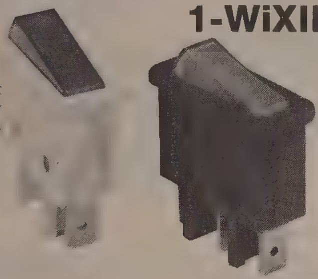
ROCKER SWITCHES

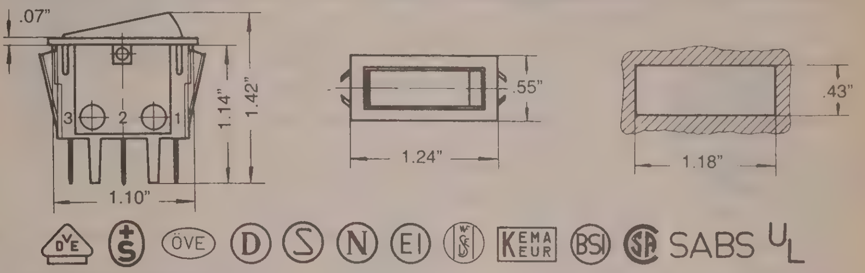
STANDARD FEATURES:

- All rocker switches rated at 16 amps @ 125/250VAC
- Includes dry circuit or high-inrush
- Maintained or momentary action
- Welded solid silver contacts
- Wide range of colors available
- VDE and other international approvals
- Body material: Nylon Type 6/6.(rated at 105°C)
- 2500V RMS Dielectric strength (Minimum)
- Greater than 3mm gap between contacts
- Greater than 4mm over-surface clearance
- Snap-in installation
- Single or Double Pole; single or double throw
- Molded or printed legends
- Illuminated or non-illuminated (Neon or incandescent)
- High-brightness, long-life neon
- Matching panel indicator styles
- Spade, solder lug or screw type terminals

When Dreefs says "standard", that's exactly what we mean. Standard features like switch ratings which give you an enormous degree of freedom when designing your product--and for not a penny more! Like a range of North American and European approvals unmatched by any other American switch manufacturer. Because we know that in your business, the ability of products to travel without hassle is important. And we know that one size--or color--or style does not fit all. When it comes to quality, reliability and performance, you'll find more choices at **Dreefs Switch** than anywhere else--because your special requirements are our standards.

1-WiXII

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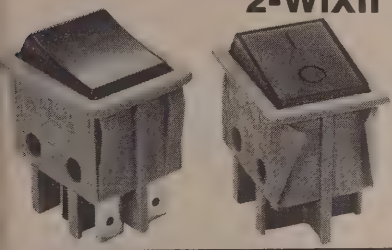
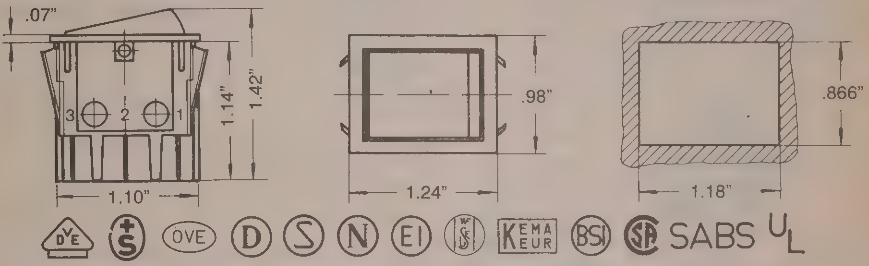
2-WiXII

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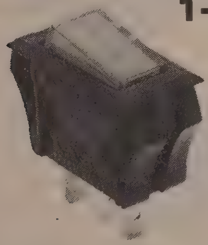
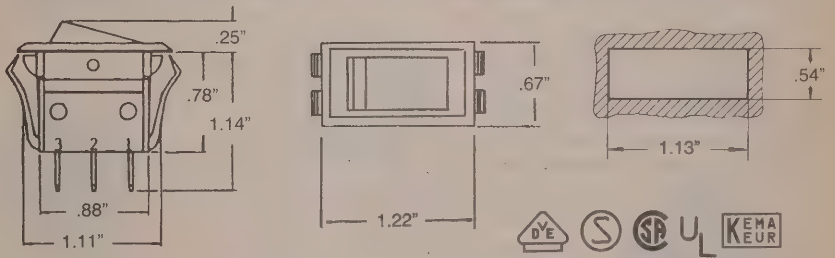
1-WiXIX

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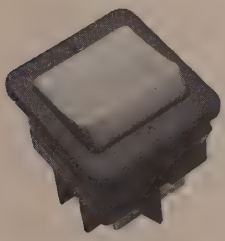
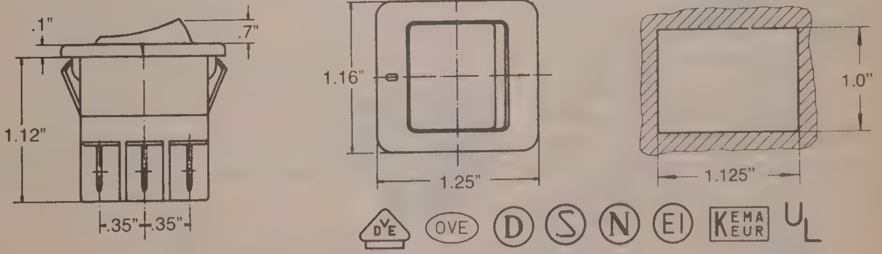
Wi26

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.7"
1.12"
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.35"
1.16"
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1.0"
1.125"
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Designed to provide users of the Carlingswitch Mini-Tippettes® with a high-quality second source product, the Wi26 series is fully compatible with the standard 1.0" X 1.125" panel cutout. Highly legible "1" and "0" numerals are molded directly into the bezel.

Dreefs

SWITCH INCORPORATED
3782 Hawthorn Court Waukegan, IL 60085
Phone: **312-662-7667** or: **800/323-9605**

SERIES WiXII ROCKER SWITCHES
STANDARD SWITCH STYLES

1-WiXII STANDARD

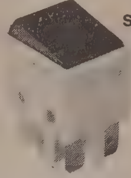
The Dreefs Series WiXII rocker switches are available in several different mounting, bezel, and rocker styles, as follows:

Standard. The Standard housing is characterized by a square-cornered bezel design and positive-grip mounting ears for snap-in mounting. These mounting ears provide a snug, wiggle-free installation in a wide range of panel thicknesses. Proper fit is assured by specifying panel thickness when ordering from the factory. Matching indicator housings and lenses are available in all colors. Paddle and splashguard version (not shown) are also available.

1-WiXII SOFTFORM

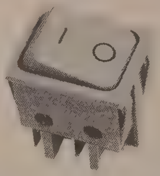
2-WiXII STANDARD

Softform.® The Softform housing features bezel contours which are slightly rounded on the top edge and at the corners. Serrated clips provide snap-in mounting and minimize lateral movement in the panel cutout. This bezel design gives a "softer" appearance to the mounted switch; while the serrated clip type of snap-in mounting provides easier switch removal from the panel when it is desired to gain access to the switch terminals. Matching indicator housings and lenses are available in all colors.

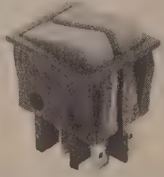

2-WiXII SERRATED CLIP

2-WiXII SOFTFORM

Hi-Tek. The new Hi-Tek housing incorporates variations of the features of the Standard and Softform versions, while displaying unique design characteristics of its own. The outside contours of the bezel are not so square as the Standard, nor as rounded as the Softform, however, the **inside** corners of the bezel have been rounded, to accomodate the rounded corners of the rocker design. Also, all edges of the rocker have been slightly rounded, to provide a clean, instrument-type appearance to the mounted switch. Serrated clips on each side of the switch body provide snap-in mounting and easy removal.


2-WiXII HI-TEK

2-WiXII STD DUAL


2-WiXII DUAL W/CLIPS

Dual. The Dual housing features a compartmentalized body which is designed to accomodate either: two individual switches, two individual indicators, or a combination switch and indicator. This housing is available in either the Standard or Softform design.

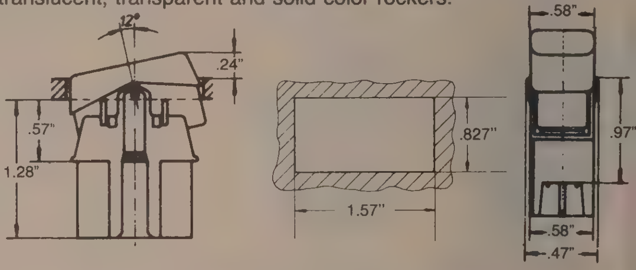
2-WiXII SOFTFORM DUAL

STANDARD FEATURES:

- All rocker switches rated at 16 Amps @ 125/250VAC
- Includes dry circuit or high-inrush
- Maintained or momentary action
- Welded solid silver contacts
- Wide range of colors available
- VDE and other international approvals
- Body material: Nylon Type 6/6.(rated at 105°C)
- 2500V RMS Dielectric strength (Minimum)
- Greater than 3mm gap between contacts
- Greater than 4mm over-surface clearance
- Snap-in installation
- Single or Double Pole; Single or Double Throw
- Molded or printed legends
- Illuminated or non-illuminated (Neon or incandescent)
- High-brightness, long-life neon
- Matching panel indicator styles
- Spade, solder lug or screw type terminals

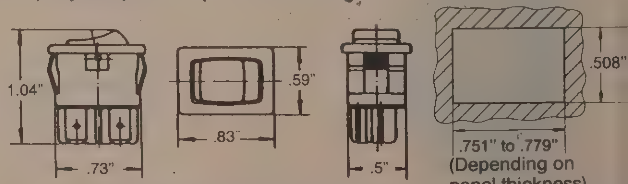
Wi23

These splashproof rocker switches offer a unique capability for contiguous mounting in a single panel cutout, so design freedom is built-in while fluids are sealed out. And you can select from translucent, transparent and solid color rockers.



Wi32

Subminiature rocker rated at 16 amps @ 125VAC or 10 amps @ 250VAC. Available in SPST, SPDT, and DPST. Uniquely adapted for power switching where size is a factor.



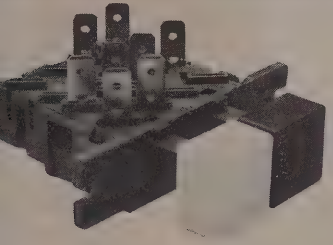
.751" to .779"
(Depending on
panel thickness)

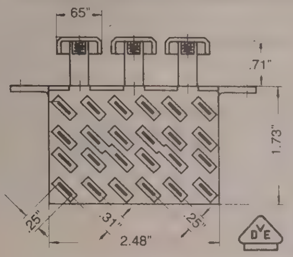
Dreefs
SWITCH INCORPORATED
3782 Hawthorn Court Waukegan, IL 60085
Phone: **312-662-7667** or: **800/323-9605**

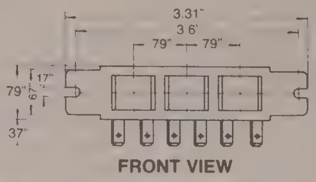
DPS PUSHBUTTONS The unique terminal arrangement and building block technique used in the design of this ushbutton allows great versatility in combining switching functions along a single shaft. For instance, power control as well as logic level witching are easily accomodated within one switch housing. The standard heavy-duty, heat resistant thermoplastic housing material llows this switch to be used in adverse temperature environments. Applications include computerized equipment, industrial controls, ppliances, office machines and instrumentation.

STANDARD FEATURES: DPS PUSHBUTTONS

- 1 to 8 pushbutton stations
- Rated at 16 Amp @ 125/250VAC
- Momentary or push-push action
- Wide variety of pushbutton styles
- Dry switching types available
- VDE and other International approvals
- Welded solid silver contacts
- Spade terminals
- Standard legends



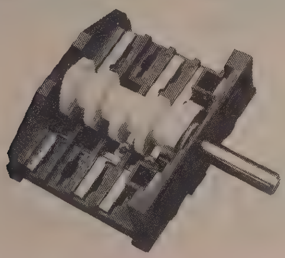


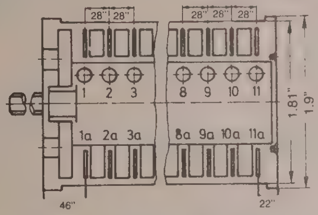


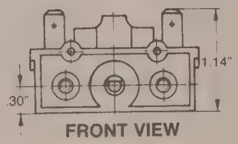
CH ROTARY SWITCH Featuring the capability of stacking up to 23 poles, each rated at 16 amp @ 125/250VAC, the elegantly simple design and rugged construction of this switch make it the designer's choice for long life and trouble-free operation. The standard solid silver contacts add a further dimension of reliability for thousands of power switching operations. The cam-action switching mechanism imparts a crisp, tactile feedback for positive detent.

STANDARD FEATURES: CH ROTARY

- 1 to 23 poles; 1 to 12 positions
- Flat or back-to-back construction
- Rated at 16 Amp @ 125/250VAC
- Variable shaft lengths and diameters
- Housing rated to withstand 85 C or 125 C
- VDE and other International approvals
- Available with matching thermostat attached
- Straight, angular or spur gear drive.
- Spade or solder lug terminals.







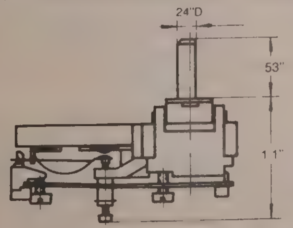
RTXI THERMOSTAT Designed to provide maximum reliability, repeatability and long life using time-proven materials and techniques, this thermostat utilizes a combination of a bi-metallic regulator with a snap-action switch mechanism, mounted on a ceramic base. Precise construction specifications permit factory adjustment within close tolerences, repeatable over at least 100,000 cyles. Various shaft lengths and diameters are standard. Spade or screw terminals in various configurations are available.

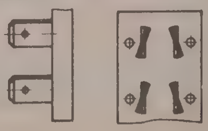
STANDARD FEATURES

- Rated at 16 amp @ 380VAC
- Available in either the 30° Series or the 50° Series, as follows:
- Temperature Differential: 1.0° C to 3° C (1.8° F to 5.4° F) within each temperature range.

SERIES	TEMPERATURE RANGE	
30° C (54° F)	5° C to 35° C	(41° F to 95° F)
	10° C to 40° C	(50° F to 104° F)
	15° C to 45° C	(59° F to 113° F)
	20° C to 50° C	(68° F to 122° F)

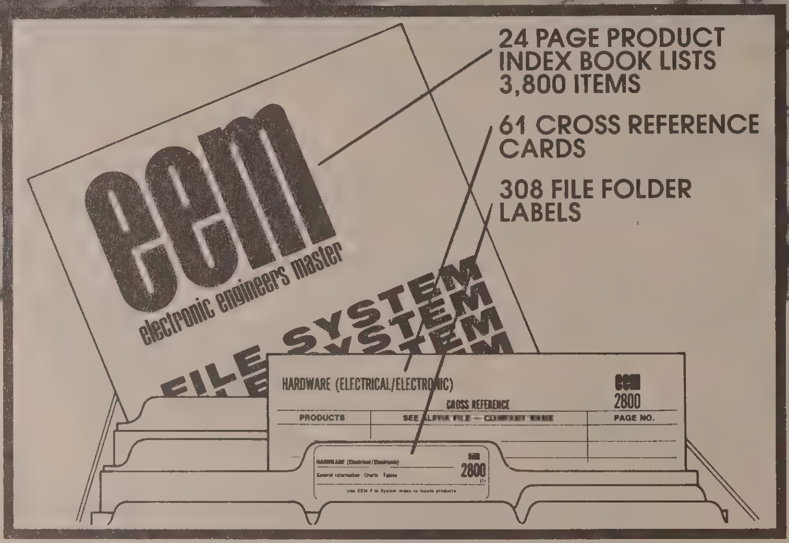
SERIES	TEMPERATURE RANGE	
50° C (90° F)	0° C to 50° C	(32° F to 122° F)
	5° C to 55° C	(41° F to 122° F)
	10° C to 60° C	(50° F to 140° F)
	15° C to 65° C	(59° F to 149° F)





Dreefs SWITCH INCORPORATED
3782 Hawthorn Court Waukegan, IL 60085

Phone: **312-662-7667** or: **800/323-9605**


24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
PRODUCTS
PAGE NO.
2800

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530

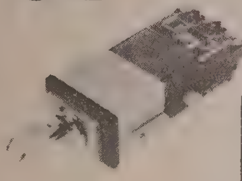
EAO SWITCHES

The World's Finest Switching Products

SERIES 01

- Round, Square, and Rectangular bezel-front panel mount
- All types mount in a round hole
- 1-4 poles
- Momentary or maintained action
- Maintained action is position indicating
- 2 piece lens cap. Can be separated for insertion of film
- 3 Switching elements—Snap, Low Level, Electronic
- 9 Lens colors
- Front panel replacement of lamps
- Lamps do not travel when the switch is actuated

SERIES 02

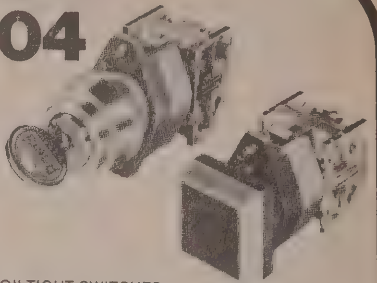


- Double pole, Double throw Momentary or Maintained action on both 380 Volt 10 Amp contacts
- Rectangular lens cap—9 colors
- Key Lock available

SERIES 03

- Full or split display—2 lamp
- Double pole, single or 2 button action
- Momentary, Maintained or combination
- Independent or Interlocked
- Key Switches available

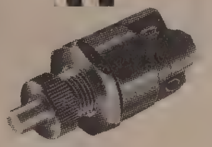
SERIES 04



OILTIGHT SWITCHES

- Round or Square panel front
- Snap together modular design
- Up to 8 pole switching
- Lighted and unlighted pushbuttons
- Mounts in 890" round hole
- Lever, Key-Lock, Emergency Stop actuators

SERIES 11

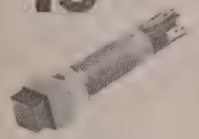


- Round lens cap—6 colors
- Mount from rear of panel
- 1-3 pole switching elements
- Momentary or maintained action
- Lamps replaceable from front
- LED available

SERIES 14

- Combines the rugged design of the 04 oiltight panel seal and the choice of switching elements
  - 5 Amps 250 volt
  - Low level or electronic elements
- Specifically designed for machine tool applications where low level or computer switching is required
- High-Security Key Lock available

SERIES 19

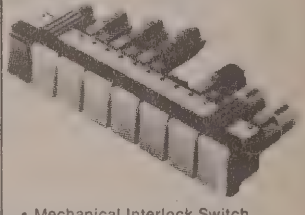


- Miniature lighted pushbuttons & indicators
- 9 mm (.354") centers.
- Round or square bezel
- Low level switching: μV up to 60V; μA up to 100 mA
- Momentary or maintained action (position indicating)

SERIES 21

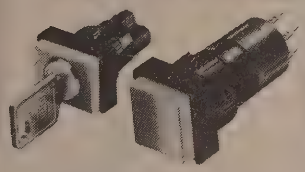
- Non illuminated version of the Series 11 with 6 different colored actuator button.
- Switching Elements
  - 5 Amp 240 volt 1 to 3 poles
  - Low level switch
  - Electronic switch Hall effect
- Momentary and maintained (position indicating) action

SERIES 30



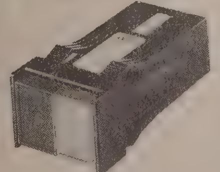
- Mechanical Interlock Switch
- 2—12 Switch units
- 5 different interlock combinations
- Slide Mechanism—All metal construction
- 3 Switching elements—Snap, Low Level, Electronic

SERIES 31/31LL



- Square or Rectangular bezel
- Flat or Concave lens
- 1–4 pole snap acting switch, Low Level or Electronic
- Lamp T-1 ¾ groove base
- Key Lock—round, square, rectangular with 3 levels of security: Low-Cost, Standard and High-Security

SERIES 41



- 2 lamp switch
- Full or split screen
- Same panel dimensions as 31 Series
- Soft mount—from front of panel
- Switching elements same as 31 Series

SERIES 51

- Combines style of Series 31 with oil and water tight features of Series 14.
- Integral 'O' ring seal; one-piece actuator; conforms to IP65 requirements
- 1-4 pole, snap-acting contacts, low level or electronic switching.
- Round, square and rectangular panel fronts; choice of 8 lens colors.

SERIES 98

- Oil/Watertight seal; built to IP67 standards
- 3 sizes; non-illuminated or illuminated (1 or 2 LED)
- Momentary or maintained action, SPDT, (Form C)
- Rated at 50 VAC/72 VDC
- Gold plated contacts; over 5 million operations

SERIES 99

LIGHTED KEYBOARD SWITCH

- Momentary and maintained action
- Gold contacts
- Long life—5 million operation minimum
- Low level switching —dry circuit
- Low constance resistance— 10 milli-ohms
- Low contact bounce, < 100μ sec

EAO Switch. You can feel the difference.

EAO SWITCH CORPORATION

P.O. Box 552, Milford, CT., 06460 • 203/877-4577 • TLX: EAO SWITCH MFRD 964347

CUTLER-HAMMER② PRODUCT SUMMARY

SWITCH SERIES Panel Mount	P.C. Board Mount	Page No.	MOMENTARY ACTION	ALTERNATE ACTION	SINGLE THROW	DOUBLE THROW	POWER SWITCHING	LOW LEVEL SWITCHING	U.L. LISTED SWITCHES	U.L. RECOGNIZED INDICATORS	C.S.A. CERTIFIED	1/2" SQUARE PUSHBUTTON	5/8" SQUARE PUSHBUTTON	5/8" x 1" RECTANGULAR PUSHBUTTON	3/4" SQUARE PUSHBUTTON	3/4" x 1" PUSHBUTTON	.73 x .97 PUSHBUTTON	SINGLE LAMP	DUAL LAMP	SINGLE LED-FLUSH	DUAL LAMP/SPLIT LEGEND	OPTIONAL BARRIERS	MATCHING INDICATOR
200	202	3	●	●		●	●	●	●		●			●								①	
201	203	3	●	●		●	●	●	●		●			●				●				①	
204	205	3								●	●			●				●				①	●
206	207	4	●	●		●	●	●	●		●			●					●		●	①	
208	209	4								●	●			●					●		●	①	●
220	222	5	●	●		●	●	●	●		●		●									①	
221	223	5	●	●		●	●	●	●		●		●					●				①	
224	225	5								●	●		●					●				①	●
231	233	6	●	●		●	●	●	●		●		●							●		①	
234	235	6								●	●		●							●		①	●
244	245	7								●	●		●						●		●	①	●
580	582	8	●	●	●			●				●											
581	583	8	●	●	●			●				●						●					
586	587	8										●						●					●
611	616	10	●	●		●	●	●	●				●					●				●	
621	626	10											●					●					●
728	748	11	●	●		●	●	●					●						●		●	●	
738	758	11											●						●		●	●	●
770		18	●	●		●	●	●	●		●						●	●	●		●	●	
775		18								●	●						●	●	●		●	●	●
810	812	17	●	●		●	●	●	●		●					●		●				●	
815	817	17								●	●					●		●				●	●
820	822	16	●	●		●	●	●	●		●				●			●				●	
825	827	16								●	●				●			●				●	●
849	852	12	●	●		●	●	●	●		●		●					●				●	
845	842	12								●	●		●					●				●	●
850	854	13	●		●			●					●					●					
856	857	13											●					●					●
860	862	14	●	●	●		●	●	●		●		●									●	
861	863	14	●	●	●		●	●	●		●		●					●				●	
845	842	14								●	●		●					●				●	●
880	882	9	●	●	●		●	●	●		●	●											
881	883	9	●	●	●		●	●	●		●	●						●					
886	887	9								●	●	●						●					●
955	959	15	●		●			●					●					●					
965	969	15											●					●					●

① Consult the Sales Office nearest you. See listings on page 22.
② "Formerly named Compu-Lite Products."

U.L. & C.S.A. APPROVAL NUMBERS

U.L. Where switches are U.L. Listed, approval is listed under file number E52533, Guide WOYR. The Series 775 Indicator is U.L. Recognized under File Number E73960, Volume 1.

C.S.A. Where switches are C.S.A. Certified, Approval number is 41964, Guide 184-N-90, Class 3211.

EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

GENERAL INFORMATION & TECHNICAL DISCUSSION

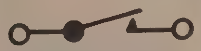
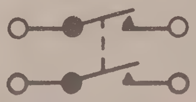
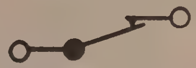
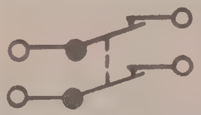
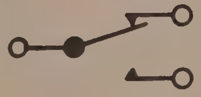
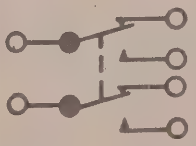
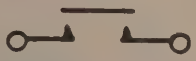
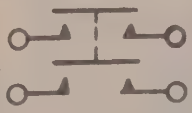
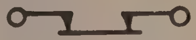
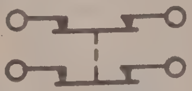
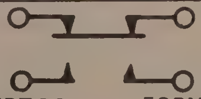
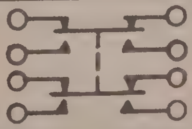
Three major terms designate a switch's function — POLE, THROW and BREAK. The term POLE refers to the number of conductors that can be controlled by the switch. A single-pole switch is capable of interrupting the current in a single conductor of the circuit. A double-pole switch is capable of simultaneously interrupting the current in two separate conductors. The term THROW indicates the number of circuits the switch can control. The moving contact member of a single-throw switch completes only one circuit. A double-throw switch permits its moving contact element to alternately complete two extreme positions. The term BREAK refers to the breaking or opening of a circuit. Single-break means that the contacts are separated at only one place. A double-break switch has two pairs of contacts that open the circuit at two places. A double-break switch provides greater volume of contact material, permitting greater heat dissipation and thereby longer switch life. A double-break switch also has twice the voltage breaking capacity, a desirable feature for DC circuit applications. **ALL CUTLER-HAMMER SINGLE-THROW SWITCHES ARE DOUBLE-BREAK.**

NORMALLY-OPEN OR NORMALLY-CLOSED?

The terms normally-open and normally-closed refer to the physical position of the contacts in reference to each other. In a normally-open switch, the contacts are separated or open; thus the circuit is open and no current can flow through the switch. Typical is a pushbutton switch where depressing the pushbutton causes the contact element to move to the other of its extreme positions and close the circuit. In a normally-closed switch, the contacts are closed, thereby making electrical contact and electrical circuit. Operation of the switch causes the contact element to move and open the circuit.

CIRCUITRY ILLUSTRATIONS

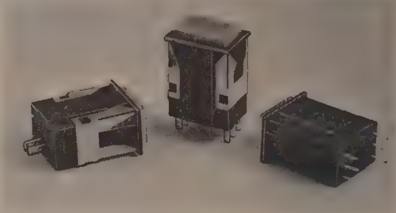
Below are illustrated the most common circuits found in pushbutton switches. The "FORM" designations are the old relay circuit terminology still used today by some switch manufacturers.

	CUTLER-HAMMER PRODUCTS		CUTLER-HAMMER PRODUCTS
 SPST NO FORM A	Use double-break, Form X, below	 DPST NO FORM AA	Use double-break, Form XX, below
 SPST NC FORM B	Use double-break, Form Y, below	 DPST NC FORM BB	Use double-break, Form YY, below
 SPDT FORM C	200, 201, 202, 203 Page 3 206, 207 Page 4 220, 221, 222, 223 Page 5 231 & 233 Page 6 849 & 852 Page 12 820 & 822 Page 16 810 & 812 Page 17 611 & 616 Page 10 728 & 748 Page 11	 DPDT FORM CC	200, 201, 202, 203 Page 3 206, 207 Page 4 220, 221, 222, 223 Page 5 231 & 233 Page 6 849 & 852 Page 12 820 & 822 Page 16 810 & 812 Page 17 611 & 616 Page 10 728 & 748 Page 11
 SPST NO DB FORM X	850 & 854 Page 13 880, 881, 882, 883 Page 9 860, 861, 862, 863 Page 14 955 & 959 Page 15 580, 581, 582, 583 Page 8	 DPST NO DB FORM XX	850 & 854 Page 13 880, 881, 882, 883 Page 9 860, 861, 862, 863 Page 14 955 & 959 Page 15 580, 581, 582, 583 Page 8
 SPST NC DB FORM Y	850 & 854 Page 13 955 & 959 Page 15 580, 581, 582, 583 Page 8	 DPST NC DB FORM YY	850 & 854 Page 13 955 & 959 Page 15 580, 581, 582, 583 Page 8
 SPDT DB FORM Z OR DPST NO/NC DB	850 & 854 Page 13 955 & 959 Page 15 580, 581, 582, 583 Page 8 770 Page 18	 DPDT DB FORM ZZ	770 Page 18

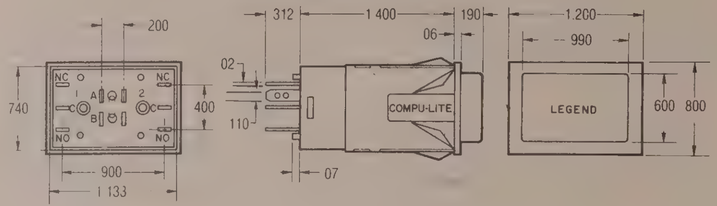
EATON

CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

200 SERIES	NON ILLUMINATED PANEL MOUNT	201 SERIES	ILLUMINATED PANEL MOUNT	202 SERIES	NON ILLUMINATED PRINTED CIRCUIT BOARD MOUNT	203 SERIES	ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

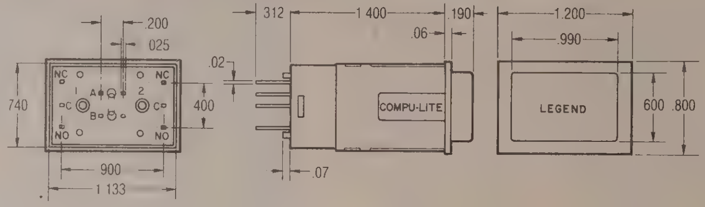


200 & 201 PANEL MOUNT

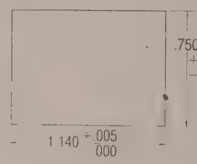


APPROXIMATE DIMENSIONS

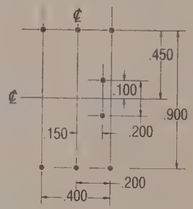
202 & 203 PRINTED CIRCUIT BOARD MOUNT



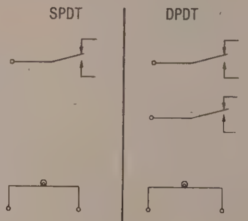
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062″



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

SWITCH ELECTRICAL RATINGS
- Silver Contacts
  5 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  0.1 A @ 125 VAC/DC
- U.L. Listed
- C.S.A. Certified

INDICATOR LISTINGS
- U.L. Recognized
- C.S.A. Certified

TERMINATION TYPES
- .020″ x .110″ Terminations suitable for solder or female 110 connectors
- .020″ x .025″ Terminations for printed circuit board mount

PUSHBUTTONS
- 5/8″ x 1″ rectangular
- Matte Style "M" Finish
- Plain, engraved, or hot stamped

MOUNTING
- Snap in panel mounting
- Stainless Steel retaining clips
- .030″ to .188″ Panel Thickness
- P.C. Board mounting

LAMPS
- One T 1-3/4 Wedge Base
- Incandescent
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .190″

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN. DO NOT USE DASHES (-) IN PART NUMBER.

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No. of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th>Pushbutton Style</th><th>Color</th><th>Pushbutton Height</th><th>Lamp</th></tr>
<tr><td>200 or 201 (Panel Mount) or 202 or 203 (P.C. Board Mount)</td><td>K Switch</td><td>1 Mom
2 Alt</td><td>1 SPDT
2 DPDT</td><td>8 Silver
9 Gold
6 DPDT: top pole silver bottom pole gold</td><td>1 Solder
2 P.C. Board</td><td>0 No Barriers
1 Vertical, Barriers ❶
2 Horizontal Barriers ❶</td><td rowspan="3">M matte</td><td rowspan="3">00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
10 Amber
12 Lunar White
13 Light Green
15 Clear
20 Gray
21 Black</td><td rowspan="3">A 19″ Full</td><td rowspan="3">Use two digit part number from bulb Chart III on page 19</td></tr>
<tr><th>Matching Indicator</th><th>Product Type</th><th colspan="3">Terminations</th><th colspan="2">Mounting</th></tr>
<tr><td>204 (Panel Mount) or 205 (P.C. Board Mount)</td><td>L Indicator</td><td colspan="3">1 Solder
2 P.C. Board</td><td colspan="2">0 No Barriers
1 Vertical Barriers ❶
2 Horizontal Barriers ❶</td></tr>
</table>

❶ Contact the Sales Office nearest you. See listings on page 22.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

201K11910M01A30

DESCRIBES: Series 201 Switch, Panel Mount, Momentary Action, SPDT, Gold Contacts, Solder Terminations, No Barriers, Style M matte pushbutton, white, .19″ above panel pushbutton height, with ASA No. 56, 5 volt incandescent lamp installed.

205L20M03A31

DESCRIBES: Series 205 Indicator Light, P.C. Board Mount, P.C. Board Terminations, flat bezel, No Barriers, Style M matte pushbutton, green, .19″ above panel pushbutton height, with ASA No. 79, 6 volt incandescent lamp installed.

EATON

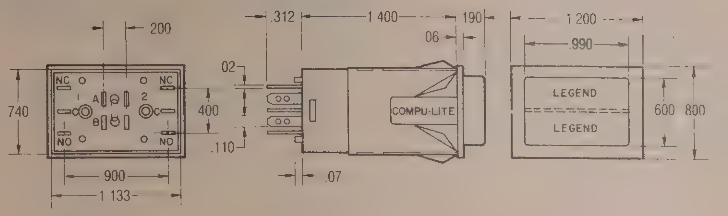
CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

206 SERIES ILLUMINATED PANEL MOUNT

207 SERIES ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

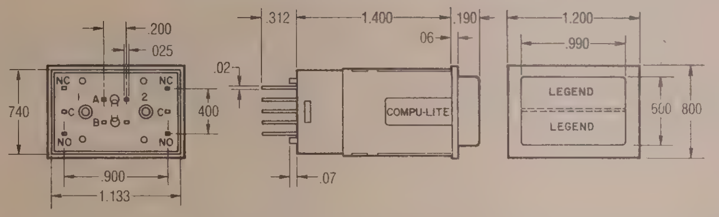
DUAL-LAMP-HORIZONTAL SPLIT LENS OR FULL CAP

206 PANEL MOUNT

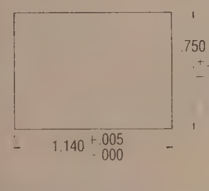


APPROXIMATE DIMENSIONS

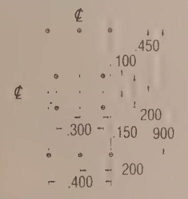
207 PRINTED CIRCUIT BOARD MOUNT



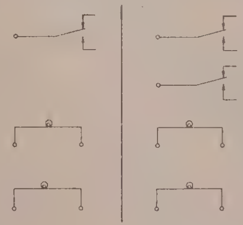
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT
- 2 independent lamp circuits

SWITCH ELECTRICAL RATINGS
- Silver Contacts
  5 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  0.1 A @ 125 VAC/DC
- U.L. Listed
- C.S.A. Certified

INDICATOR LISTINGS
- U.L. Recognized
- C.S.A. Certified

TERMINATION TYPES
- .020" x .110" Terminations suitable for solder or female 110 connectors
- .020" x .025" Terminations for printed circuit board mount

PUSHBUTTONS
- 5/8" x 1" rectangular
- Matte Style "M" Finish
- Full or Horizontal Split Lens
- Plain, engraved, or hot stamped

MOUNTING
- Snap in panel mounting
- Stainless Steel retaining clips
- .030" to .188" Panel Thickness
- P.C. Board mounting

LAMPS
- Two T 1-3/4 Wedge Base Lamps
- Incandescent
- Front Relampable
- Lamps stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .190"

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN. DO NOT USE DASHES (-) IN PART NUMBER.

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th>Pushbutton Style</th><th>Full Cap or Top Lens Color</th><th>Btm. Lens Color ②</th><th>Pushbutton Height</th><th>Lamps (accepts 2)</th></tr>
<tr><td>206
(Panel Mount)
or
207
(P C Board Mount)</td><td>K Switch</td><td>1 Mom
2 Alt</td><td>1 SPDT
2 DPDT</td><td>8 Silver
9 Gold
6 DPDT. top pole silver bottom pole gold</td><td>1 Solder
2 P.C. Board</td><td>0 No Barriers
1 Vertical Barriers ①
2 Horizontal Barriers ①</td><td rowspan="3">M matte</td><td rowspan="3">00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
10 Amber
12 Lunar White
13 Light Green
15 Clear
20 Gray
21 Black</td><td rowspan="3">00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
10 Amber
12 Lunar White
13 Light Green
15 Clear
20 Gray
21 Black</td><td rowspan="3">A .19" Full
S 19" Split</td><td rowspan="3">Use two digit part number from bulb Chart III on page 19</td></tr>
<tr><th>Matching Indicator</th><th>Product Type</th><th colspan="3">Terminations</th><th colspan="2">Mounting</th></tr>
<tr><td>208
(Panel Mount)
or 209 (P C. Board Mount)</td><td>L Indicator</td><td colspan="3">1 Solder
2 P.C. Board</td><td colspan="2">0 No Barriers
1 Vertical Barriers ①
2 Horizontal Barriers ①</td></tr>
</table>

① Contact the Sales Office nearest you. See listings on page 22.
② For full cap styles this code is not required.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

207K11910M0501S31
DESCRIBES: Series 207 Switch, P.C. Board Mount, Momentary Action, SPDT, Gold Contacts, Solder Terminations, No Barriers, Style M matte pushbutton, blue and white split lens cap, .19" above panel pushbutton height, with 2 ASA No. 79, 6 volt incandescent lamps installed.

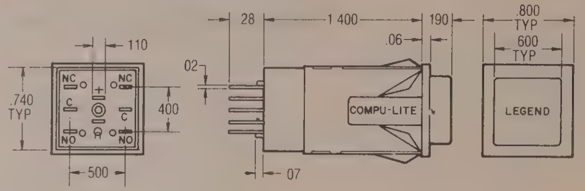
208L10M0203S31
DESCRIBES: Series 208 Indicator Light, Panel Mount, Solder Terminations, No Barriers, Style M matte pushbutton, red and green split lens cap, .19" above panel pushbutton height, with 2 ASA No. 79, 6 volt incandescent lamps installed.

EATON

CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

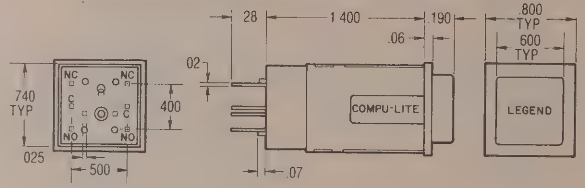
220 SERIES	NON ILLUMINATED PANEL MOUNT	**221 SERIES**	ILLUMINATED PANEL MOUNT	**222 SERIES**	NON ILLUMINATED PRINTED CIRCUIT BOARD MOUNT	**223 SERIES**	ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

220 & 221 PANEL MOUNT

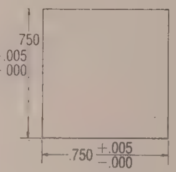


APPROXIMATE DIMENSIONS

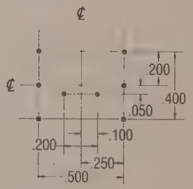
222 & 223 PRINTED CIRCUIT BOARD MOUNT



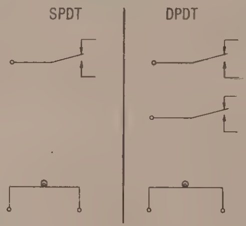
MOUNTING HOLE



P.C. BOARD LAYOUT❶
Hole Diameter .062"



CIRCUITRY



❶ P.C. Board layout for Series 225 is on page 7.

SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

SWITCH ELECTRICAL RATINGS
- Silver Contacts
  5 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  0.1 A @ 125 VAC/DC
- U.L. Listed
- C.S.A. Certified

INDICATOR LISTINGS
- U.L. Recognized
- C.S.A. Certified

TERMINATION TYPES
- .020" x .110" Terminations suitable for solder or female 110 connectors
- .020" x .025" Terminations for printed circuit board mount

PUSHBUTTONS
- 5/8" square
- Matte Style "M" Finish
- Plain, engraved or hot stamped

MOUNTING
- Snap in panel mounting
- Stainless Steel retaining clips
- .030" to .188" Panel Thickness
- P.C. Board mounting

LAMPS
- One T 1-3/4 Wedge Base
- Incandescent
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .190"

ORDERING INFORMATION

**CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.**

Switch Series	Product Type	Action	No of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Pushbutton Height	Lamp
220 or 221 (Panel Mount) or 222 or 223 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT	8 Silver 9 Gold 6 DPDT: top pole silver bottom pole gold	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers ❷ 2 Horizontal Barriers ❷	M matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 10 Amber 12 Lunar White 13 Light Green 15 Clear 20 Gray 21 Black	A 19" Full	Use two digit part number from bulb Chart III on page 19

Matching Indicator	Product Type	Terminations	Mounting
224 (Panel Mount) or 225 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers ❷ 2 Horizontal Barriers ❷

❷ Contact the Sales Office nearest you. See listings on page 22.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

222K12620M03A

DESCRIBES: Series 220 Switch, P.C. Board Mount, Momentary Action, DPDT. Top pole silver contacts, Bottom pole gold contacts. P C Board Terminations, No Barriers, Style M matte pushbutton, green, 19" above panel pushbutton height

225L20M04A33

DESCRIBES: Series 225 Indicator Light, P.C. Board Mount, P.C. Board Terminations, No Barriers, Style M matte pushbutton, yellow, 19" above panel pushbutton height, with ASA No. 86, 6.3 volt incandescent lamp installed.

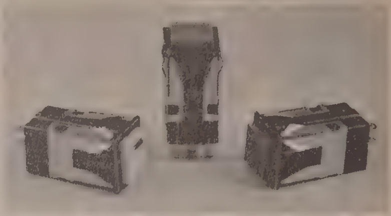
Eaton Corporation/Cutler Hammer; 4201 N. 27th Street, Milwaukee WI 53216 • (414) 449-7487

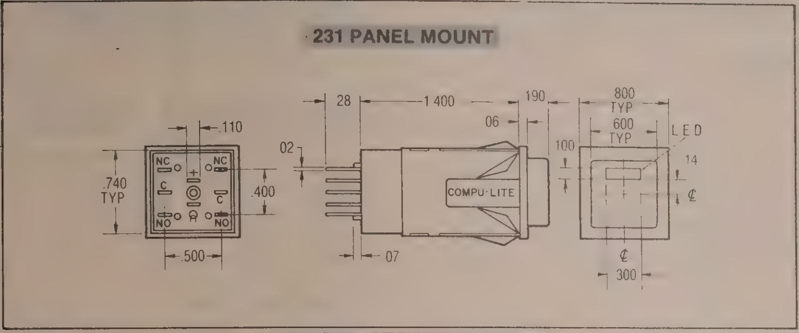
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

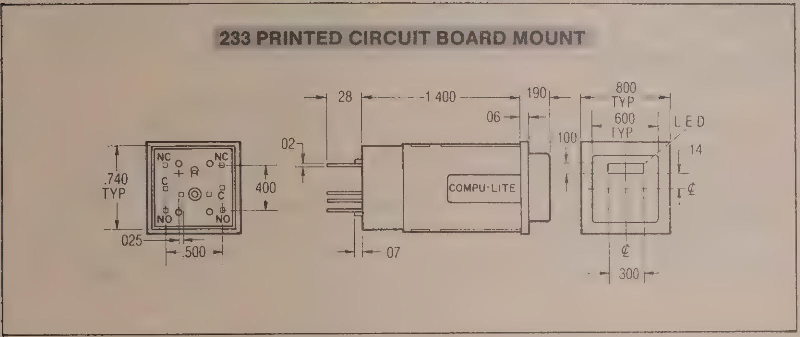
231 SERIES LED DISPLAY PANEL MOUNT

233 SERIES LED DISPLAY PRINTED CIRCUIT BOARD MOUNT





APPROXIMATE DIMENSIONS



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

SWITCH ELECTRICAL RATINGS
- Silver Contacts
  5 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  0.1 A @ 125 VAC/DC
- U.L. Listed
- C.S.A. Certified

INDICATOR LISTINGS
- U.L. Recognized
- C.S.A. Certified

TERMINATION TYPES
- .020″ x .110″ Terminations suitable for solder or female 110 connectors
- .020″ x .025″ Terminations for printed circuit board mount

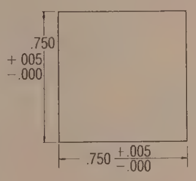
PUSHBUTTONS
- 5/8″ square
- Matte Style "M" Finish
- Plain, engraved, or hot stamped

MOUNTING
- Snap in panel mounting
- Stainless Steel retaining clips
- .030″ to .188″ Panel Thickness
- P.C. Board mounting

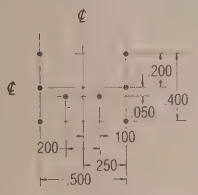
LAMPS
- One rectangular LED flush with cap
- Various voltages available
- Diode protection available

PUSHBUTTON TRAVEL
- .190″

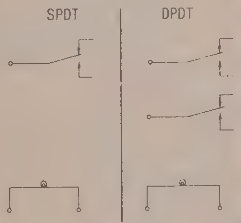
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062″



CIRCUITRY



ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Pushbutton Height	Lamp
231 (Panel Mount) or 233 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT	8 Silver 9 Gold 6 DPDT: top pole silver bottom pole gold	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers ➊ 2 Horizontal Barriers ➊	M matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 10 Amber 12 Lunar White 13 Light Green 15 Clear 20 Gray 21 Black	A 19″ Full	Use two digit part number from bulb Chart III on page 19

Matching Indicator	Product Type	Terminations	Mounting
234 (Panel Mount) or 235 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C Board	0 No Barriers 1 Vertical Barriers ➊ 2 Horizontal Barriers ➊

➊ Contact the Sales Office nearest you. See listings on page 22.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

231K22910M04A02

DESCRIBES: Series 231 Switch, Panel Mount, Alternate Action, DPDT, Gold Contacts, Solder Terminations, No Barriers, Style M matte pushbutton, yellow, .19″ above panel pushbutton height, with red LED for 5 VDC operation without diode protection.

234L10M02A12

DESCRIBES: Series Indicator Light, Panel Mount, Solder Terminations, No Barriers, Style M matte pushbutton, red, .19″ above panel pushbutton height, with red LED for 5 VDC operation with diode protection.

Cutler-Hammer Page 6

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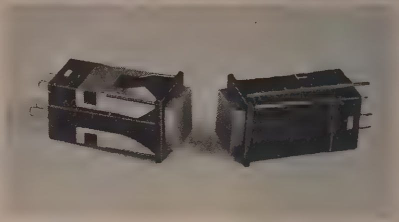
EATON

CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

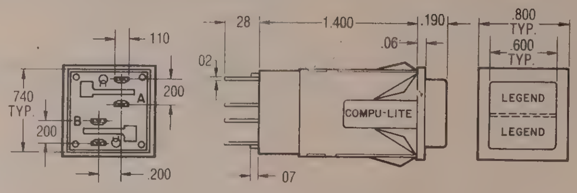
244 SERIES PANEL MOUNT

245 SERIES PRINTED CIRCUIT BOARD MOUNT



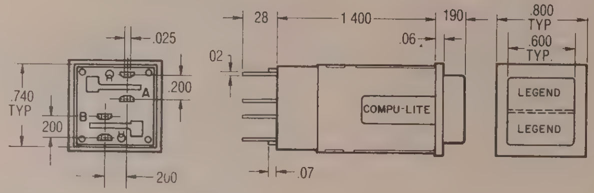
DUAL-LAMP INDICATORS WITH SPLIT LENS OR FULL CAP

244 PANEL MOUNT

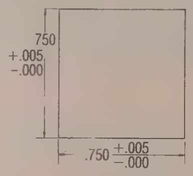


APPROXIMATE DIMENSIONS

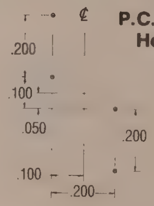
245 PRINTED CIRCUIT BOARD MOUNT



MOUNTING HOLE



P.C. BOARD LAYOUT ①
Hole Diameter .062″



① For P.C. Board layout on 225 Series shown on page 5 eliminate two bottom terminals.

SPECIFICATIONS

— Pushbutton style indicators match 5/8″ square lighted switches

CIRCUITRY
— Two independent lamp circuits

LISTINGS
— U.L. Recognized
— C.S.A. Certified

TERMINATION TYPES
— .025″ x .110″ Terminations suitable for solder or female 110 connectors
— .020″ x .025″ Terminations for printed circuit board mount

PUSHBUTTONS
— 5/8″ square
— Matte Style "M" Finish
— Same variety of colors as used on 200 Series switches
— Full or horizontal split lens
— Plain, engraved, or hot stamped

MOUNTING
— Snap in panel mounting
— Stainless Steel retaining clips
— .030″ to .188″ Panel Thickness
— P.C. Board mounting

LAMPS
— Two T 1-3/4 Wedge Base Lamps
— Incandescent
— Front Relampable

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN. DO NOT USE DASHES (-) IN PART NUMBER.

Indicator	Product Type	Terminations	Mounting	Pushbutton Style	Full Cap or Top Lens Color	Btm Lens Color ③	Pushbutton Height	Lamps
244 (Panel Mount) or 245 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers ② 2 Horizontal Barriers ②	M matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 10 Amber 12 Lunar White 13 Light Green 15 Clear 20 Gray 21 Black	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 10 Amber 12 Lunar White 13 Light Green 15 Clear 20 Gray 21 Black	A .19″ Full S .19″ Split	Use two digit part number from bulb Chart III on page 19

② Contact the Sales Office nearest you. See listings on page 22.
③ For full cap styles this code is not required.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

244L10M04A30

DESCRIBES: Series 244 Indicator Light, Panel Mount, Solder Terminations, No Barriers, Style M matte pushbutton, yellow, .19″ above panel pushbutton height, with 2 ASA No. 56, 5 volt incandescent lamps installed.

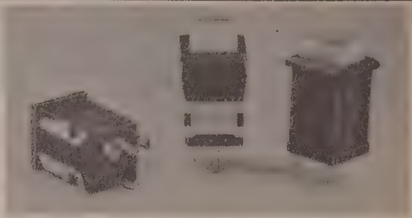
245L20M0203S31

DESCRIBES: Series 245 Indicator Light, P.C. Board Mount, P.C. Terminations, No Barriers, Style M matte pushbutton, red and green split lens cap, .19″ above panel pushbutton height, with 2 ASA No. 79, incandescent lamps installed.

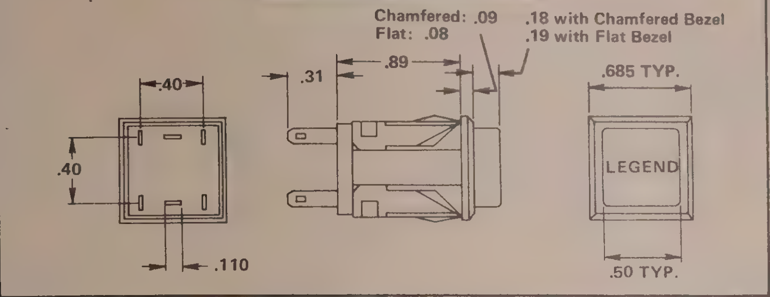
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

580 SERIES	NON ILLUMINATED PANEL MOUNT	**581 SERIES**	ILLUMINATED PANEL MOUNT	**582 SERIES**	NON ILLUMINATED PRINTED CIRCUIT BOARD MOUNT	**583 SERIES**	ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

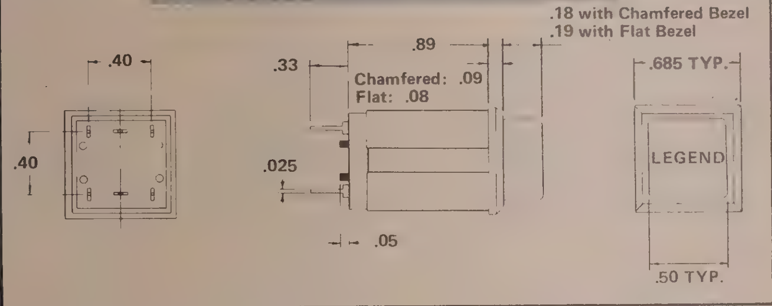


580 & 581 PANEL MOUNT

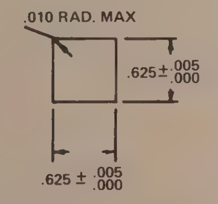


APPROXIMATE DIMENSIONS

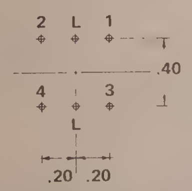
582 & 583 PRINTED CIRCUIT BOARD MOUNT



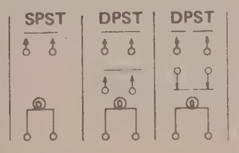
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Double break
- SPST or DPST

ELECTRICAL RATINGS
- Silver Plated Contacts 1 Amp @ 125 VAC
- Gold Plated Contacts for low level

TERMINATION TYPES
- .012" x .110" Terminations suitable for solder or female 110 connectors
- .012" x .025" Terminations for printed circuit board mount

PUSHBUTTONS
- 1/2" SQUARE
- .18" height above bezel (.19" w/flat bezel)
- Translucent, Style "T" or Matte Style "M"
  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .625" square cutout
- Choice of two Bezel Styles: Chamfered or Flat
- Stainless Steel retaining clips
- 1/16" to 3/16" Panel Thickness
- P.C. Board mounting on .685 centers min.

LAMPS
- One T 1-3/4 Wedge Base
- Incandescent
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .170"

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Height	Lamp
580 or 581 (Panel Mount) or 582 or 583 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPST NO 2 SPST NC 3 DPST NO 4 DPST NC 5 DPST NO/NC	5 Silver Plate 9 Gold Plate	1 Solder 2 PC Board	0 Chamfered bezel - no barriers 1 Flat bezel - no barriers	T translucent M matte (see page 20)	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 12 Lunar White 15 Clear 21 Black	A .18" or .19"	Use two digit part number from page 19 Chart III

Matching Indicator	Product Type		Terminations	Mounting
586 (Panel Mount) or 587 (P.C. Board Mount)	L Indicator		1 Solder 2 P.C. Board	0 Chamfered bezel - no barriers 1 Flat bezel - no barriers

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

581K11910T01A30
DESCRIBES: Series 581 Switch, Panel Mount, Momentary Action, SPST NO, Gold Contacts, Solder Terminations, chamfered bezel, No Barriers, Style T translucent pushbutton, white, .18" above panel pushbutton height, with ASA No. 56, 5 volt incandescent lamp installed.

587L21M03A31
DESCRIBES: Series 587 Indicator Light, P.C. Board Mount, P.C. Board Terminations, flat bezel, No Barriers, Style M matte pushbutton, green, .19" above panel pushbutton height, with ASA No. 79, 6 volt incandescent lamp installed.

Cutler-Hammer Page 8

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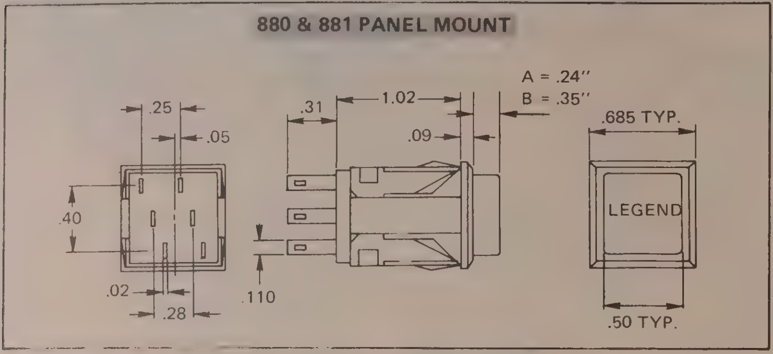
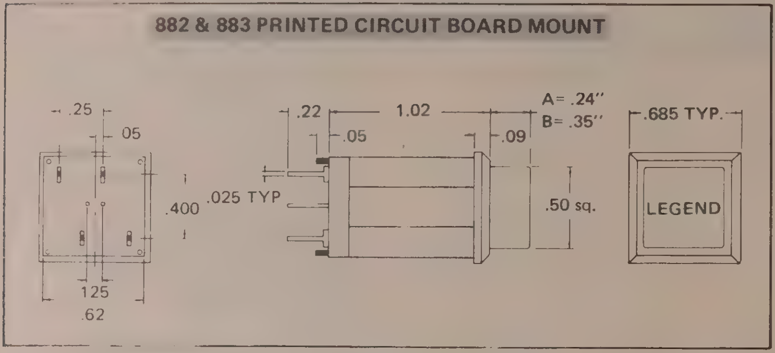
EATON

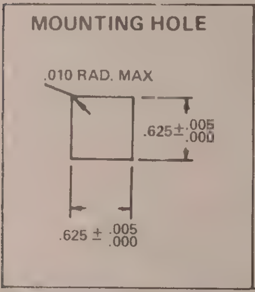
CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

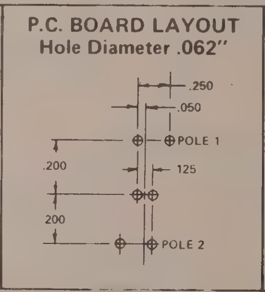
880 SERIES	NON-ILLUMINATED PANEL MOUNT	881 SERIES	ILLUMINATED PANEL MOUNT	882 SERIES	NON ILLUMINATED PRINTED CIRCUIT BOARD MOUNT	883 SERIES	ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

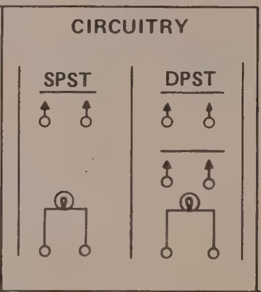

880 & 881 PANEL MOUNT

APPROXIMATE DIMENSIONS


882 & 883 PRINTED CIRCUIT BOARD MOUNT


MOUNTING HOLE


P.C. BOARD LAYOUT
Hole Diameter .062″


CIRCUITRY

SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Double break
- SPST or DPST, normally open

ELECTRICAL RATINGS
- Silver Contacts
  6 Amps @ 125 VAC or
  3 Amps @ 250 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed
- C.S.A. Certified

TERMINATION TYPES
- .025″ x .110″ Terminations suitable for solder or female 110 connectors
- .025″ square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 1/2″ SQUARE
- 2 Heights above bezel:
  A = .24″
  B = .35″
- Translucent, Style "T" or Matte Style "M" only
  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .625″ square cutout
- Stainless Steel retaining clips
- 1/16″ to 3/16″ Panel Thickness
- P.C. Board mounting on .685 centers

LAMPS
- One T 1-3/4 Bi Pin Base
- Incandescent, Neon or LED
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .220″

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Height	Lamp
880 or 881 (Panel Mount) or 882 or 883 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPST 3 DPST	8 Silver 9 Gold 6 DPST: top pole silver bottom pole gold	1 Solder 2 PC Board	0 No Barriers	T translucent M matte (see page 20)	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 12 Lunar White 15 Clear 21 Black	A 24″ B .35″	Use two digit part number from page 19 Chart I, IV, VI

Matching Indicator	Product Type	Terminations	Mounting
886 (Panel Mount) or 887 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers

EXAMPLES:

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

881K23810T02A13

DESCRIBES: Series 881 Switch, Panel Mount, Alternate Action, DPST, silver contacts, solder terminations, No Barriers, Style T translucent pushbutton, red, .24″ above panel pushbutton height, with ASA No. 7387, 28 volt incandescent lamp installed.

886L10M04B03

DESCRIBES: Series 886 Indicator Light, Panel Mount, solder terminations, No Barriers, Style M matte pushbutton, yellow, .35″ above panel pushbutton height, with ASA No. 7945, 6 volt incandescent lamp installed.

Cutler-Hammer Page 9

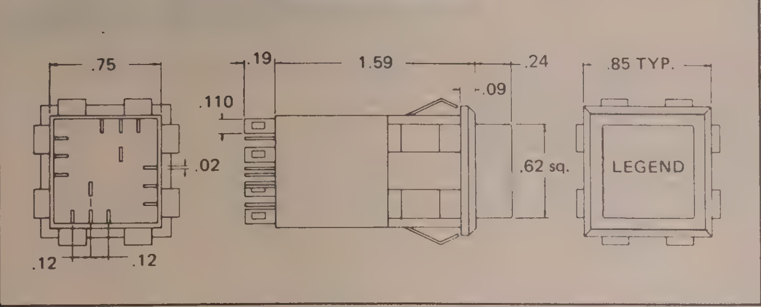
EATON

CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

611 SERIES PANEL MOUNT

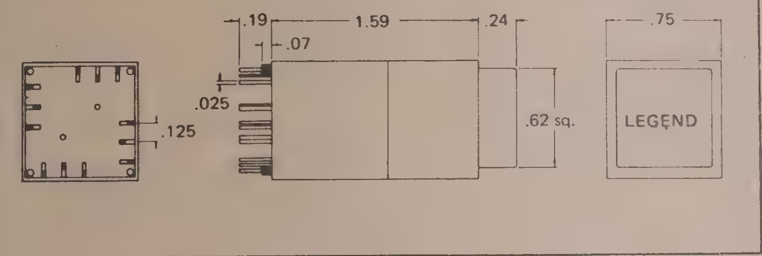
616 SERIES PRINTED CIRCUIT BOARD MOUNT

611 PANEL MOUNT

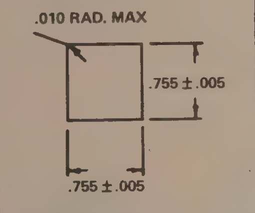


APPROXIMATE DIMENSIONS

616 PRINTED CIRCUIT BOARD MOUNT

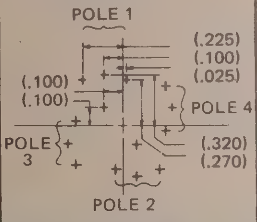


MOUNTING HOLE

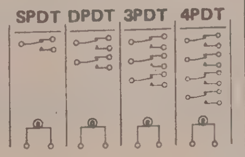


P.C. BOARD LAYOUT

Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT to 4PDT

ELECTRICAL RATINGS
- Silver Contacts
  10 Amps @ 125 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed (one and two pole only) ❶

TERMINATION TYPES
- .025" x .110" Terminations suitable for solder or female 110 connectors
- .025" square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 5/8" SQUARE
- 4 Styles
  - T = Translucent
  - M = Matte
  - F = White with Colored Insert
  - C = Clear with Colored Insert

  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .755" square cutout
- Stainless Steel retaining clips
- 1/16" to 3/16" Panel Thickness
- P.C. Board mounting on .755" centers
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- One T 1-3/4 Midget Flange Base Lamp
- Incandescent or Neon
- Front Relampable

PUSHBUTTON TRAVEL
- .220"

❶ Series 412 — Contact the Sales Office nearest you. See listings on page 22.

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN. DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Height	Lamp
611 (Panel Mount) or 616 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT 3 3PDT 4 4PDT	8 Silver 9 Gold 6 DPDT: top pole silver bottom pole gold	1 Solder 2 PC Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers	T translucent M matte F filtered C clear (see page 20)	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 12 Lunar White 15 Clear 21 Black	A .24"	Use two digit part number from page 19 Chart II, IV

Matching Indicator	Product Type	Terminations	Mounting
621 (Panel Mount) or 626 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

611K23911T03A58

DESCRIBES: Series 611 Switch, Panel Mount, Alternate Action, 3PDT, Gold Contacts, Solder Terminations, Vertical Barriers, Style T translucent pushbutton, green, .24" above panel pushbutton height, with ASA No. 327, 28 volt lamp installed.

621L20M02A59

DESCRIBES: Series 621 Indicator Light, Panel Mount, P.C. Board Terminations, No Barriers, Style M matte pushbutton, red, .24" above panel pushbutton height, with ASA No. 387, 28 volt lamp installed.

Cutler-Hammer Page 10

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EATON

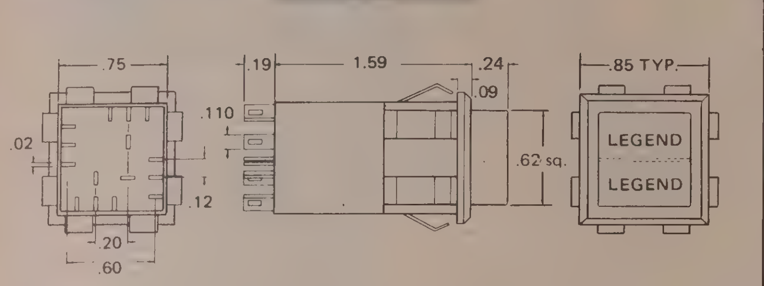
CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

728 SERIES PANEL MOUNT

748 SERIES PRINTED CIRCUIT BOARD MOUNT

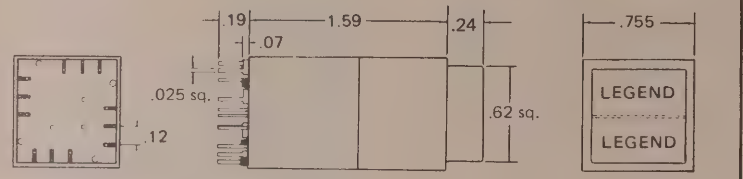
DUAL-LAMP-HORIZONTAL SPLIT LEGEND

728 PANEL MOUNT

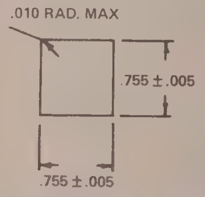


APPROXIMATE DIMENSIONS

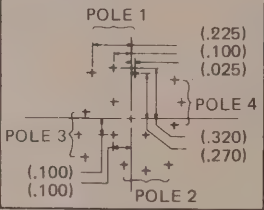
748 PRINTED CIRCUIT BOARD MOUNT



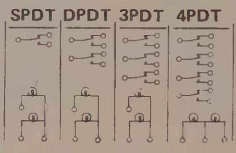
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062″



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or 4PDT

ELECTRICAL RATINGS
- Silver Contacts
  10 Amps @ 125 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC

TERMINATION TYPES
- .025″ x .110″ Terminations suitable for solder or female 110 connectors
- .025″ square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 5/8″ SQUARE
- Horizontal Split Legend
- 3 Styles
  - F = White with Colored Insert
  - M = Matte
  - C = Clear with Colored Insert

  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .755″ square cutout
- Stainless Steel retaining clips
- 1/16″ to 3/16″ Panel Thickness
- P.C. Board mounting on .755″ centers
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- Two T 1-3/4 Midget Flange Base Lamps
- Incandescent or Neon
- Front Relampable

PUSHBUTTON TRAVEL
- .220″

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls.	Terminations	Mounting	Pushbutton Style	Top Filter Color	Btm. Filter Color	Pushbutton Height	Lamps (accepts 2)
728 (Panel Mount) or 748 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT 3 3PDT 4 4PDT	8 Silver 9 Gold 6 DPDT: top pole silver bottom pole gold	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers	F filtered C clear (see page 20) M matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue	A .24″	Use two digit part number from page 19 Chart II, V

Matching Indicator	Product Type	Terminations	Mounting
738 (Panel Mount) or 758 (P.C. Board Mount)	L Indicator	1 Solder 2 PC Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers

EXAMPLES:

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

748K14920F0102A57

DESCRIBES: Series 748 Switch, P.C. Board Mount, Momentary Action, 4PDT, Gold Contacts, P.C. Board Terminations, No Barriers, Style F filtered pushbutton with white filter in top section, red filter in bottom section, with two (2) ASA No. 370, 18 volt incandescent lamps installed.

738L10C0304A56

DESCRIBES: Series 738 Indicator Light, Panel Mount, Solder Terminations, No Barriers, Style C clear pushbutton with green filter in top section, yellow filter in bottom section, with two (2) ASA No. 383, 14 volt incandescent lamps installed.

Cutler-Hammer Page 11

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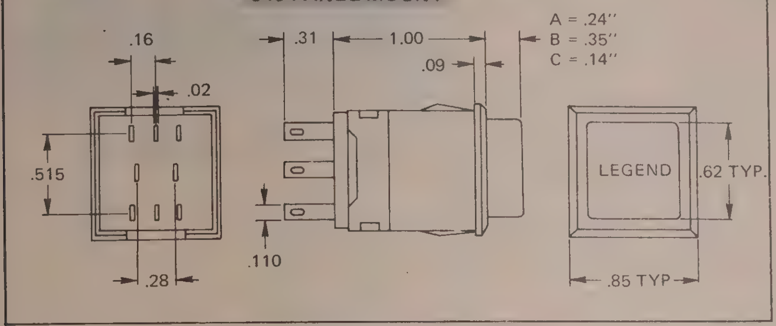
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

849 SERIES PANEL MOUNT

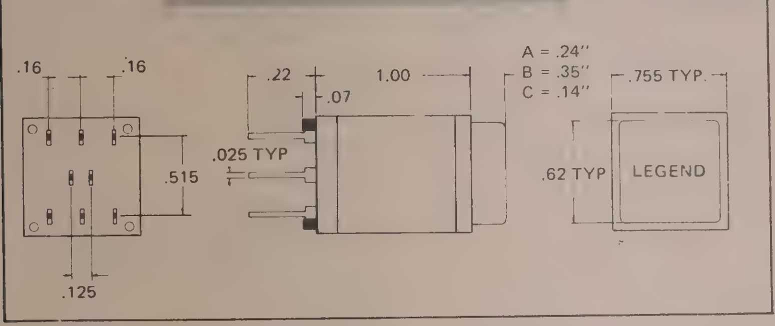
852 SERIES PRINTED CIRCUIT BOARD MOUNT

849 PANEL MOUNT

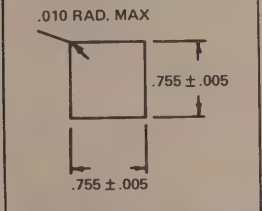


APPROXIMATE DIMENSIONS

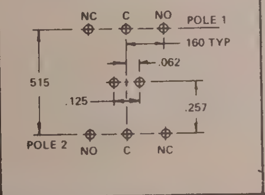
852 PRINTED CIRCUIT BOARD MOUNT



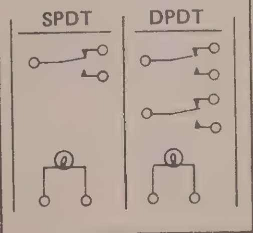
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062″



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

ELECTRICAL RATINGS
- Silver Contacts
  3 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed
- C.S.A. Certified

TERMINATION TYPES
- .025″ x .110″ Terminations suitable for solder or female 110 connectors
- .025″ square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 5/8″ SQUARE
- 3 Heights above bezel:
  A = .24″
  B = .35″
  C – .14″
- 4 Styles
  T = Translucent
  M – Matte
  F = White with Colored Insert
  C – Clear with Colored Insert

SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .755″ square cutout
- Stainless Steel retaining clips
- 1/16″ to 3/16″ Panel Thickness
- P.C. Board mounting on .755″ centers
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- One T 1-3/4 Bi Pin Base
- Incandescent, Neon or LED
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .220″

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No. of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th rowspan="2">Pushbutton Style</th><th rowspan="2">Color</th><th rowspan="2">Height</th><th rowspan="2">Lamp</th></tr>
<tr><td>849 (Panel Mount) or 852 (P.C. Board Mount)</td><td>K Switch</td><td>1 Mom
2 Alt</td><td>1 SPDT
2 DPDT</td><td>8 Silver
9 Gold
6 DPDT: top pole silver bottom pole gold</td><td>1 Solder
2 PC Board</td><td>0 No Barriers
1 Vertical Barriers
2 Horizontal Barriers</td></tr>
<tr><th>Matching Indicator</th><th>Product Type</th><th colspan="3">Terminations</th><th colspan="2">Mounting</th><td rowspan="2">T translucent
M matte
F filtered
C clear
(see page 20)</td><td rowspan="2">00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
12 Lunar White
15 Clear
21 Black</td><td rowspan="2">A .24″
B .35″
C .14″</td><td rowspan="2">Use two digit part number from page 19 Chart I, IV, VI</td></tr>
<tr><td>845 (Panel Mount) or 842 (P.C. Board Mount)</td><td>L Indicator</td><td colspan="3">1 Solder
2 P.C. Board</td><td colspan="2">0 No Barriers
1 Vertical Barriers
2 Horizontal Barriers</td></tr>
</table>

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

849K11811T01A12
DESCRIBES: Series 849 Switch, Panel Mount, Momentary Action, SPDT, Silver Contacts, Solder Terminations, Vertical Barriers, Style T translucent pushbutton, white, .24″ above panel pushbutton height, with ASA No. 7327, 28 volt incandescent lamp installed.

842L20M00A70
DESCRIBES: Series 842 Indicator Light, Printed Circuit Board Mount, P.C. Board Terminations, No Barriers, Style M matte pushbutton, orange, .24″ above panel pushbutton height, with No. 7A1H neon lamp installed.

Cutler-Hammer Page 12

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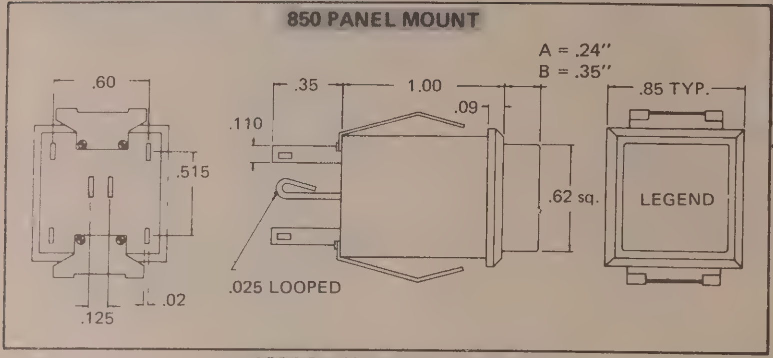
EATON

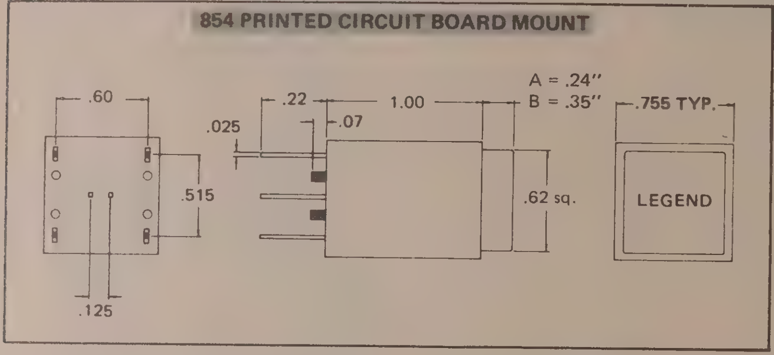
CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

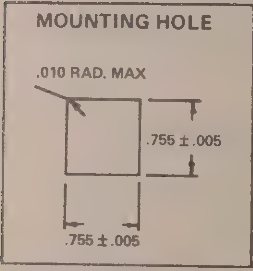
850 SERIES PANEL MOUNT

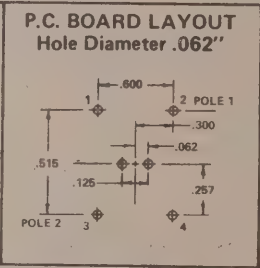
854 SERIES PRINTED CIRCUIT BOARD MOUNT

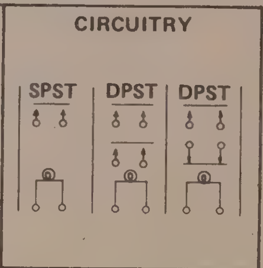

850 PANEL MOUNT
.60
.35
1.00
A = .24"
B = .35"
.09
.85 TYP.
.110
.515
.62 sq.
LEGEND
.025 LOOPED
.02
.125

APPROXIMATE DIMENSIONS


854 PRINTED CIRCUIT BOARD MOUNT
.60
.22
1.00
A = .24"
B = .35"
.755 TYP.
.025
.07
.515
.62 sq.
LEGEND
.125


MOUNTING HOLE
.010 RAD. MAX
.755 ± .005
.755 ± .005


P.C. BOARD LAYOUT
Hole Diameter .062"
.600
1
2 POLE 1
.300
.062
.515
.125
.257
POLE 2
3
4


CIRCUITRY
SPST
DPST
DPST

SPECIFICATIONS

ACTION
- Momentary

SWITCH CIRCUITRY
- Double break
- SPST or DPST

ELECTRICAL RATINGS
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC

TERMINATION TYPES
- .025" x .110" Terminations suitable for solder or female 110 connectors
- .025" square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 5/8" SQUARE
- 2 Heights above bezel:
  A = .24"
  B = .35"
- Translucent, Style "T" or Matte, Style "M" only
  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .755" square cutout
- Stainless Steel retaining clips
- 1/16" to 3/16" Panel Thickness
- P.C. Board mounting on .755" centers

LAMPS
- One T 1-3/4 Bi Pin Base
- Incandescent, Neon or LED
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .090"

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No. of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th>Pushbutton Style</th><th>Color</th><th>Height</th><th>Lamp</th></tr>
<tr><td>850 (Panel Mount) or 854 (P.C. Board Mount)</td><td>K Switch</td><td>1 Mom</td><td>1 SPST NO
2 SPST NC
3 DPST NO
4 DPST NC
5 DPST NO/NC</td><td>9 Gold</td><td>1 Solder
2 PC Board</td><td>0 No Barriers</td><td rowspan="3">T translucent
M matte
(see page 20)</td><td rowspan="3">00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
12 Lunar White
15 Clear
21 Black</td><td rowspan="3">A .24"
B .35"</td><td rowspan="3">Use two digit part number from page 19 Chart I, IV, VI</td></tr>
<tr><th>Matching Indicator</th><th>Product Type</th><th colspan="3">Terminations</th><th colspan="2">Mounting</th></tr>
<tr><td>856 (Panel Mount) or 857 (P.C. Board Mount)</td><td>L Indicator</td><td colspan="3">2 PC Board
3 .025" sq. pins looped for soldering</td><td colspan="2">0 No Barriers</td></tr>
</table>

EXAMPLES:

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

854K15920T01B05

DESCRIBES: Series 854 Switch, Printed Circuit Board Mount, Momentary Action, DPST NO/NC, Gold Contacts, P.C. Board Terminations, No Barriers, Style T translucent pushbutton, white, .35" above panel pushbutton height, with ASA No. 7380 6.3 incandescent lamp installed.

856L30M00A06

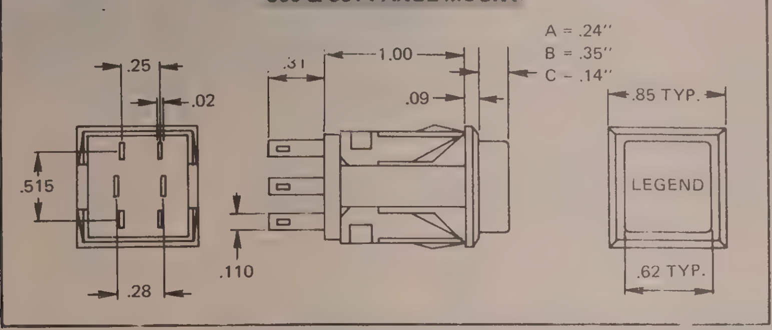
DESCRIBES: Series 856 Indicator Light, Panel Mount, .025" square pins looped for soldering, No Barriers, Style M matte pushbutton, orange, .24" above panel pushbutton height, with ASA No. 7377, 6.3 volt incandescent lamp installed.

EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

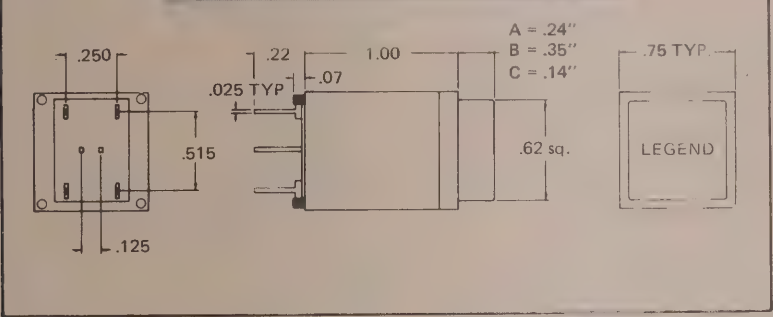
860 SERIES	NON-ILLUMINATED PANEL MOUNT	861 SERIES	ILLUMINATED PANEL MOUNT	862 SERIES	NON ILLUMINATED PRINTED CIRCUIT BOARD MOUNT	863 SERIES	ILLUMINATED PRINTED CIRCUIT BOARD MOUNT

860 & 861 PANEL MOUNT

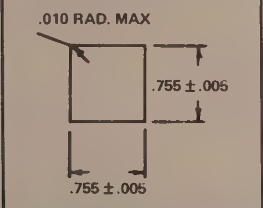


APPROXIMATE DIMENSIONS

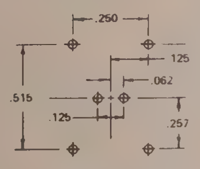
862 & 863 PRINTED CIRCUIT BOARD MOUNT



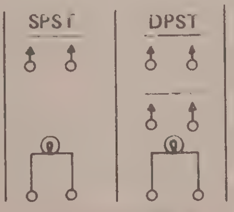
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- — Momentary
- — Alternate with positive latch down

SWITCH CIRCUITRY
- — Double break
- — SPST or DPST, normally open

ELECTRICAL RATINGS

Silver Contacts
6 Amps @ 125 VAC or
3 Amps @ 250 VAC
Gold Contacts
.25 Amp @ 125 VAC or 30 VDC
U.L. Listed
C.S.A. Certified

TERMINATION TYPES

.025" x .110" Terminations suitable for solder or female 110 connectors
.025" square Terminations for printed circuit board mount
Epoxy sealed

PUSHBUTTONS
- — 5/8" SQUARE
- — 3 Heights above bezel:
  - A = .24"
  - B = .35"
  - C = .14"
- — 4 Styles
  - T = Translucent
  - M – Matte
  - F = White with Colored Insert
  - C = Clear with Colored Insert

SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- - Snap in panel mounting in .755" square cutout
  Stainless Steel retaining clips
  1/16" to 3/16" Panel Thickness
- - P.C. Board mounting on .755" centers
- · Barrier Mount available (SEE PAGE 20.)

LAMPS

One T 1-3/4 Bi Pin Base
- -- Incandescent, Neon or LED
- - Front Relampable
- - Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL

.220"

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

ORDERING INFORMATION

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Height	Lamp
860 or 861 (Panel Mount) or 862 or 863 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPST 3 DPST	8 Silver 9 Gold 6 DPST: top pole silver bottom pole gold	1 Solder 2 PC Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers	T translucent M matte F filtered C clear (see page 20)	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 12 Lunar White 15 Clear 21 Black	A .24" B .35" C .14"	Use two digit part number from page 19 Chart I, IV, VI

Matching Indicator	Product Type	Terminations	Mounting
845 (Panel Mount) or 842 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers 2 Horizontal Barriers

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

860K11812T05A
DESCRIBES: Series 860 Switch, Panel Mount, Momentary Action, SPST. Silver Contacts, Solder Terminations, Horizontal Barriers, Style T translucent pushbutton, blue, .24" above panel pushbutton height (no lamp)

845L12T05A14
DESCRIBES: Series 845 Indicator Light, Panel Mount, Solder Terminations, Horizontal Barriers, Style T translucent pushbutton, blue, .24" above panel pushbutton height, with ASA No. 7876, 28 volt incandescent lamp installed.

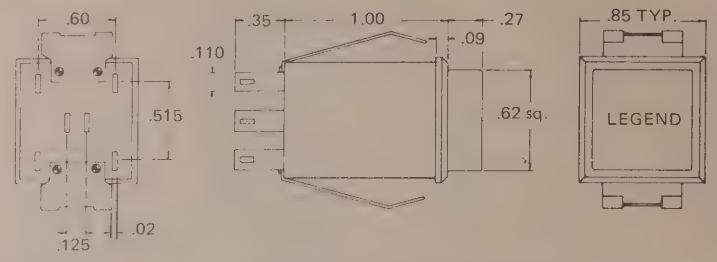
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

955 SERIES PANEL MOUNT

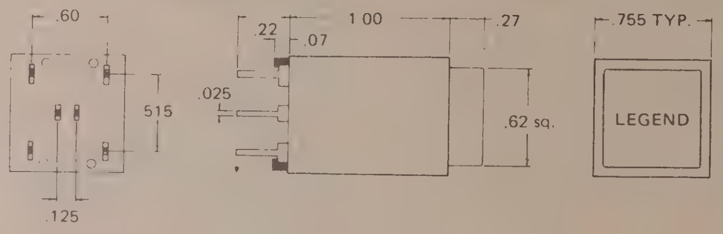
959 SERIES PRINTED CIRCUIT BOARD MOUNT

955 PANEL MOUNT

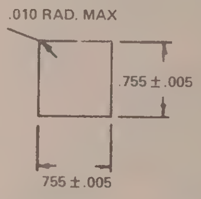


APPROXIMATE DIMENSIONS

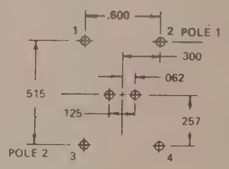
959 PRINTED CIRCUIT BOARD MOUNT



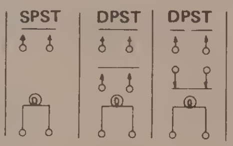
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062″



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary

SWITCH CIRCUITRY
- Double break
- SPST or DPST

ELECTRICAL RATINGS
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC

TERMINATION TYPES
- .025″ x .110″ Terminations suitable for solder or female 110 connectors
- .025″ square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 5/8″ SQUARE
- Horizontal split legend ❶
- 4 Styles
  - T = Translucent
  - M = Matte
  - F = White with Colored Insert
  - C = Clear with Colored Insert

  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .755″ square cutout
- Stainless Steel retaining clips
- 1/16″ to 3/16″ Panel Thickness
- P.C. Board mounting on .755″ centers

LAMPS
- One T 1-3/4 Midget Flange Base
- Incandescent or Neon
- Front Relampable

PUSHBUTTON TRAVEL
- .090″

❶ Series 838/858 — Contact the Sales Office nearest you. See listings on page 22.

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No. of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th rowspan="4">Pushbutton Style</th><th rowspan="4">Color</th><th rowspan="4">Height</th><th rowspan="4">Lamp</th></tr>
<tr><td>955 (Panel Mount) or 959 (P.C. Board Mount)</td><td>K Switch</td><td>1 Mom</td><td>1 SPST NO
2 SPST NC
3 DPST NO
4 DPST NC
5 DPST NO/NC</td><td>9 Gold</td><td>1 Solder
2 PC Board</td><td>0 No Barriers</td></tr>
<tr><td>Matching Indicator</td><td>Product Type</td><td colspan="3">Terminations</td><td colspan="2">Mounting</td></tr>
<tr><td>965 (Panel Mount) or 969 (P.C. Board Mount)</td><td>L Indicator</td><td colspan="3">1 Solder
2 P.C. Board</td><td colspan="2">0 No Barriers</td></tr>
<tr><td colspan="7"></td><td>T translucent
M matte
F filtered
C clear
(see page 20)</td><td>00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
12 Lunar White
15 Clear
21 Black</td><td>A .27″</td><td>Use two digit part number from page 19 Chart II, V</td></tr>
</table>

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

955K13910C04A52

DESCRIBES: Series 955 Switch, Panel Mount, Momentary Action, DPST NO, Gold Contacts, Solder Terminations, No Barriers, Style C clear pushbutton with yellow filter installed, .27″ above panel pushbutton height, with ASA No. 328,6 volt incandescent lamp installed.

969L20T01A55

DESCRIBES: Series 969 Indicator Light, P.C. Board Mount, P.C. Board Terminations, No Barriers, Style T translucent pushbutton, white, .27″ above panel pushbutton height, with ASA No. 330, 14 volt incandescent lamp installed.

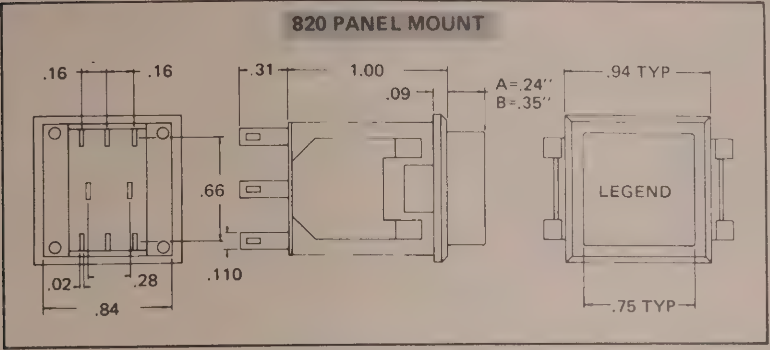
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

820 SERIES PANEL MOUNT

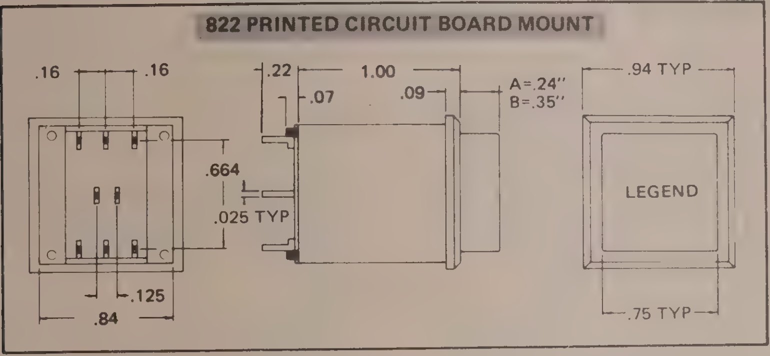
822 SERIES PRINTED CIRCUIT BOARD MOUNT

820 PANEL MOUNT

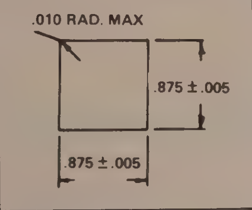


APPROXIMATE DIMENSIONS

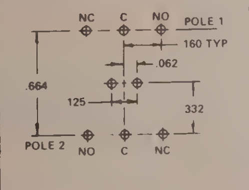
822 PRINTED CIRCUIT BOARD MOUNT



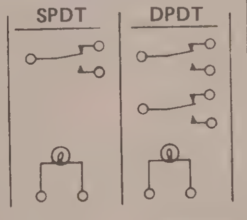
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

ELECTRICAL RATINGS
- Silver Contacts
  3 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed
- C.S.A. Certified

TERMINATION TYPES
- .025" x .110" Terminations suitable for solder or female 110 connectors
- .025" square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 3/4" SQUARE
- 2 Heights above bezel:
  A = .24"
  B = .35"
- 4 Styles
  T = Translucent
  M = Matte
  F = White with Colored Insert
  C = Clear with Colored Insert
  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .875" square cutout
- Stainless Steel retaining clips
- 1/16" to 3/16" Panel Thickness
  P.C. Board mounting on .94" centers
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- One T 1-3/4 Bi Pin Base
- Incandescent, Neon or LED
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .220"

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

ORDERING INFORMATION

<table>
<tr><th>Switch Series</th><th>Product Type</th><th>Action</th><th>No. of Poles</th><th>Contact Mat'ls</th><th>Terminations</th><th>Mounting</th><th rowspan="3">Pushbutton Style</th><th rowspan="3">Color</th><th rowspan="3">Height</th><th rowspan="3">Lamp</th></tr>
<tr><td>820 (Panel Mount) or 822 (P.C. Board Mount)</td><td>K Switch</td><td>1 Mom
2 Alt</td><td>1 SPDT
2 DPDT</td><td>8 Silver
9 Gold
6 DPDT: top pole silver bottom pole gold</td><td>1 Solder
2 PC Board</td><td>0 No Barriers
1 Vertical Barriers
2 Horizontal Barriers</td></tr>
</table>

<table>
<tr><th>Matching Indicator</th><th>Product Type</th><th>Terminations</th><th>Mounting</th><th>Pushbutton Style</th><th>Color</th><th>Height</th><th>Lamp</th></tr>
<tr><td>825 (Panel Mount) or 827 (P.C. Board Mount)</td><td>L Indicator</td><td>1 Solder
2 P.C. Board</td><td>0 No Barriers
1 Vertical Barriers
2 Horizontal Barriers</td><td>T translucent
M matte
F filtered
C clear
(see page 20)</td><td>00 Orange
01 White
02 Red
03 Green
04 Yellow
05 Blue
12 Lunar White
15 Clear
21 Black</td><td>A .24"
B .35"</td><td>Use two digit part number from page 19 Chart I, IV, VI</td></tr>
</table>

Pushbutton Style, Color, Height and Lamp columns are common to both switch and indicator.

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

820K22910T04B09
DESCRIBES: Series 820 Switch, Panel Mount, Alternate Action, DPDT, Gold Contacts, Solder Terminations, No Barriers, Style T translucent pushbutton, yellow, .35" above panel pushbutton height. with ASA No. 7330, 14 volt incandescent lamp installed.

825L10M02A04
DESCRIBES: Series 825 Indicator Light, Panel Mount, Solder Terminations, No Barriers, Style M matte pushbutton, red, .24" above panel pushbutton height, with ASA No. 7328,6 volt incandescent lamp installed.

Cutler-Hammer Page 16

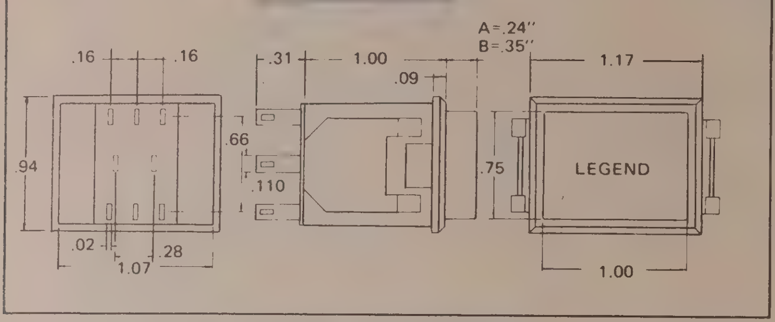
EATON

CUTLER-HAMMER ILLUMINATED PUSHBUTTON SWITCHES

810 SERIES PANEL MOUNT

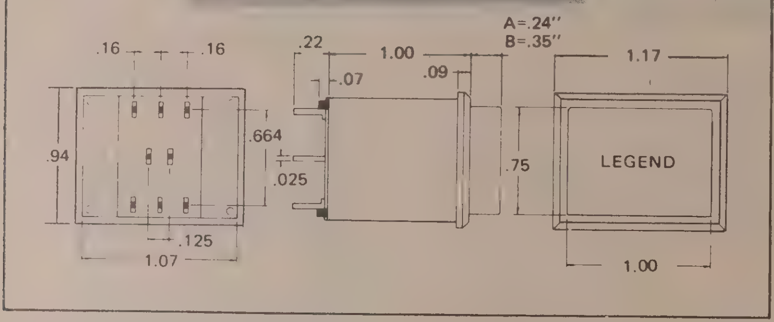
812 SERIES PRINTED CIRCUIT BOARD MOUNT

810 PANEL MOUNT

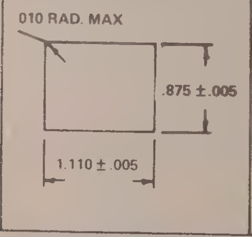


APPROXIMATE DIMENSIONS

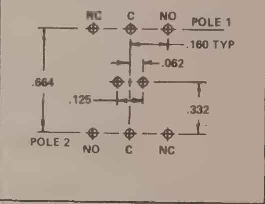
812 PRINTED CIRCUIT BOARD MOUNT



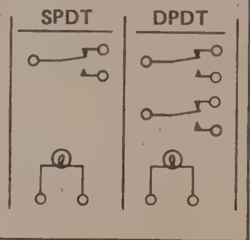
MOUNTING HOLE



P.C. BOARD LAYOUT
Hole Diameter .062"



CIRCUITRY



SPECIFICATIONS

ACTION
- Momentary
- Alternate with positive latch down

SWITCH CIRCUITRY
- Break before make
- SPDT or DPDT

ELECTRICAL RATINGS
- Silver Contacts
  3 Amps @ 125 VAC or 250 VAC
- Gold Contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed
- C.S.A. Certified

TERMINATION TYPES
- .025" x .110" Terminations suitable for solder or female 110 connectors
- .025" square Terminations for printed circuit board mount
- Epoxy sealed

PUSHBUTTONS
- 3/4" x 1" RECTANGULAR
- 2 Heights above bezel:
  - A = .24"
  - B = .35"
- 4 Styles
  - T = Translucent
  - M = Matte
  - F = White with Colored Insert
  - C = Clear with Colored Insert

SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
- Snap in panel mounting in .875" x 1.110 square cutout
- Stainless Steel retaining clips
- 1/16" to 3/16" Panel Thickness
- P.C. Board mounting on 1.17" centers
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- One T 1-3/4 Bi Pin Base
- Incandescent, Neon or LED
- Front Relampable
- Lamp stationary to reduce mechanical shock to filament

PUSHBUTTON TRAVEL
- .220"

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN.
DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls	Terminations	Mounting	Pushbutton Style	Color	Height	Lamp
810 (Panel Mount) or 812 (P.C. Board Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT	8 Silver 9 Gold 6 DPDT: top pole silver bottom pole gold	1 Solder 2 PC Board	0 No Barriers 1 Vertical Barriers	T translucent M matte F filtered C clear (see page 20)	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue 12 Lunar White 15 Clear 21 Black	A .24" B .35"	Use two digit part number from page 19 Chart I, IV, VI

Matching Indicator	Product Type	Terminations	Mounting
815 (Panel Mount) or 817 (P.C. Board Mount)	L Indicator	1 Solder 2 P.C. Board	0 No Barriers 1 Vertical Barriers

EXAMPLES:

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

812K12620F03B08

DESCRIBES: Series 812 Switch, P.C Board Mount, Momentary Action, DPDT, Top pole silver contacts, Bottom pole gold contacts, P.C. Board Terminations, No. Barriers, Style F filtered pushbutton with green filter installed, .35" above panel pushbutton height, with ASA No. 7371, 12 volt incandescent lamp installed.

817L21C05A10

DESCRIBES: Series 817 Indicator Light, P.C. Board Mount, P.C. Board Terminations, Vertical Barriers, Style C Clear pushbutton with blue filter installed, .24" above panel pushbutton height, with ASA NO. 7382, 14 volt incandescent lamp installed.

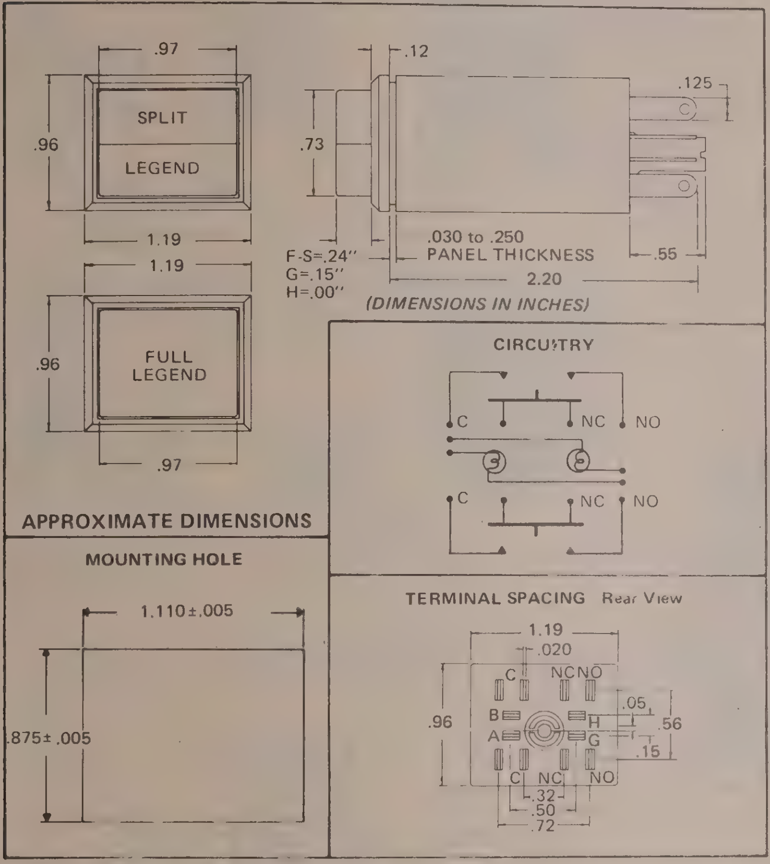
EATON

CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

770 SERIES PANEL MOUNT

SNAP ACTION POWER SWITCH

COMPU-LITE PRODUCTS



SPECIFICATIONS

ACTION
- Momentary
  Alternate with positive latch down

SWITCH CIRCUITRY
- SPDT or DPDT
  2 independent lamp circuits

ELECTRICAL RATINGS
- 10.5 Amps @ 125 VAC or 250 VAC
- Gold contacts
  .25 Amp @ 125 VAC or 30 VDC
- U.L. Listed
  C.S.A. Certified

TERMINATION TYPES
020" x 125" Terminations suitable for solder or female 110 connectors
- Epoxy Sealed

PUSHBUTTONS
- .73 x .97 Rectangular
- Translucent Colors, Matte Finish only
- Full or Horizontal Split Legend
  SEE PAGE 20 FOR INFORMATION ON PUSHBUTTONS, ENGRAVING AND HOT STAMPING.

MOUNTING
Panel mounting retained by molded sleeve and nut
- May be individually mounted or gang mounted in horizontal or vertical rows
- Panel Thickness from .030" to .250"
- Barrier Mount available (SEE PAGE 20.)

LAMPS
- Accepts two T 1-3/4 midget flange base lamps
- Incandescent or Neon
- Front Relampable

PUSHBUTTON TRAVEL
- .220"

ORDERING INFORMATION

CHOOSE ONE OPTION FROM EACH COLUMN. DO NOT USE DASHES (-) IN PART NUMBER.

Switch Series	Product Type	Action	No. of Poles	Contact Mat'ls.	Terminations	Mounting	Full Lens Pushbutton Style	Full Lens Pushbutton Color	Full Lens Pushbutton Type/Height	Lamps (accepts 2)
770 (Panel Mount)	K Switch	1 Mom 2 Alt	1 SPDT 2 DPDT	8 Silver 9 Gold	1 Solder	0 No Barriers 1 Vertical Barriers	M Matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue	F Full .24" G Full .15" H Full flush w/Bezel	Use two digit part number from page 19 Chart II, V

or

Matching Indicator	Product Type	Terminations	Mounting	Split Lens Pushbutton Style	Split Lens Pushbutton Top Color	Split Lens Pushbutton Botm Color	Split Lens Pushbutton Type/Height
775 (Panel Mount)	L Indicator	1 Solder	0 No Barriers 1 Vertical Barriers	M matte	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue	00 Orange 01 White 02 Red 03 Green 04 Yellow 05 Blue	S Split .24"

SPECIFY ENGRAVING OR HOT STAMPING INFORMATION WHEN ORDERING FROM SALES OFFICE

EXAMPLES:

770K21810M0204S51
DESCRIBES: Series 770 Switch, Panel Mount, Alternate Action, SPDT, Silver Contacts, Solder Terminations, No Barriers, Style M matte pushbutton, top color red, bottom color yellow, split lens, .24" above panel pushbutton height, with two (2) ASA No. 345, 6 volt incandescent lamps installed.

775L10M01F81
DESCRIBES: Series 775 Indicator Light, Panel Mount Solder Terminations, No Barriers, Style M matte pushbutton, white, Full lens, .24" above panel pushbutton height, with two (2) C-24 lamps with built in resistor installed.

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INCANDESCENT LAMPS

I. T 1¾ Bi-Pin Base for all 800 Series "Shorty" Switches and Indicators

Item No.*	To order lamp separately	ASA Lamp Number	Designed Volts	Design Amps	Brightness (MSCP)	Lab Avg. Life (hrs.)
02	28-3154-2	7361	5	.06	.05	100,000
03	28-3154-3	7945	6	.04	.03	10,000
04	28-3154-4	7328	6	.20	.60	1,000
05	28-3154-5	7380	6.3	.04	.02	50,000
06	28-3154-6	7377	6.3	.075	.22	500
07	28-3154-7	7381	6.3	.20	.40	50,000
08	28-3154-8	7371	12	.04	.12	10,000
09	28-3154-9	7330	14	.08	.50	750
10	28-3154-10	7382	14	.08	.30	50,000
11	28-3154-11	7370	18	.04	.15	10,000
12	28-3154-12	7327	28	.04	.34	7,000
13	28-3154-13	7387	28	.04	.30	25,000
14	28-3154-14	7876	28	.06	.34	25,000

*Use this two digit number for installation in switches and indicators

II. T 1¾ Midget Flange Base for all 600, 700 & 900 Series Switches and Indicators

Item No.*	To order lamp separately	ASA Lamp Number	Designed Volts	Design Amps	Brightness (MSCP)	Lab Avg. Life (hrs.)
51	28-3155-2	345	6	.04	.03	10,000
52	28-3155-3	328	6	.20	.60	1,000
53	28-3155-4	377	6.3	.075	.22	500
54	28-3155-5	394	12	.04	.12	10,000
55	28-3155-6	330	14	.08	.50	750
56	28-3155-7	382	14	.08	.30	50,000
57	28-3155-8	370	18	.04	.15	10,000
58	28-3155-9	327	28	.04	.34	7,000
59	28-3155-10	387	28	.04	.30	25,000

*Use this two digit number for installation in switches and indicators

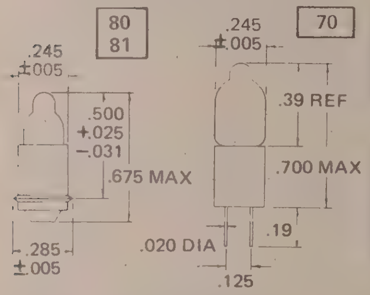
III. T 1¾ Subminiature Wedge Base for all 500 Series Switches and Indicators

Item No.*	To order lamp separately	ASA Lamp Number	Designed Volts	Design Amps	Brightness (MSCP)	Lab Avg. Life (hrs.)
30	28-3158	56	5	.115	.15	20,000
31	28-3158-2	79	6	.20	.60	1,000
32	28-3158-3	84	6.3	.04	.03	20,000
33	28-3158-4	86	6.3	.20	.40	20,000
34	28-3158-5	18	14	.04	.13	5,000
35	28-3158-6	73	14	.08	.30	15,000
36	28-3158-7	85	28	.04	.30	7,000
37	28-3158-8	17	28	.06	.65	5,000

*Use this two digit number for installation in switches and indicators

NEON LAMPS

Miniature Neon glow lamps are characterized by a rare combination of brightness, long life, dependability, and extremely low cost. Lamps requiring external resistance are available with either T 1¾ midget flange base or Bi-Pin Base. Lamps with built-in ballast resistors are available in T 1¾ Midget Flange Base only. All lamps listed are recommended for use with red, yellow, white or orange filters and lens caps only. Based neon lamps may also be ordered as part of Cutler-Hammer illuminated pushbutton switches and indicator assemblies, or with use in Cutler-Hammer Bi-Pin Lamp Sockets.



IV. T 1¾ Bi-Pin Base Neon Lamp for all 800 Series "Shorty" Switches and Indicators

Item No.*	To order lamp separately	CLC Lamp Number	Circuit Volts A.C.	Circuit Volts D.C.	Nominal Current MA	Average Useful Life (hrs.)	External Resistance Required	Ignition Voltage A.C.	Ignition Voltage D.C.	Bulb Size	Lamp Length	Lead Length
70	28-3156	7A1H	105-125	150	1.5	25,000	35K	95	135	T-2	.700	.250

*Use this two digit number for installation in switches and indicators

V. T 1¾ Midget Flange Base Neon Lamps for all 600, 700 & 900 Series Switches and Indicators

Item No.*	To order lamp separately	CLC Lamp Number	Circuit Volts A.C.	Circuit Volts D.C.	Nominal Current MA	Average Useful Life (hrs.)	External Resistance Required	Built-In Resistance	Ignition Voltage A.C.	Ignition Voltage D.C.	Bulb Size	Maximum Overall Length
80	28-3157	A1H	105-125	150	1.5	25,000	35K	None	95	135	T-2	.675
81	28-3157-2	C-24	105-125	150	4.2	8,000	None	35K	95	135	T-2	.675

*Use this two digit number for installation in switches and indicators

LED LAMPS

VI. T 1¾ Wire LED's for all 800 Series Switches and Indicators

Item No. *	Old LED Part Number	Forward Current (MA)	Luminous Intensity (MCD) Typical	Forward Voltage (V) Typical	Diffused or Undiffused
90	ESBR 5101	20	60	1.7	Undiffused
91	ESBR 5131	20	4	1.7	Diffused
92	ESBR 5431	20	4	1.7	Diffused
93	ESBR 5501	20	80	1.7	Undiffused
94	ESBR 5531	20	8	1.7	Diffused

*Use this two digit number for installation in switches and indicators.

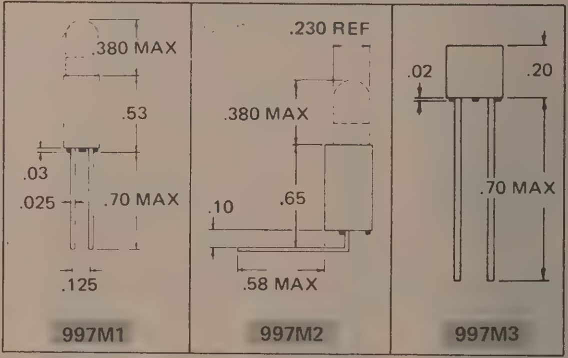
VII. LED Lamps for Series 231 thru 235 Switches and Indicators

Color	Voltage	W/O Diode Protection	With Diode Protection
		Item No.	Item No.
Red	VDC ❷ 5 VDC 15 VDC	01 02 03	11 12 13
Yellow	VDC ❷ 5 VDC 15 VDC	04 05 06	14 15 16
Green	VDC ❷ 5 VDC 15 VDC	07 08 09	17 18 19

❷ Lamps without internal current limiting resistor. User must include in his circuit — to give current of 20mA to LED.

Note: LEDs are sold installed only

BI-PIN LAMP SOCKETS



Cutler-Hammer Bi-Pin Lamp Sockets are the lowest cost units on the market today. Designed for mounting directly on Printed Circuit Boards, these lamp sockets accept T 1¾ Bi-Pin Incandescent, Neon or LED lamps. All plastic parts are high impact polyester, while termination material is gold plated Grade A, spring temper phosphor bronze. Sleeved versions mount either parallel or perpendicular to the Printed Circuit Board, and all versions are suitable for flow solder or wire wrap. The standard configurations are as illustrated, and the Factory will be glad to assist as far as possible with special requirements.

EATON

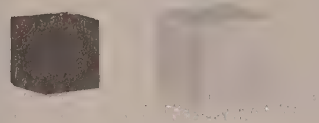
CUTLER-HAMMER
ILLUMINATED PUSHBUTTON SWITCHES

PUSHBUTTON STYLES AND INFORMATION
FULL LEGEND PUSHBUTTON STYLES

STYLES "T" & "M"

Style "T" - Glossy Finish
Style "M" – Matte Finish
Translucent Colors: Orange, White, Red, Yellow, Blue and Green

Available on all 400, 500, 600, 800 and 900 Series Switches and Indicators.



STYLE "F"

White pushbutton with colored filter insert Filter colors: Orange, Red, Yellow, Blue or Green. Outer White Shell may be engraved with black letters (see Engraving and Hot Stamping information below).

Not available on Series 880, 881, 882, 883, 886, 887, 850, 854, 856 or 857 pushbutton switches and indicators.

STYLE "C"

Clear pushbutton with colored filter insert. Filter colors: Orange White, Red, Yellow, Blue or Green. The filter insert may be removed to insert or change film, with engraved legend held captive between the clear shell and filter insert.

Not available on Series 880, 881, 882, 883, 886, 887, 850, 854, 856 or 857 pushbutton switches and indicators.

HORIZONTAL SPLIT LEGEND PUSHBUTTON STYLES

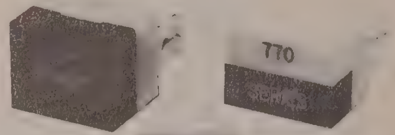
EXPLODED VIEW SERIES 728

STYLE "F"

Outer white pushbutton with two filter inserts and a metal divider for horizontal split legend. Filter Colors: Orange, Red, Yellow, Blue, Green or White.

STYLE "C"

Outer clear pushbutton with two filter inserts and a metal divider for horizontal split legend. Filter colors same as for Style "F".

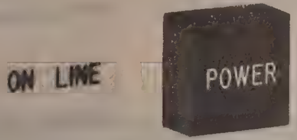


SERIES 770

Full color or horizontal split color pushbuttons with metal divider. Matte Finish only on pushbutton. Translucent Colors: Orange, White, Red, Yellow, Blue and Green.

NOTE: THE FILTER INSERTS FOR STYLES F & C FOR THE SERIES 611 & 728 PUSHBUTTONS ARE NOT REMOVABLE

ENGRAVING AND HOT STAMPING



All legend markings are engraved or hot stamped in accordance with the limitations below. Standard markings are of condensed gothic type, 1/8" high characters, with white letters on blue, red and green translucent pushbuttons, and black letters on white, yellow, orange and all filtered pushbuttons. Our Sales Offices will be glad to assist with any special requirements as to customized symbols, type styles, and character size.

PUSHBUTTON SIZE

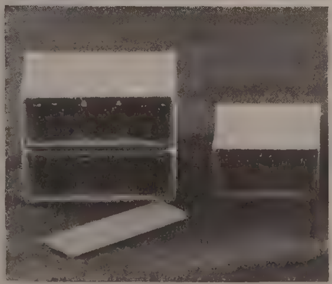
1/2" square pushbuttons
5/8" square pushbuttons - Full Legend
5/8" square pushbuttons - Split Legend
3/4" square pushbuttons
3/4" x 1" rectangular pushbuttons - Full Legend
3/4" x 1" rectangular pushbuttons Split Legend

STANDARD ENGRAVING LIMITATIONS

2 lines, 4 characters per line
3 lines, 6 characters per line
2 lines, 6 characters per line
3 lines, 7 characters per line
3 lines, 9 characters per line
2 lines, 9 characters per line

STANDARD HOT STAMPING LIMITATIONS

1 line, 4 characters per line
2 lines, 5 characters per line
2 lines, 5 characters per line
2 lines, 6 characters per line
2 lines, 8 characters per line
2 lines, 8 characters per line



REAR PROJECTION INDICATORS

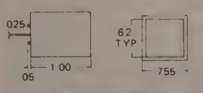
Cutler-Hammer's rear projection indicators are unique products for use behind plastic translucent or dead front panels for simple, inexpensive, multiple-message display.

Self-contained "egg-crate" dividers available.

Direct Printed Circuit Board Mounting or Snap-in Mounting to sub-panel. Can be used as individual or multiple egg-crate assemblies.

Units accept 1, 2, or 3 T. 1¾ Bi-Pin incandescent, neon or LED lamps.

Plastic casing is manufactured in white polyster for excellent light reflection.



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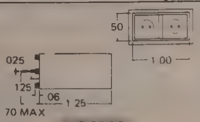
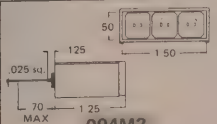


094M1



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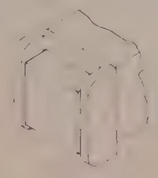
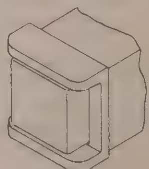
BARRIERS

Barriers may be used to prevent accidental switch operation or to protect panel mounted switches from objects dropped on to the panel. Cutler-Hammer barriers are an integral part of the switch housing and do not require modified panel cut-outs or stocking of any accessory parts. To order a barrier mount pushbutton switch simply insert the proper number as shown on the applicable ordering chart on the preceding pages.

VERTICAL BARRIERS



HORIZONTAL BARRIERS



Cutler-Hammer Page 20

CUTLER-HAMMER OTHER PRODUCTS

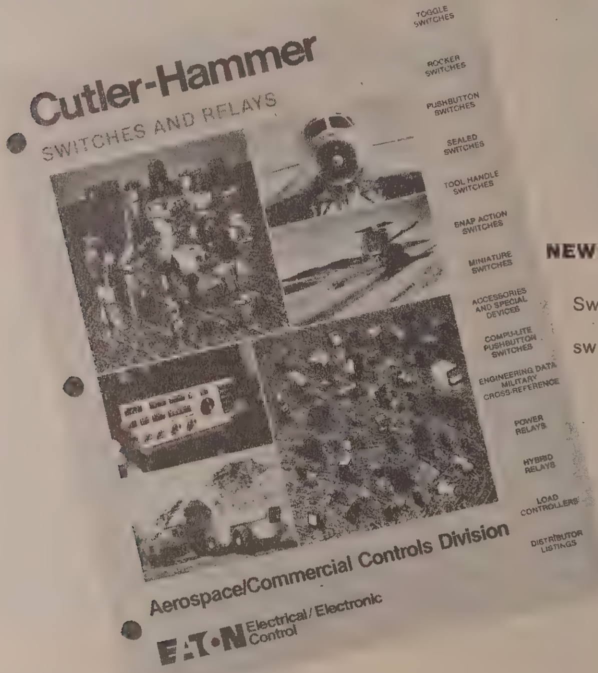
NEW MASTER CATALOG DESCRIBING COMPLETE LINE OF CUTLER-HAMMER COMMERCIAL MINIATURE SWITCHES

The complete line of Cutler-Hammer miniature switches is included in a just published 64 page catalog. Electrical and material specifications, product photographs, dimension drawings, construction details and wiring diagrams provide a thorough description for the variety which includes miniature toggle, rocker, illuminated rocker, keylite, and pushbutton switches. Also included are product summary charts for quick selection of standard switches and a section devoted to custom designed miniature switches. Not happy with your present source? Our catalog even includes complete cross references to our competition.

Write for our complete catalog NU-196.

Eaton Corporation
Aerospace/Commercial Controls Division
424 Chapel Street
New Haven, CT 06511

Cutler-Hammer
MINIATURE SWITCHES
E:T·N Electrical/Electronic Control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SWITCHES AND RELAYS
TOGGLE SWITCHES
ROCKER SWITCHES
PUSHBUTTON SWITCHES
SEALED SWITCHES
TOOL HANDLE SWITCHES
SNAP ACTION SWITCHES
MINIATURE SWITCHES
ACCESSORIES AND SPECIAL DEVICES
COMPU-LITE PUSHBUTTON SWITCHES
ENGINEERING DATA MILITARY CROSS-REFERENCE
POWER RELAYS
HYBRID RELAYS
LOAD CONTROLLERS
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NEW MASTER CATALOG DESCRIBING COMPLETE LINE OF CUTLER-HAMMER SWITCHES AND RELAYS

Switches and relays: Toggle switches, pushbutton switches, sealed switches, tool handle switches, snap action switches, miniature switches, accessories. Power relays and hybrid relays. Engineering data. 230 pages.

Write for our complete catalog NJ-125.

Eaton Corporation
Aerospace/Commercial Controls Division
4201 N. 27th Street
Milwaukee, WI 53216

COMPREHENSIVE PRODUCT BROCHURE

Describing Cutler-Hammer's new Econoswitch line of cost efficient sealed switches.

From rocker action to lever-locks, we have it all, and can provide as standard, many combinations of configurations including:

- One, two and four pole switching
- 16 circuit combinations
- Solder, screw or spade type terminations
- Five actuator styles
- Four mounting methods to suit your application

We call it the Econoswitch line. If your application calls for a switch that's dust proof and water/moisture resistant — but the price of a MIL SPEC switch is prohibitive for you — we have a new answer for you.

Write for this complete brochure NU-161.

Eaton Corporation
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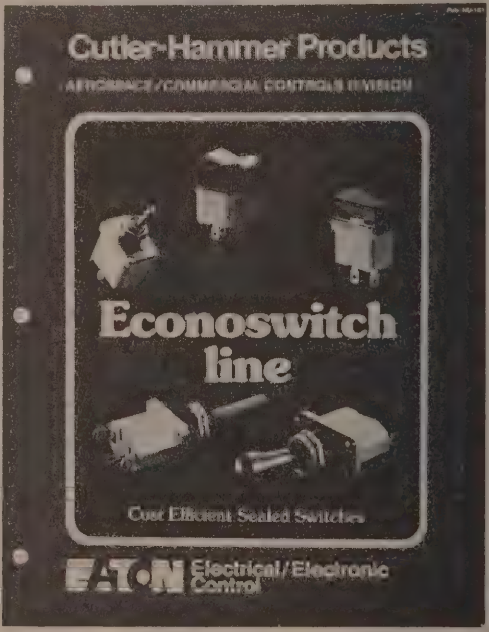
Sarasota, FL 33580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AEROSPACE/COMMERCIAL CONTROLS DIVISION
Econoswitch line
Cost Efficient Sealed Switches
E:T·N Electrical/Electronic Control

AEROSPACE/COMMERCIAL CONTROLS DIVISION

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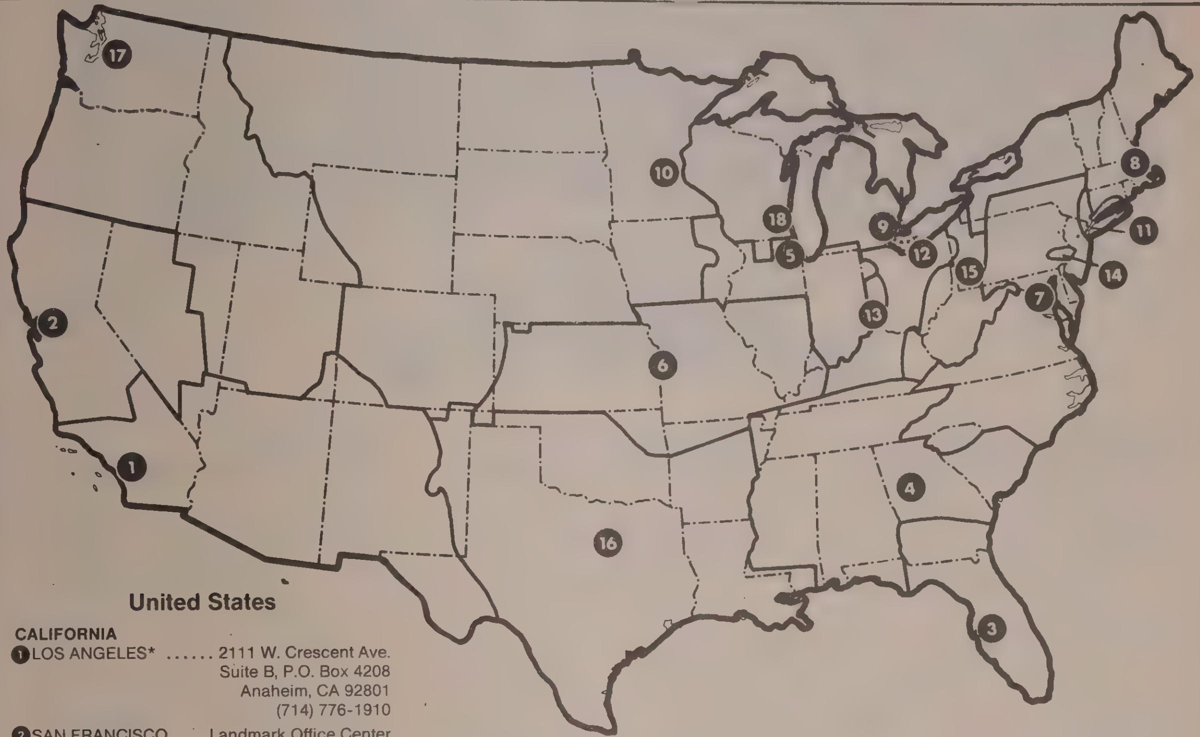

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EATON

Cutler-Hammer Page 22

Eaton Corporation/Cutler Hammer; 4201 N. 27th Street, Milwaukee, WI 53216 • (414) 449-7487

For manufacturers' sales offices, see yellow pages

EECO® THUMBWHEEL SWITCHES

1000 Series Thumbwheel Switch

The .236 wide 1000 Series switch provides reliability and compact size for applications where space is limited. Available in standard thumbwheel adjust, or in safety-lock Push-Set and Pen-Set.

Number of Positions	10
Life	300,000 Detents
Electrical Rating	
Non-Switching Load	0.500 Amps
Switching Load	0.100 Amps
Contact Resistance	0.200 Ohms
Dielectric Withstanding V.	500 VDC
Seal	Dust
Panel Mount	Rear
Dimensions, Module	
Height	0.551 (14.0)
Width	0.236 (5.99)
Depth, Behind Panel	0.865 (21.97)
Actuation Method	
Thumbwheel/Push/Pen-Set	Std.

1100 Series Thumbwheel Switch

With the same narrow .236 width design as the 1000 Series switch, but with front mount configuration; the 1100 Series switch offers space saving dimensions in an attractive black matte finish.

Number of Positions	10
Life	300,000 Detents
Electrical Rating	
Non-Switching Load	0.500 Amps
Switching Load	0.100 Amps
Contact Resistance	0.200 Ohms
Dielectric Withstanding V.	500 VDC
Seal	Dust
Panel Mount	Front
Dimensions, Module	
Height	0.708 (17.98)
Width	0.236 (5.99)
Depth, Behind Panel	0.905 (22.99)
Actuation Method	
Thumbwheel/Push/Pen/Lock-Set	Std.

1200 Series Thumbwheel Switch

This .300 wide single pole decimal or binary coded switch offers long life and reliability in a snap-together Push-Set panel switch. With small size and easily read characters, the 1200 Series switch provides 10 positions.

Number of Positions	10
Life	300,000 Detents
Electrical Rating	
Non-Switching Load	0.500 Amps
Switching Load	0.100 Amps
Contact Resistance	0.200 Ohms
Dielectric Withstanding V.	500 VDC
Seal	Dust
Panel Mount	Front
Dimensions, Module	
Height	0.708 (17.98)
Width	0.300 (7.62)
Length	0.905 (22.99)
Actuation Method	Push-Set

1300 Series Thumbwheel Switch

With .300 width, snap-together assembly, front snap-in mounting and large characters, this 10- or 16-position switch is the perfect choice for users that require high reliability and compactness.

Number of Positions	10 and 16
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.200 Ohms
Dielectric Withstanding V.	500 VDC
Seal	Dust
Panel Mount	Front
Dimensions, Module	
Height	0.945 (24.00)
Width	0.300 (7.62)
Depth, Behind Panel	1.338 (33.99)
Actuation Method	Push-Set

1400 Series Thumbwheel Switch

Thumbwheel, Push-Set or Lock-Set, the 1400 Series switch with its high reliability, easy snap-together assembly and variety of binary or decimal codes gives design flexibility to the user.

Number of Positions	10 and 16
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.200 Ohms
Dielectric Withstanding V.	500 VDC
Seal	Dust
Panel Mount	Front
Dimensions, Module	
Height	0.945 (24.00)
Width	0.315 (8.00)
Depth, Behind Panel	1.338 (33.99)
Actuation Method	
Thumbwheel/Push/Lock-Set	Std.

1600 Series Thumbwheel Switch

Low cost and small size, combined with front snap-in mounting make this 10-position thumbwheel actuated switch ideal for applications where panel space is limited. Snap-together modules eliminate tools.

Number of Positions	10
Life	100,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.150 Ohms
Dielectric Withstanding V.	500 V rms
Seal	None
Panel Mount	Front
Dimensions, Module	
Height	0.945 (24.00)
Width	0.295 (7.49)
Depth, Behind Panel	1.110 (28.19)
Actuation Method	Thumbwheel

Dimensions in inches (mm)

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Incorporated

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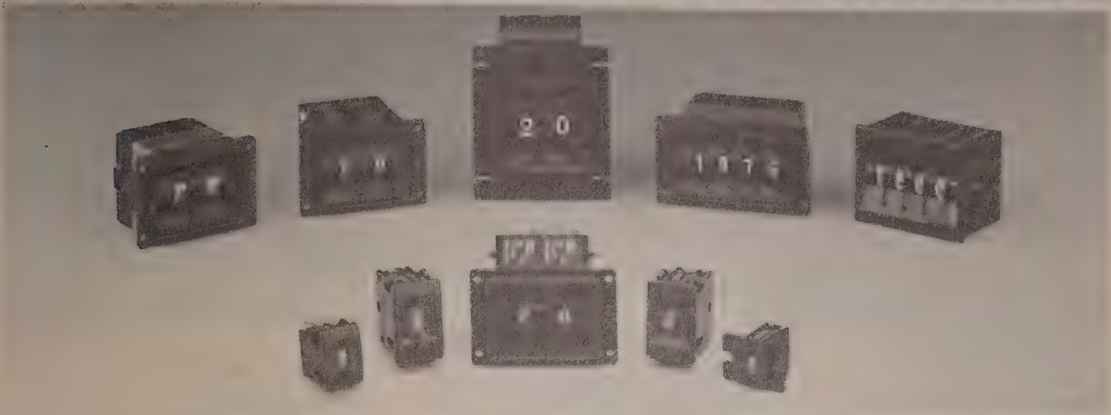
EECO® THUMBWHEEL SWITCHES



1776/1976 Series Thumbwheel Switch

Revolutionary in design, the 1776 Series .500 wide thumbwheel switch, and the slimmer (.350) 1976 Series switch, offer optional notched terminals for mounting directly to motherboards.

Number of Positions	8, 10, 12, and 16
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	1000 V rms
Seal	Dust
Panel Mount	Rear
Dimensions, Module	
Height	1.200 (30.48)
Width	0.500 (12.70),0.350 (8.89)
Depth, Behind Panel	1.508 (38.30)
Actuation Method	Thumbwheel

1800 Series Thumbwheel Switch

A reliable, low cost snap-in mount switch available in gray, beige or black in gloss or molded matte finish. The 1800 Series switch has PCB termination and is a slim .315 wide.

Number of Positions	10
Life	500,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	1000 V rms
Seal	None
Panel Mount	Front
Dimensions, Module	
Height	1.240 (31.50)
Width	0.315 (8.00)
Depth, Behind Panel	1.417 (35.99)
Actuation Method	Thumbwheel

2000 Series Thumbwheel Switch

A general purpose, large industrial-type switch, the 2000 Series offers over 50 codes in 8-, 10-, 12-, and 16-positions. Available with an unsealed and sealed option, plus extra large legend.

Number of Positions	8, 10, 12, and 16
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	1,000 V rms
Seal	Optional
Panel Mount	Rear
Dimensions, Module	
Height	2.100 (53.34)
Width	0.500 (12.70)
Depth, Behind Panel	2.030 (51.56)
Actuation Method	Thumbwheel

6000 Series Thumbwheel Switch

Designed to Military standards and field-proven, the 6000 Series switch is sealed to protect the contact area from dust, moisture and salt spray. Offered in 8-, 10-, and 12-positions, and with 3 types of term.

Number of Positions	8, 10, and 12
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	1,000 V rms
Seal	Environmental
Panel Mount	Rear
Dimensions, Module	
Height	1.150 (29.21)
Width	0.500 (12.70)
Depth, Behind Panel	1.560 (39.62)
Actuation Method	Thumbwheel

7000 Series Military Thumbwheel Switch

Qualified to the rigid standards of MIL-S-22710/15, this Military-grade switch offers a completely sealed contact area, impervious to dust, high humidity and salt spray. Can be used safely in explosive environments.

Number of Positions	8, 10, and 12
Life	1,000,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	1,000 V rms
Seal	Environmental
Panel Mount	Rear
Dimensions, Module	
Height	1.150 (28.07)
Width	0.500 (12.70)
Depth, Behind Panel	1.570 (39.88)
Actuation Method	Thumbwheel

Thumbpot™ Digital Voltage Divider

This unit is available in .500 or .350 wide models and electrically divides the input voltage into precise, incremental voltage output values. The major feature of the unit is exacting repeatability.

Number of Positions	10
Life	1,000,000 Detents
Electrical Rating	
Std. Res. Range	100-100K Ohms
Std. Res. Tolerance	+ 1%
Dielectric Withstanding V.	500 V rms
Ins. Res. (@ 500 VDC)	1,000 Megohms
Seal	Dust
Panel Mount	Rear
Dimensions, Module	
Height	1.200 (30.48)
Width	0.500 (12.70), 0.350 (8.89)
Depth, Behind Panel	1.250 (31.75)
Actuation Method	Thumbwheel

Dimensions in inches (mm)

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Incorporated

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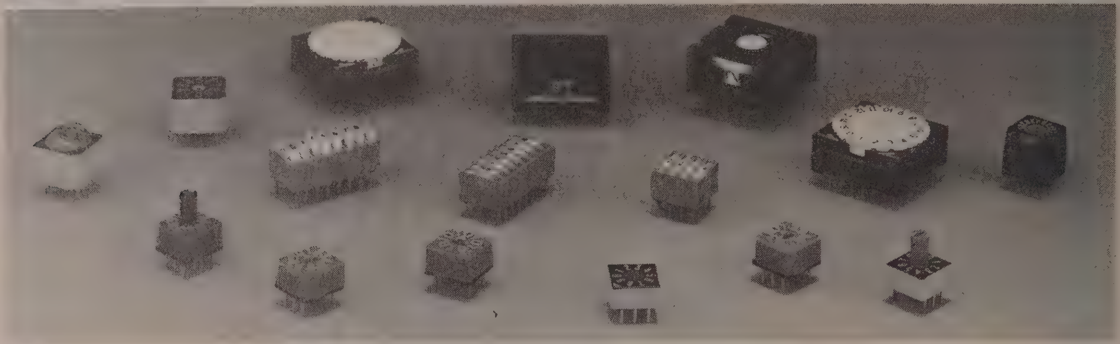
EECO® PCB SWITCHES



2300 Series
MICRO-DIP®

Advanced in concept, the 2300 Series switch is a space-saving yet economical method of equipment programming. Ideal for address encoding or presetting of PROM's and data entry devices.

Number of Positions	10 and 16
Life	10,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	250 V rms
Dimensions	
Height	0.239 - 0.394 (6.07 - 10.01)
Width	0.376 - 0.450 (9.55 - 11.43)
Length	0.396 - 0.450 (10.06 - 11.43)
Actuation Method	
Thumbwheel	Available
Screwdriver	Standard
Shaft	Available
Binary Coded Output	Standard

3300 Series
MICRO-DIP®

A low-profile, fully-sealed version of the original 2300 Series MICRO-DIP switch, this switch has all of its features, plus full sealing to withstand automated soldering and cleaning processes.

Number of Positions	10 and 16
Life	10,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.100 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	250 V rms
Full Environmental Seal	Standard
Dimensions	
Height	0.190 (4.83)
Width	0.380 (9.65)
Length	0.380 (9.65)
Actuation Method	
Screwdriver	Standard
Shaft	Available
Binary Coded Output	Standard

2400 Series
MINI-DIP®

With exclusive gold-on-gold cleaning/wiping action contacts, this series of switches assures low contact resistance while the unique locking rod design prevents accidental actuation.

Number of Positions	2 to 10
Life	2,000 Detents
Electrical Rating	
Non-Switching Load	1.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.050 Ohms
Dielectric Withstanding V.	500 V rms
Full Environmental Seal	Optional
Dimensions	
Height	0.375 (9.52)
Width	0.385 (9.78)
Length	0.200 - 1.000 (5.08 - 25.4)
Actuation Method	Rocker
Standard Options	
Special Marking	Yes
Seal	Yes

2100 Series
STRIPSWITCH®

The most economical method of handsetting coded values. Requires a minimum of space, no mounting hardware, and can be "ganged" up to four stations in a strip. Two legend locations provide readability.

Number of Positions	10 and 16
Life	250,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	500 V rms
Dimensions	
Height	0.430 (10.92)
Width	0.775 (19.68)
Length	0.800 (20.32)
Actuation Method	
Thumbwheel	Standard
Screwdriver	Standard
Binary Coded Output	Standard

2200 Series
STRIPSWITCH®

This switch offers all of the features of the proven 2100 Series STRIPSWITCH in a low-profile, fully-sealed unit. The easy-to-read thumbwheel has a built-in screwdriver slot.

Number of Positions	10 and 16
Life	100,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	500 V rms
Full Environmental Seal	Standard
Dimensions	
Height	0.360 (9.14)
Width	0.790 (20.07)
Length	0.790 (20.07)
Actuation Method	
Thumbwheel	Standard
Screwdriver	Standard
Binary Coded Output	Standard

2600 Series
STRIPSWITCH®

This is a 10 position low profile switch with a standard bottom seal to prevent solder wicking and flux migration. Horizontally or vertically mounted, with thumbwheel and screwdriver slots.

Number of Positions	10
Life	250,000 Detents
Electrical Rating	
Non-Switching Load	3.000 Amps
Switching Load	0.125 Amps
Contact Resistance	0.100 Ohms
Dielectric Withstanding V.	500 V rms
Dimensions	
Height	0.343 (8.71)
Width	0.780 (19.81)
Length	0.800 (20.32)
Actuation Method	
Thumbwheel	Standard
Screwdriver	Standard
Binary Coded Output	Standard

Dimensions in inches (mm)

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EEČO®
MEMBRANE SWITCHES

A UNION OF GRAPHICS EXCELLENCE AND ELECTROMECHANICAL EXPERTISE.

The Membrane Switch Operations of EECO Incorporated provides high quality switches to customers requiring absolute reliability combined with faultless graphics.

EECO membrane switches integrate SPST, momentary, normally open switches into control panels which include exceptional graphic features. Circuitry is screen-printed on polyester substrates and conductors carry low voltage DC logic signals. Construction methods provide totally-sealed panels capable of withstanding harsh environmental conditions. Mechanical designs minimize the effect of normal handling during the assembly process and use of the finest available materials ensures quality.

Typical applications include:
- Medical products and instrumentation.
- Depth-finders and radar systems for marine use.
- Heat and humidity intensive products such as handheld military radios.
- Office products.
- Point-of-Sale terminals.

Vertical Integration

EECO ensures quality and efficiency by exercising careful control over processes and materials. EECO in-house capabilities include:
- Computer Assisted Design to ensure documentation quality.
- Design engineering and art layout.
- Photographic reproduction.
- One of the finest technical graphics capabilities in the country.
- Circuit printing and a comprehensive testing program for the electronic component portion of all EECO membrane switches.
- A graphic ink laboratory for production and matching of high quality inks.
- Fabrication of steel rule dies.
- Production of stainless steel and polyester mesh screens in humidity-controlled environment.
- Die cutting.
- Assembly.

Features

- Embossed graphics provide tactile location and enhance the user interface.
- Selective texturing adds chemical resistance and allows a transparent readout area in a matte background without a die-cut opening.
- Connectors are installed and tested to met specific circuit configurations.
- Standard aluminum or plastic support panels can be provided with mounting hardware.
- PCB's with components and connectors are available for integration of LED backlighting.
- Graphic interchangeability permits cosmetic changes to control panels for private labeling.
- Backlit switch functions are available.
- "Deadfront" legends allow selective display of instructions.
- Lenses for LED, Vacuum Fluorescent, Liquid Crystal, and CRT displays are available.
- Polyester or stainless steel domes provide tactile feedback which adds mechanical resistance and travel.
- ESD/EMI shielding provided with aluminum or copper foils, or a variety of cost-effective printed conductive materials.

Quality & Reliability

The EECO quality system is organized to provide reliable membrane switch products that you can count on—every time!
- All aspects of a proposed design are reviewed prior to production.
- Training programs for the entire manufacturing force assure quality at every phase of production.
- All component materials are selected, qualified and inspected with quality standards prior to release to manufacturing.
- Die cutting, color matching, printing and assemblies are all first-article inspected before continued manufacture.
- Continuous monitoring of operations assures adherence to strict quality standards.
- Circuits and connectors are fully electrically inspected before final assembly.
- Conductors are fully tested for electrical conformance, proper substrate adhesion, hardness and proper curing.
- Each switch function is thoroughly tested for design compliance, continuity and electrical specifications.
- Final inspection is 100%, plus a simulated customers' incoming inspection program sampling.
- A thoroughly documented Quality Assurance Program assures that only top quality products are shipped.

EECO
Incorporated

EECO (Membrane Switch Operations) • 2949 N. 31st Ave., Phoenix, AZ 85017 • Phone: (602) 272-5645 • TWX 910-950-0196
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all types of switches...
AEROSPACE - COMMERCIAL —

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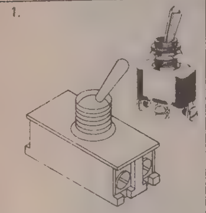
TOGGLE
General Purpose

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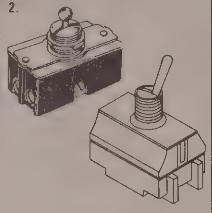
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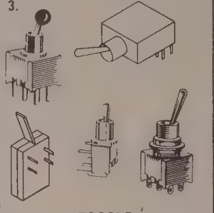
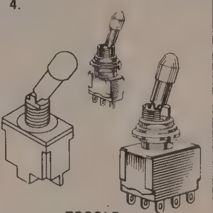
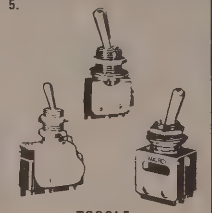
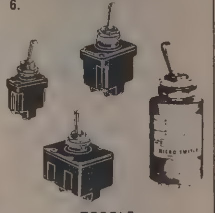
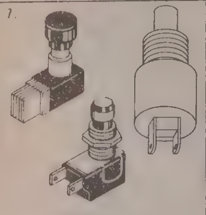
High Capacity

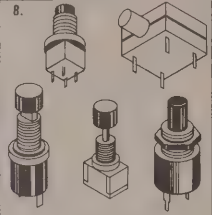
3.

TOGGLE
Miniature & Ultra Miniature

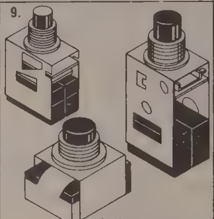
4.

TOGGLE
Locking Lever

5.

TOGGLE
Precision

6.

TOGGLE
Environmentally Sealed

7.

PUSHBUTTON
General Purpose

8.

PUSHBUTTON
Miniature & Ultra Miniature

9.

PUSHBUTTON
Precision

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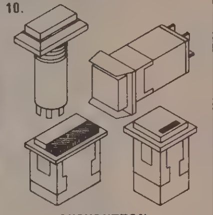
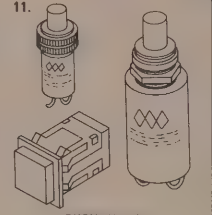
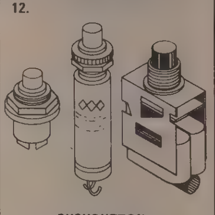
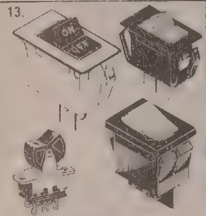
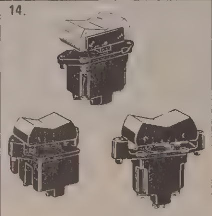
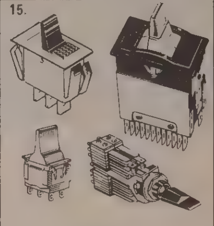

PUSHBUTTON
Lighted

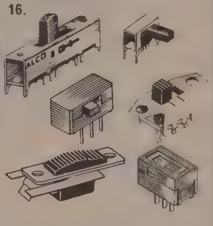
11.

PUSHBUTTON
Reed & Solid State

12.

PUSHBUTTON
Environmentally Sealed

13.

ROCKER
Lighted & Unlighted

14.

ROCKER
Heavy Duty / Sealed

15.

PADDLE

16.

SLIDE

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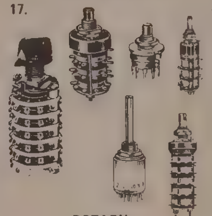
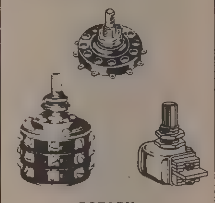
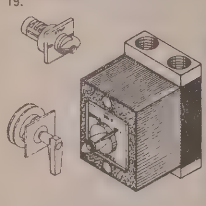
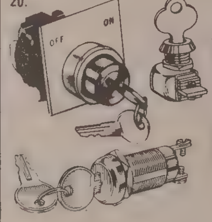

ROTARY
Electronic Duty

18.

ROTARY
General Purpose

19.

CAM–ROTARY
High Capacity HP Rated

20.


KEY LOCK

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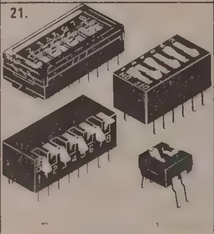
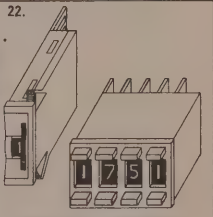
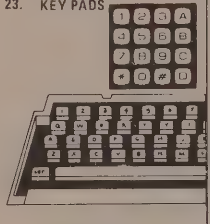
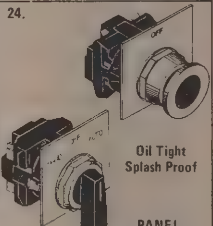

DIP SWITCH

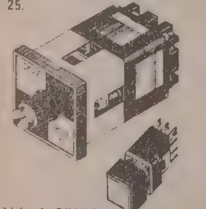
22.


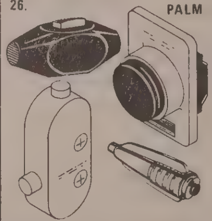
PB/ROTARY THUMBWHEEL
Programmable Code Switch

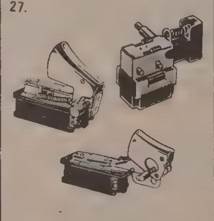
23. KEY PADS


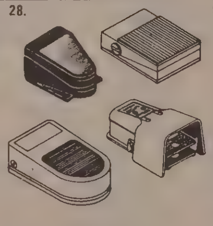
KEY BOARDS

24.

Oil Tight
Splash Proof
PANEL
CONTROLS

25.

Lighted - Oil Tight
PANEL CONTROLS

26. PALM

PENDANT FEED THRU

27.

TOOL HANDLE

28.

FOOT SWITCH

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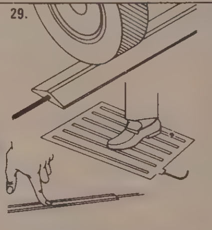
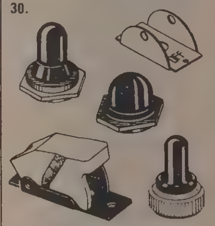
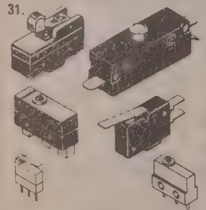
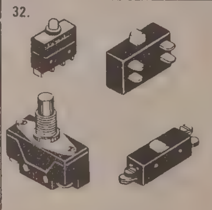
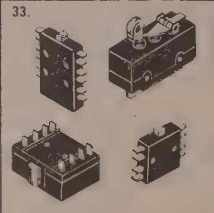
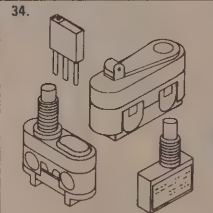

TAPE/AIR SWITCHES

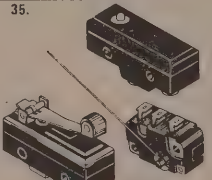
30.

SWITCH GUARDS & SEALS

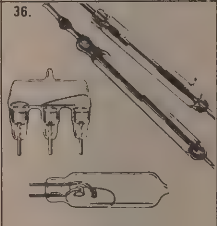
31.

MICRO
Single Break

32.

MICRO
Double Break

33.

MICRO
2 & 3 Poles

34.

MICRO
Sealed & Hi-Temperature

35.

MICRO
Rotary
MICRO High DC Capacity
Magnetic Blow-Out Switches

36.

REED & MERCURY

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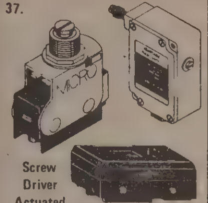
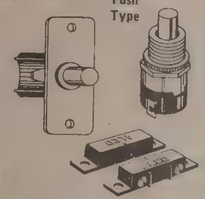
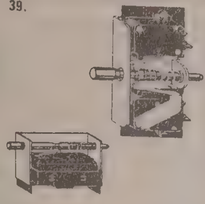
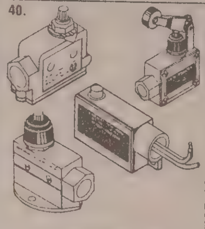
37.


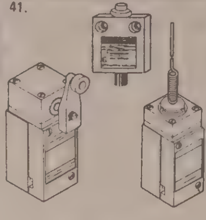
Screw Driver Actuated & PULSE SWITCHES

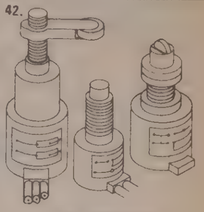
38.


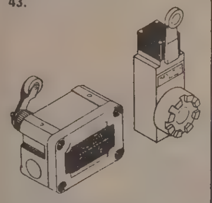
Magnetic Actuated DOOR SWITCHES

39.

DOOR INTERLOCK

40.

ENCLOSED SWITCHES

41.

LIMIT SWITCHES

42.

LIMIT SWITCHES
Sealed & Hi-Temperature

43.

LIMIT SWITCHES
Explosion Proof

44.

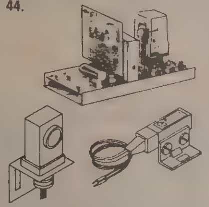



PHOTO-ELECTRIC CONTROLS
Fiber Optics-LED-Incandescent

45.

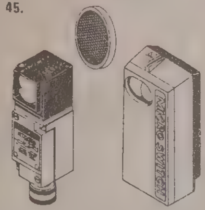
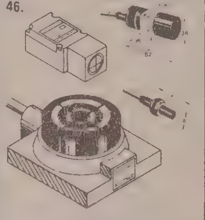
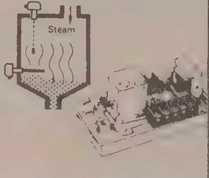
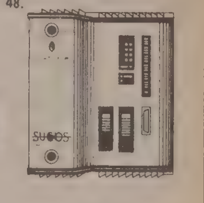



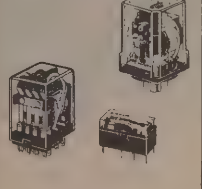
PHOTO-ELECTRIC
Self-Contained

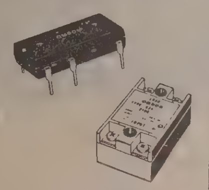
46.

PROXIMITY CONTROLS

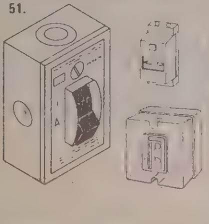
47.


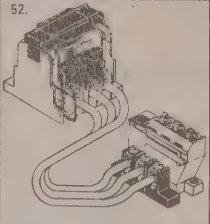
LIQUID LEVEL CONTROLS
Capacitance & Resistance Type

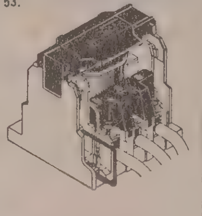
48.

PC
Programmable Controller

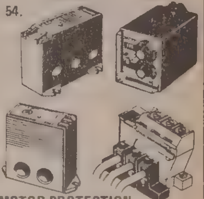
49.

RELAYS
Electro-Mechanical

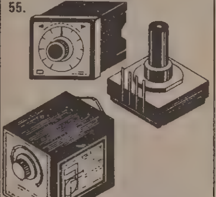
50.

RELAYS
Reeds & Solid State

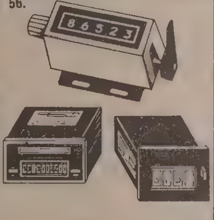
51.

MANUAL MOTOR STARTERS

52.

MAGNETIC MOTOR STARTERS

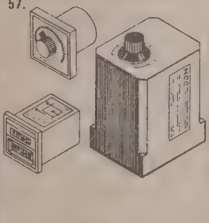
53.

MAGNETIC CONTACTOR

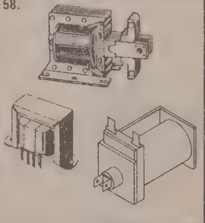
54.

MOTOR PROTECTION
Thermal · OverCurrent
Open & Reverse Phase

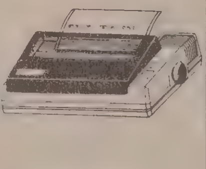
55.

PRESSURE
TRANSDUCERS
TEMPERATURE CONTROLS

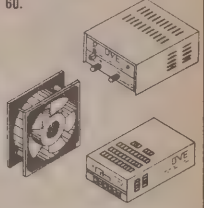
56.


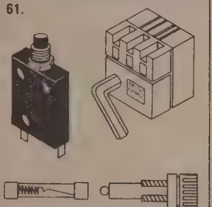
COUNTERS

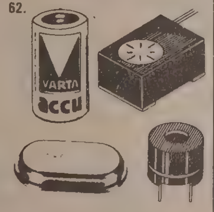
57.

TIMERS

58.

SOLENOIDS & TRANSFORMERS

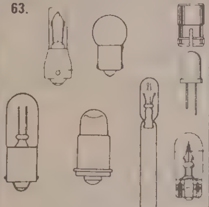
59.

IMPACT PRINTERS

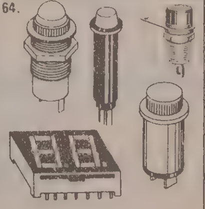
60.

FANS & POWER SUPPLIES

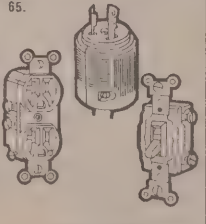
61.

CIRCUIT PROTECTION
FUSES & FUSEHOLDERS

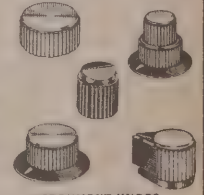
62.


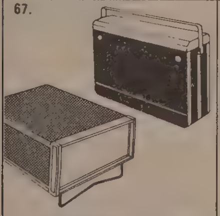
BATTERIES/BUZZERS-ELECT,.
Audio Transducers

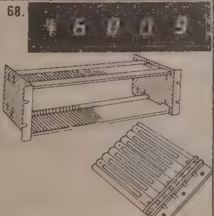
63.

LEDS & NEON
Incandescents Mini-Lamps

64.

INDICATOR LIGHTS
LED DISPLAYS

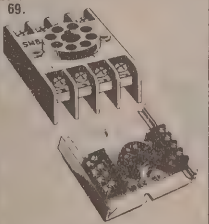
65.

WIRING DEVICES

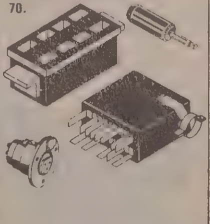
66.

INSTRUMENT KNOBS
Commercial & Military

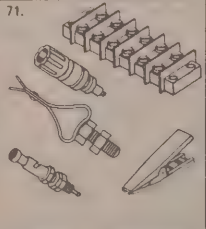
67.

INSTRUMENT CASES
BAILS & HANDLES

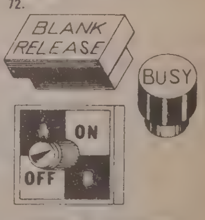
68.


DIGIBEZELS
PC RACKS & BOARDS

69.

SOCKET SNAP-TRACKS

70.

PLUGS JACKS & CONNECTORS

71.

TERMINALS & HARDWARE

72.


CUSTOMER ENGRAVING

Send for Free Copy of Our New SWITCHLOG No. 20, Write to:

E S I

ELECTRIC SWITCHES
INCORPORATED

2478 Fletcher Dr. Los Angeles, California 90039

Electric Switches, Inc.
Dept. 84 EEM
P.O. Box 3085, Terminal Annex
Los Angeles, California 90051

electro-mech
LIGHTED PUSH-BUTTON SWITCHES

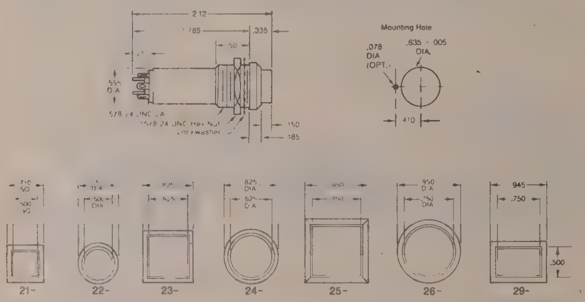
**DISPLAY ASSEMBLIES/
INTERLOCK SWITCH ASSEMBLIES/INDICATORS**

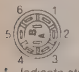
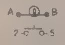
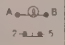
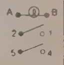
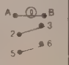
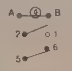
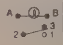
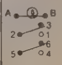
ELECTRO-MECH provides a perfect blend of quality standard products with in-depth experience in answering unique requirements. Proven engineering designs are illustrated by the excellent performance characteristics of each ELECTRO-MECH lighted push-button switch, indicator, and display assembly. Low-bounce, long-life contacts, new innovations in legends, displays, field-service, packaging—all standard features. Whatever your applications, ELECTRO-MECH is prepared to answer your specific needs. Choose from any of the most popular models.

Technical specifications apply to all ELECTRO-MECH Switch models unless otherwise specified:

- **Ratings: 30 Volts DC or 115 Volts AC; 2 amps resistive, 1 amp inductive**
- **Weight: 0.8 oz. (approx.)**
- **Operating Pressure: 2 lbs. + 1 lb.**
- **Plunger Travel: 3/16" (approx.)**
- **Actuations: 100,000**
- **Accommodates all "switchlines" standard lenses. Uses one T1-3/4, AN3140-327, 328, 330 bulb or neon lamp, 3 actuation modes standard**
- **Lenses: Available in ½" to 1" round and square, plus various rectangular sizes.**

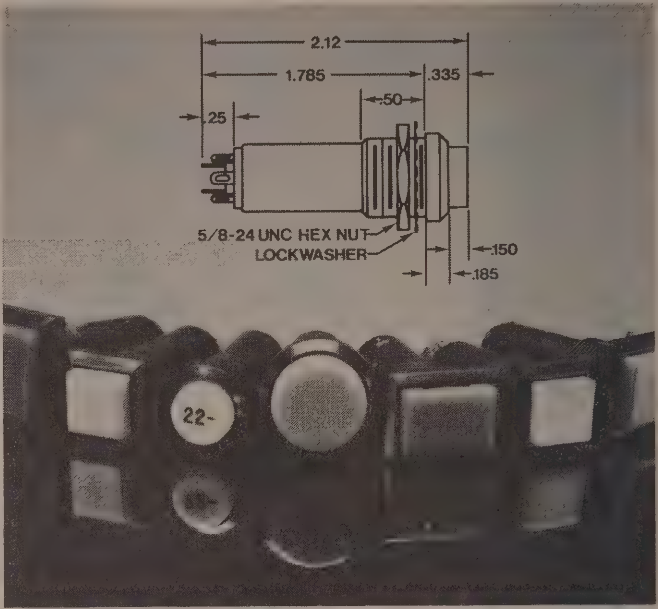
MOUNTING SPECIFICATIONS



SWITCH FUNCTIONS	SPST N.O.	SPST N.C.	DPST N.O.	DPST N.C.	DPST 1 N.O., 1 N.C.	SPDT	DPDT
MOMENTARY	2* 128	2*-129	2*-130	2*-131	2*-132	2*-149	2*-150
PUSH-ON PUSH-OFF	2*-228	2*-229	2*-230	2*-231	2*-232	2*-249	2*-250
PUSH-ON REMAIN-IN PUSH-OFF	2*-828	2*-829	2*-830	2*-831	2*-832	2*-849	2*-850
N.O. POS	2-5		1-2, 4-5		1-2	1-2	1-2, 4-5
N.C. POS		2-5		2-3, 5-6	5-6	2-3	2-3, 5-6
COMMON POS			2, 5	2, 5		2	2, 5
							

*—Indicate style of switch (21- through 26, and 29)

SERIES 20
A NEW CONCEPT OF FAST EASY SWITCH INSTALLATION AND DISPLAY DESIGN VERSATILITY



FEATURES:

- **Momentary or alternate action**
- **Mounts in a ⅝" dia. round hole**
- **High density mounting ability—less than ¾" centers**
- **Low profile appearance in one unitized housing**

ELECTRO-MECH's Series 20 Switches are provided in display configurations.

These low profile units are available in any switching mode with independent circuitry from SPST to DPDT including a separate indicator circuit. The all plastic, unitized housing assures ease in handling (no adapters, clamps or brackets). Just drop in round hole and secure with a nut from behind panel.

Series 20 Switches have the same internal parts as the all metal 6100 Series Switches including positive action, reliable circuitry and proven low bounce characteristics made possible by our unique design concept of silver slide bar action.

Available options include gold plating for dry circuit applications. Round slotted nuts for mounting switches on close centers.

SERIES 400
MULTI-STATION SUB-PANEL ASSEMBLIES

Multi-station switch assemblies designed for sub-panel mounting by means of a flanged "U" channel. All standard ELECTRO-MECH switches can be incorporated with several types of mechanical interlocking/lockout actions between stations. Up to 12 stations in one or two row configurations. The standard center distance between switches is ⅝", ¾", ⅞" and 1".

SERIES 500
INTERLOCKING SWITCH ASSEMBLIES

Added beauty and long-lasting appearance with handsome chrome barriers between each switch or indicator. Independent or interlocking action. Ten types of tracking action and switching sequences. Up to 12 switches in single or dual row, ⅞" or 1" centers.

PROGRAM MEMORY
CLEAR
DATA

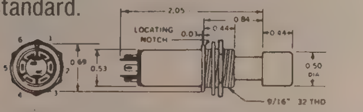
ELECTRO-MECH COMPONENTS, INC. • 1826 NORTH FLORADALE AVE. • SO. EL MONTE, CALIF. 91733 • (213) 442-7180

electro-mech
LIGHTED PUSH-BUTTON SWITCHES

COMMUNICATIONS/INDUSTRIAL CONTROLS/DISPLAYS
COMPUTER PERIPHERALS/INSTRUMENTATION

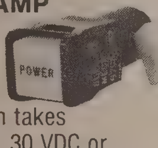
SERIES 2100

This version of our standard illuminated Pushbutton Switch features silver slide bar action. Add BR after part number for mounting on ⅝″ centers. Utilizes AN3140-T 1¾″or Neon bulb. All other specifications same as standard.


2.05
0.84
LOCATING NOTCH
0.03
0.44
0.44
0.69
0.53
0.50 DIA
9/16" 32 THD
1
2
3
4
5
6

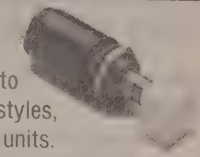
	1 PST		2 PST		1 N.O.		
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.C.	1 PDT	2 PDT
Momentary	2128	2129	2130	2131	2132	2149	2150
Push-on/ Push-off	2228	2229	2230	2231	2232	2249	2250

SERIES 4000 10 AMP

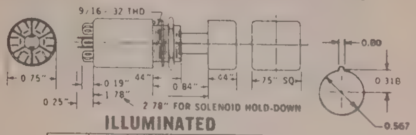


Low profile matches standard industry models. Momentary or Alternate Action design takes any standard lens size. 30 VDC or 115 VAC, 10 A Resistive, 5 A Inductive.

SERIES 2600



Standard models are available from 2PST to 6PDT in 116 different styles, including non-lighted units. Virtually any standard ELECTRO-MECH lens may be used with the 2600 Series.


9/16 - 32 THD
0.75"
0.19"
1.78"
0.25"
.44"
0.84"
.64"
.75" SQ
2.78" FOR SOLENOID HOLD-DOWN
0.80
0.318
0.567
MOUNTING HOLE

ILLUMINATED

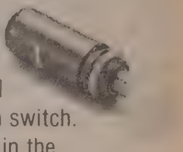
	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.
2 PDT	2650	2750	2850	2550
3 PDT	2651	2751	2851	2551
4 PDT	2652	2752	2852	2552
5 PDT	2653	2753	2853	2553
6 PDT	2654	2754	2854	2554

SERIES 5000

An exceptionally short momentary switch available in circuit configurations up to 2 PDT.

	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	5128	5129	5130	5131	5132	5149	5150

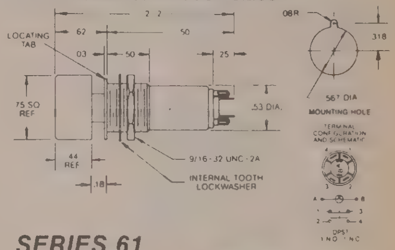
SERIES 3000



Illuminated Pushbutton switches with an integral hold-down coil which is activated with switch. Holds the push-button in the depressed position until coil is de-energized returning it to relaxed position. Available in all circuit configurations up to 6 PDT. Same specifications as standard model.

SERIES 6100

High-density packaging requirements are answered with this shorter, front panel mount, providing the same quality design as standard ELECTRO-MECH model sizes.


LOCATING TAB
2.2
.62
.50
.08R
.318
.03
.50
.25
.75 SQ REF
.53 DIA.
.567 DIA MOUNTING HOLE
TERMINAL CONFIGURATION AND SCHEMATIC
9/16-32 UNC-2A
.44 REF
.18
INTERNAL TOOTH LOCKWASHER
DPST 1 NO 1 NC

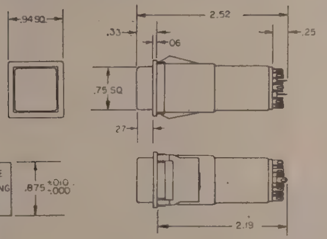
Designer Group Switches

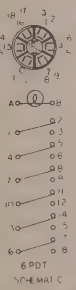
¾″ sq., ¾″ x 1½″, ¾″ x ⅞″, ½″ sq.

These ELECTRO-MECH Standards feature typical switch functions and mounting options for design flexibility. A choice of dual/quad display units are also available.

All Designer Group units feature:

- **1PST TO 6PDT**
- **Momentary: Alternate action; push-on remain-in; push-on, push-off and momentary snap-feel.**

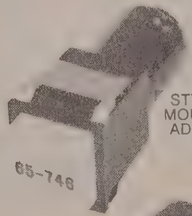

.94 SQ.
.33
.06
2.52
.25
.75 SQ
.27
SQUARE MOUNTING HOLE
.875 +.010 -.000
2.19


6 PDT SCHEMATIC

MODEL 65
NO BARRIER

MODEL 68
SINGLE BARRIER (L OR R)

MODEL 67
DOUBLE BARRIER

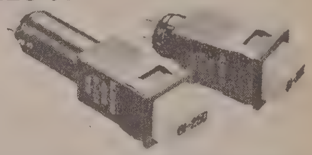


STYLE 65
MOUNTING
ADAPTER

MODEL 600/800
DUAL/QUAD LITE
SWITCH

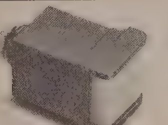
MODEL 73
¾″ x 1½″
RECTANGULAR

SERIES 61



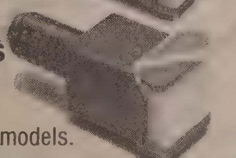
ELECTRO-MECH's Series 61 switches are provided in ½-inch square, snap-in or hardmount configurations. Each low-profile unit is available in any function from SPST to 2PDT, each controlled with an independent circuit. The all plastic, unitized housing, helps insulate switch from other surrounding components. The 61 Series is also available in a standard PC Board mounting configuration.

SERIES 60
MOMENTARY SWITCH



Rear mounted "U" bracket accepts switch installation from front of panel.

LG SERIES SAFETY LENS



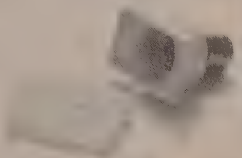
Available on all 67-single-station, double-barrier lighted push-button bezel switch models.

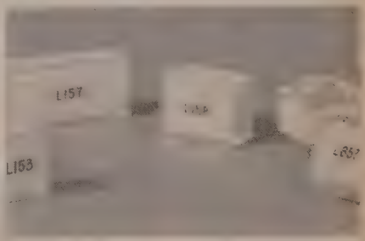
EL SERIES FLUSH MOUNTING

Available in round, square or rectangular styles. Specify switch model desired with "EL" suffix (i.e. 73 EL-2654).

SERIES 150
INTERCHANGABLE LENSES/FILTERS

Displays may be changed or buttons replaced. Non-wearing, clear-acrylic lens and filter buttons. Available in standard, Opaque or Contour.





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eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC alternating current
A/D analog to digital
ADC analog to digital converter
ADP automatic data processing
AF audio frequency
AFC automatic frequency control
ALGOL algorithmic language
AM amplitude modulation
AND a logical operator
AQL acceptable quality level
ASCII American national standard code for information interchange
AWG American wire guage

B

BALUN balanced to unbalanced
BASIC beginners' all-purpose symbolic instruction code
BCD binary-coded decimal
BNC baby "N" connector
BUS basic utility system

C

CAD computer aided design
CAM computer aided manufacture
CATV cable television or community antenna television
CERMET ceramic metal element
Comm. communications
CMOS complementary metal-oxide semiconductor
CPS characters per second
CPU central processing unit

D

D/A digital to analog
DAC digital to analog converter
DC direct curent
DIL dual in-line
DIP dual in-line package
DPM digital panel meter
DTL diode transistor logic

E

EDP electronic data processing
EBCDIC extended binary coded decimal interchange code
EEPROM electrically erasable PROM
EMC electromagnetic compatibility
EMI electromagnetic interference
EPROM electrically programmable ROM
ESR equivalent series resistance

F

FEP fluorinated ethylene propylene Copolymar, 200° Teflon
FET field-effect transistor
FM frequency modulation
FORTRAN formula translator

G

GaAsFET gallium arsenide field effect transistor
GPIB general purpose interface bus

H

HF high frequency (3 to 30 MHz)
HIPOT test, measurement and diagnostic equipment
HLL high level language
HV high voltage
Hz Hertz

I

IC integrated circuit
IF intermediate frequency
IO input/output (devices)
IR insulation resistance (or) infrared

J

JFET junction field effect transistor
JMOS junction metal oxide semiconductor

K

kHz kilohertz (10^3 hertz)
KSR keyboard send receive

L

LC inductance capacitance
LCD liquid crystal display
LED light-emitting diode
LF low frequency (30 to 300 kHz)
LSI large scale integration
LVDT linear velocity displacement transformer

M

MATV master antenna television
μF microforad
MHz megahertz
MOS metal oxide semiconductor
MOSFET metal oxide semiconductor field effect transistor
MOV metal oxide varistor
MPU microprocessor unit
MSI medium scale integration

N

NBS National Bureau of Standards
NIM nuclear instrumentation module
NOR not OR

O

OEM original equipment manufacturer
OR a logical operator

P

pF picofarad
PC printed circuit
PCB printed circuit board
PIN positive-intrinsic-negative (transistor)
PLA programmable logic array
PPI plan position indicator
PROM programmable read only memory
PUT programmable unijunction transistor

Q

QAM quadrature amplitude modulation
Q (meter) quality-factor meter

R

RAM random access memory
RC resistance-capacitance
RFI radio frequency interference
RMS root mean square
ROM read only memory
RF radio frequency
RFC radio-frequency choke
RFI radio-frequency interference
RTD resistance-temperature detector
RTL resistor transistor logic
RTV room temperature vulcanizing
RW read/write

S

SAS silicon asymmetrical switch
SBC single board (micro) computer
SBS silicon bilateral switch
SCR silicon-controlled rectifier
SIP single in-line package
SSI small scale integration
SSR solid state relay
STL Schottky transistor logic

T

TC temperature coefficient
TCXO temperature compensated crystal oscillator
TFE tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL transistor-transistor logic
TTY teletypewriter

U

UHF ultra high frequency (300 MHz to 3 GHz)
UL Underwriters Laboratory
UPS uninterruptible power supply

V

VAC volts (of) alternating current
VAR volt-ampere reactive
VCR video cassette recorder
VDC volts (of) direct current
VHF very high frequency
VHSIC very high speed integrated circuit
VLF very low frequency (3 to 30 kHz)
VLSI very large scale integration
VRM voice recognition module
VTVM vacuum tube volt meter
VU volume unit
VSWR voltage standing wave ratio

W

WPS word processing software

Y

YIG yttrium iron garnet

The Electro-mechanical switch source

Superior quality
High integrity

Extremely competitive prices

Quick delivery from "off the shelf"

TA Series

"The old reliable electro-mechanical push button switch"

NIPPON DENYO CO., LTD.

"Push button switches with LED lamp"

COBA

"Widmaier MTS System"

Highly reliable modular input switches

320M SERIES

"Miniature input switches for electronic devices"

UNIMEC

"Modular switch system"

SIGMATAST

"High quality input switch for electronic devices"

IWATSU

"Miniature short stroke push switch"

TANAKA T.M.S

"Light touch smooth action push button and slide switches"

MIYAMA

"Illuminated panel mounted push button switches"

Call or write for catalog, samples and price information. Contact us directly or find name of your closest distributor or representative in manufacturers listing.

MANUFACTURER AND IMPORTER
ELECTRONIC COMPONENTS GROUPE
14143 21st Avenue North, Minneapolis, MN 55441
612/559-0720 • TWX 910-576-1725

selector guide

ELECTROSWITCH

rotary switches

	LOW CURRENT SWITCHES			CAM-ACTIVATED SWITCHES						
CHARACTERISTICS	SERIES 1	SERIES 2	SERIES 4	PR 10	PR 16	PR 20	PR 25	CC 32	CC 63	CC 125
SECTIONS	1-24	1-15	1-10	1-12	1-12	1-12	1-12	1-12	1-12	1-6
POLES	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-24	1-12
POSITIONS	2-12	2-32	2-48	2-12	2-12	2-12	2-12	2-12	2-12	2-12
DETENTING ANGLE	30,60,90,180°	11¼,15,22½,30°	7½,15°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°	30,45,60,90°
ELECTRICAL RATINGS										
Continuous Rating	10A-115V	10A-115V	10A-115V	12A-600V	20A-600V	24A-600V	34A-600V	40A-600V	80A-600V	160A-600V
Interrupting Current										
120 VAC	0.35A(115VAC)	2A	1A	10A	16A	20A	25A	32A	63A	125A
240 VAC				10A	16A	20A	25A	32A	63A	125A
600 VAC				10A	16A	20A	25A	32A	63A	125A
24 VDC	1A(28VDC)	2A(30VDC)	2A(30VDC)	10A	16A	20A	25A	32A	63A	125A
125 VDC				3A	2½A	2½A	2½A	5A	3A	3.5A
250 VDC		0.1A								
Max. Breaking Ability				42A	65A	75A	125A	107A	215A	267A
Max. Making Ability				64A	100A	120A	170A	160A	320A	400A
Momentary Current										
1 second				300A	400A	420A	1100A	1200A	1500A	2400A
3 seconds								350A		
30 seconds								155A		
60 seconds								120A		
Overload Current (50 operations)										
120 VAC				60A		120A		360A		
240 VAC				55A	96A			360A		
600 VAC					66A	102A	132A	270A		
24 VDC								45A		
125 VDC								45A		
250 VDC								2A		
Dielectric Strength	1000 VRMS	1500 VRMS	1500 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS	2200 VRMS
Insulation Resistance	10^4 megohms	10^6 megohms	10^6 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms
Contact Resistance	2.5 milliohms	2.0 milliohms	2.0 milliohms	30 milliohms	30 milliohms	30 milliohms	30 milliohms	10 milliohms	10 milliohms	6 milliohms
HORSEPOWER RATINGS										
3-phase ratings — reduce by ½ for 1-phase										
110/120 VAC				1 hp	2 hp	3 hp	3 hp	5 hp	10 hp	
220/240 VAC				3 hp	5 hp	5 hp	7½ hp	9 hp	20 hp	
440/480 VAC				5 hp	7½ hp	10 hp	15 hp	15 hp	27 hp	
550/600 VAC				7½ hp	10 hp	15 hp	20 hp			
MOUNTINGS										
Single-Hole	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
2-Hole		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-Hole										
Base-mount				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Water proof-mount	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Door-mount				Yes	Yes	Yes	Yes	Yes	Yes	Yes
LOCKING FEATURES										
Key-interlock				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Push-to-turn										
Solenoid-lock										
SPECIAL DRIVES										
Key-operated				Yes	Yes	Yes	Yes			
Solenoid-operated										
Ganged gear-operated				Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spring return	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
APPROVALS										
U/L				Recognized	Recognized	Recognized	Recognized	Recognized	Recognized	
CSA Certified				Yes	Yes	Yes	Yes	Yes	Yes	

ELECTRO SWITCH CORP. • Weymouth, Massachusetts 02188 • Telephone: 617/335/5200 • TWX: 710/388/0377

FOR GENERAL INDUSTRIAL CONTROL

Single-hole
4-hole

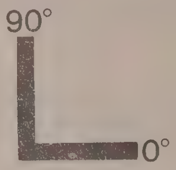
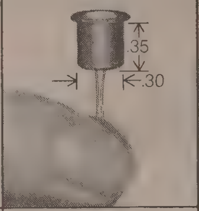
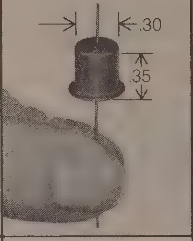
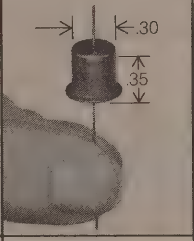
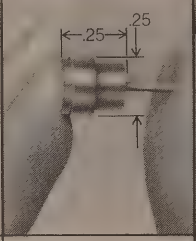
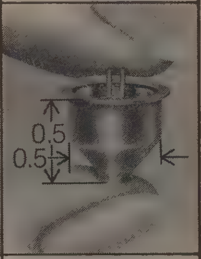
DETENT SWITCHES						SNAP-ACTION SWITCHES				
SERIES 21	SERIES 24	SERIES 25	SERIES 28	SERIES 31	SERIES 31	SERIES 101	SERIES 103	SERIES 105	SERIES 107	CHARACTERISTICS
1-30	1-10	1-25	1-15	1-10	1-10	1-12	1-12	1-8	1-8	SECTIONS
1-60	1-20	1-75	1-30	1-20	1-20	1-12	1-12	1-8	1-8	POLES
2-8	2-8	2-12	2-16	2-8	2-8	2-4	2-4	2-4	2-4	POSITIONS
45°	45°	30°	22½°	45°	45°	90°	90°	90°	90°	DETENTING ANGLE
										ELECTRICAL RATINGS
15A-600V	30A-600V	10A-600V	5A-600V	15A-600V	15A-600V	20A-600V	45A-600V	75A-600V	200A-600V	Continuous Rating
										Interrupting Current
15A	20A	10A	5A	10A	10A	15A	40A	60A	200A	120 VAC
7½A	15A	5A	3A	5A	5A	10A	40A	60A	200A	240 VAC
4A	6A	3A	2A	3A	3A	5A	30A	60A	200A	600 VAC
10A		7½A	5A	5A	5A	15A	30A	60A	200A	24 VDC
2A	3A			1A	1A	10A	30A	60A	on request	125 VDC
						5A	30A	60A	on request	250 VDC
30A		75A	15A	60A	60A	90A	180A	360A	600A	Max. Breaking Ability
30A		75A	15A	60A	60A	90A	180A	360A	600A	Max. Making Ability
										Momentary Current
										1 second
140A	200A	75A		90A	90A	140A	300A	300A		3 seconds
45A	75A	30A		35A	35A	45A	125A	250A		30 seconds
35A	60A	25A		25A	25A	35A	100A	175A		60 seconds
										Overload Current (50 operations)
30A	95A	75A	15A	60A	60A	90A	180A	360A	600A	120 VAC
	65A	20A		45A	45A					240 VAC
	35A			20A	20A					600 VAC
				30A	30A					24 VDC
				15A	15A					125 VDC
										250 VDC
1200 VRMS	2200 VRMS	1200 VRMS	1200 VRMS	2000 VRMS	2000 VRMS	2200 VRMS	2500 VRMS	2500 VRMS	2500 VRMS	Dielectric Strength
100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	100 megohms	Insulation Resistance
30 milliohms	10 milliohms	10 milliohms	10 milliohms	10 milliohms	10 milliohms	30 milliohms	10 milliohms	6 milliohms	1.5 milliohms	Contact Resistance
										HORSEPOWER RATINGS
										3-phase ratings — reduce by ½ for 1-phase
						½ hp				110/120 VAC
						½ hp	2 hp			220/240 VAC
							2 hp			440/480 VAC
										550/600 VAC
										MOUNTINGS
				Yes		Yes				Single-Hole
	3-hole									2-Hole
Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	4-Hole
						Yes	Yes	Yes	Yes	Base-mount
Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Water proof-mount
										Door-mount
										LOCKING FEATURES
Yes	Yes	Yes	Yes							Key-interlock
Yes	Yes	Yes	Yes							Push-to-turn
Yes	Yes	Yes	Yes							Solenoid-lock
										SPECIAL DRIVES
	Yes			Yes						Key-operated
	Yes				Yes					Solenoid-operated
Yes	Yes	Yes	Yes							Ganged gear-operated
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Spring return
										APPROVALS
listed	Yes	listed	listed	listed	listed	listed	listed			U/L
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			CSA Certified

ELECTRO SWITCH CORP. • Weymouth, Massachusetts 02188 • Telephone 617 335 5200 • TWX 710/388/0377

FIFTH DIMENSION, INC.

Tilt Switches

Fifth Dimension tilt switches are small, precision-made, omnidirectional devices which trigger at a predetermined angle. The operating mechanism in each of these reliable switches is a free mass of mercury enclosed in a rugged welded steel, hermetically sealed case containing an oxygen-free atmosphere. Jitter switches are actuated by vibration, acceleration or movement.

	Normally Closed	Normally Open	Jitter	Low-Cost Jitter	Normally Closed
	Mounting Position: Glass Seal Down				Glass Seal Up
					
	TS7B	**TS7W10**	**TS7K**	**TS66**	**TS411**
Nominal Operating Angle	45°	70°	70°	horizontal operation	45°
Operating Angle Tolerance	±25°	±15°	±15°		±15°
Relative Amount Contact Jitter	M	M	S	S	L
*Relative Speed of Response	M	M	F	F	F
Load Current @ 115 VAC Amperes	0.5	0.5	0.5	0.01	0.5
Load Current @ 12 VDC	1.0	1.0	1.0	0.1	2.0
Contact Resistance @ 100mA ohms	1.0	0.5	2.0	10.0	0.05
Contact Resistance @ 1mA ohms	1.0	0.5	10.0	200.0	0.05
Operational Lower Temperature Degrees C	−20	−20	−20	−38	−38
Operational Upper Temperature Degrees C	+105	+105	+105	+105	+85

L–Little M–Moderate S–Substantial SL–Slow F–Fast

*Viscosity of damping fluids changes with temperature. Switch is slower at cold extreme and faster at higher temperature.

Custom-Designed Tilt Switches and Tilt-Switch Packages

Tell us about your application and we'll develop a special tilt switch or tilt-switch package that will enhance your product's performance or marketability. We can design tilt switches that will trigger at specified angles, that will detect the direction of an impulse, the direction and amplitude of acceleration or of tilt; switches that will respond to shock, vibration and, in fact, to virtually any kind of motion.

Then, if you require, we will incorporate the switch into a pc board, add other components, provide a special connector, encapsulate the assembly in a potting material...all with the objective of ensuring that the package will meet the special precision, configuration, reliability and repeatability specifications of your industrial, commercial or military application.

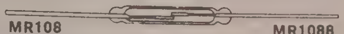
FIFTH DIMENSION, INC.

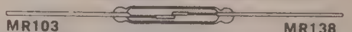
801 New York Avenue, Trenton, NJ 08638 • Tel: 609-393-8350 • TWX: 510-681-8412

GORDOS CORPORATION

REED SWITCHES

Part Number	Max. Glass Dia. mm (Inches)	Max. Glass Length mm (Inches)	Nom. Uncut Switch Length mm (Inches)	Min. Trim Length mm (Inches)	Max. Switching Current (Amps)	Max. Switching Voltage (VDC)	D.C. Contact Rating (Watts)	Min. VBD (Vrms)	Max. Initial Contact Resistance (Ohms)	**Contact Plating Material	Stock Ampere Turn Range
DRY SUB-MINIATURE SPST/FORM A CENTER GAP											
MR0690	1.88 (.075)	11.94 (.470)	50.29 (1.98)	15.24 (.600)	.250	50	7	200	.200	RU	10-30
DRY MINIATURE SPST/FORM A CENTER GAP											
MR103	2.67 (.105)	19.94 (.785)	53.34 (2.10)	26.16 (1.03)	1.0	200	†	250	.500*	W	30-50
MR108	2.67 (.105)	19.94 (.785)	53.34 (2.10)	26.16 (1.03)	.500	200	10	250	.100	RH	20-40
MR1088	2.67 (.105)	19.94 (.785)	53.34 (2.10)	26.16 (1.03)	.500	500	10	1000	.100	RH	20-40
DRY MINIATURE SPDT/FORM C											
MR5203	3.17 (.125)	14.85 (.585)	52.58 (2.07)	21.59 (.850)	.300	100	3	200	.150	RH	15-35
MR5204	3.17 (.125)	14.85 (.585)	51.82 (2.04)	21.59 (.850)	.300	100	3	200	.150	RH	15-35
MR7603	3.17 (.125)	14.85 (.585)	52.58 (2.07)	21.59 (.850)	.300	100	4	250	.150	RH	15-35
DRY STANDARD SPST/FORM A OFFSET GAP											
MR8901	4.83 (.190)	43.18 (1.70)	81.28 (3.20)	49.53 (1.95)	3.0	250	100	400	.500	W	60-100

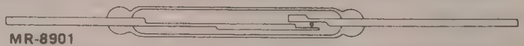




NC
NO
MR5203
C

NC
C
MR7603
NO

NO
NC
MR5204
C



Inrush Current Permitted

MERCURY WETTED SUB-MINIATURE SPST/FORM A OFFSET GAP

WR1125-1	2.54 (.100)	12.70 (.500)	41.14 (1.62)	19.05 (.750)	1.0	500	50	1500	.050	Hg	25-55
WR1125-20	2.54 (.100)	12.70 (.500)	41.14 (1.62)	NA	1.0	500	50	1500	.050	Hg	30-60

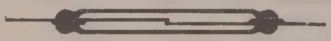
(MOUNTING POSITION — WITHIN 30° OF VERTICAL)

C
NO
NC
UP
WR1201-1

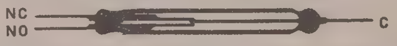
MERCURY WETTED MINIATURE SPDT/FORM C

WR1201-1	3.17 (.125)	16.00 (.630)	39.87 (1.57)	21.59 (.850)	1.0	500	50	1500	.050	Hg	40-80
WR1201-20	3.17 (.125)	16.00 (.630)	52.71 (2.075)	NA	1.0	500	50	1500	.050	Hg	45-85

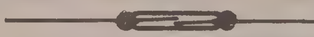
(MOUNTING POSITION — WITHIN 30° OF VERTICAL)



MR1517	5.4 (.212)	52.0 (2.04)	79.0 (3.11)	1.0	1500	30	3000	.080	Rh	75-95
MR1521	5.4 (.212)	52.0 (2.04)	79.0 (3.11)	2.5	250	80	800	.080	Rh Vap	75-95
MR1525	5.4 (.212)	52.0 (2.04)	79.0 (3.11)	1.3	250	60	800	.080	Rh	75-95
MR1526	5.4 (.212)	52.0 (2.04)	79.0 (3.11)	5.0	250	—	600	.100	GA32	80-100

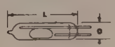
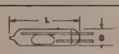
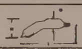
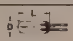


MR1625	5.6 (.220)	52.0 (2.05)	80.0 (3.15)	1.000	220	30	500/400	.100	Rh	80-160



MR2125	2.3 (.090)	15.8 (.622)	59.3 (2.33)	0.500	100	10	250	.100	Rh	15-50
MR2715	2.6 (.102)	19.0 (.748)	55.0 (2.16)	0.500	350	8	600	.100	Rh	30-50
MR2725	2.6 (.102)	19.0 (.748)	55.0 (2.16)	0.500	220	10	400	.100	Rh	15-50
MR2736	2.6 (.102)	19.0 (.748)	55.0 (2.16)	1.500	240	20	500	.100	GA34	30-60

MERCURY TILT SWITCHES

	Switch Part No.	Contact Arrangement	AC Resistive Switching Current Ratings			Differential Angle Degrees		Inches Millimeters			Type of Contact†	Standard Mounting Clip Part No.	Remarks
			30	115	120	Max.	Min.	D	L	H			
	HG 213 LO	SPST	.3	.1	.05	5°	Typ 1°	.175 (4.45)	7/8" (22.23)	—	MDM	M-539	Low Angle
	HG 225 LO	SPST	.3	.1	.05	10°	—	.175 (4.45)	7/8" (22.23)	—	MWM	M-539	Platinum & Platinum Tipped Electrodes
	HG 251 LO	SPST	3	1	.5	2°	—	.325 (8.26)	1" (25.40)	—	MDM	M-514	Low Angle General Purpose Switch
	HG 252 LO	SPST	4	2	1	14°	—	.325 (8.26)	1" (25.40)	—	MWM	M-514	General Purpose Switch
	HG 455 LO	SPST	15	10	4	5°	—	.435 (11.05)	1 11/16" (25.40)	—	MDM	M-59	Small 10A Switch
	HG 457 LO	SPST	20	10	.05	32.5°	27.5°	.446 (11.30)	2.25 (57.15)	.875 (22.23)	MDM	M-56	High Differential Angle
	HG 520 LO	SPST	25	.1	.05	10°	—	.155 (3.94)	1/2" (12.70)	—	MDM	M-539	Precision Switch Subminiature
	HG 2703	SPST	—	.5	—	—	15°	.22 (5.6)	.63 (16.0)	—	MDM	—	General Purpose Miniature
	HG 3803	SPST	—	—	2	—	15°	.30 (7.5)	.73 (18.5)	—	MDM	—	General Purpose Miniature
	HG 3903	SPDT	—	—	1	—	15°	.30 (7.5)	.91 (23.0)	—	MDM	—	Miniature SPDT

† Type of contact: **MWM** — Mercury to Wet Metal. **MDM** — Mercury to Dry Metal.

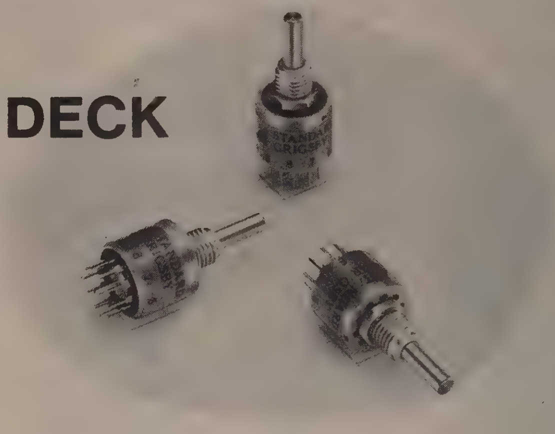
GORDOS CORPORATION/250 GLENWOOD AVE., BLOOMFIELD, NJ 07003 USA/TELEPHONE (201) 743-6800/TWX: 710-994-4787

STANDARD GRIGSBY

SG SERIES – SD

A GORDOS INTERNATIONAL Company

S.G. SERIES – SD
1/2" ROTARY – SINGLE DECK



- .500" approximate size.
- P.C. or solder lug available.
- 30°, 36° indexing angles.
- 25,000 cycles.
- Adjustable stops.

ELECTRICAL CHARACTERISTICS

Current and Voltage Ratings — 200 MA. at 28 VDC resistive; 150 MA. at 115 VAC resistive.
Current Carrying Capacity — 6 amps.
Dielectric Strength — 600 VAC min.
Insulation Resistance — 50,000 megohms.

MECHANICAL SPECIFICATIONS

Life — 25,000 cycles.
Rotational Torque — 8 to 24 oz./in. at ambient conditions.
Stops — Adjustable stops supplied.

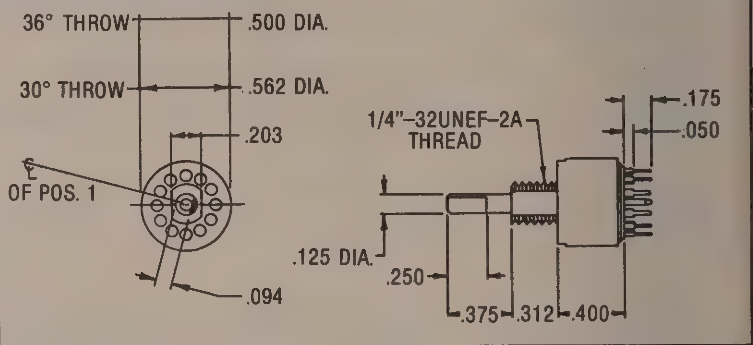
MATERIAL AND FINISHES

Switch Base — Diallyl Phthalate, MIL-M-14.
Shaft — Stainless steel passivated.
Index Housing — Zamak with chromate finish.
Rotor Contacts — Coin silver alloy.
Common Ring — Gold plate.
Terminals — Gold plate.
Mounting Hardware — Mounting nut and lockwasher supplied unassembled.

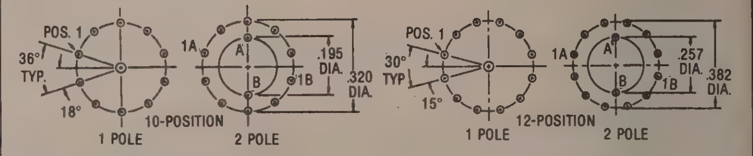
SG SERIES – SD DISTRIBUTOR NUMBERS

30° Index – 12 Positions:	
Part No.	Description
D501-SGS-12-P	1 pole, non-shorting, PC pins
D502-SGS-12-S	1 pole, non-shorting, solder lugs
D503-SGS-12-P	2 poles, non-shorting, PC pins
D504-SGS-12-S	2 poles, non-shorting, solder lugs
D509-SGS-12-P	1 pole, shorting, PC pins
D510-SGS-12-S	1 pole, shorting, solder lugs
D511-SGS-12-P	2 poles, shorting, PC pins
D512-SGS-12-S	2 poles, shorting, solder lugs
36° Index – 10 Positions:	
Part No.	Description
D517-SGS-10-P	1 pole, non-shorting, PC pins
D518-SGS-10-S	1 pole, non-shorting, solder lugs
D519-SGS-10-P	2 poles, non-shorting, PC pins
D520-SGS-10-S	2 poles, non-shorting, solder lugs
D521-SGS-10-P	1 pole, shorting, PC pins
D522-SGS-10-S	1 pole, shorting, solder lugs
D523-SGS-10-P	2 poles, shorting, PC pins
D524-SGS-10-S	2 poles, shorting, solder lugs

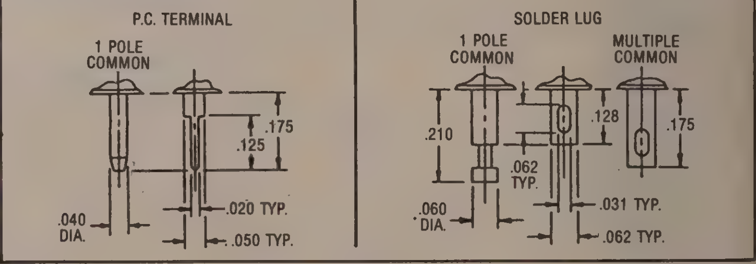
OUTLINE DIMENSIONS

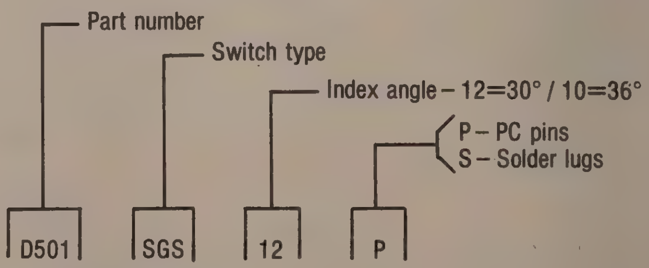

36° THROW
.500 DIA.
30° THROW
.562 DIA.
.203
℄ OF POS. 1
.094
1/4"–32UNEF–2A THREAD
.175
.050
.125 DIA.
.250
.375
.312
.400

VIEW FROM KNOB END


POS. 1
36° TYP.
18°
10-POSITION
1 POLE
1A
A
B
1B
.195 DIA.
.320 DIA.
2 POLE
POS. 1
30° TYP.
15°
12-POSITION
1 POLE
1A
A
B
1B
.257 DIA.
.382 DIA.
2 POLE

TERMINAL DETAILS


P.C. TERMINAL
1 POLE COMMON
.175
.125
.040 DIA.
.020 TYP.
.050 TYP.
SOLDER LUG
1 POLE COMMON
MULTIPLE COMMON
.210
.128
.175
.062 TYP.
.060 DIA.
.031 TYP.
.062 TYP.


Part number
Switch type
Index angle – 12=30° / 10=36°
P – PC pins
S – Solder lugs
D501
SGS
12
P

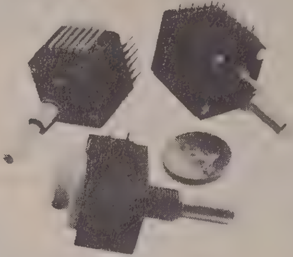
STANDARD GRIGSBY
920 RATHBONE AVE., P.O. BOX 1528, AURORA, IL 60507-9990 USA / TELEPHONE (312) 844-4300 / TWX 910-232-3138

STANDARD GRIGSBY MICROMINIATURE P/REL A GORDOS INTERNATIONAL Company

MICROMINIATURE P/REL PROGRAMMABLE ROTARY ENCODED LOGIC SWITCH

DUAL FLEX™ DETENT

The Dual Flex detent has a dual ball starwheel drive to provide positive indexing and longer life, tactile feedback and resistance to teasing.



ELECTRICAL RATINGS

Switching Loads — 1.5 mA at 115 VAC, 150 mA at 14 VDC
Current Carrying Capacity — 250 milliamps at 28 VDC resistive load
Contact Resistance — 75 milliohms max. over lifetime
Codes — Hexidecimal, B.C.D., and others
Dielectric Strength — 500 volts min.
Contacts — Make before break

MECHANICAL SPECIFICATIONS

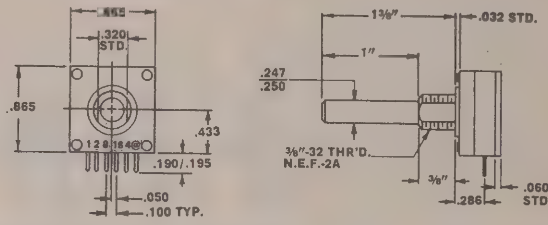
Life — 50,000 cycles at rated load
Operating Temperature Range — −55°C to +85°C
Shafts and Hardware — Shafts and hardware are steel, cadmium plated and chromate treated
Contacts — Gold plated
Anti-Rotation Device — Flatted mounting bushing. .375″ dia. x .320″, double "D"

Part Number	Description
D101-08-BH	8 position Binary parallel shaft mounting
D103-08-BV	8 position Binary perpendicular shaft mounting
D105-10-BH	10 position Binary parallel shaft mounting
D107-10-BV	10 position Binary perpendicular shaft mounting
D109-12-BH	12 position Binary parallel shaft mounting
D111-12-BV	12 position Binary perpendicular shaft mounting
D113-16-BH	16 position Binary parallel shaft mounting
D114-16-CH	16 position Binary complement parallel shaft mounting
D115-16-BV	16 position Binary perpendicular shaft mounting
D116-16-CV	16 position Binary complement perpendicular shaft mounting
D117-18-BH	18 position Binary parallel shaft mounting
D119-18-BV	18 position Binary perpendicular shaft mounting
D121-20-BH	20 position Binary parallel shaft mounting
D123-20-BV	20 position Binary perpendicular shaft mounting
D125-24-BH	24 position Binary parallel shaft mounting
D127-24-BV	24 position Binary perpendicular shaft mounting
D129-28-BH	28 position Binary parallel shaft mounting
D131-28-BV	28 position Binary perpendicular shaft mounting

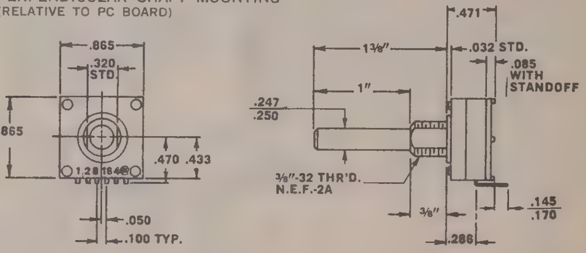
Note: All switches are continuous rotation.

OUTLINE DIMENSIONS

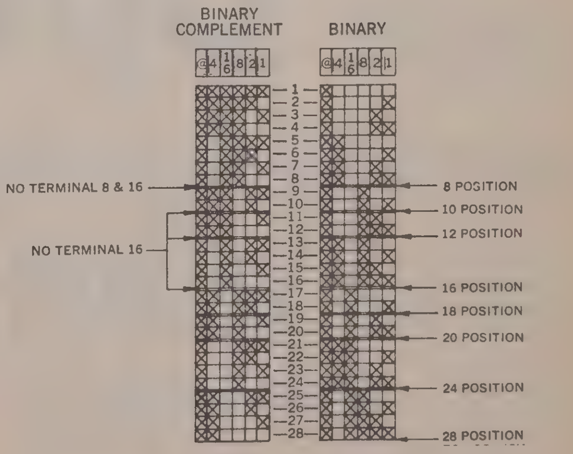
PARALLEL SHAFT MOUNTING
(RELATIVE TO PC BOARD)


.865
.320 STD.
.865
.433
1 2 8 16 4 @
.190/.195
.050
.100 TYP.
1⅜″
.032 STD.
1″
.247
.250
⅜″-32 THR'D. N.E.F.-2A
⅜″
.286
.060 STD.

PERPENDICULAR SHAFT MOUNTING
(RELATIVE TO PC BOARD)


.865
.320 STD.
.865
.470
.433
1 2 8 16 4 @
.050
.100 TYP.
.471
1⅜″
.032 STD.
.085 WITH STANDOFF
1″
.247
.250
⅜″-32 THR'D. N.E.F.-2A
⅜″
.286
.145
.170

TRUTH TABLES


BINARY COMPLEMENT
BINARY
@ 4 16 8 2 1
@ 4 16 8 2 1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
NO TERMINAL 8 & 16
NO TERMINAL 16
8 POSITION
10 POSITION
12 POSITION
16 POSITION
18 POSITION
20 POSITION
24 POSITION
28 POSITION

D101 - 08 - B H
Part number — D101
Positions — 08
H = Parallel shaft mounting
V = Perpendicular shaft mounting
B = Binary
C = Binary complement

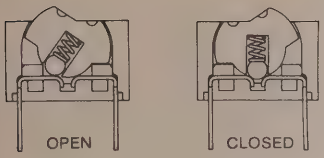
EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

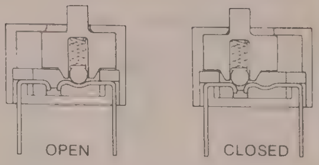
Grayhill INC

DIP Switches Features

Exclusive Contact System



- Now available in Rockers *AND* Slide Actuators



Unique spring-loaded ball contact system provides high contact pressure for reliable contact and shock and vibration immunity. It also provides exceptional mechanical and electrical life.

Complete Seal

After being wave soldered, your printed circuit boards can be vapor, spray or immersion cleaned without damaging switch contacts.

- Epoxy Potted Bottom Is Standard
- Top Seal Available At Minimum Additional Price

A top tape seal is a standard feature that can be added to all Series 76 and Series 78 GRAYHILL DIP switches with the exception of toggle actuators. Adding the letter S as a suffix to the part number orders the top tape seal.

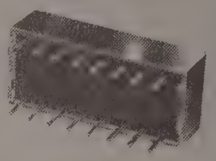
Military Qualification

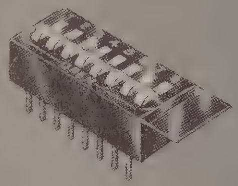
Another difference from the different DIP Switch Company . . . Grayhill SPST Rocker DIP Switches are qualified to MIL-S-83504/01 and MIL-S-83504/02 and MIL-S-83505/04.

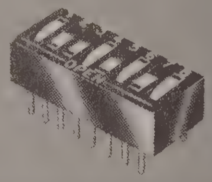
And More . . .

Grayhill can print your own part number or wording on the switch. We can also provide position location markings, rigid protective covers, and cards of tape seal. Contact Grayhill.

Another Difference from the Different DIP Switch Company . . .







Specifications—Series 76 and 78, Standard and Military

For Series 79 Specifications, see the Linear Action DIP Switch pages.

Ratings

	Series 76	Series 78	Series 78SS
Mechanical Life: (Operations Per Position)	50,000	35,000	10,000
Make and Break Current Rating (Operations):			
At 50 mA, 30 Vdc	35,000	25,000	7,500
At 125 mA, 30 Vdc	25,000	15,000	No Rating

Contact Resistance: 100 milliohms maximum after life (30 milliohms initially), measured at 10 mA dc and 50 mV (open circuit).

Insulation Resistance: (at 100 Vdc); Between adjacent closed contacts: 1,000 megohms minimum after life, (5,000 megohms initially). Across open switch contacts: 1,000 megohms minimum after life, (5,000 megohms initially).

Dielectric Strength: Between adjacent closed contacts: 500 Vac after life (750 Vac initially). Across open switch contacts: 500 Vac after life (750 Vac initially).

Current Carry Rating: With a maximum contact temperature rise of 20°C: Series 76—5 Amps; Series 78—4 Amps.

Environmental

Refer to MIL-STD-202F Per MIL-S-83504.

Vibration: 10 to 2,000 Hz at 15g (or 0.060″ double amplitude); no damage and no contact openings exceeding 10 microseconds. (Method 204, Test Condition B)

Shock: 50g, 11 mS half sine; no damage and no openings exceeding 10 microseconds. (Method 213, Test Condition A)

Moisture Resistance: 240 hours with temperature cycling and polarization; pass insulation resistance and dielectric strength. (Method 106)

Thermal Shock: For 5 cycles (1 cycle: -55°C, +25°C, +85°C, +25°C); no failures; passes contact resistance.

Thermal Aging: 1,000 hours at 85°C; no failures.

Machine Soldering

The sealed recessed rocker switches have been tested to EIA Standard RS-448-2, "Environment Effects of Machine Soldering," with the results listed below. Similar performance can be expected from sealed switches with other means of actuation.

Fluxing: Passes test with flux touching the switch body.

Cleaning: Passes immersion test (and is therefore also suitable for spray and vapor/spray cleaning).

Soldering: Passes two, four and six seconds soldering time.

Cleaning Solution: 1-1-1 trichlorethane, Freon (TF or TE), isopropyl alcohol and water/detergent.

Materials and Finishes

— For Part Numbers Beginning 78SS —

Shorting Bar (Ball), Base Contacts, and Terminals: Copper Alloy, Silver plated .00003″ minimum over Nickel.

— For All Other Series 76 and 78 Switches —

Shorting Bar (Ball): Brass, Gold plated .00001″ minimum over Nickel plate.

Base Contacts: Copper Alloy, Gold plated .00001″ minimum over Nickel plate.

Terminals: Copper Alloy, Tin plated .00005″ minimum over Nickel plate. Gold plate over Nickel also available.

— For All Series 76 and 78 Switches —

Switch Cover, Rocker and Base: Polyester UL94 VO type.

Potting Material: Epoxy.

Protective Cover: Polycarbonate.

Top Seal: Polyester film.

Optional Contact Plating: Gold thicknesses of .00003″ and .0001″ are also available. Contact GRAYHILL.

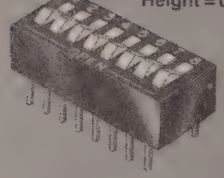
Available Locally Through Your Grayhill Distributor

Grayhill INC.

Single Pole/Single Throw DIP Switches

Rockers and Toggles—Series 76

Height = 0.315



Raised and Recessed Rockers

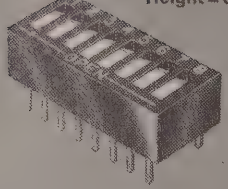
No. of Stations	Length	Part No. Raised	Part No. Recessed	Unit Price
2	0.280	76SB02	76RSB02	$2.90
3	0 380	76SB03	76RSB03	3.00
4	0 480	76SB04	76RSB04	3.10
5	0 580	76SB05	76RSB05	3.20
6	0.680	76SB06	76RSB06	3.30
7	0.780	76SB07	76RSB07	3.35
8	0 880	76SB08	76RSB08	3.45
9	0 980	76SB09	76RSB09	3 55
10	1.080	76SB10	76RSB10	3.60
12	1 280	76SB12	76RSB12	3 80

PIANO-DIP®

No. of Stations	Length	Part No.	Unit Price
4	0.480	76PSB04	$3.65
5	0.580	76PSB05	3.70
6	0.680	76PSB06	3.80
7	0.780	76PSB07	3.90
8	0.880	76PSB08	3.95
9	0.980	76PSB09	4.10
10	1.080	76PSB10	4.25

To order top seal versions, add suffix "S" to part number, add $0.20 to unit price, and discount accordingly.

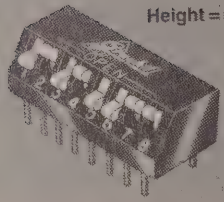
Height = 0.267



Military Qualified Raised and Recessed Rockers

No. of Stations	Length	Military Raised	Grayhill Number	Military No. Recessed	Grayhill Number	Unit Price
2	0.280	M83504/01-022	76MSB02	M83504/02-022	76MRSB02	$3 20
3	0 380	M83504/01-023	76MSB03	M83504/02-023	76MRSB03	3.30
4	0 480	M83504/01-024	76MSB04	M83504/02-024	76MRSB04	3 40
5	0 580	M83504/01-025	76MSB05	M83504/02-025	76MRSB05	3 50
6	0 680	M83504/01-026	76MSB06	M83504/02-026	76MRSB06	3 60
7	0.780	M83504/01-027	76MSB07	M83504/02-027	76MRSB07	3 65
8	0 880	M83504/01-028	76MSB08	M83504/02-028	76MRSB08	3 75
9	0 980	M83504/01-029	76MSB09	M83504/02-029	76MRSB09	3 85
10	1 080	M83504/01-030	76MSB10	M83504/02-030	76MRSB10	3 90
12	1 280	M83504/01-032	76MSB12	M83504/02-032	76MRSB12	4.10

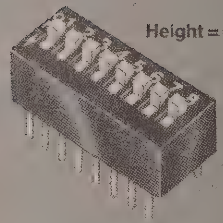
Height = 0.301



To order top sealed switch, add suffix "S" to Grayhill part number (or "T" to Military Number); add $0.20 to unit price, and discount accordingly. Contact GRAYHILL for information and prices on switches with the following Military Numbers: M83504/01-002 thru M83504/01-010, and M83504/02-002 thru M83504/02-010.

Slide Actuated—Series 78

Height = 0.305



Slides

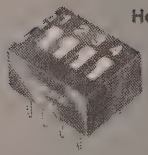
No. of Stations	Length	Part No. Raised	Part No. Recessed	Unit Price
2	0 280	78B02	78RB02	$2.61
3	0.380	78B03	78RB03	2.70
4	0.480	78B04	78RB04	2.79
5	0.580	78B05	78RB05	2.88
6	0.680	78B06	78RB06	2.97
7	0.780	78B07	78RB07	3.02
8	0 880	78B08	78RB08	3.11
9	0.980	78B09	78RB09	3.20
10	1 080	78B10	78RB10	3.24

Silver Contact Slide Switches

No. of Stations	Description	Ordering Information	
4	SPST only;	78SS04	$2.35
8	Raised Slides	78SS08	2.65
5, 6, 7, 9 or 10	Special order in minimum lots of 50,000 per part number. Contact GRAYHILL.		

To order top sealed switch, add suffix "S" to Grayhill part number; add $0.18 to unit price, and discount accordingly.

Height = 0.255



Dimensions & Discounts

Switch length is indicated in chart; width is 0.380 inches; maximum height above board is shown with pictures.

Discount Schedule

	76PSB	Others
1-9	Unit Price	Unit Price
10-24	Less 8%	Less 8%
25-49	Less 16%	Less 21%
50-99	Less 21%	Less 40%
100-499	Less 30%	Less 50%
500-999	Less 40%	Less 57%
1000 Up	Contact Your Local Distributor or Grayhill	

Prices and Discounts subject to change without notice.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Multiple Pole and Multiple Throw DIP Switches

Two, Three, and Four Pole/Single Throw

Slide Actuated

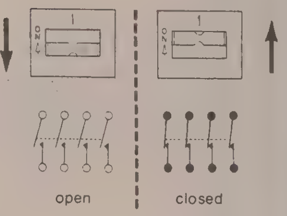
Last 2 digits in part number indicate number of stations in switch.

DPST		3PST		4 PST		
Part No.	Unit Price	Part No.	Unit Price	Part No.	Unit Price	Length
78F01	$3.56	–	–	–	–	0.280
–	–	78G01	3.74	–	–	0.380
78F02	3.78	–	–	78H01	3.78	0.480
78F03	3.96	78G02	3.96	–	–	0.680
78F04	4.19	–	–	78H02	4.19	0.880
–	–	78G03	4.23	–	–	0.980
78F05	4.37	–	–	–	–	1.080

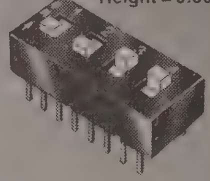
For top seal versions, add the suffix "S" to part number; add $0.20 to unit price and discount accordingly.

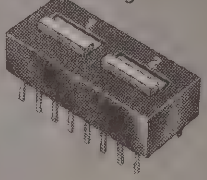
Typical Circuit Diagram

● indicates closed contact
○ indicates open contact



Circuitry diagrams shown are for 4PST. Circuitry is achieved in a similar fashion for 2PST and 3PST switches.


Height = 0.305


Height = 0.305

Single Pole/Double Throw

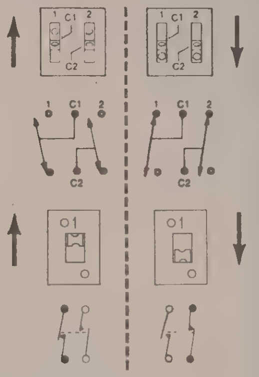
Rockers and Toggles

No. of Stations	Length	DIP-C® Raised Part No.	DIP-C® Recessed Part No.	TOGGLE-DIP™ Toggle Part No.	TOGGLE-DIP™ Unit Price
2	0.380	76SC02	76RSC02	76STC02	$3.70
3	0.580	76SC03	76RSC03	76STC03	3.95
4	0.780	76SC04	76RSC04	76STC04	4.20

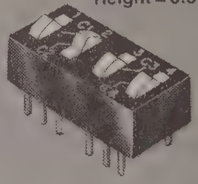
Slide Actuated Switches

No. of Stations	Length	Part No.	Price
1	0.280	78J01	$4.41
2	0.480	78J02	4.59
3	0.680	78J03	4.82
4	0.880	78J04	5.04
5	1.080	78J05	6.30

To order top seal versions add suffix "S" to part number (not available on TOGGLE-DIP), add $0.20 to unit price, and discount accordingly.



See Double Throw Note.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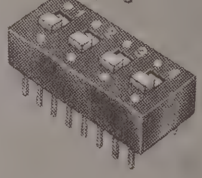

Height = 0.305

Double Pole/Double Throw

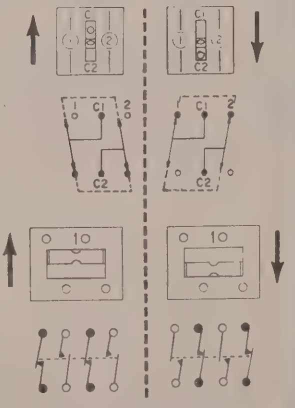
Rockers and Toggles

DOUBLE DIP™ No. of Stations	Length	Raised Part No.	Recessed Part No.	TOGGLE-DIP™ Part No.	Unit Price
1	0.380	76SD01	76RSD01	76STD01	$3.80
2	0.780	76SD02	76RSD02	76STD02	4.30

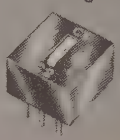
Slide Actuated Switches

No. of Stations	Length	Part No.	Price
1	0.480	78K01	$6.48
2	0.880	78K02	7.02

To order top seal versions, add suffix "S" to part number (not available on TOGGLE-DIP), add $0.20 to unit price, and discount accordingly.



See Double Throw Note.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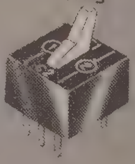
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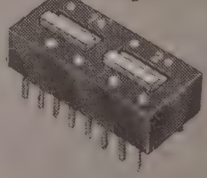

Height = 0.305

Dimensions

Switch length is indicated in chart; width is 0.380 inches; maximum height above board is shown with picture.

Discount Schedule

	Series 76	Series 78
1-9	Unit Price	Unit Price
10-24	Less 8%	Less 8%
25-49	Less 16%	Less 21%
50-99	Less 21%	Less 40%
100-499	Less 30%	Less 50%
500-999	Less 35%	Less 57%
1000 Up	Contact Grayhill	

Prices and Discounts Subject to Change Without Notice.

Double Throw Circuitry

All Series 78 double throw switches have alternately opposed circuits which are actually 2 completely separate circuit paths. A single slide actuates both circuits thus providing double throw. True double-throw circuitry is achieved by tying selected terminals on the PC board for a common. The "on" position of each circuit is indicated by a dot on the cover.

Available Locally Through Your Grayhill Distributor

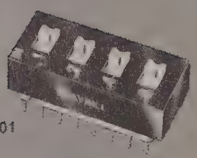
Grayhill INC.

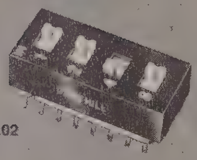
The Attenuator DIP Switch

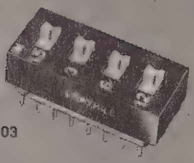
Adjustable Attenuation Of An Input Signal In A DIP Switch

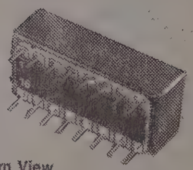
Three Ranges

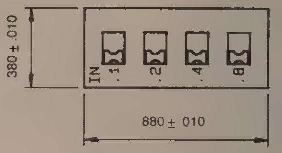
- 0.1 To 1.5 dB In 0.1 dB Steps
- 1.0 To 15 dB In 1.0 dB Steps
- 1.5 To 22.5 dB In 1.5 dB Steps


78J04-A01

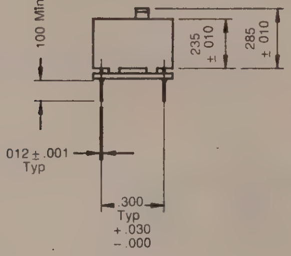

78J04-A02

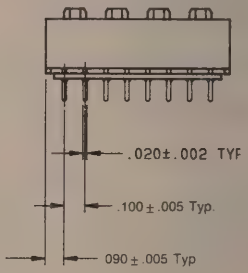

78J04-A03


Bottom View

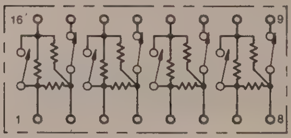


Markings Shown For One Attenuator Combination The Two Others Listed Above And Shown In Pictures



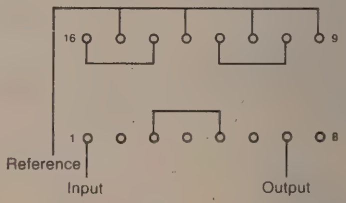


Attenuator Schematic (View From Component Side Of The Board)



Attenuator Range	Part No.
0.1 to 1.5 DB	78J04-A01
1.0 to 15 DB	78J04-A02
1.5 to 22.5 DB	78J04-A03

PC Board Pattern Requirements (View From Component Side Of The Board)



Specifications

Ratings

Power Rating: 20 dB Maximum.
Impedance: 600 OHM ± 2%, Unbalanced.
Insertion Loss: 0.02 dB.
Loss In DB: ± 0.015 dB Cummulative.

Materials and Finishes

Switch Cover, Slide and Base: Polyester (94 VO Type).
Shorting Bar (Ball): Brass, Gold plated.00001″ minimum over Nickel plate.
Base Contacts: Copper Alloy, Gold plated 0.00001″ minimum over Nickel plate.
Terminals: Copper Alloy, Tin Plated 0.00005″ Minimum over Nickel plate.
Network Encapsulation: Polymer Plastic.

Ordering Information

Part No. Without Tape Seal	Price	Part No. With Tape Seal	Price
78J04-A01	$14.50	78J04S-A01	$14.70
78J04-A02	14.50	78J04S-A02	14.70
78J04-A03	14.50	78J04S-A03	14.70

Prices and discounts subject to change without notice.

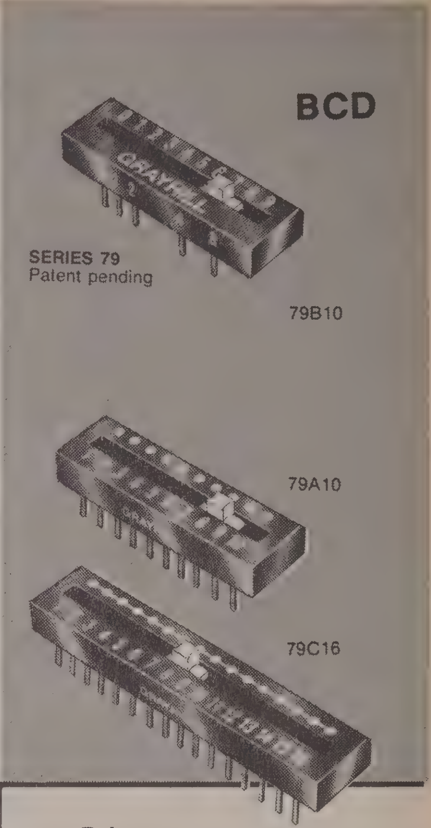
Discount Schedule

	Series 78	Series 79
1-9	Unit Price	Unit Price
10-24	Less 8%	Less 8%
25-49	Less 21%	Less 16%
50-99	Less 40%	Less 21%
100-499	Less 50%	Less 30%
500-999	Less 57%	Less 35%
1000 Up	Contact Grayhill	

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Linear Action DIP Switches

- Tap Switches And Coded Outputs
- Positive Detent
- Reliable Switching
- 2,000 Cycle Life—60,000 Detent Operations

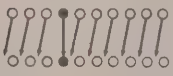


Dimensions

Height above board is 0.265″ width is 0.380″; length of 10 position switch is 1.180″; length of 16 position switch is 1.780″.

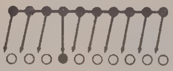
Circuit Selector In 10 And 16 Circuits

● indicates closed circuit
○ indicates open circuit



1-of-10 circuits	Part No. 79A10
1-of-16 circuits	Part No. 79A16

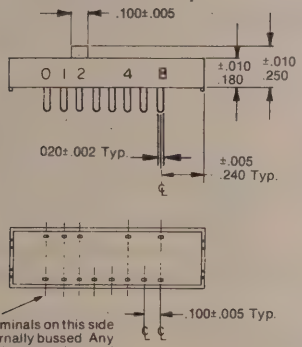
SP/10 Position Tap Switch
SP/16 Position Tap Switch



SP/10 Position	Part No. 79C10
SP/16 Position	Part No. 79C16

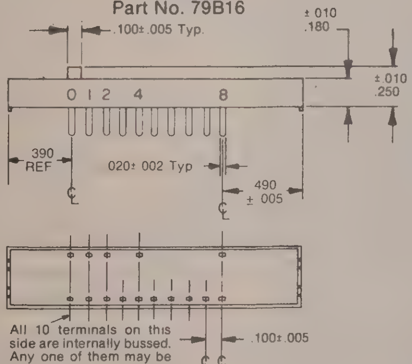
Binary Code Decimal And Hexadecimal Outputs

10 Position
Part No. 79B10



All 8 terminals on this side are internally bussed. Any one of them may be used as the common terminal.

16 Position
Part No. 79B16



All 10 terminals on this side are internally bussed. Any one of them may be used as the common terminal.

Prices

Part Number	Unit Price
79A10	$4.00
79A16	4.65
79B10	4.00
79B16	4.65
79C10	4.00
79C16	4.65

To order top seal versions, add suffix "S" to part number, add $0.30 to unit price and discount accordingly. Discount using Schedule at left.

Specifications

Ratings

Mechanical Life: 4,000 cycles minimum. Note: A cycle is one complete operation, back and forth thru all switch positions.

Make and Break Current Rating: 2,000 cycles at 10 mA, 30 mV dc; 2,000 cycles at 125 mA, 6 Vdc; 2,000 cycles at 50 mA, 30 Vdc.

Contact Resistance: 100 milliohms maximum after life, measured at 10 mA dc and 50 mV (open circuit). Initial values are 60 milliohms maximum for coded switches, and 50 milliohms for other Linear Action Switches.

Insulation Resistance (At 100 Vdc): Between adjacent isolated contacts—1,000 Megohms minimum after life; (5,000 Megohms initially). Across open contacts 1,000 Megohms minimum after life. (5,000 Megohms initially).

Dielectric Strength: Between adjacent isolated contacts: 500 Vac after life, (750 Vac initially). Across open contacts: 500 Vac after life, (750 Vac initially).

Current Carry Rating: 2 Amps with a maximum contact temperature rise of 20°C.

Environmental Refer to MIL-STD-202F Per MIL-S-83504.

Vibration: 10 to 2,000 Hz at 15g (or 0.060″ double amplitude); no damage and no contact openings exceeding 10 microseconds. (Method 204, Test Condition B)

Shock: 50g, 11 mS half sine; no damage and no openings exceeding 10 microseconds. (Method 213, Test Condition A).

Materials and Finishes

Switch Cover, Slide, Base: Polyester, UL94 VO rating.

Shorting Arm: Phosphor Bronze, Gold plated .00001 minimum over Nickel plate .00002 minimum.

Base Contacts: Copper Alloy, Gold plated .00001 minimum over Nickel plate .00002 minimum.

Terminals: Copper Alloy, Tin plated .00005 minimum over Nickel plated .00002 minimum.

Potting Material: Epoxy.

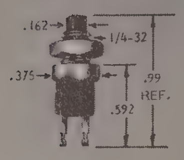
Tape Seal: Polyester film.

Available Locally Through Your Grayhill Distributor

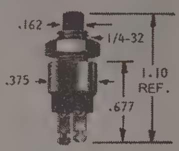
Grayhill INC.

Pushbutton Switches

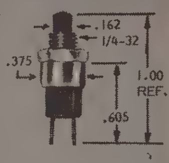
SPST—N.O.



SPST—N.C.



SPST—N.O.
with Over travel



SPST—N.O.-Sealed
SPST—N.C.-Sealed
Dimensions approximately same as above.

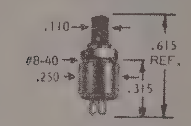
1 Amp Butt Contact Pushbutton Switches

Life Expectancy — 1 Million Operations,
UL Listed Types Available

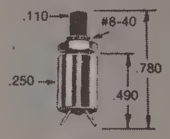
RATING CRITERIA
Make and break 1 Amp

Part No.	Description	Circuitry	Operations at Rated Load	Part No.	Description		Operations at Rated Load
30-1	Momentary	SPST-N.O.	1,000,000	30-251	Sealed, SPST-N.O.		1,000,000
30-3				30-352	Sealed, SPST-N.C.		
30-2		SPST-N.C.	1,000,000	30-1UL	UL Listed	SPST-N.O.	6,000 at 5 Amp 115 VAC
30-6				30-3UL			
30-15	.020" Overtravel	SPST-N.O.	500,000	30-2UL		SPST-N.C.	
30-37				30-6UL			

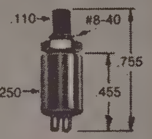
SPST—N.O. *



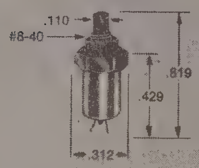
SPST—N.C.



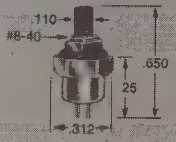
SPST—N.O.
with Over travel *



SPST—N.C. sealed



SPST—N.O. sealed



***Also in PC Styles. Dimensions are similar.**

¼ Amp and ½ Amp Miniature Butt Contact Pushbutton Switches

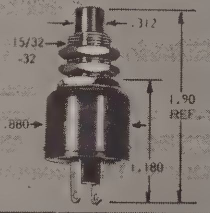
Minimum of Space, Flux Cleaning Protection

Part Number	Circuitry Momentary	Description	Operations at Rated Load	Rated Load
39-1	SPST—N.O.	Red Button	1,000,000	1/2 Amp, 115 VAC
39-3		Black Button		
39-601		Silver Contacts		150 mA, 5 VDC (20 mA, 20 VDC)
39-401		PC Mount		150 mA, 28 VDC
39-405		PC, No Nut		
39-351		Sealed	100,000	1/2 Amp, 115 VAC
39-12	SPST—N.O. .130" Overtravel	Red Button	100,000	1/2 Amp, 115 VAC
39-24		Black Button		
39-424		PC Mount	100,000	150 mA, 28 VDC
39-2	SPST—N.C.	Black Button	250,000	1/4 Amp, 115 VAC
39-352		Sealed	100,000	

See also Accessory Button Cap.

30102 ACCESSORY BUTTON CAP
Extends button surface to 0 25 dia Available in Red, Black, Yellow or White. Adhesive required to mount. This cap fits 1 amp Butt Contact and part no. 39-1 and 39-2, 1/2 amp Miniature Butt contact switches.

SPST—N.O. SPDT
SPST—N.C.



10C105-1 BUTTON GUARD
Prevents Accidental Actuation 0.29 dia. by 0.41 deep.
For 10 amp snap action, 1 amp wiping contact and DPST wiping contact switches

7C1040-1 DECORATIVE MOUNTING NUT
.77 Dia.
.75 Across Flats and .12 Thick.
For 10 amp snap action, 1 amp wiping contact and DPST wiping contact switches.

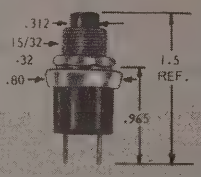
10 Amp Snap Action Pushbutton Switches

Extremely Fast Make And Break, Audible Click
Life Expectancy—25,000 Operations

Make and break 10 Amp			Make and break 10 Amp		
Part No.	**Circuitry Momentary Contact**	**Operations at Rated Load**	**Part No.**	**Circuitry Momentary Contact**	**Operations at Rated Load**
2201	SPST-N.O.	25,000	7-8	SPST-N.C.	25,000
7-7			2202		
			7-26 RED	SPDT	25,000
			7-26 BLK		

Common terminal of SPDT switch (not shown) extends overall length to 1.966.

SPST-N.O.



1 Amp Wiping Contact Pushbutton Switches

Life Expectancy — 100,000 Operations,
UL Listed Types Available

Make and break 1 Amp				UNDERWRITERS LABORATORY LISTED Make and break 3 Amp			
Part No.	**Action**	**Circuitry**	**Operations at Rated Load**	**Part No.**	**Action**	**Circuitry**	**Operations at Rated Load**
4001	Momentary	SPST-N.O.	100,000	4001UL	Momentary	SPST-N.O.	6,000
10-9				10-9UL			

ORDERING INFORMATION

Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price
7-7	Blk	$6.67	30-1UL	Red	$1.53	30-251 RED	Red	$4.16	39-3	Blk	$2.32	39-405 RED	Red	$1.94
7-8	Red	7 12	30-2	Blk	1.72	30-251 BLK	Blk	4.16	39-12	Red	2.87	39-405 BLK	Blk	1.94
7-26 RED	Red	8.11	30-2UL	Blk	1.72	30-252 RED	Red	4.89	39-24	Blk	2.87	39-424 RED	Red	2.57
7-26	Blk	8.11	30-3	Blk	1.53	30-252 BLK	Blk	4.89	39-351 RED	Red	4.52	39-424 BLK	Blk	2.57
7C1040-1	—	.34	30-3UL	Blk	1.53	30B1012-5	Red	.23	39-351 BLK	Blk	4.52	39-601 RED	Red	1.68
10-9	Blk	2.30	30-6	Red	1.72	30B1012-8	Wht	.23	39-352 RED	Red	5.20	39-601 BLK	Blk	1.68
10-9UL	Blk	2.30	30-6UL	Red	1.72	30B1012-9	Blk	.23	39-352 BLK	Blk	5.20	2201	Red	6.67
10C1015-1	—	.50	30-15	Red	1.90	39-1	Red	2.32	39-401 RED	Red	2.00	2202	Blk	7.12
30-1	Red	1.53	30-37	Blk	1.90	39-2	Blk	3.41	39-401 BLK	Blk	2.00	4001	Red	2.30
												4001UL	Red	$2.30

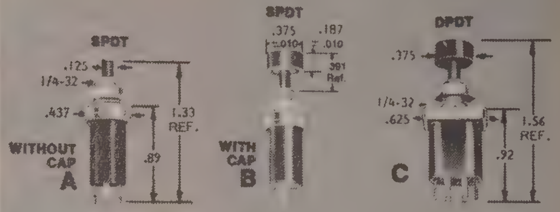
For Discounts See Next Page.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 373 / La Grange, IL 60525-0373 / (312) 354-1040

Pushbutton Switches

All Switches on this page and page at left have these qualifications . . .

- **RATING CRITERIA:** See individual charts. 115 VAC resistive load.
- **CONTACT RESISTANCE:** 25 milliohms maximum on a new switch.
- **VOLTAGE BREAKDOWN:** 1,000 VAC between mutually insulated parts.
- **INSULATION RESISTANCE:** 1,000 megohms minimum.


SPDT
.125
1/4-32
.437
WITHOUT CAP
A
.89
1.33 REF.
SPDT
.375
.187
.010
.010
.391 Ref.
WITH CAP
B
DPDT
.375
1/4-32
.625
C
.92
1.56 REF.

¼ Amp Wiping Contact Pushbutton Switches

Long Wipe Assures High Reliability With Life Expectancy To 250,000 Operations

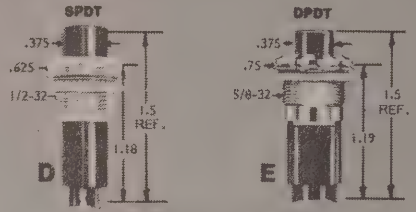
Make and break ¼ Amp

Part No.	Fig.	Momentary Circuitry	Operations at Rated Load
46-101 RED	A	SPDT	250,000
46-101 BLK			
46-102 RED(CAP)	B	SPDT	
46-102 BLK (CAP)			
46-200 RED	C	DPDT	250,000
46-200 BLK			

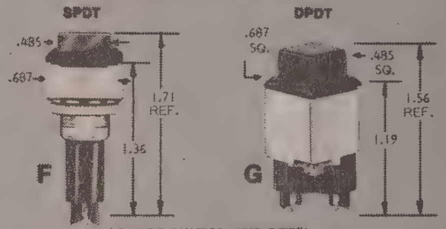
DECORATIVE
Make and break ¼ Amp

Part No.	Fig.	Momentary Circuitry	Operations at Rated Load
46-05-05-502-0303	D	SPDT	250,000
46-05-05-502-0707			
46-05-08-502-0303	E	DPDT	
46-05-08-502-0707			
46-01-05-500-0303	F	SPDT	
46-01-05-500-0707			
46-01-08-500-0303	G	DPDT	
46-01-08-500-0707			

DECORATIVE MOUNTING


SPDT
.375
.625
1/2-32
1.5 REF.
1.18
D
DPDT
.375
.75
5/8-32
1.5 REF.
1.19
E

ROUND BUTTON AND BEZEL


SPDT
.485
.687
1.71 REF.
1.36
F
DPDT
.687 SQ.
.485 SQ.
1.56 REF.
1.19
G

SQUARE BUTTON AND BEZEL

¼ Amp Wiping Contact Pushbutton Switches

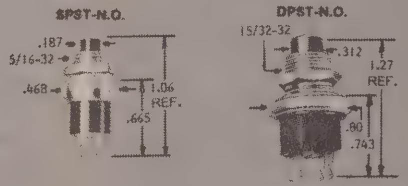
Momentary Contact With Life Expectancy To 100,000 Operations

Make and break ¼ Amp

Part No.	Circuitry	Operations at Rated Load
23-1	SPST-N.O.	100,000
23-4		

Make and break ½ Amp

Part No.	Circuitry	Operations at Rated Load
35-1	DPST-N.O.	100,000
35-3		

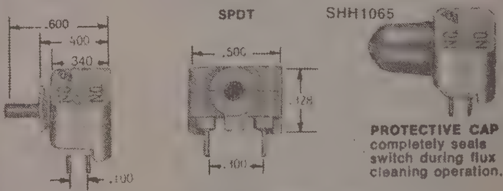

SPST-N.O.
.187
5/16-32
.468
1.06 REF.
.665
DPST-N.O.
15/32-32
.312
1.27 REF.
.80
.743

PC Mount, ¼ Amp Butt Contact Switches

Side Actuated, PC Mounted, Sealed—500,000 Operations

Make and Break ¼ Amp

Part No.	Circuitry	Button	Part No.	Circuitry	Button
Switch With Protective Cap Assembled			Switch Without Protective Cap		
39-250 RED	SPDT (2 Circuits)	Small	39-251 RED	SPDT (2 Circuits)	Small
39-250 BLK			39-251 BLK		
39-260 RED		.187 Dia. Flat	39-261 RED		.187 Dia. Flat
39-260 BLK			39-261 BLK		


.600
.400
.340
.100
SPDT
.500
.128
.100
SHH1065

PROTECTIVE CAP completely seals switch during flux cleaning operation.

Also available with .187 Diameter Flat Button.

ORDERING INFORMATION

Part No.	Button Color	Unit Price
23-1	Red	$2.10
23-4	Blk	2.10
35-1	Red	3.07
35-3	Blk	3.07

Protective Cap Only		
SHH1065	Red	0.10

Part No.	Button	Unit Price
39-250 RED 39-250 BLK	Small	$1.80 1.80
39-251 RED 39-251 BLK	Small	1.49 1.49
39-260 RED 39-260 BLK	Flat	1.80 1.80
39-261 RED 39-261 BLK	Flat	1.49 1.49

Part No.	Button Color	Unit Price	Part No.	Button Color	Unit Price
46-101 RED	Red	$2.24	46-05-05-502-0303	Red	$4.48
46-101-BLK	Blk	2.24	46-05-05-502-0707	Blk	4 48
46-102 RED(CAP)	Red	2.35	46-05-08-502-0303	Red	5.94
46-102 BLK (CAP)	Blk	2.35	46-05-08-502-0707	Blk	5 94
46-200 RED	Red	4.75	46-01-05-500-0303	Red	5.39
46-200 BLK	Blk	4.75	46-01-05-500-0707	Blk	5.39
			46-01-08-500-0303	Red	6 79
			46-01-08-500-0707	Blk	6 79

Discount Schedule

1-49	Unit Price
50-99	Less 15%
100-499	Less 25%
500-999	Less 36%
1000 UP	Contact GRAYHILL

Prices and Discounts Subject to Change Without Notice.

Available Locally Through Your Grayhill Distributor

Grayhill INC.

½ Inch Diameter Single Deck

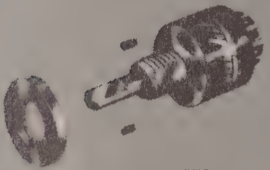
Outstanding Circuit Versatility And A Wide Range Of Options

The most popular Series 50 and 51 rotary switches are fixed stop, with or without panel seals, solder lug or PC terminals. The drawing below (Figures 1 thru 4) show these combinations. The chart below lists the switch style that describes the combination and the appropriate drawing that illustrates the combination. The Series 50 is 36° angle of throw and 0.500″ diameter. The Series 51 is 22½° or 30° angle of throw and 0.562″ diameter. Many other options are available as described below.

STANDARD FEATURES OR OPTIONS

—Screwdriver Slotted Shafts
—Coded Versions
—Spring Return (Momentary Positions)
—Push-To-Turn or Pull-To-Turn†
—Keylock (Key Operated)
—RFI Grounding†
—Electrostatic or Electromagnetic Shielding†
—Intermix of Shorting and Non-Shorting Contacts†

†Indicates not available through distributors



ADJUSTABLE STOPS

Military Style Rotary Switches

The Series 50 and 51 Rotary Switches are also available with military type switch materials. Many types of the Series 50 are fully qualified to MIL-S-3786/20. Many types of the Series 51 are fully qualified to MIL-S-3786/35. These documents as well as the QPL (Qualified Products List) should be consulted for complete specification and ordering information. Contact GRAYHILL for additional assistance in specifying military styles Series 50 and 51 Rotary Switches.

45°, 60° or 90° Angles of Throw

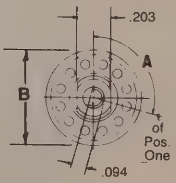
The Series 50 Rotary Switch is also available with 45° (8 position), 60° (6 position) or 90° (4 position) angles of throw. These angles of throw are available with 1 or 2 poles per deck, solder lug or PC mount terminals, with or without shaft and panel seal, fixed or adjustable stops and in standard or military types.

Adjustable Stops

Adjustable stop versions of the Series 50 and 51 Rotary Switches are readily available from local distributor stock. The adjustable stop versions are form, fit and function equivalents to their fixed stop counterparts. Adjustable stop Series 50 and 51 Rotary Switches can be provided in all angles of throw and with or without shaft and panel seal. Contact your local distributor or GRAYHILL for cross reference information between fixed and adjustable stop switches.

UNSEALED — FIXED STOPS

Shown on these two pages are the standard unsealed and sealed fixed stop version with solder lug or PC terminals.



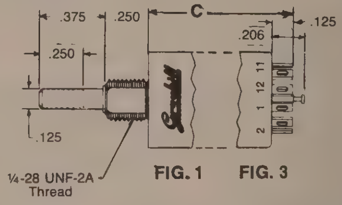


FIG. 1 FIG. 3

SEALED — FIXED STOPS

Seal does not alter dimensions when mounted

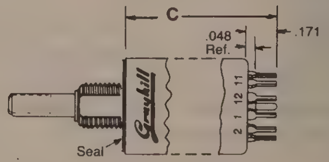


FIG. 2 FIG. 4

Type	Terminal	Switch Style	Applicable Figures	Dimension C
Unsealed	Solder Lug	A	1,3	.617
Fixed Stop	PC Terminal	P	1,4	.667
Sealed	Solder Lug	S	2,3	.617
Fixed Stop	PC Terminal	SP	2,4	.667

Series	51	51	50
Angle of Throw	22½°	30°	36°
Angle A	101°15″	105°	108°
Dimension B	.562	.562	.500

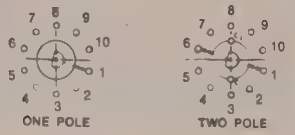
Rotary Switches

Circuit Diagrams

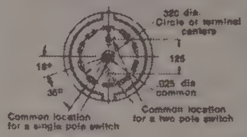
Switches are viewed from shaft end and shown in position 1.

Common location for a single pole switch. Two pole commons are located as shown in circuit diagram on a .156 dia. Circle of centers; four pole commons are located as shown in circuit diagram on a .175 dia. circle of centers.

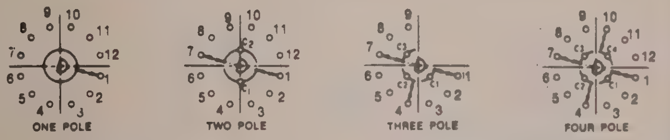
SERIES 50


7
8
9
6
10
5
1
4
3
2
ONE POLE
TWO POLE

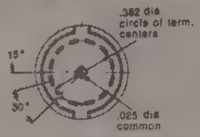
36° ANGLE OF THROW


.380 dia. Circle of terminal centers
.125
18°
36°
.025 dia common
Common location for a single pole switch
Common location for a two pole switch

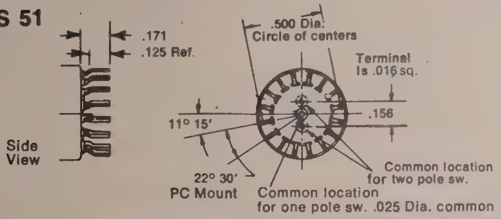
SERIES 51

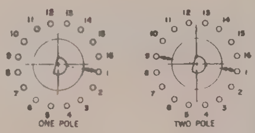

9
10
8
11
7
12
6
1
5
2
4
3
ONE POLE
TWO POLE
THREE POLE
FOUR POLE

30° ANGLE OF THROW


.382 dia circle of term. centers
15°
30°
.025 dia common

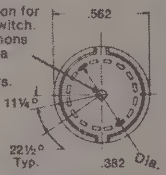
SERIES 51


.171
.125 Ref.
Side View
.500 Dia. Circle of centers
Terminal Is .016 sq.
.156
11° 15′
22° 30′
PC Mount
Common location for two pole sw.
Common location for one pole sw. .025 Dia. common


ONE POLE
TWO POLE

22½° ANGLE OF THROW

Common location for a single pole switch. Two pole commons are located on a .156 Dia. circle of centers.


.562
11¼°
Solder Lug
22½° Typ.
.382 Dia.

SPECIFICATIONS

RATING:

Rated to make and break 200MA for 10,000 cycles of operation or 50MA for 25,000 cycles of operation, resistive load, 115VAC or 30VDC. For 22½° switch, rating is lower. For complete load life information, see GRAYHILL Rotary Switch catalog.

CONTACT RESISTANCE:

50 milliohms maximum (10 milliohms initially).

INSULATION RESISTANCE:

10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

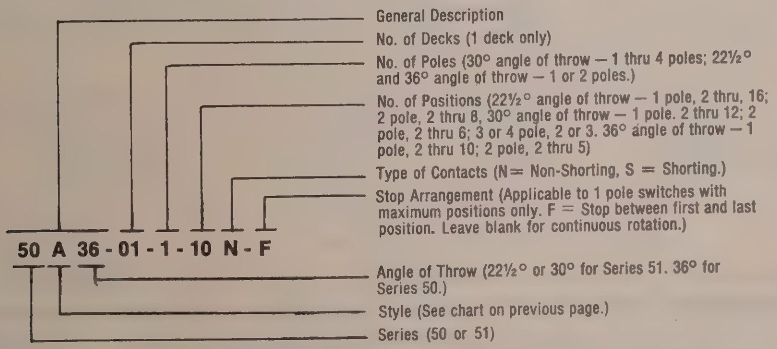
VOLTAGE BREAKDOWN:

600VAC between mutually insulated parts; 400VAC for 22½° switch.

CARRY CURRENT:

6 amperes with a maximum contact temperature rise of 20°C.

HOW TO ORDER



50 A 36 - 01 - 1 - 10 N - F

General Description

No. of Decks (1 deck only)

No. of Poles (30° angle of throw — 1 thru 4 poles; 22½° and 36° angle of throw — 1 or 2 poles.)

No. of Positions (22½° angle of throw — 1 pole, 2 thru, 16; 2 pole, 2 thru 8, 30° angle of throw — 1 pole. 2 thru 12; 2 pole, 2 thru 6; 3 or 4 pole, 2 or 3. 36° angle of throw — 1 pole, 2 thru 10; 2 pole, 2 thru 5)

Type of Contacts (N = Non-Shorting, S = Shorting.)

Stop Arrangement (Applicable to 1 pole switches with maximum positions only. F = Stop between first and last position. Leave blank for continuous rotation.)

Angle of Throw (22½° or 30° for Series 51. 36° for Series 50.)

Style (See chart on previous page.)

Series (50 or 51)

Style A (for Style P, add $.50)

No. of Poles	Non-Shorting			Shorting		
	Series 50 36°	Series 51 22½°*	Series 51 30°	Series 50 36°	Series 51 22½°*	Series 51 30°
1	$11.00	$15.55	$11.85	$12.20	$16.70	$13.05
2	13.60	17.30	14.35	15.20	18.80	15.90
3	...	...	16.45	...	...	18.50
4	...	...	18.80	...	...	21.15

Style S (for Style SP, add $.50)

No. of Poles	Non-Shorting			Shorting		
	Series 50 36°	Series 51 22½°	Series 51 30°	Series 50 36°	Series 51 22½°*	Series 51 30°
1	$12.00	$16.78	$12.89	$13.22	$17.94	$14.11
2	14.78	18.67	15.57	16.42	20 20	17 15
3	...	...	17 77	...	..	19 88
4	...	...	20.24	...	...	22 67

Discount Schedule

1-9	......Unit Price
10-24	.....LESS 8%
25-49	.....LESS 16%
50-99	.....LESS 37%
100-499	.....LESS 50%
500 UP	. . Contact your local distributor or Grayhill

Prices and Discounts Subject to Change Without Notice.

Available Locally Through Your Grayhill Distributor

Grayhill INC.

1/2 Inch Diameter Single Deck

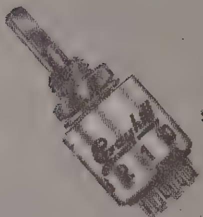
Grayhill Quality For As Little As $3.25*

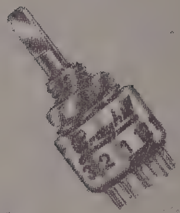
Great Variety Of Styles And Features:

Shaft and Panel Seal	**Adjustable Stops**
Screwdriver Actuation	**Extra Short Depth**
PC Termination	**30⁰ or 36⁰, 1 or 2 Poles**

*Standard Style, 1 Pole, 10 Position, Non-Shorting Switch in lots of 1000.

SERIES 56


SERIES 55


SERIES 56

SERIES 55

Dimensions

See Choices and Limitations for applicable Figures.

Fig. 1

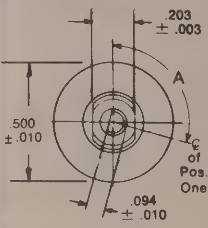
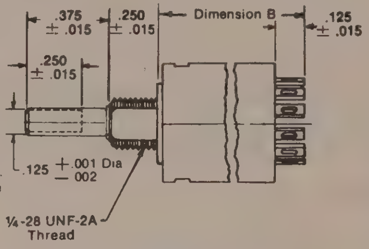

.203
± .003
A
.500
± .010
℄ of
Pos.
One
.094
± .010

Fig. 2


.375
± .015
.250
± .015
Dimension B
.125
± .015
.250
± .015
.125 +.001 −.002 Dia
¼-28 UNF-2A
Thread

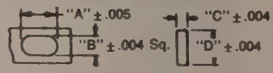
Stop pin holes can be seen in Fig. 3.

Angle Of Throw	30°	36°
Angle 'A'	105°	108°

Series	55	56
Dimension 'B'	.635 ±.020	.480 ±.020

Rear Views Shown With Circuit Diagrams

SOLDER LUG TERMINAL DETAIL


"A" ± .005
"B" ± .004 Sq.
"C" ± .004
"D" ± .004

Angle	30°			36°		
		Common			Common	
Dim.	Term.	1 Pole	2 or 4	Term.	1 Pole	2 Pole
"A"	.063	WIRE WRAP STYLE	.068	0.68	WIRE WRAP STYLE	.068
"B"	.020		.036	.036		.036
"C"	.016	.062 DIA. ±.001	.020	.020	.062 DIA. ±.001	.020
"D"	.046		.062	.062		.062

Fig. 3

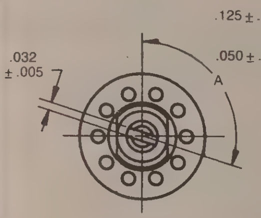
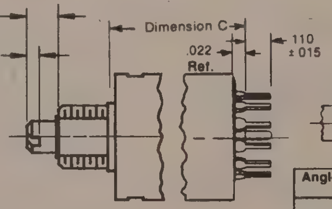

.032
± .005
A
.125 ± .015
.050 ± .005

Fig. 4


Dimension C
.022
Ref.
.110
± .015

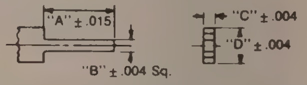
For additional dimensions, See Figure 1.

Angle Of Throw	30°	36°
Angle 'A'	105°	108°

Series	55	56
Dimension 'C'	.532 ± .020	.377 ±.020

Rear Views Shown With Circuit Diagrams

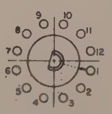
PC TERMINAL DETAIL


"A" ± .015
"B" ± .004 Sq.
"C" ± .004
"D" ± .004

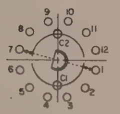
Angle	30°			36°		
		Common			Common	
Dim.	Term.	1 Pole	2 or 4	Term.	1 Pole	2 Pole
"A"	.110	RND. PIN	.110	.110	RND. PIN	.110
"B"	.016		.020	.020		.020
"C"	.016	.025 DIA. ±.002	.020	.020	.025 DIA. ±.002	.020
"D"	.046		.062	.062		.062

CIRCUIT DIAGRAMS

30⁰ ANGLE OF THROW

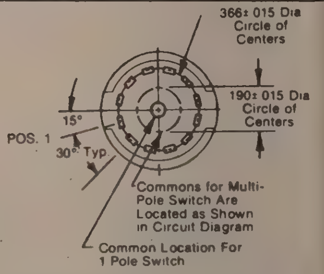

9
10
11
12
1
2
3
4
5
6
7
8

ONE POLE

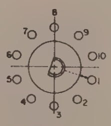

9
10
11
12
1
2
3
4
5
6
7
8
C2
C1

TWO POLE

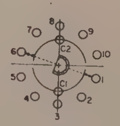
Note: Four pole switch is also available. Contact Grayhill.


366± 015 Dia
Circle of
Centers
190± 015 Dia
Circle of
Centers
15°
POS. 1
30° Typ
Commons for Multi-Pole Switch Are Located as Shown in Circuit Diagram
Common Location For 1 Pole Switch

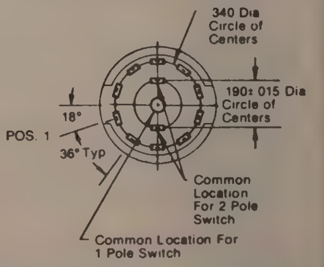
36⁰ ANGLE OF THROW


8
9
10
1
2
3
4
5
6
7

ONE POLE


8
9
10
1
2
3
4
5
6
7
C2
C1

TWO POLE


340 Dia
Circle of
Centers
190± 015 Dia
Circle of
Centers
18°
POS. 1
36° Typ
Common Location For 2 Pole Switch
Common Location For 1 Pole Switch

Rotary Switches

Specifications

RATING:

Rated to make and break 200 mA for 10,000 cycles of operation or 50 mA for 25,000 cycles of operation, resistive load, 115 VAC or 30 VDC. For complete load life information, see GRAYHILL Catalog Number One.

CONTACT RESISTANCE:

100 milliohms maximum (15 milliohms initially).

INSULATION RESISTANCE:

10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

VOLTAGE BREAKDOWN:

600VAC between mutually insulated parts.

CARRY CURRENT:

6 amperes with a maximum contact temperature rise of 20°C.

SHAFT AND PANEL SEAL

Panel is sealed by an "O" ring at the base of bushing. Shaft is sealed by an "O" ring inside the bushing. After the switch is mounted, seals do not alter the dimensions of the unsealed style.

ADJUSTABLE STOPS

Set and Reset Stops to Limit Rotation Form, Fit and Function Equivalent to Fixed Stop Counterparts

Adjustable Stop Switches: Two stop pins and an adhesive backed sticker or seal washer are provided. Stop pins can be located or reset as desired. Sticker or seal washer maintains stop pins in place. Sticker or seal washer can be removed to change stop pin location.

Choices And Limitations

Style, Description, and Applicable Drawing Figures	Angle Of Throw	Stops	Terminals	Number of Poles		Number Of Positions/Pole
				Shorting	Non-Shorting	
A = Standard 1,2 **S** = Standard, Shaft/Panel Seal 1,2 **B** = Screwdriver Slotted 3,2 **BS** = Slotted, Shaft/Panel Seal 3,2	30°	Fixed	Solder Lug	1 2	1 2	2 thru 12 2 thru 6
	36°			1 2	1 2	2 thru 10 2 thru 5
P = PC Mount 1,4 **SP** = PC Mount, Shaft/Panel Seal 1,4 **BP** = Screwdriver Slotted, PC Mount 3,4 **BSP** = Slotted, Sealed, PC Mount 3,4	30°	Fixed	Printed Circuit	1 2	1 2	2 thru 12 2 thru 6
	36°			1 2	1 2	2 thru 10 2 thru 5
D = Adjustable Stops 1,2 **SD** = Adj. Stops, Shaft/Panel Seal 1,2 **BD** = Adj. Stops, Screwdriver Slotted 3,2 **BSD** = Slotted, Sealed, Adjustable 3,2	30°	Adjustable	Solder lug	1 2	1 2	Adjustable (2 thru 12) Adjustable (2 thru 6)
	36°			1 2	1 2	Adjustable (2 thru 10) Adjustable (2 thru 5)
DP = Adj. Stops, PC Mount 1,4 **SDP** = Adjustable, PC Mount, Sealed 1,4 **BDP** = Slotted, Adjustable, PC Mount 3,4 **BSDP** = Slotted, Sealed, Adj., PC 3,4	30°	Adjustable	Printed Circuit	1 2	1 2	Adjustable (2 thru 12) Adjustable (2 thru 6)
	36°			1 2	1 2	Adjustable (2 thru 10) Adjustable (2 thru 5)

ADDITIONAL OPTIONS (CONTACT GRAYHILL)

—KEYLOCK
—DIFFERENT SHAFT FLAT
—INTERMIXING OF SHORTING CONTACTS AND NON-SHORTING

HOW TO ORDER

Part number is descriptive and formed in the following manner:

56 A 36—01—1—10 N—F

Series Number
Series 55 or Series 56 (Shorter Switch)
Style Letter(s). If it includes "D", see "Positions" note.
Angle of Throw (30° or 36°)
Stop Arrangement—The suffix C or F must be added to a one pole per deck, switch with the maximum number of positions to indicate continuous rotation (C) or fixed stops (F) between position 1 and the last position. Leave blank if not applicable.
Type of Contacts-N=Non-shorting, S=Shorting.
Positions per Pole-requires 02 positions as a minimum to maximum allowable dependent on the angle of throw and poles per deck. Use the letters AJ in this location if adjustable stop switch is required.
Poles per Deck (1 or 2)
Number of Decks (1 deck only)

PRICES

All Prices Are Unit Prices

Angles Of Throw	Poles	Shorting Non-Shorting	Switch Style			
			A,B,D,BD	P,BP,DP,BDP	S,BS,SD,BSD	SP,BSP,SDP, BSDP
30°	1	N	$7.75	$8.00	$8.40	$8.65
		S	8.00	8.25	8.65	8.90
	2	N	8.60	8.85	9.25	9.50
		S	9.10	9.35	9.75	10.00
36°	1	N	7.50	7.75	8.15	8.40
		S	7.75	8.00	8.40	8.65
	2	N	8.35	8.60	9.00	9.25
		S	8.85	9.10	9.50	9.75

Discount Schedule

Quantity Range	
1-9	Unit Price
10-24	Less 8%
25-49	Less 16%
50-99	Less 37%
100-499	Less 50%
500 and up	Contact Your Local Sales Office Or GRAYHILL

PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

Available Locally Through Your Grayhill Distributor

Grayhill INC

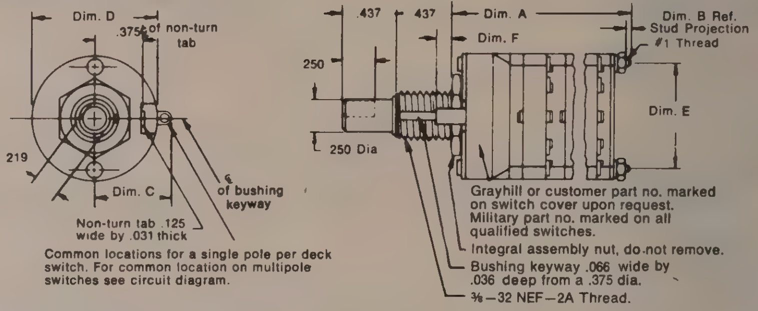
1 Inch, 1 Amp, Rotary Switch

Standard Or Military

Our Most Popular Rotary Switch Family

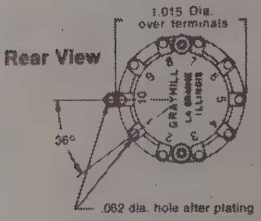
- Available in standard and military styles
- Single or concentric shafts
- P.C. Mounting
- Add-a-pots
- Shaft and panel seals

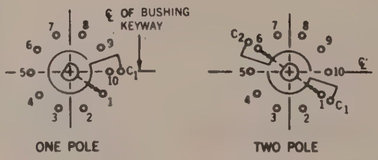
DIMENSIONS


Dim. D
.375 ℄ of non-turn tab
219
Dim. C
℄ of bushing keyway
Non-turn tab .125 wide by .031 thick
Common locations for a single pole per deck switch. For common location on multipole switches see circuit diagram.
.437
.437
250
250 Dia
Dim. A
Dim. F
Dim. B Ref. Stud Projection #1 Thread
Dim. E
Grayhill or customer part no. marked on switch cover upon request. Military part no. marked on all qualified switches.
Integral assembly nut, do not remove.
Bushing keyway .066 wide by .036 deep from a .375 dia.
⅜—32 NEF—2A Thread.

CIRCUIT DIAGRAMS

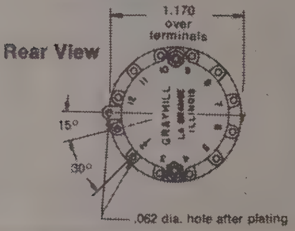
Series 42
36° Angle of Throw

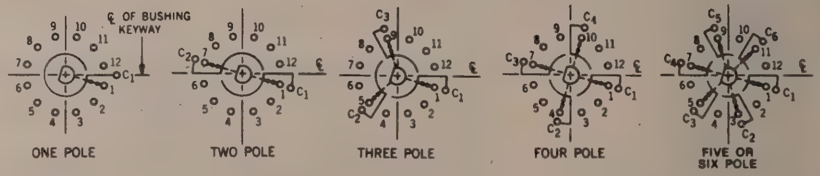

1.015 Dia. over terminals
Rear View
36°
GRAYHILL LA GRANGE ILLINOIS
.062 dia. hole after plating


℄ OF BUSHING KEYWAY
ONE POLE
TWO POLE

Dimensions	C	D	E	F
SERIES 42	.562	1,000	.830	.093
SERIES 44	.642	1,162	1.000	.121

Series 44
30° Angle of Throw


1.170 over terminals
Rear View
15°
30°
GRAYHILL LA GRANGE ILLINOIS
.062 dia. hole after plating


℄ OF BUSHING KEYWAY
ONE POLE
TWO POLE
THREE POLE
FOUR POLE
FIVE OR SIX POLE

ORDERING INFORMATION:

How to determine part number—Sample part number for a standard style, fixed stop, 2 deck, 1 pole per deck 12 positions per pole, 30° angle of throw rotary switch with non-shorting contacts.

44 A 30 - 02 - 1-12-N - F

General Description
Number of Decks (1 thru 3)
Number of Poles per Deck (1 or 2)
Number of Positions per Pole (AJ = Adjustable Stops)
Type of Contacts — N = Non-Shortning, S = Shorting
Add -F for Stop between First and Last Position of a 1 Pole/Deck Switch with Max. Positions. No Notation required for Continuous Rotation.
Angle of Throw (See Series)
Style — A = Standard, Solder Lug Terminals; D = Style A with Adjustable Stops
Series 42 (36°) or Series 44 (30°)

Discount Schedule

1-9	....Unit Price
10-24	....Less 8%
25-49	....Less 16%
50-99	....Less 37%
100-499	....Less 50%
500-UP	.... Contact your local distributor or Grayhill

Prices and Discounts subject to change without notice.

For other angles of throw; 3 to 6 poles per deck; 4 thru 12 decks; military, sealed, UL listed, or PC mountable styles, contact factory.

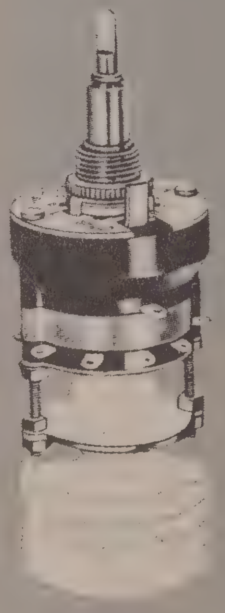
Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

1 Inch, 1 Amp, Rotary Switch

With A Wide Range Of Variations And Options

- 30°, 36°, 45°, or 90° angle of throw
- 1 thru 6 poles/deck
- 1 thru 12 decks
- Non-shorting or shorting contacts
- Adjustable stops (see below)

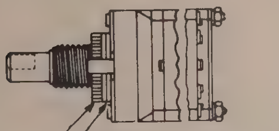
P.C. Mounting

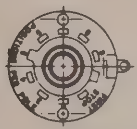


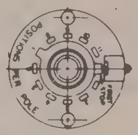
Add-A-Pot

ADJUSTABLE STOPS

Adjustable stop switches permit the user to externally set the switch stops which limit its rotation. Adjustment is accomplished by removing the stop washers and relocating them. The knurled nut or the panel can be used to hold-in the stop washers. All other dimensions are the same as the standard style.







Series 44 is available with adjustable stops in 30° angle of throw only.

SPECIFICATIONS

Rated: To make and break the following loads with 30° or 36° angle of throw: 1 amp., 115 VAC resistive; 1 amp., 6 to 28 VDC resistive; 0.25 amp., 115 VAC inductive; 0.02 amp., 115 VDC inductive; 0.10 amp., 6 to 28 VDC inductive; 0.10 amp., 115 VDC resistive. To carry 10 amps. continuously.

Contact Resistance: After 25,000 cycles of operation .020 ohms maximum.

Insulation Resistance: 50,000 megohms minimum (initially).

Voltage Breakdown: 1,000 VAC initially (500 VAC or better after most enviornmental tests).

Life Expectancy: 100,000 mechanical cycles of operation; details in catalog.

Stop Strength: 15 pound-inches standard, 12 pound-inches adjustable minimum.

Rotational Torque: 8-115 ounce-inches, depending on the number of poles per deck and the number of decks.

Contacts: Shorting or non-shorting wiping contacts with over 150 grams contact force.

Shaft Flat Orientation: Flat opposite contacting position of pole number one. (See circuit diagram.)

Specifications and circuit values for military styles along with additional characteristics available—contact Grayhill for complete engineering catalog.

PRICES

One Pole Per Deck — Fixed Stops

	SERIES 42A 36 AND 44A 30 (FIXED STOPS)									SERIES 44A 30	
No. of Decks	Number of Positions										
	2	3	4	5	6	7	8	9	10	11	12
1	$18.72	$19.13	$19.53	$19.93	$20.34	$20.75	$21.15	$21.56	$21.97	$22.37	$22.76
2	22.13	22.94	23.76	24.56	25.38	26.19	27.00	27.80	28.62	29.42	30.24
3	25.55	26.76	27.98	29.19	30.41	31.63	32.84	34.05	35.27	36.50	37.71

Two Poles Per Deck — Fixed Stops

	SERIES 42A 36 AND 44A 30 (FIXED STOPS)				SERIES 44A 30
No. of Decks	Number of Positions				
	2	3	4	5	6
1	$20.48	$21 29	$22 09	$22 91	$23.72
2	25.65	27 28	28 90	30 51	32.14
3	30.83	33 26	35 69	38 13	40.55

Series 42 D 36 — Adjustable Stop

No. of Decks	No. of Positions	
	2-12 1 Pole	2-5 2 Pole
1	$21.97	$22.91
2	28.62	30.51
3	35.27	38.13

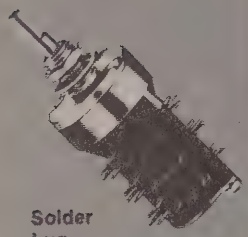
Series 44 D 30 — Adjustable Stop

No. of Decks	No. of Positions	
	2-10 1 Pole	2-6 2 Pole
1	$22.76	$23.72
2	30.24	32.14
3	37.71	40.55

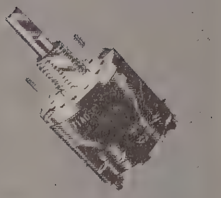
Available Locally Through Your Grayhill Distributor

Grayhill INC.

½ Inch Diameter, ¼ Amp



Solder Lug Terminals



Adjustable Stops

Value Engineered To Compete In Price And Outperform Open-Wafers

- 30º Or 36º Angle Of Throw
- Military Qualification
- 1/8″ or 1/4″ Shaft Diameter
- Solder Lug Or PC Mount
- 1 Thru 12 Decks; 1 To 6 Poles Per Deck

ADDITIONAL FEATURES

ADJUSTABLE STOPS—Stocked By Distributors

Number of positions per pole can be changed by removing and relocating stop pins in holes in the switch front plate. Available in the single shaft versions with either .125″ or .250″ diameter, 30º or 36º angle of throw; and solder lug terminals or PC mount.

Non Adjustable Style	With Adjustable Stops Style Becomes
A	AD
B	BD
AF	ADF
BF	BDF

MILITARY QUALIFIED, MIL-S-3786/39

The Series 71 rotary switch qualification includes the 30º and 36º angles of throw in both shaft diameters, sealed and unsealed styles, in 1 thru 5 decks with solder lug terminals, and in 1 thru 4 operative decks with PC terminals. For more details, see GRAYHILL Engineering Catalog Number One.

Commercial Style	Military Style
A	MA
B	MB
AF	MAF
BF	MBF

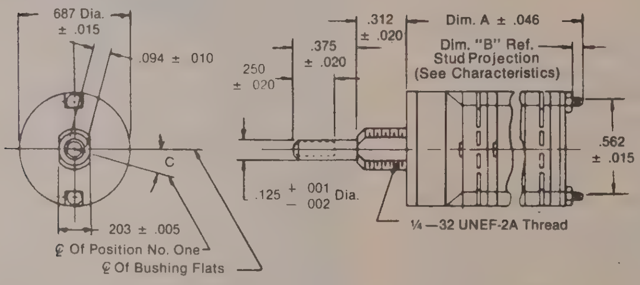
SHAFT AND PANEL SEAL

Shaft is sealed by "O" ring inside bushing. Panel is sealed "O" ring at base of bushing. Seals do not alter dimensions as shown in the drawings when switch is mounted. Panel seal is silicone rubber. Shaft seal is an "O" ring per MIL-P-5516B.

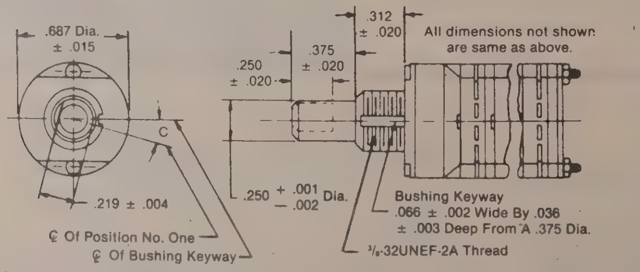
Non Sealed Style	With Seals Style Becomes	Military Style Becomes
A	AS	MAS
B	BS	MBS
AF	ASF	MASF
BF	BSF	MBSF

DIMENSIONS — SOLDER LUG TERMINALS

Style A, 0.125 Dia. Shaft


687 Dia.
± .015
.094 ± 010
C
203 ± .005
℄ Of Position No. One
℄ Of Bushing Flats
.312
± .020
.375
± .020
250
± 020
Dim. A ± .046
Dim. "B" Ref.
Stud Projection
(See Characteristics)
.562
± .015
.125 + 001 − 002 Dia.
¼—32 UNEF-2A Thread

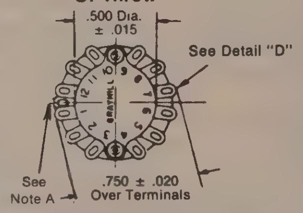
Style B, 0.250″ Dia. Shaft


.687 Dia.
± .015
C
.219 ± .004
℄ Of Position No. One
℄ Of Bushing Keyway
.250
± .020
.375
± .020
.312
± .020
All dimensions not shown are same as above.
.250 + .001 − .002 Dia.
Bushing Keyway
.066 ± .002 Wide By .036
± .003 Deep From A .375 Dia.
³/₈-32UNEF-2A Thread

Rear Views

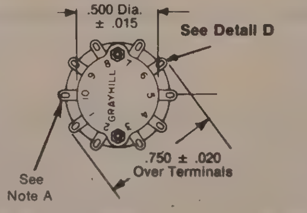
30° and 36° Angle of Throw may be Interposed on Either Shaft Diameter

30° Angle Of Throw


.500 Dia.
± .015
See Detail "D"
GRAYHILL
See Note A
.750 ± .020
Over Terminals

Note A: Common Location for a Single Pole Per Deck Switch. For Common Location on Multipole Switches See Circuit Diagram.

36° Angle Of Throw


.500 Dia.
± .015
See Detail D
GRAYHILL
See Note A
.750 ± .020
Over Terminals

Dimensions A & B

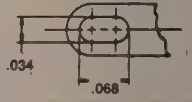
Extended studs are provided on switches of 6 or more decks for recommended double end mounting. See also military note under drawing for PC mountable styles.

No. of Decks	Dimension A Mil. F Styles	Dimension A Others	Dim. B
1	.761	.761	.031
2	.979	.979	.031
3	1.415	1.197	.031
4	1.633	1.415	.031
5	—	1.633	.031
6	—	2.131	.312
7	—	2.349	.312
8	—	2.567	.312
9	—	2.785	.312
10	—	3.003	.312
11	—	3.221	.312
12	—	3.439	.312

Dimension C

10 Position Switches	12 Position Switches
36º	15º

Detail D

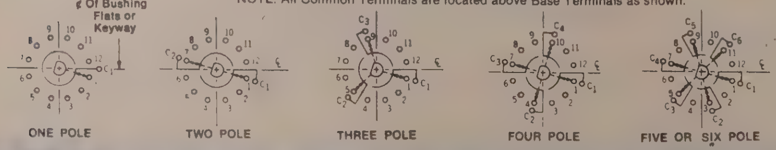


CIRCUIT DIAGRAMS

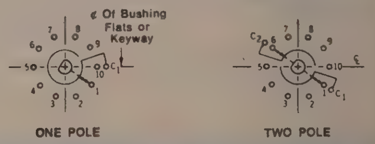
(Switch is viewed from Shaft End and shown in Position No. 1)

Solder Lug, 30° Angle Of Throw

NOTE: All Common Terminals are located above Base Terminals as shown.


℄ Of Bushing Flats or Keyway
ONE POLE
TWO POLE
THREE POLE
FOUR POLE
FIVE OR SIX POLE

Solder Lug, 36° Angle Of Throw

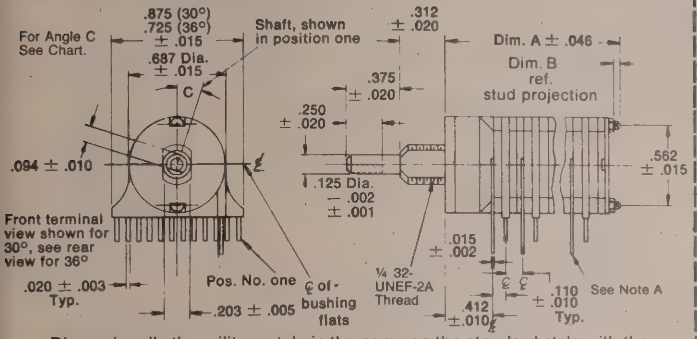

℄ Of Bushing Flats or Keyway
ONE POLE
TWO POLE

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Multideck, Rotary Switches

DIMENSIONS—PC BOARD MOUNTABLE

Style AF, 0.125" Dia. Shaft

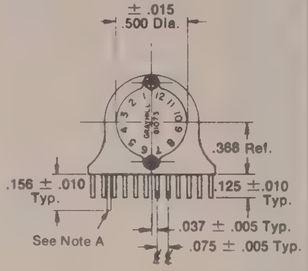

For Angle C
See Chart.
.875 (30°)
.725 (36°)
± .015
.687 Dia.
± .015
C
Shaft, shown
in position one
.312
± .020
Dim. A ± .046
Dim. B
ref.
stud projection
.375
± .020
.250
± .020
.562
± .015
.094 ± .010
.125 Dia.
— .002
± .001
Front terminal
view shown for
30°, see rear
view for 36°
.015
± .002
.020 ± .003
Typ.
Pos. No. one
℄ of
bushing
flats
¼ 32-
UNEF-2A
Thread
.412
±.010
.110
± .010
Typ.
See Note A
.203 ± .005

Dimensionally the military style is the same as the standard style with the exception of the PC version of 3 or 4 decks; a spacer deck between decks 2 and 3 adds another deck length to the switch without increasing the number of operative decks. See chart.

Rear Views

30° and 36° Angle of Throw may be interposed on either Shaft Diameter

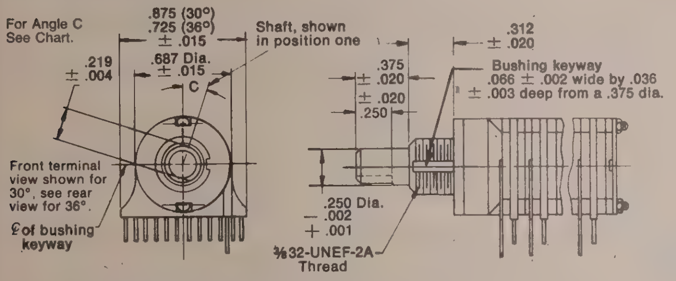
30° Angle Of Throw


± .015
.500 Dia.
.368 Ref.
.156 ± .010
Typ.
.125 ± .010
Typ.
See Note A
.037 ± .005 Typ.
.075 ± .005 Typ.

Note A: Common Location for a Single Pole Per Deck Switch. For Common Location on Multipole Switches See Circuit Diagram

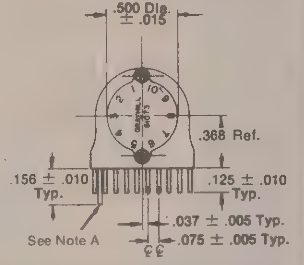
PC Mountable

Style BF, 0.250" Dia. Shaft


For Angle C
See Chart.
.875 (30°)
.725 (36°)
± .015
.219
± .004
.687 Dia.
± .015
C
Shaft, shown
in position one
.312
± .020
.375
± .020
± .020
.250
Bushing keyway
.066 ± .002 wide by .036
± .003 deep from a .375 dia.
Front terminal
view shown for
30°, see rear
view for 36°.
℄ of bushing
keyway
.250 Dia.
— .002
+ .001
⅜32-UNEF-2A
Thread

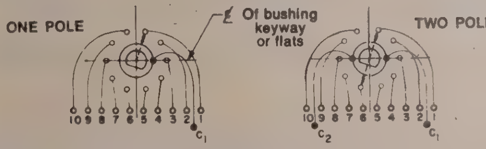
For other dimensions and military styles, see drawing above.

36° Angle Of Throw

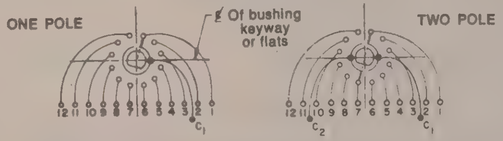

.500 Dia.
± .015
.368 Ref.
.156 ± .010
Typ.
.125 ± .010
Typ.
See Note A
.037 ± .005 Typ.
.075 ± .005 Typ.

CIRCUIT DIAGRAMS

36° Angle Of Throw


ONE POLE
℄ Of bushing
keyway
or flats
TWO POLE
10 9 8 7 6 5 4 3 2 1
C_1
10 9 8 7 6 5 4 3 2 1
C_2
C_1

30° Angle Of Throw


ONE POLE
℄ Of bushing
keyway
or flats
TWO POLE
12 11 10 9 8 7 6 5 4 3 2 1
C_1
12 11 10 9 8 7 6 5 4 3 2 1
C_2
C_1

SPECIFICATIONS

RATING:
Rated to make and break 400MA for 10,000 cycles of operation or 200MA for 25,000 cycles of operation, resistive load, 115VAC or 30VDC. Rated to make and break 250MA for 10,000 cycles of operation or 100MA for 25,000 cycles of operation, inductive load (250 Millihenries), 30VDC.

For complete load life information, see GRAYHILL Engineering Catalog Number One.

CONTACT RESISTANCE:
50 milliohms maximum (10 milliohms initially).

VOLTAGE BREAKDOWN:
500 VAC minimum between mutually insulated parts.

CARRY CURRENT:
4 amperes with a maximum contact temperature rise of 20°C.

INSULATION RESISTANCE:
10,000 megohms minimum between mutually insulated parts (50,000 megohms initially).

HOW TO ORDER

71 A 30 - 02 - 1 - 12 N - C

- Series 71, Style (as described on these pages), Angle of Throw (30° or 36°)
- No. of Decks (12 decks max., also see poles per deck limitation in price table.)
- No. of Poles per Deck (See circuit diagram for style and angle of throw limitations. Also limited to a maximum of 16 total poles per switch.
- No. of Positions (30° angle of throw solder lug—1 pole, 2 thru 12; 2 pole, 2 thru 6; 3 pole, 2 thru 4; 4 pole, 2 or 3; 5 or 6 pole, 2 only. 30° angle of throw PC mount—1 pole, 2 thru 12; 2 pole, 2 thru 6. 36° angle of throw—1 pole, 2 thru 10; 2 pole, 2 thru 5.)
- Type of Contacts (N=Non-Shorting. S=Shorting)
- Stop Arrangement (Applicable to 1 pole switches with maximum positions only. C=Continuous, F=Stop between first and last position.)

Prices on following page.

Grayhill INC. 16, 20, and 24 Position Rotary Switches (1/2 Amp)

PRICES
SERIES 71
(cont'd)

71A30 71B30 / 71A36 71B36 — Poles/Deck and Positions/Pole; **71AF30 71BF30 / 71AF36 71BF36** — Poles/Deck and Positions/Pole

Decks \ Poles	1 (2-12)	2 (2-6)	3 (2-4)	4 (2-3)	5 (2)	6 (2)	1 (2-12)	2 (2-6)
1	$11.89	$12.37	$12.87	$13.37	$13.86	$14.37	$13.06	$13.57
2	15.60	16.60	17.59	18.57	19.58	20.57	18.14	19.14
3	19.34	20.82	22.31	23.79	25.29	N.A.	23.24	24.74
4	23.05	25.04	27.03	29.00	N.A.	N.A.	28.34	30.31
5	26 78	29.26	31.74	N.A.	N.A.	N.A.	33.42	35.92
6	30.51	33 48	N.A.	N A.	N.A.	N.A.	38.51	41.49
7	34.23	37.71	N.A.	N.A.	N.A.	N.A.	43.61	47.08
8	37.95	41.93	N.A.	N.A.	N.A.	N.A.	48.69	52.66
9	41.69	N.A.	N.A.	N A.	N.A.	N.A.	53.78	N.A.
10	45.40	N.A.	N.A.	N.A.	N.A.	N.A.	58.87	N.A.
11	49.13	N.A.	N.A.	N.A.	N.A.	N.A.	63.97	N.A.
12	52.86	N.A.	N.A.	N.A.	N.A.	N.A.	69.06	N.A.

NOTE: Number of Positions does not affect price.

71MA30, 71MB30, 71MA36, 71MB36 — Poles/Deck and Positions/Pole

Decks \ Poles	1 (2-12)	2 (2-6)	3 (2-4)	4 (2-3)	6 (2)
1	$12.56	$13.05	$13.56	$14.04	$15.05
2	16.51	17.49	18.49	19.48	21.48
3	20.46	21.95	23.44	24.92	27.92
4	24.40	26.40	28.38	30.36	N.A.
5	28.36	30.85	33.32	N.A.	N.A.

**71MAF30
71MAF36
71MBF30
71MBF36**

Number of Decks	1 (2-12)	2 (2-6)
1	$13.73	$14.23
2	19.06	20.04
3	24.37	25.86
4	29.68	31.67

PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

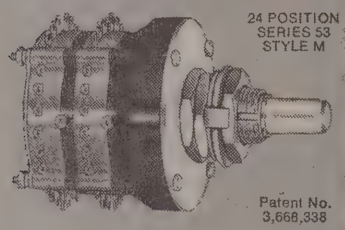
Shaft and Panel Seal, Style AS, ASF, BS, BSF, MAS, MASF, MBS, or MBSF—Add $1.23 to the price of a similar Style A, AF, B, BF, MA, MAF, MB or MBF switch.

Adjustable Stops, Style AD, ADF, BD or BDF—Add $0.62 to the cost of a similar Style A, AF, B, or BF rotary switch.

Discount Schedule

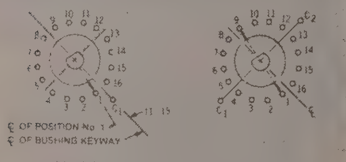
1-9	. . . UNIT PRICE
10-24	. . . . LESS 8%
25-49	. . . . LESS 16%
50-99	. . . . LESS 37%
100-499	. . . . LESS 50%
500 UP	. . . Contact your local distributor or Grayhill

More Circuits In Less Space.


24 POSITION
SERIES 53
STYLE M
Patent No.
3,668,338

SERIES 57 —

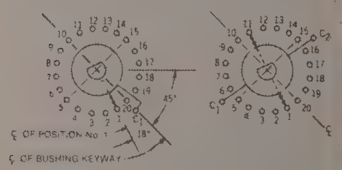
22½° ANGLE OF THROW (16 POSITIONS)


℄ OF POSITION No. 1
℄ OF BUSHING KEYWAY

ONE POLE TWO POLE

SERIES 59 —

18° ANGLE OF THROW (20 POSITIONS)

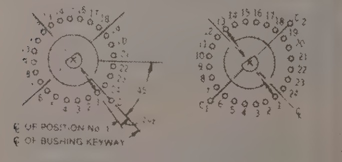

45°
18°
℄ OF POSITION No. 1
℄ OF BUSHING KEYWAY

ONE POLE TWO POLE

CIRCUIT DIAGRAMS

SERIES 53 —

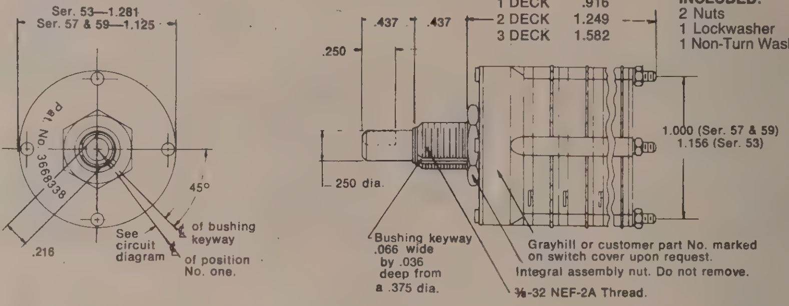
15° ANGLE OF THROW (24 POSITIONS)


℄ OF POSITION No. 1
℄ OF BUSHING KEYWAY

ONE POLE TWO POLE

Provides Logic Level To ½ Amp Switching Capability

DIMENSIONS


Ser. 53—1.281
Ser. 57 & 59—1.125
Pat. No. 3668338
45°
.216
See circuit diagram
℄ of bushing keyway
℄ of position No. one.
.437
.437
.250
250 dia.
1 DECK .916
2 DECK 1.249
3 DECK 1.582
1.000 (Ser. 57 & 59)
1.156 (Ser. 53)
Bushing keyway .066 wide by .036 deep from a .375 dia.
Grayhill or customer part No. marked on switch cover upon request.
Integral assembly nut. Do not remove.
⅜-32 NEF-2A Thread.

INCLUDED:
2 Nuts
1 Lockwasher
1 Non-Turn Washer

SPECIFICATIONS

Voltage: 115 VAC or 30 VDC, resistive load; 30 VDC inductive load.

Contact Resistance: 50 milliohms maximum (15 milliohms initially).

Insulation Resistance: 10,000 megohms minimum between mutually insulated parts. (50,000 megohms initially.)

Voltage Breakdown: 500 VAC minimum between mutually insulated parts. These switches will carry 4 amperes with a maximum contact temperature rise of 20°C.

Life: 10,000 cycles at 500 mA; 30,000 cycles at 200 mA (resistive loads). Cycle is 360° in one direction and a 360° return. Life measured at sea level, 25°C and 68% relative humidity.

ORDERING INFORMATION

53 M 15 - 02 - 1 - 24 N - C

- General Description
- Number of Decks (1 thru 3)
- Number of Poles per Deck (1 or 2)
- Number of Positions per Pole
- Type of Contacts — N = Non-shorting. S = Shorting
- Stop Arrangement—Use suffix only for 1 pole with maximum positions. Add C for continuous rotation; add F for fixed stop after last position.
- Angle of Throw (See Series)
- Style — M = Military Style
- Series 53 (15°). Series 59 (18°) or Series 57 (22°)

For 3 to 12 poles per deck; 4 thru 12 decks; military qualified, sealed styles, contact factory.

Poles/Deck and Positions/Pole

Series No.	1 Pole	2 Pole
53	2-24	2-12
59	2-20	2-10
57	2-16	2-8

For 3-12 poles, 4-12 decks, sealed, or military styles, contact GRAYHILL.

Prices

Number Of Decks	1 Pole	2 Pole
1	$29.42	$30.83
2	39.82	42.63
3	50.20	54.44

Use Discounts Above.

0.3" Diameter Rotary Switches

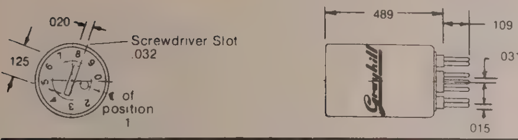
Designed As The World's Smallest Rotary Switch

- 10 Position, 1 or 2 Poles
- Rated to make and break logic loads for a minimum of 15,000 cycles of operation
- Non-Shorting Wiping Contacts

Screwdriver Actuated

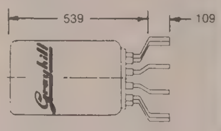
Style AP

Body diameter is .298


020
125
Screwdriver Slot
.032
℄ of position 1
489
109
031
015
Grayhill

Style AF

All Dimensions Not Shown and Front View Same as Style AP


539
109
Grayhill

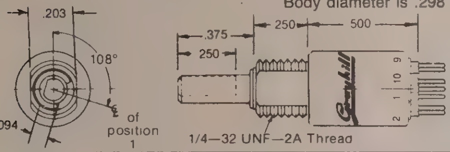
ACTUAL SIZE

Shaft Actuated

Style BP

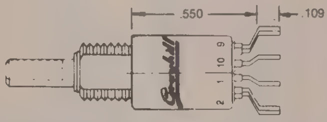
See Style AP for Terminal Dimensions

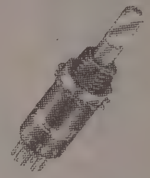
Body diameter is .298


.203
108°
094
℄ of position 1
.375
250
250
500
1/4—32 UNF—2A Thread
Grayhill
10 9 1 2

Style BF

All Dimensions Not Shown and Front View Same as Style BP


.550
.109
Grayhill
10 9 1 2

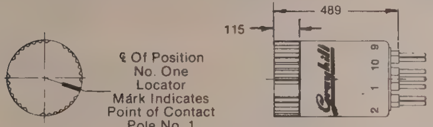


Integral Knob Actuated

Style CP

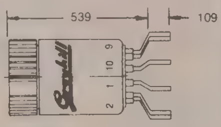
See Style AP for Terminal Dimensions

Body diameter is .298

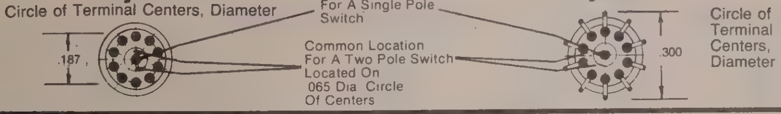

115
489
℄ Of Position No. One
Locator Mark Indicates Point of Contact Pole No. 1
Grayhill
10 9 1 2

Style CF

All Dimensions Not Shown and Front View Same as Style CP


539
109
Grayhill
10 9 1 2

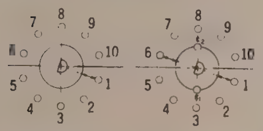
Style P **Style F**


Circle of Terminal Centers, Diameter
.187
Common Location For A Single Pole Switch
Common Location For A Two Pole Switch Located On 065 Dia Circle Of Centers
.300
Circle of Terminal Centers, Diameter

REAR VIEWS

CIRCUIT DIAGRAM

(Switch is viewed from shaft end and shown in position 1.)


7 8 9 10 1 2 3 4 5 6
7 8 9 10 1 2 3 4 5 6

ONE POLE TWO POLE

SPECIFICATIONS

Voltage: 115 VAC or 30 VDC, resistive load.

Contact Resistance: 50 milliohms maximum. (15 milliohms initially).

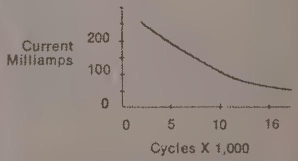
Insulation Resistance: 10,000 megohms minimum between mutually insulated parts. (50,000 megohms initially.)

Voltage Breakdown: 500 VAC minimum between mutually insulated parts.

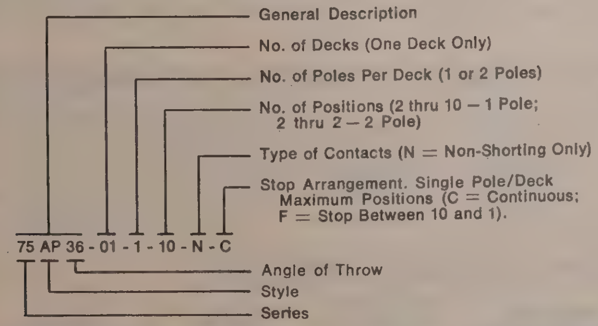
Chart shown for non-shorting contacts (break before make).

One cycle is 360° rotation and a return through all switch positions to the starting position. The data for the curve was measured at sea level, 25°C. and 68% relative humidity with the above life limiting criteria.

RATING:
Life Expectancy:



ORDERING INFORMATION



General Description
No. of Decks (One Deck Only)
No. of Poles Per Deck (1 or 2 Poles)
No. of Positions (2 thru 10 — 1 Pole; 2 thru 2 — 2 Pole)
Type of Contacts (N = Non-Shorting Only)
Stop Arrangement. Single Pole/Deck Maximum Positions (C = Continuous; F = Stop Between 10 and 1).

75 AP 36 - 01 - 1 - 10 - N - C

Angle of Throw
Style
Series

PRICES

Style	Unit Price	
	1 Pole/Deck	2 Pole/Deck
AF or CF	$13.14	$16.29
AP or CP	12.74	15.23
BF	14.96	18.09
BP	14.54	17.03

Discount Schedule

1-9	.....Unit Price
10-24	.....Less 8%
25-49	.....Less 16%
50-99	.....Less 37%
100-499	.....Less 50%
500-UP	... Contact your local distributor or Grayhill

PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE.

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HAMLIN INC

LAKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
PHONE: SALES 414/648-2361 · TWX 910-260-3740

REED SWITCHES & SENSORS • REED, HG & MOS RELAYS • LIQUID CRYSTAL DISPLAYS

MAGNETIC REED SWITCHES

Dry and mercury wetted magnet switches are precision created for reliable operation under most critical conditions. They offer excellent flexibility in a broad range of applications. These switches are hermetically sealed for safe dependable use in any atmosphere - even under explosive conditions and are unaffected by high or low temperatures or pressure. They offer long life with high sensitivity and their rapid cycling rate make these ideal for a wide variety of uses.

MINI - MINIATURE SIZE MAGNETIC REED SWITCHES

Stock No	Switch Model No	Form	Dimension*	Max DC Rating	Max Amps	Max DC Volts	Ampere Turn Pull In Range	Magnet	Price	Special Features
33F-1066	MMRR-2-185	A	1	.3W	.010	100	30 ± 7.5	H-31	2.50	"Grain of Wheat" size
33F-1067	MINI-2S-115	A	2	3W	.100	100	20 ± 7.5	H-31	1.60	The MINI Reed
33F-1064	MDRR-4-185	A	3	10W	.500	200	30 ± 7.5	H-33	.95	Low Profile Form A
33F-1057	MSRR-2-185	A	9	10W	.500	200	30 ± 7.5	H-33	1.00	Mod. Current and Voltage
33F-1051	MRR-2-185	A	11	10W	.500	200	30 ± 7.5	H-33	1.05	Mod. Current and Voltage
33F-1058	MSRR-2CD-155	A	9	10W	.500	200	25 ± 7.5	H-33	2.50	Close Differential
33F-1201	MARC-2-186	A	10	10W	.900	200	30 ± 10	H-33	.89	Economy Form A
	MARH-2-185	A	10	10W	.500	200	30 ± 7.5	H-33	1.20	Inst. Grade Prem. Per.
	MARR-5-196	A	20	10W	.500	500	32.5 ± 10	H-33	3.55	Breakdown Voltage to 1500 VDC
	MRR-5-196	A	11	10W	.500	500	32.5 ± 10	H-33	3.55	Breakdown Voltage to 1500 VDC
	MDSR-4-185	A	3	10W	.500	200	30 ± 7.5	H-33	.95	.090" Dia. Low Profile
	MARR-2-185	A	10	10W	.500	200	30 ± 7.5	H-33	.95	.105 Dia. Reliability
	MDRR-6-185	A	3	10W	.500	300	30 ± 7.5	H-33	1.85	Tiny Size
	MAR-8-185	A	9	20W	.750	300	30 ± 7.5	H-33	1.55	High Stability
	MAR-2-185	A	9	20W	.750	200	30 ± 7.5	H-33	.98	High Stability
	MRT-2-306	A	11	50W	1.00	200	52.5 ± 10	H-33	1.60	Long Life 1 AMP
	5091	A	17	360VA	5.00	600AC/300DC	340 ± 55	H-34	17.25	High Current Nema/B600/D300
	MAAC-2-185	A	20	15W	.210	120VAC/12DC	30 ± 7.5	H-33	1.30	Lamp Loads
	MRH-DT-175	C	18	3W	.250	28	27.5 ± 7.5	H-33	4.00	Instrument Grade Form C
	MRG-DT-175	C	18	3W	.250	200	27.5 ± 7.5	H-33	3.45	Mod. Current and Voltage
33F-1203	MLC-DT-186	C	7	3W	.140	28	30 ± 10	H-33	2.80	Economy Form C
	MDRR-DT-175	C	19	3W	.250	200	27.5 ± 7.5	H-33	3.88	3W Low Profile Form C

STANDARD SIZE MAGNETIC REED SWITCHES

Stock No	Switch Model No	Form	Dimension*	Max DC Rating	Max Amps	Max DC Volts	Ampere Turn Pull In Range	Magnet	Price	Special Features
33F-1072	DRR-1-425	A	14	60W	1.000	400	70 ± 7.5	H-34	1.76	Form A Rhodium Contacts
	MSRF-2-235	A	10	10W	.500	200	40 ± 7.5	H-34	2.50	R.F. 0-30 MHZ
33F-1080	DRR-DTH-445	C	13	30VA	.500	250	72.5 ± 7.5	H-32	2.55	High Breakdown Form C
	DRT-DTH-445	C	13	50VA	1.500	500	72.5 ± 7.5	H-34	5.30	Inductive Loads

HIGH VOLTAGE SIZE MAGNETIC REED SWITCHES

Stock No	Switch Model No	Form	Dimension*	Max DC Rating	Max Amps	Max DC Volts	Ampere Turn Pull In Range	Magnet	Price	Special Features
33F-1084	DRVT-10-658	A	14	50W	3.00	7500	120 ± 20	H-34	6.00	Breakdown Voltage 10KVDC
33F-1074	DRR-5-425	A	14	40W	1.00	1000	70 ± 7.5	H-34	3.00	High Breakdown Voltage
33F-1075	DRT-5-425	A	14	60W	3.00	1000	70 ± 7.5	H-34	5.00	Inductive Load
	DRR-HV-536	A	16	30W	2.00	1500	90 ± 10	H-34	5.22	High Stability

HIGH CURRENT SIZE MAGNETIC REED SWITCHES

Stock No	Switch Model No	Form	Dimension*	Max DC Rating	Max Amps	Max DC Volts	Ampere Turn Pull In Range	Magnet	Price	Special Features
33F-1078	SRT-2-455	A	15	110VA	1.00/3.00	28DC/110VAC	75 ± 7.5	H-34	3.45	Power Switch
33F-1079	DRR-129-425	A	14	100W	3.00	400	70 ± 7.5	H-34	3.75	High Stability

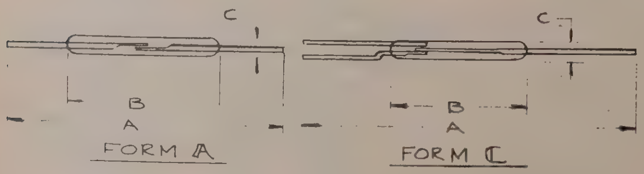
HIGH INRUSH CURRENT MERCURY WETTED MAGNETIC REED SWITCHES

Stock No	Switch Model No	Form	Dimension*	Max DC Rating	Max Amps	Max DC Volts	Ampere Turn Pull In Range	Magnet	Price	Special Features
33F-1088	MDC-1-387	A	7	50W	2.00	500	65 ± 15	H-33	2.50	Miniature Form A
33F-1207	MDC-DT-327	C	3	28W	1.00	200	55 ± 15	H-33	9.25	Miniature Form C

*See dimension chart

DIMENSION CHART FOR SWITCHES

SIZE CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A Overall Length Nominal	2.000	1.235	1.600	2.078	1.500	2.125	2.250	.950	2.250	2.250	2.250	3.375	3.375	3.250	3.465	3.200	2.250	2.120	2.080	1.775
B Glass Length Maximum	.375	.500	.600	.563	.850	.750	.610	.800	.800	.800	.800	1.610	1.562	1.950	1.640	1.940	1.312	.610	.560	.800
C Glass Diameter Maximum	.090	.070	.100	.105	.214	.092	.130	.145	.090	.105	.130	.195	.218	.218	.212	.200	.260	.130	.100	.105



ALNICO V PERMANENT MAGNETS

STOCK NO	MAGNETIC TYPE	DIMENSIONS	Price
33F1090	H-31-604	1/16" × 1/16" × 1/2"	.75
33F1091	H-32-605	3/16" × 3/16" × 1"	.85
33F1092	H-33-606	1/8" × 1/8" × 3/4"	1.10
33F1093	H-33-607	1/4" × 1/4" × 1"	1.10

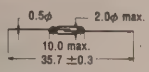
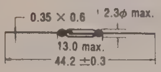
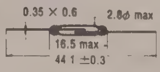
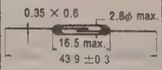
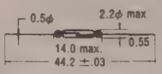
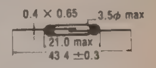
SWITCH ELECTRICAL CHARACTERISTICS

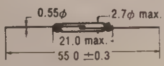
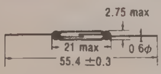
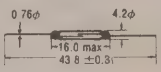
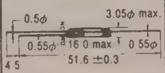
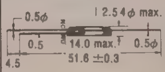
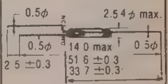
Form	Watts	Volts	Max. Current (AMPS) Switch	Max. Contact Resistance (OHMS)	Min. Breakdown VDC Across Contacts	Voltage VAC Cont/Coil	Insulation Resistance (Typ.)
1A-2A	10	200	.5	.150	300	2500	10^{10}
1C	3	200	.250	.200	250	2500	10^{9}

HASCO COMPONENTS INC. / REED SWITCHES

OKI
electric industry company, ltd.

Specifications

							
		ORD-211	**ORD-221**	**ORD-225**	**ORD-226**	**ORD-228**	**ORD-234**
Electrical Characteristics	Contact	1A	1A (offset)	1A	1A RLS/OP >0.8	1A	1A
	Contact resist. (Initial) [mΩ]	150 max.	150 max.	150 max.	150 max.	150 max.	150 max.
	Breakdown voltage [DCV]	150 min.	200 min.	250 min.	150 min.	200 min.	300 min.
	Insulation resistance [Ω]	10^9 min.	10^9 min.	10^{10} min.	10^9 min.	10^9 min.	10^{10} min.
	Electrostatic cap. [PF]	0.2 max.	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.5 max.
	Contact capacity [VA]	1.0	10	10	10	10	10
	Max. conductive curr. [A]	0.3	1.0	1.0	0.5	1.0	2.0
	Max. voltage [V]	24	100	100	100	100	200
Oper. Characteristics	Operate time [ms]	0.3 max.	0.3 max.	0.4 max.	0.3 max.	0.3 max.	0.5 max.
	Bounce time [ms]	0.3 max.	0.3 max.	0.4 max.	1.0 max.	0.3 max.	0.5 max.
	Release time [ms]	0.05 max.	0.05 max.	0.05 max.	0.1 max.	0.05 max.	0.05 max.
	Resonant frequency [Hz]	8600 ±500	2750 ±250	3700 ±300	4200 ±200	5300 ±300	2200 ±300
	Max operating freq. [Hz]	500	500	500	500	500	500
Standard Coil	Coil resistance [Ω]	600	450	450	450	450	500
	No. of turns [T]	5000	5000	5000	5000	5000	5000
	Dimensions [mm]	2.0 x 10	2.9 x 15	2.9 x 15	2.9 x 15	2.9 x 15	3.6 x 20
	Type No.	8	6	6	6	6	3
Features (Contact material)		Ultra-miniature Rh	Miniature offset (Rh)	General purpose miniature (Rh)	Drop-out Pull-in >0.8 (Rh)	General purpose miniature (Rh)	Long life (Rh)

					 0.5ϕ 3.05ϕ max. 0.55ϕ 16 0 max 0 55ϕ 4 5 51.6 ±0.3	 0.5ϕ 2.5 4ϕ max. 0.5 14.0 max. 0.5ϕ 4.5 51.8 ±0.3	 0.5ϕ 2.5 4ϕ max. 0.5ϕ 14 0 max 0 5ϕ 2 5 ±0.3 51 6 ±0 3 33 7 ±0.3
		ORD-229	**ORD-2210**	**ORT-2211**	**ORT-233**	**ORT-551**	**ORT-551-1**
Electrical Characteristics	Contact	1A	1A	1A	1C		
	Contact resist. (Initial) [mΩ]	150 max.	150 max.	100 max.	150 max.	150 max.	150 max.
	Breakdown voltage [DCV]	700 min.	300 min.	200 min.	200 min.	200 min.	200 min.
	Insulation resistance [Ω]	10^{10} min.	10^{10} min.	10^9	10^9 min.	10^9 min.	10^9 min.
	Electrostatic cap. [PF]	0.2 max.	0.5 max.	0.3 max.	1.5 max.		
	Contact capacity [VA]	20	70	30W max.	3	3	3
	Max. conductive curr. [A]	2.0	2.5	0.5; in-rush 3	0.5	0.5	0.5
	Max. voltage [V]	250	100	100	30	30	30
Operating Characteristics	Operate time [ms]	0.5 max.	0.5 max.	0.6 max.	1.0 max.	1.0 max.	1.0 max.
	Bounce time [ms]	0.5 max.	0.5 max.	0.4 max.	(NC) 1.0 max. (NO) 1.5 max.	(NC) 1.5 max. (NO) 1.0 max.	(NC) 1.5 max. (NO) 1.0 max.
	Release time [ms]	0.1 max.	0.1 max.	0.05 max.	0.5 max.	0.5 max.	0.5 max.
	Resonant frequency [Hz]	2200 ±300	2350 ±250	4600 ±500	6000 ±4000		
	Max. operating freq. [Hz]	500	500	500	200		
Standard Coil	Coil resistance [Ω]	500	500	450	570		
	No. of turns [T]	5000	5000	5000	5000		
	Dimensions [mm]	2.8 x 18	3.6 x 20	2.9 x 15	3.6 x 10		
	Type No.	7	3	6	10		
Features (Contact material)		High breakdown voltage (Rh)	High power (Rh)	High inrush	Miniature transfer (Rh)	Ultra Miniature transfer (Rh)	Ultra Miniature transfer (Rh)

For a comprehensive engineering Reed Switch Catalog, contact factory.

High Reliability Supported by Unique Technology

Flux Scanning Method:

In spite of severe control of the sealing process, there is a slight probability that foreign matter such as magnetic particles may enter the glass. After extensive study in the detection of micro impurities, OKI has adopted the highly reliable flux scanning method. In flux scanning, external magnetism is moved so that foreign matter near the reed is forced to jump to the contact part. The contact resistance then measured is used as the standard for the selection of characteristics. We have thus succeeded in remarkably improving the reliability of reed switches by replacing conventional visual checking with the latest flux scanning method.

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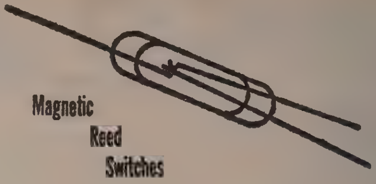
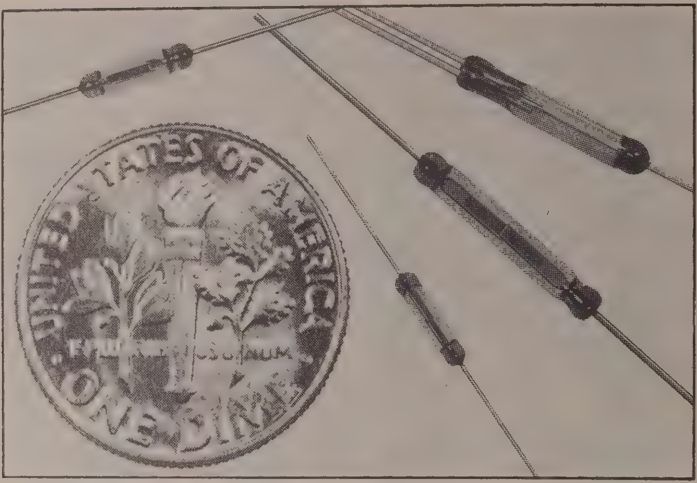
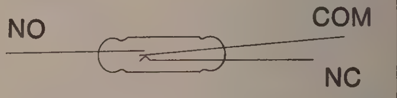
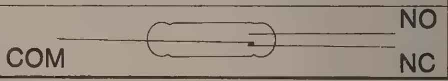
HERMETIC SWITCH





MANUFACTURERS OF

THE WORLD'S SMALLEST REED SWITCHES

Model	Form	Max D C. Watts	Max D C. Amps	Max D C. Volts	Stock Amp-Turn Pull-In Range	Overall Length Inches	Max Glass Diameter Inches	Max Glass Length Inches	Special Features
THE WORLD'S SMALLEST									
HSR-003	A	0.1	.01	10	5-25	1.050	.055	.210	AVAILABLE IN HI-REL AND COMMERCIAL GRADES
HSR-005	A	0.1	.01	10	5-40	1.000	.055	.260	
HSR-067	A	4	.20	30	10-35	1.240	.070	.460	
HSR-370	C	3	.10	28	15-35	1.490	.072	.485	
MINIATURE FORM C									
HSR-301	C	4	.20	100	15-40	1.930	.093	.580	
HSR-3015	C	4	.20	100	15-40	1.930	.103	.580	
HSR-302	C	4	.20	100	15-40	1.930	.120	.580	
HSR-510	C	3	.25	100	15-40	2.000	.105	.590	
HSR-520	C	3	.25	100	15-40	2.000	.125	.600	
HIGH POWER									
HSR-V200	A	200	3.0	7500	50-150	3.230	.210	2.100	200 WATT SWITCHING
HIGH VOLTAGE									
HSR-V10K	A	50	3.00	7500	50-150	3.230	.210	2.100	10,000 VDC DIELECTRIC

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ON COMPLETE REED SWITCH PRODUCT LINE
INCLUDING OVER 25 STANDARD MODELS**

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TELEX 796125 HERMETIC CKSA

THUMBWHEEL SWITCHES

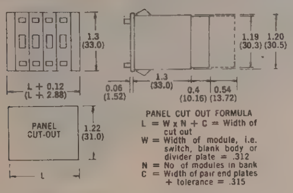
IMLEC

MODEL II IMLEC INDEXER PUSHBUTTON FRONT MOUNT

The Imlec Indexer is a bi-directional push indexing front mount switch, 5/16″ in width. Identical in size to our popular MF switches. With snap together banking and snap-in panel mounting. Pushbuttons above and below the legend allow the user to add or subtract from the count.

These 10 or 16-position switches are available in all popular codes.

DIMENSIONS IN INCHES (IN MILLIMETERS)



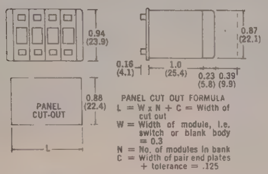
PANEL CUT OUT FORMULA
L = W x N + C = Width of cut out
W = Width of module, i.e. switch, blank body or divider plate = .312
N = No of modules in bank
C = Width of pair end plates + tolerance = .315

MODEL MI MINI INDEXER PUSHBUTTON FRONT MOUNT

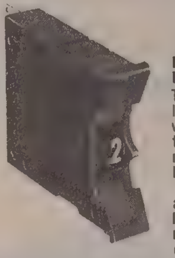
The Mini Indexer is a bi-directional push indexing front mount switch. 0.30″ in width. Similar to our Imlec Indexer but smaller in size. Features snap together banking and snap-in panel mounting. Pushbuttons above and below the legend allow the user to add or subtract from the count.

Available in most popular 10-position codes.

DIMENSIONS IN INCHES (IN MILLIMETERS)



PANEL CUT OUT FORMULA
L = W x N + C = Width of cut out
W = Width of module, i.e. switch or blank body = 0.3
N = No. of modules in bank
C = Width of pair end plates + tolerance = .125

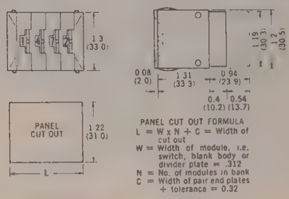


MODEL MF MINIATURE FRONT MOUNT

The MF is our most popular, low cost, 5/16″ wide Thumbwheel Switch. Slim, attractive, snap-in panel mounting requires no panel mounting hardware.

Available in all popular 10 and 16-position codes. Matte black finish on high impact moldings, with white legend on black wheel standard.

DIMENSIONS IN INCHES (IN MILLIMETERS)



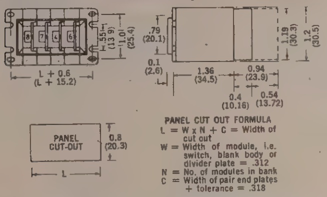
PANEL CUT OUT FORMULA
L = W x N + C = Width of cut out
W = Width of module, i.e. switch, blank body or divider plate = .312
N = No. of modules in bank
C = Width of pair end plates + tolerance = 0.32

MODEL TR THIN REAR MOUNT

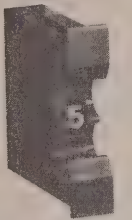
For applications that require a lot of switch in a small space, these 5/16″ wide TR switches are ideal. Rear mount counterpart to our popular MF front mount switches.

Available in most 10-position codes including Decimal, BCD, BCD plus Complement and Complement only.

DIMENSIONS IN INCHES (IN MILLIMETERS)



PANEL CUT OUT FORMULA
L = W x N + C = Width of cut out
W = Width of module, i.e. switch, blank body or divider plate = .312
N = No. of modules in bank
C = Width of pair end plates + tolerance = .318

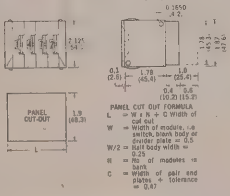


MODEL IF INTERMEDIATE FRONT MOUNT

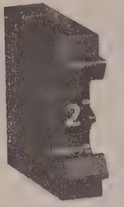
A rugged front mount switch with large digits, ½″ wide module. Snap-in front mounting hardware. Available in most popular 10 and 16-position codes.

Matte black finish with white legends on black wheel standard. Gloss fnish, other wheel colors and legends available.

DIMENSIONS IN INCHES (IN MILLIMETERS)



PANEL CUT OUT FORMULA
L = W x N + C Width of cut out
W = Width of module, i.e switch, blank body or divider plate = 0.5
W/2 = Half body width = 0.25
N = No of modules in bank
C = Width of pair end plates + tolerance = 0.47

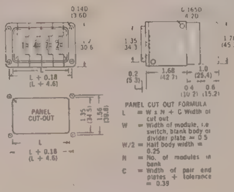


MODEL IR INTERMEDIATE REAR MOUNT

Rugged rear mount counterpart to our IF model, with large readable digits, ½″ wide module. Available in most popular 10 and 16-position codes.

Matte black finish with white legends on black wheel standard. Gray bodies, gloss finish, other wheel colors and legends available.

DIMENSIONS IN INCHES (IN MILLIMETERS)

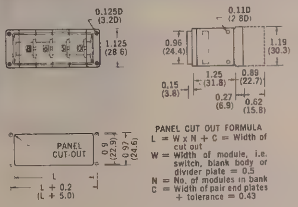


PANEL CUT OUT FORMULA
L = W x N + C Width of cut out
W = Width of module, i.e switch, blank body or divider plate = 0 5
W/2 = Half body width = 0.25
N = No. of modules in bank
C = Width of pair end plates + tolerance = 0.39

MODEL MR MINIATURE REAR MOUNT

Popular rear mount switch, ½″ wide module but lower profile than IR model. Available in matte black in most popular 10-position codes including Decimal, BCD, and BCD plus Complements.

DIMENSIONS IN INCHES (IN MILLIMETERS)



PANEL CUT OUT FORMULA
L = W x N + C = Width of cut out
W = Width of module, i.e. switch, blank body or divider plate = 0.5
N = No. of modules in bank
C = Width of pair end plates + tolerance = 0.43

SPECIFICATIONS
ALL MODELS

Contact Current: Contacts rated 2 amps @ 115 VAC or 28 VDC non-switching; 0.5 amps @ 28 VAC or DC switching. Minimum recommended switching current 10 microamps @ 20 millivolts.

Voltage: 200 volts max DC (within power rating) or RMS.

Power: 24 watts max per switch with 12 watts max per energized output.

Insulation Resistance: 1000 megohms between adjacent contacts at 25°C and 20% relative humidity.

Contact Resistance: 0.1 ohms initial and 0.2 ohms after life test at 25°C.

Dielectric Strength: 500 VAC.

Moldings: High impact acetate body in matte black, gloss black or gray finish; wheels are polycarbonate in black with white legends standard, white with black legends for lighted versions, other colors available.

Contact Material: Stator has 0.0001″ hard gold over 1 oz. copper on glass fibre as MIL-P-13949GF. Rotor has silver/gold alloy on beryllium copper.

Life: 1,000,000 detents minimum either direction.

Stops: Stops to limit switch to any position.

Panel Thickness: 1/16″ to 5/32″.

Operating Temperature: −20°C to 70°C. Storage temperature: −40°C to 70°C.

Shock: 100 G's, 6 MS.

Vibration: 15 G's to 70-2000 Hz.

Humidity: 96 HRS, 95% relative.

Options and Accessories Available: Extended Boards for diode suppression; Termination Pins; Stopping; Blank Bodies, Half Bodies; End Plates Divider Plates; Connectors; External LED Lighting; Sealing, etc.

HOW TO ORDER

CODE NO.	DESCRIPTION	II	MI	MF	TR	MR	IF	IR
-12	10 pos. Decimal	II-12	MI-12	MF-12	TR-12	MR-12	IF-12	IR-12
-12A	10 pos. Decimal Ext. Board	II-12A	MI-12A	MF-12A	TR-12A	—	IF-12A	IR-12A
-13	10 pos. Decimal 2 pole	II-13	—	MF-13	TR-13	MR-13	IF-13	IR-13
-18	10 pos. BCD Complement Only	II-18	MI-18	MF-18	TR-18	—	—	—
-18A	10 pos. BCD Complement Only Ext. Board	II-18A	MI-18A	MF-18A	TR-18A	—	—	—
-21	10 pos. BCD	II-21	MI-21	MF-21	TR-21	MR-21	IF-21	IR-21
-21A	10 pos. BCD Ext. Board	II-21A	MI-21A	MF-21A	TR-21A	MR-21A	IF-21A	IR-21A
-22	10 pos. BCD and Complement	II-22	—	MF-22	TR-22	MR-22	IF-22	IR-22
-22A	10 pos. BCD and Complement Ext. Board	II-22A	—	MF-22A	TR-22A	MR-22A	IF-22A	IR-22A
-55	16 pos. Decimal 0-15 or 0-F	II-55	—	MF-55	—	—	IF-55	IR-55
-56	16 pos. BCD 0-15 or 0-F	II-56	—	MF-56	—	—	IF-56	IR-56
-57	16 pos. BCD and Comp. 0-15 or 0-F	II-57	—	MF-57	—	—	IF-57	IR-57
-57A	16 pos. BCD and Comp. 0-15 or 0-F Ext. Board	II-57A	—	MF-57A	—	—	IF-57A	IR-57A
-EP	End Plates, Pair	II-EP	MI-EP	MB-EP	TR-EP	MR-EP	IF-EP	IR-EP
-BB	Blank Body	II-BB	MI-BB	MF-BB	TR-BB	MR-BB	IF-BB	IR-BB
-DP	Divider Plate	—	—	MF-DP	TR-DP	MR-DP	IF-DP	IR-DP
-BBH	Blank Body with Decimal Point	II-BBH	MI-BBH	MF-BBH	TR-BBH	MR-BBH	IF-BBH	IR-BBH
-CN	Connector 10 position only	MCN-10	—	MCN-10	MCN-10	—	ICN-10	ICN-10
-HB	Half Body	—	—	—	—	—	IF-HB	IR-HB
IH	Banking Hardwade (insert no. of modules)	—	—	—	—	IH-( )	IH-( )	IH-( )
MFH	Banking Hardwade (insert no. of modules)	—	—	MFH-( )	MFH-( )	—	—	—

INTER-MARKET INC. Dept. EM. 1946 Lehigh Avenue / Glenview. Illinois 60025 / (312) 729-5330 / TWX-910-651-1997

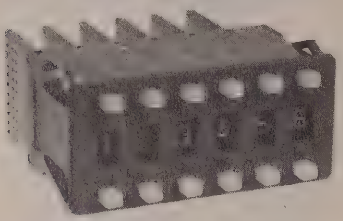
Thumbwheel, LED-Line, Codicount and Multicount

INTERSWITCH

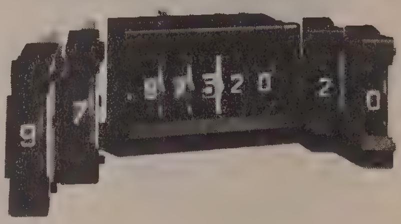
ONE OF THE PURDY GROUP OF COMPANIES

770 AIRPORT BLVD., BURLINGAME, CA 94010 • TEL (415) 347-8217 • TWX 910-374-2353 OR 910-375-2012

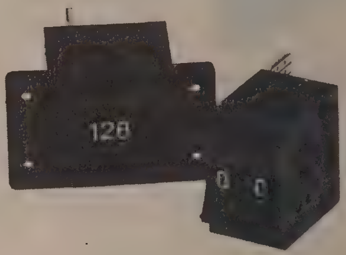
Type D & Z Pushbutton



Type U



Type E



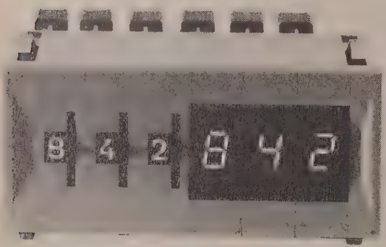
THUMBWHEEL SWITCHES

Our thumbwheel switches are designed to give the logic and package designer maximum flexibility through an almost unlimited choice of electrical/mechanical configurations, switching logic, terminations, and circuit capacity. Interswitch offers more than 25 different codes including decimal, BCD, hexadecimal, seven segment code, voltage dividers, and resistance decades. Numerous options are available such as long PC boards (for mounting components), colored wheels, stops, and custom markings on housings, spacers and thumbwheels.

Available Switches

Series	A	B	D	E	G	H	L	M	N	P	R	S	U	V	Z
Front Mounting		●	●		●	●		●			●	●	●	●	●
Rear Mounting	●			●			●		●	●					
Width in mm	11	12.5	7.62	16	20	10	8	8	7	10	20	10	8	8	7.62
Height in mm	39	58	24	18	76	33	18	33	18	24.2	33	33	33	26.5	15
Mounting Depth in mm	63.6	67.1	33.5	31.5	79	38	31.5	38	31.5	38.25	38	38	40	32.5	24
Spacer 2.54 mm			●												
Spacer 2.7 mm						●				●		●			

CODICOUNT DISPLAYS

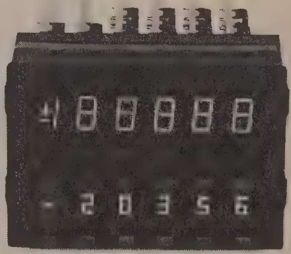


Our highly reliable, compact Codicount LED display modules are easily assembled into multi-decade blocks incorporating the Interswitch thumbwheel series, or used by themselves as output devices.

General Information

- 8 series over 50 modules
- TTL or CMOS logic
- 5 to 24V supply voltage
- 9 to 45 mm digit heights
- red or green LED's
- seven segment and sign/overflow displays
- modules are available with direct, decimal, BCD, inverted or counter inputs, memory, and BCD outputs

MULTICOUNT SWITCHES



The versatile Multicount modules contain a presetable decade switch operated by pushbuttons and a red 7-segment LED numerical display with decoder-latch. Additional functions such as counting and comparing can be integrated into the elements.

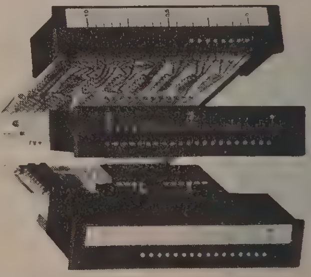
By combining the switch and display within one single housing, the following features are achievable:

- reduced panel space
- easy mounting
- simplified wiring

General Information

- 6 types
- TTL or CMOS logic
- 5V (TTL) or 12V (CMOS) supply voltage
- 9 mm character height

LED-LINE DISPLAY



LED-Line is a modern analog panel display for electrical inputs. The signal value and its trend can be seen at a glance.

LED-Line instruments have many advantages and can be used as replacements for pointer instruments or as a supplement to digital meters.

LED-Line displays are compact and can be mounted horizontally or vertically. For comparison of different signals the units can be mounted adjacent to each other.

General Information

- 4 types
- 21 or 51 dots
- dot or bar display
- completely solid state

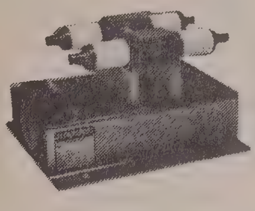
PLEASE CALL OR WRITE FOR COMPLETE ENGINEERING BULLETINS

vacuum contactors

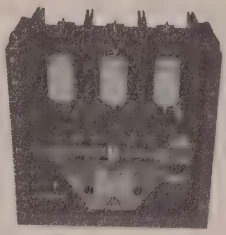
Vacuum Contactors are used to control large amounts of DC power and RF currents with ratings up to 50 kv and currents up to 600 Amperes continuous. These contactors are recommended wherever high voltage capability, small size, and high speed operation with a long and low maintenance life are important. Applications include primary control of power supplies, industrial motors, and induction heating equipment, RF system tap changing, and fault protection of high power transmitters. The 16 page catalog provides complete specifications with a variety of specific applications for 3-pole, high voltage AC and DC, RF contactors and overcurrent relays actuated by solenoid, air or motor drives.

RP101, 103

RP900-901



RT22



RP130, RP173

RP157

GENERAL PURPOSE

Model Number	Test Voltage (Pk KV)	Operate Voltage (Pk KV)	Continuous Current (Amps)	Max. Interrupt AC Current (Amps RMS)	Max. Interrupt DC Power (KW)	Capacitor Discharge Decaying to 0 in 200 μs	Contact Arrangement	Actuator Voltage (Volts)	Time to Close (Ms)	Break Time (Ms)	Weight (Lbs.)
RP101F4903D21B20 RP101F4904D21B20	50	30	200 DC	2000	300 (10 A Max.)	N/A	N/O N/C	115 60 Hz	60	50	8¾
RP101F4304D26B20 RP103F4304D26B20	50	30	200 DC 200 RMS	2000 2000	300 (10 A Max.) N/A	N/A N/A	N/C	100 DC	55	42	8¾
RP103F4903D21B20 RP103F4904W21B20	50	30	200 RMS	2000	N/A	50 K Amps	N/O N/C	115 60 Hz	60 30	50 60	8¾
RP901K4903D21B30 RP901K4904D21B30	70	50	400 DC	4000	500 (10 A Max.)	100 K Amps	N/O N/C	115 60 Hz	60 30	50 60	15
RP901K4601D26B30 RP901K4602D26B30	70	50	400 DC	4000	500 (10 A Max.)	100 K Amps	N/O N/C	100 DC	34 60	11 25	15
RP900K4903D21B30 RP900K4904D21B30	70	50	400 RMS	4000 at 13 KV RMS	N/A	100 K Amps	N/O N/C	115 60 Hz	60 30	50 60	15
RT1G4201C21A10 RT1G4202C21A10	35	20	100	500	100	1 K Amps	N/O N/C	115 AC	60	25 30	2
RT5C4202A21A10	25	15	50	100	50	0.5 K Amps	N/C	115 AC	60	30	1.5

RF

Unit	Pk. Operate Voltage 32 MHz	Contact Current 32 MHz RMS	Contact Resistance Ohms Max.	Contact Capacitance pF	Contact Inductance Nh	Contact Arrangement	Open Time	Close Time	Pull-in Current RMS	Hold Current RMS	Hold Power Watts	Actuating Voltage or Air Pressure	Approx. Weight	Life	Auxiliary Contacts Ratings Volt RMS Current RMS
RT224070A31NB (Solenoid Operated)	5*	25	.0005	2.5	n/a	Latching	<300 Ms.	<300 Ms.	.3	n/a	n/a	230 VAC	12 lbs.	2.5x10^5	Form C 230/15
RP233D1585 (Air Operated)	25	35	.0005	2	25	N/O	<200 Ms.	n/a	n/a	n/a	n/a	40 ±5 psig	12 oz.	1x10^5	n/a

*Higher voltage ratings available at lower frequencies.

3-PHASE

Model Number	Operate Voltage V (RMS)	Continuous Current 60 Hz	Interrupt Current Amps RMS	Mechanical Life (Min.)	Actuator Voltage	Approx. Pull-in Current Amps Max.	Approx. Hold Current Amps Max.	Interrupt Time	Auxiliary Contacts	Approx. Weight
RP151B4541X46R20	600	200	2000	2.5x10^5	26.5 VDC 100 VDC	3.5 1.1	.5 .07	Less than 2 Cycles	2 SPDT 230 VAC/10A	16 lbs.
RP1574549X41TX0 (60 Hz) RP1574549X4KTX0 (50 Hz)	1500	300	3000	1x10^6	115 VAC	15	1.5	Less than 2 Cycles	4 PDT 230 VAC/5A	25 lbs.
RP1574544X44TX0 RP1574544X45TX0 RP1574544X46TX0	1500	300	3000	2.5x10^5	26.5 VDC 48 VDC 100 VDC	24.4 11.3 5.9	.30 .14 .08	Less than 2 Cycles	115 VAC/5A	25 lbs.
RP173-2310	7200	450	4500	1x10^6	115 VAC	3.5	.5	Less than 2 Cycles	SPST 3 NO/2 NC 600 VAC 10A*	70 lbs.
RP130-2330	1500	450	4500	1x10^6	115 VAC*	5.1	.9	Less than 2 Cycles	SPST 4 NO/3 NC 600 VAC 10A	25 lbs.

NOTE — * 230 VAC OPERATION AVAILABLE ON SPECIAL ORDER

ITT JENNINGS Dept. EM, 970 McLaughlin Ave. • San Jose, CA 95122 • (408) 292-4025

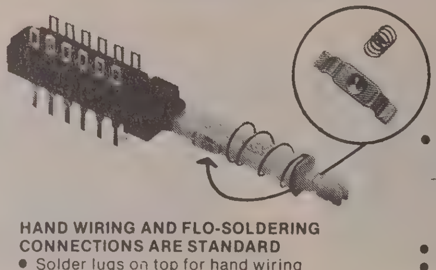
DIVISION OF ITT CORPORATION

MODULAR PUSH BUTTON SWITCHES

"Creative Switchmakers" for Home Entertainment Products and Test Equipment

If it's a better switch you need . . . better switch to Schadow!

better switch...here's why...

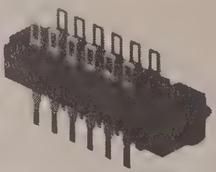


HAND WIRING AND FLO-SOLDERING CONNECTIONS ARE STANDARD

- Solder lugs on top for hand wiring
- PC spikes at bottom for flo-soldering

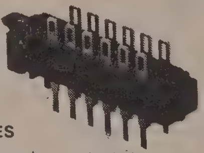
INDIVIDUAL COIL SPRING LOADED MOVING CONTACTS

- The coil spring-loaded contoured moving contacts have been designed to provide balanced contact pressure for optimum surface to surface interface with the fixed contacts . . . assuring reliable performance in low voltage (dry circuit) applications
- Long term low contact resistance
- Constant coil spring tension at the contact points provides positive self-cleaning action



SUPERIOR MODULAR CONSTRUCTION

- Ease of maintenance . . . switch plunger with sliding contacts is removable from the front without disturbing electrical connections



MODULE ADVANTAGES

- Enclosed housing protects inner contact area from dust and foreign intrusions
- Fixed terminals are "staked" in position, providing an extra seal to help prevent wicking of solder or flux
- Molded PC Board Standoffs, front and back, on bottom side, assure parallel mounting

TECHNICAL DATA

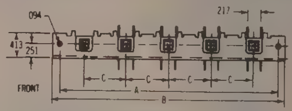
Contact Resistance ....4-6 mOhms
after 25,000 cycles ....6-20 mOhms
Lifetime Expectation Interlocked (50,000)
Momentary, Push Push (100,000) cycles
Material of Construction
Fixed contact. Brass/Silver Plated ....0002"
Moving contact ....Bimetal Brass/Silver .0004"
Plunger Material....Polycarbonate V-0 rated or Delrin
Contacts ....Non-shorting
Housing Material.........Polycarbonate V-0 rated or Glass Reinforced Nylon
Terminal Board Material ....High Grade Paper Phenolic or V-0 rated material......Series F
Key pressure with 2PDT ....28 oz.
Key pressure with 4PDT ....32 oz.
Key pressure with 6PDT ....35 oz.
Key pressure with 8PDT ....42 oz.
Key pressure with 10PDT ....46 oz.
Key pressure with Power Switch ....42 oz.

NOTE: Lighter key pressures available, contact factory for details.

NOTE: For switching applications requiring flame retardant materials, contact factory.

CHASSIS DIMENSIONS FOR SERIES F

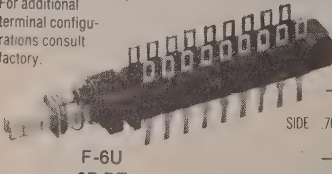
NOTE: Maximum stations to be grouped in one interlocking action. 10mm-10/12.5mm-23/15mm-23/17.5mm-23/20mm-19



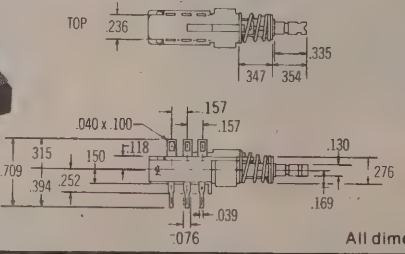
C Dim.	No. of Stations	A MTG.	B O. ALL
10mm (.394)	2	1.181	1.417
	3	1.575	1.811
	4	1.969	2.205
	5	2.362	2.598
	6	2.756	2.992
	7	3.150	3.386
	8	3.543	3.780
	9	3.937	4.173
	10	4.331	4.567
	11	4.724	4.961
	12	5.118	5.354
	13	5.512	5.748
	14	5.906	6.142
	15	6.299	6.535
	16	6.693	6.929
	17	7.087	7.323
	18	7.480	7.717
	19	7.874	8.110
	20	8.268	8.504
	21	8.661	8.898
	22	9.005	9.291
	23	9.449	9.685
	24	9.843	10.079
	25	10.236	10.472
	26	10.630	10.866
	27	11.024	11.260
	28	11.417	11.654
	29	11.811	12.047
	30	12.205	12.441
	31	12.598	12.835
	32	12.992	13.228
	33	13.386	13.622
	34	13.780	14.016
	35	14.173	14.409
	36	14.567	14.803
	37	14.961	15.197
	38	15.354	15.591
	39	15.748	15.984
	40	16.142	16.378
	41	16.535	16.772
	42	16.929	17.165
	43	17.323	17.559
12.5mm (.492)	2	1.201	1.437
	3	1.693	1.929
	4	2.185	2.421
	5	2.677	2.913
	6	3.169	3.406
	7	3.661	3.898
	8	4.154	4.390
	9	4.646	4.882
	10	5.138	5.374
	11	5.630	5.866
	12	6.122	6.358
	13	6.614	6.850
	14	7.106	7.343
	15	7.598	7.835
	16	8.091	8.327
	17	8.583	8.819
	18	9.075	9.311
	19	9.567	9.803
	20	10.059	10.295
	21	10.551	10.787
	22	11.043	11.280
	23	11.535	11.772
	24	12.028	12.264
	25	12.520	12.756
	26	13.012	13.248
	27	13.504	13.740
	28	13.996	14.232
	29	14.488	14.724
	30	14.980	15.217
	31	15.472	15.709
	32	15.965	16.201
	33	16.457	16.693
	34	16.949	17.185
15mm. (.590)	2	1.378	1.614
	3	1.969	2.205
	4	2.560	2.795
	5	3.150	3.386
	6	3.740	3.976
	7	4.331	4.567
	8	4.921	5.157
	9	5.512	5.748
	10	6.102	6.339
	11	6.693	6.929
	12	7.283	7.520
	13	7.874	8.110
	14	8.465	8.701
	15	9.055	9.291
	16	9.646	9.882
	17	10.236	10.472
	18	10.827	11.063
	19	11.417	11.654
	20	12.008	12.244
	21	12.598	12.835
	22	13.189	13.425
	23	13.780	14.016
	24	14.370	14.606
	25	14.961	15.197
	26	15.551	15.787
	27	16.142	16.378
	28	16.732	16.968
	29	17.323	17.559
17.5mm (.689)	2	1.476	1.713
	3	2.165	2.402
	4	2.854	3.091
	5	3.543	3.780
	6	4.232	4.468
	7	4.921	5.157
	8	5.610	5.846
	9	6.299	6.535
	10	6.988	7.224
	11	7.677	7.913
	12	8.366	8.602
	13	9.055	9.291
	14	9.744	9.980
	15	10.433	10.669
	16	11.122	11.358
	17	11.811	12.047
	18	12.500	12.736
	19	13.189	13.425
	20	13.878	14.114
	21	14.567	14.803
	22	15.256	15.492
	23	15.945	16.181
	24	16.634	16.870
	25	17.323	17.559
20mm (.787)	2	1.575	1.811
	3	2.362	2.598
	4	3.150	3.386
	5	3.937	4.173
	6	4.724	4.961
	7	5.512	5.748
	8	6.299	6.535
	9	7.807	7.323
	10	7.874	8.110
	11	8.661	8.898
	12	9.449	9.685
	13	10.236	10.472
	14	11.024	11.260
	15	11.811	12.047
	16	12.598	12.835
	17	13.386	13.622
	18	14.173	14.409
	19	14.961	15.197
	20	15.748	15.984
	21	16.535	16.772
	22	17.323	17.559

F SERIES

For additional terminal configurations consult factory.

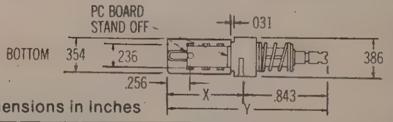


F-6U
6P DT



MODULE DIMENSIONS

	X	Y
2PDT	.827	1.670
4PDT	1.300	2.143
6PDT	1.772	2.615
8PDT	2.244	3.087
10PDT	2.716	3.559
16PDT		

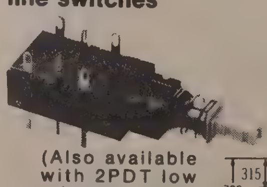


All dimensions in inches

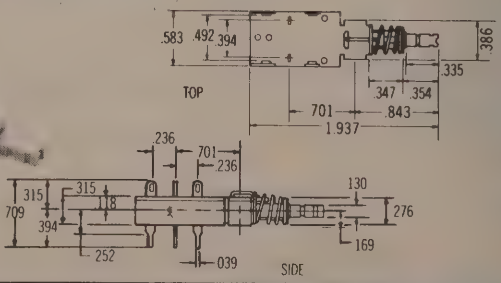
NEED A BUTTON?

Please consult factory for detailed information on buttons and switches

Series NE 15/F line switches



(Also available with 2PDT low voltage auxiliary contacts) UL, CSA, VDE Approved, 4 AMP 250 VAC.



ITT ITT Schadow inc

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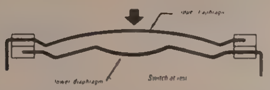
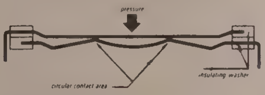
TWX 910-576-2469 • TELEX: 29-0556
Manufacturing facilities in
Minneapolis, Minnesota; Einbeck, W. Germany; W. Berlin, Cucq, Dole, France and Singapore
In Canada: ITT Components, 4001 Chesswood Drive, Downsview, Ontario M3J 2R8
(416) 630-7971 • TELEX: 06-22703

DISC SWITCH

Modular Electronic Components

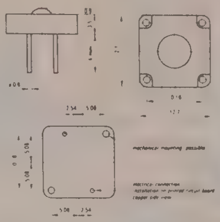


The Disc switch is built around two contact diaphragms separated by an insulating material. The profile of each of these two diaphragms is such that, under the action of applied pressure on the upper dome, it is momentarily collapsed, making instant positive, 3 point contact with the lower diaphragm.

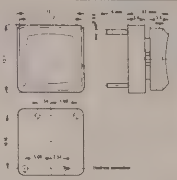


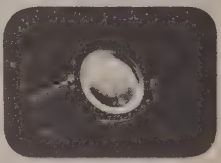
- High Reliability...10 X 10^6
- Self Cleaning
- Broad Range of Switching Power...from a few milliwatts to 30 watts.
- Low Bounce (less than 100 microseconds)

MD Disc module: Extra-flat momentary contact module. Shorter stroke configuration installable directly on printed circuit board. Enables you to design your own keyboard adapted to your own specific needs.

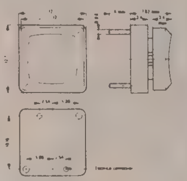


ED Push button switch assembly with a momentary action contact and incorporating the unique design disc switch. The switch is designed for direct insertion into printed circuit boards. Two principal advantages of the MDP switch are the short stroke (only 0.5 mm) and the crisp tactile feel.





MDP Push button switch assembly with a momentary action contact and incorporating the unique design disc switch. The switch is designed for direct insertion into printed circuit boards. Two principal advantages of the MDP switch are the short stroke (only 0.5mm) and the crisp tactile feel. Contact arrangement: single, normally open contact with momentary action. TERMINALS: tinned terminals — 0.8mm dia. x 4mm long. SOLDERING: since the disc switch is completely sealed, it can be flow soldered. PUSH BUTTONS AND KEYS: dimensions (mm) 12.7 x 12.7 x 3.4 (7.62 with key). STANDARD COLORS: red, blue, light grey, dark grey.



D6 SERIES KEY SWITCHES

The D6 is a single pole, single throw normally open keyswitch specially designed for digital electronic control. Its small size enables keyboard design with minimum center spacing of .500 (12.70 mm). The commoned terminals offer the possibility of X. Y coding by using a single sided printed Circuit Board.

Built-in buttons (square or round) are available in several colors and have been designed to fit directly onto front panels.

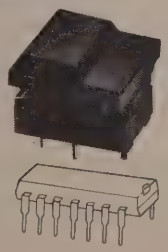
The total travel of .031 (0.80 mm) combined with the snap effect provide the user with a smooth, gentle yet positive tactile feedback.

- Tactile feedback
- Three package styles
- Eight colors
- Commoned terminals
- Small size .500 (12.70 mm)
- Low cost

ELECTRICAL DATA

Electrical diagram SPST NO	
Contact resistance	≤20 mΩ
Breaking capacity	10 mA/35 VDC
Insulation resistance	100,000 MΩ
Dielectric Strength	500 V
Inter-terminal capacity	1 pF
Contact bounce	3 ms
Life (nominal current and voltage)	500,000 Cycles
Temperature range	– 20°C to + 65°C (– 4°F to + 149°F)
Climatic category	21 days
Solder ability	235°C during 5 seconds

DIGITAST



digitast

SR 12.3mm wide x 17.1mm

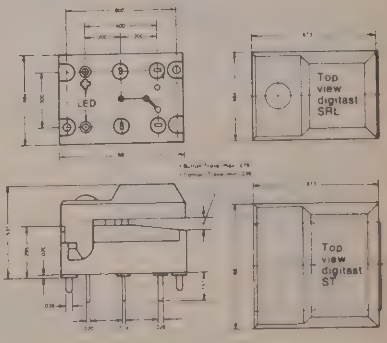
ST 17.3mm wide x 17.1mm (pictured)

digitast

SRL (LED factory or customer installed) 12.3mm wide x 17.1mm (pictured)

STL (LED factory or customer installed) 17.3mm wide x 17.1mm

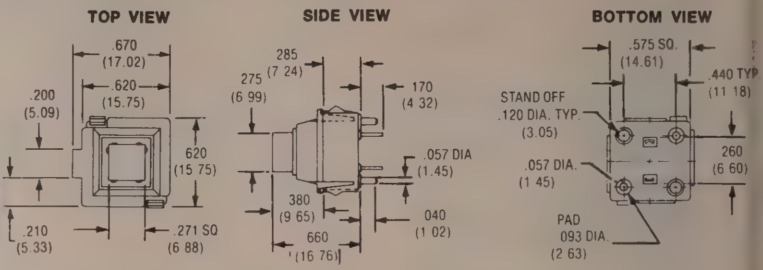
Digitast for use with DIP packages, consistent tactile feel, SPDT momentary spring loaded contact, less than 1 ms contact bounce, 24v 10ma or 60v 100ma ratings. Mechanical life greater than 1 million operations. Available with built in LED. PCB mounting. Hot stamped graphics available.



DC-60 SERIES

Full Travel Keyboard Switch

(DC61-01 EXAMPLE)



The ITT Schadow DC60 Series Key Switches are value engineered to achieve the highest possible performance at a much lower cost than conventional mechanical switches.

- Choice of 3 low profile
- Trifurcated gold-inlayed contacts
- Snap fit sub panel mounting
- Tactile feedback
- Variety of actuation forces
- Momentary or push push action
- 61-01 complies with European D.I.N. specifications
- Modular construction

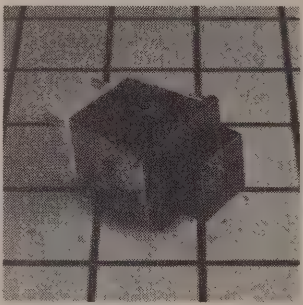
D.I.N. Compliance

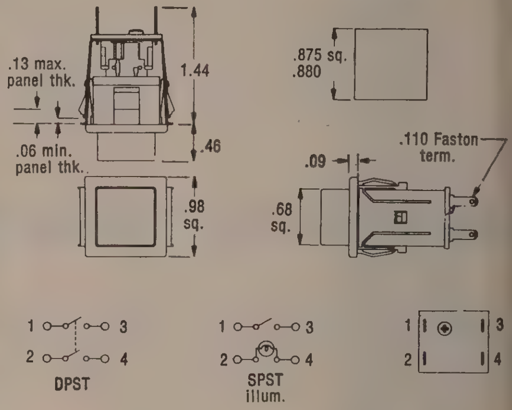
ITT Schadow's DC61-01 and DC61-02 Full Travel Key Switches are among the lowest profile module Key Switches ever built. This low profile conforms to strict European health and safety regulations by complying to their D.I.N. standard. So if you are now selling or ever plan to sell to the European market, you owe it to yourself to take a look at these low profile switches.

ML SERIES

ITT Schadow's ML Series offers the Design Engineer the latest in high tech front panel appearance with a wide variety of switching capabilities. Features Include:

- Front Panel Mount
- Sub-Chassis Mount
- Up to 20 Million Cycle life
- Incandescent Illumination
- PC Mount
- SPST through 16PDT
- Switching 10 MA @ 5 VDC through 15A @ 125 VAC
- Eight Button Colors





PUSH BUTTON SWITCH SERIES

F Series Miniature Push Button: The F Series miniature push button switch forms a versatile system of modules designed for reliable performance in low voltage (dry circuit) applications.

F Series Power Switches: F Series power switches form an integral or stand alone option to our standard F Series. All mechanical functions performed by the F Series are available in the power switch offering with the exception of lockout.

KEY SWITCH SERIES (Low Travel)

Digitast Series: The Digitast Series key switch is specially designed for use with dual in-line packages, yet offers a wide variety of options.

REK Series: The REK Series key switch is designed for switching low current loads utilizing a patented contact system resulting in high reliability and long operating life.

Disc Series: The Disc Series key switch is built around two contact diaphragms separated by an insulating material designed for instant contact with the advantage of being a self-cleaning contact with tactile feed back.

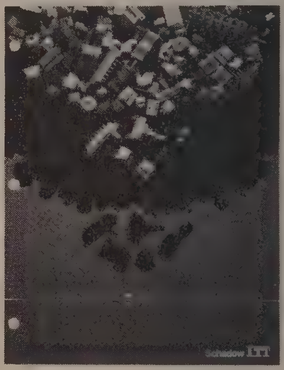
D6 Series: The D6 Series key switch is a single pole, single throw key switch designed for digital electronic control allowing keyboard design with a minimum center spacing of .500 (12.70).

KEY SWITCH SERIES (Full Travel)

DC60 Series: The DC60 Series key switches are value engineered to achieve the highest possible performance at a much lower cost than conventional mechanical switches.

ROTARY SWITCH SERIES (Closed Deck)

RT-A Series: The RT-A Series rotary switch is a PC or panel mounted switch with the shaft perpendicular to the PC Board for mounting with components such as displays and indicators.



Please write to your nearest Sales Office or Distributor, or to ITT Schadow for a free copy of the 1983 ITT Schadow product catalog. This catalog covers the following switch series . . .

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ITT ITT Schadow inc

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TWX 910-576-2469 • TELEX 29-0556

Manufacturing facilities in
Minneapolis, Minnesota; Einbeck, W. Germany; W. Berlin, CUCQ and Dole, France; and Singapore
In Canada: ITT Components, 4001 Chesswood Drive, Downsview, Ontario M3J 2R8
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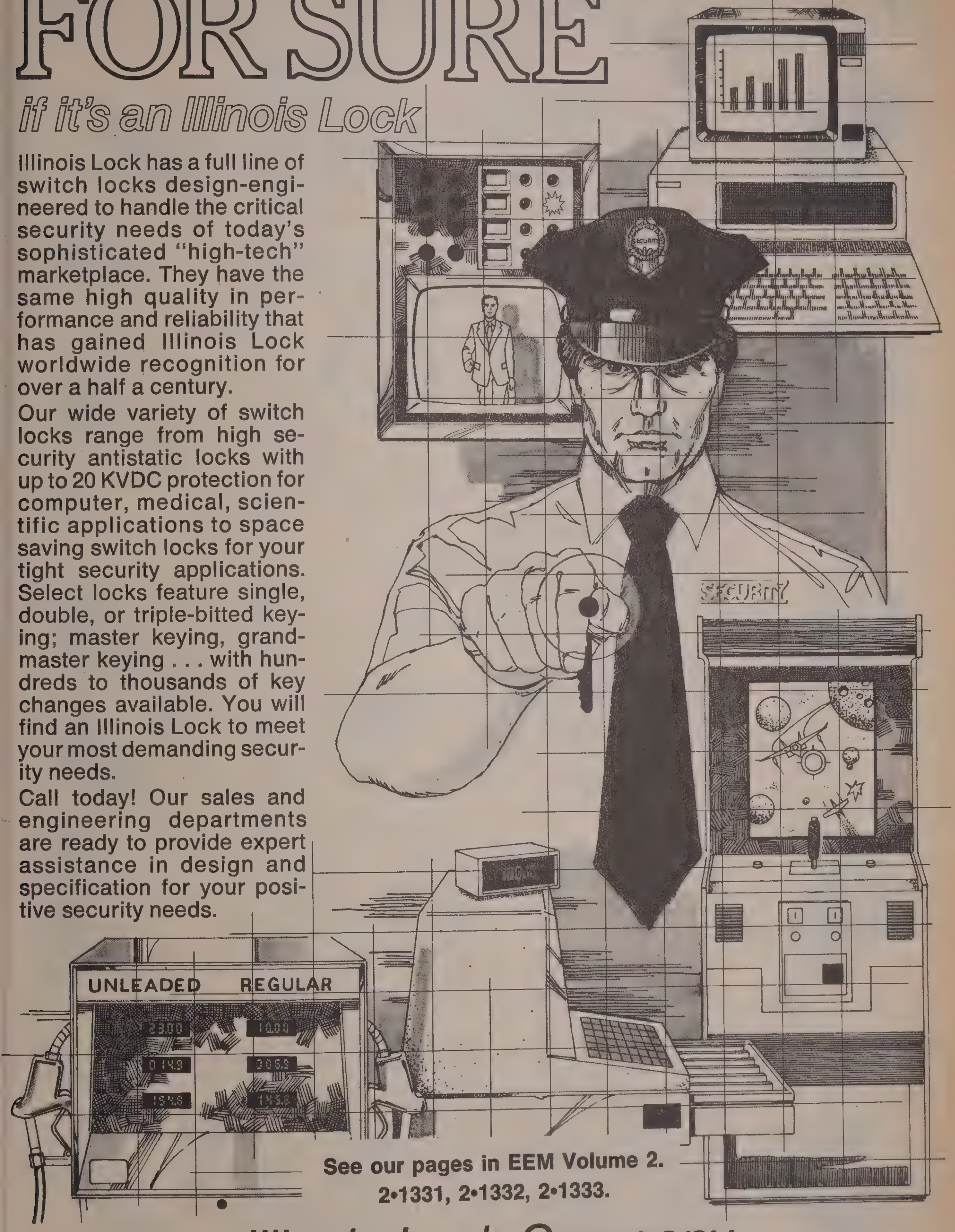
FOR SURE

if it's an Illinois Lock



Illinois Lock has a full line of switch locks design-engineered to handle the critical security needs of today's sophisticated "high-tech" marketplace. They have the same high quality in performance and reliability that has gained Illinois Lock worldwide recognition for over a half a century.

Our wide variety of switch locks range from high security antistatic locks with up to 20 KVDC protection for computer, medical, scientific applications to space saving switch locks for your tight security applications. Select locks feature single, double, or triple-bitted keying; master keying, grandmaster keying . . . with hundreds to thousands of key changes available. You will find an Illinois Lock to meet your most demanding security needs.

Call today! Our sales and engineering departments are ready to provide expert assistance in design and specification for your positive security needs.

See our pages in EEM Volume 2.
2•1331, 2•1332, 2•1333.

Illinois Lock Company
A Division of the Eastern Co.
301 West Hintz Road • Wheeling, Illinois 60090 • 1-312-537-1800

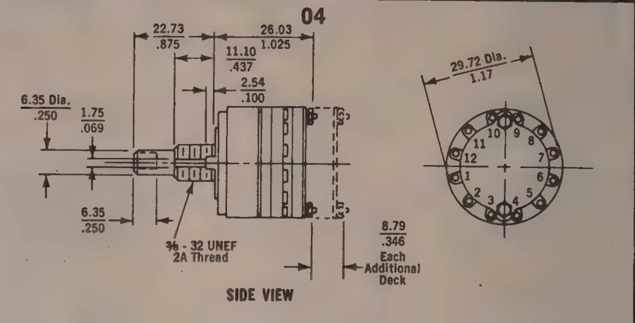
ITW ROTARY SWITCHES

ITW SWITCHES • 6615 W. IRVING PARK RD. • CHICAGO, IL 60634 • (312) 282-4040

SERIES 04

Military qualified to MIL-S-3786/04. Designed for a broad range of applications, from low levels to moderately high loads. Up to 6 poles per deck with any shorting or non-shorting combination available. Meets or exceeds MIL-S-3786. Explosion proof per paragraph 4.8.16 of MIL-S-3786.

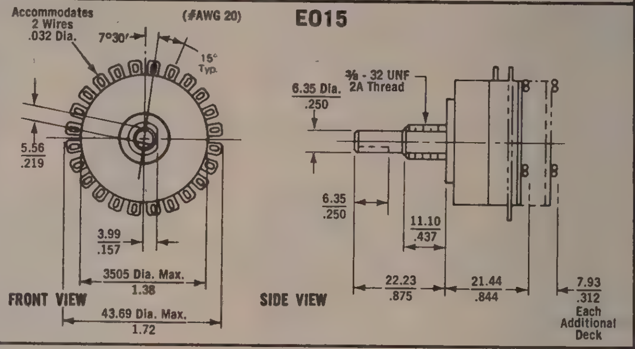
- Up to 12 active positions per deck.
- Shorting or non-shorting contacts.
- Furnished with or without panel & shaft seals.
- Approved to MIL-S-3786/04.
- Up to 9 decks.
- Up to 6 poles/deck.
- Non turn tab supplied on unsealed only.
- 1″ shaft length without shaft flat.

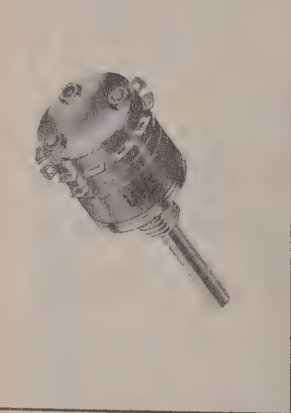

04
22.73
.875
26.03
1.025
11.10
.437
2.54
.100
6.35 Dia.
.250
1.75
.069
6.35
.250
⅜ - 32 UNEF
2A Thread
8.79
.346
Each
Additional
Deck
SIDE VIEW
29.72 Dia.
1.17
1 2 3 4 5 6 7 8 9 10 11 12

SERIES E015, E030

The Series EO a rotary switch offers many of the same unique design features found in the Series CO switches, plus up to 24 active positions in a 1⅜″ diameter body. The adaptability of these switches plus their relatively low cost and reliability make them an important part of the ITW product line.

- Up to 24 active positions per deck.
- Shorting or non-shorting contacts.
- Furnished with or without panel & shaft seals.
- Available with fixed or adjustable stop (Adjustable stop unsealed only).
- Up to 9 decks.
- Up to 12 poles/deck (E015).
- Panel & shaft sealed.
- 1″ shaft length without shaft flat.

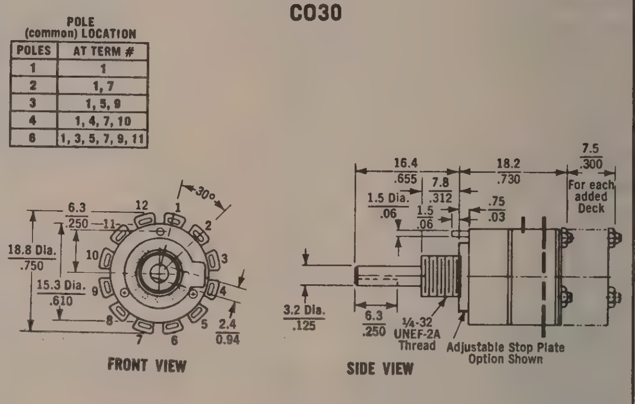

Accommodates
2 Wires
.032 Dia.
(#AWG 20)
7°30′
15°
Typ.
E015
5.56
.219
3.99
.157
3505 Dia. Max.
1.38
FRONT VIEW
43.69 Dia. Max.
1.72
⅜ - 32 UNF
2A Thread
6.35 Dia.
.250
6.35
.250
11.10
.437
22.23
.875
21.44
.844
7.93
.312
Each
Additional
Deck
SIDE VIEW



SERIES C030, C036, C060

Series CO, Military Approved rotary switches are designed to simplify and reduce wiring. The contact and lug assembly is completely encapsulated to prevent movement and contamination during soldering and cleaning. These adaptable switches are available with many of the most commonly required modifications and options.

- Up to 12 active positions per deck.
- One-piece contact-terminal construction has holes large enough to accept two #22 AWG wires.
- Shorting or non-shorting contacts.
- Furnished with or without panel seal & shaft seal.
- Available with fixed or adjustable stop (Adjustable stop unsealed only).
- Approved to MIL-S-3786/41 (Comparable to MIL-S-3786/13).
- Up to 9 decks.
- Up to 6 poles/deck (C030).
- 1″ shaft length without shaft flat.


C030
30°
6.3
.250
18.8 Dia.
.750
15.3 Dia.
.610
1 2 3 4 5 6 7 8 9 10 11 12
2.4
0.94
FRONT VIEW
16.4
.655
7.8
.312
18.2
.730
7.5
.300
For each
added
deck
1.5 Dia.
.06
1.5
.06
.75
.03
3.2 Dia.
.125
6.3
.250
¼-32
UNEF-2A
Thread
Adjustable Stop Plate
Option Shown
SIDE VIEW

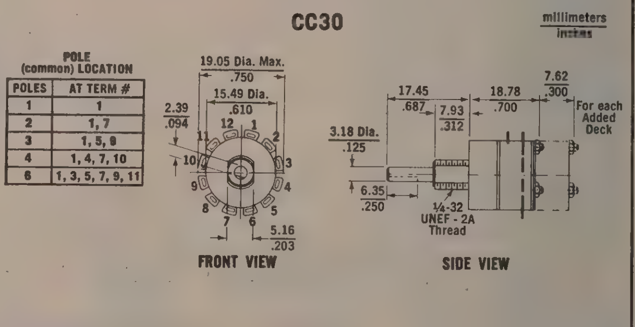
POLE (common) LOCATION

POLES	AT TERM #
1	1
2	1, 7
3	1, 5, 9
4	1, 4, 7, 10
6	1, 3, 5, 7, 9, 11

SERIES CC30

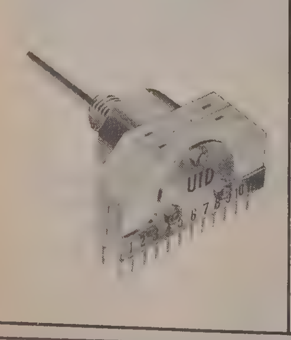
This commercially desirable series of switches has been designed to simplify and reduce wiring. The contact and lug assembly is completely encapsulated, preventing movement and contamination during soldering and cleaning. These adaptable switches are also available with many of the most commonly required options.

- Up to 12 active positions per deck.
- One-piece contact-terminal construction has hole large enough to accept two #22 AWG wires.
- Shorting or non-shorting contacts.
- Available with fixed or adjustable stop.
- Up to 6 decks.
- Up to 6 poles/deck.
- 1″ shaft length without shaft flat.


CC30
millimeters
inches
19.05 Dia. Max.
.750
15.49 Dia.
.610
2.39
.094
1 2 3 4 5 6 7 8 9 10 11 12
5.16
.203
FRONT VIEW
17.45
.687
7.93
.312
18.78
.700
7.62
.300
For each
Added
Deck
3.18 Dia.
.125
6.35
.250
¼-32
UNEF - 2A
Thread
SIDE VIEW

POLE (common) LOCATION

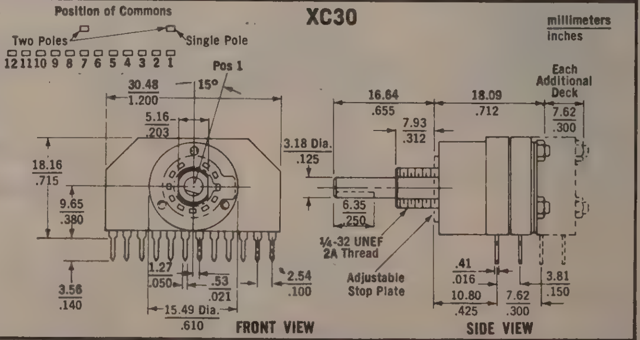
POLES	AT TERM #
1	1
2	1, 7
3	1, 5, 9
4	1, 4, 7, 10
6	1, 3, 5, 7, 9, 11



SERIES XC30

These molded, miniature printed circuit switches are designed for commercial application. The contact and lug assembly is integrally "molded in" causing exceptionally high stability by eliminating movement. Contact surfaces are completely enclosed preventing contamination during soldering and cleaning operations.

- Shorting or non-shorting contacts.
- XC Series offers up to 12 active positions/deck. Up to 6 poles/deck.
- Up to 6 decks.
- Up to 6 poles/deck (XC30).
- 1″ shaft length without shaft flat.
- Unsealed only.
- Die cast body


Position of Commons
Two Poles
Single Pole
12 11 10 9 8 7 6 5 4 3 2 1
XC30
millimeters
inches
Pos 1
15°
30.48
1.200
5.16
.203
18.16
.715
9.65
.380
3.56
.140
1.27
.050
.53
.021
2.54
.100
15.49 Dia.
.610
FRONT VIEW
16.64
.655
7.93
.312
18.09
.712
Each
Additional
Deck
7.62
.300
3.18 Dia.
.125
6.35
.250
¼-32 UNEF
2A Thread
Adjustable
Stop Plate
.41
.016
10.80
.425
7.62
.300
3.81
.150
SIDE VIEW

ITW ROTARY SWITCHES

ITW SWITCHES • 6615 W. IRVING PARK RD. • CHICAGO, IL 60634 • (312) 282-4040

UID
10
UID
10
1
UID

SERIES RO
16 & 12 positions

A subminiature 3⁄16" diameter rotary switch offering the features of larger switches in a fraction of the space required. Designed to meet the needs of communications and related fields. Approved to MIL-S-3786/35.

SERIES FO
10 & 6 positions

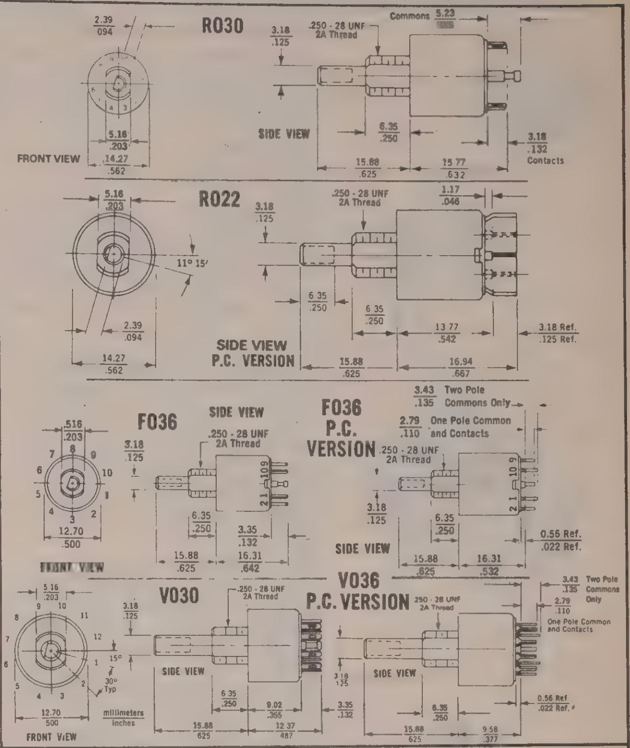
A miniature rotary switch approved to MIL-S-3786/20.

SERIES VO
12, 10, 8 & 6 positions

A totally integrated series of switches approved to MIL-S-3786/20. Common angles of rotation are available in a single deck subminiature size (½" dia. x 0.355" body length).

SERIES RO — FO — VO

- Up to 10 (F036); 12 (VO); 16 (RO) active positions.
- Shorting & non-shorting contacts (all series).
- Available with fixed or adjustable stops (all series).
- Insert molded terminals.
- Poles: 1 or 2 (VO); up to 3 (F036); up to 6 (RO30).
- Panel & shaft sealed.
- Solder terminals or P.C. terminals.
- Flatted or non-flatted shaft.
- 1" shaft length without flats.
- 30°, 36°, 45° or 60° rotation increments (VO only).


R030
2.39 .094
3.18 .125
.250 - 28 UNF 2A Thread
Commons 5.23
SIDE VIEW
6.35 .250
3.18 .132 Contacts
FRONT VIEW
5.16 .203
14.27 .562
15.88 .625
15.77 .632
R022
5.16 .203
3.18 .125
.250 - 28 UNF 2A Thread
1.17 .046
11° 15'
6.35 .250
6.35 .250
2.39 .094
13.77 .542
3.18 Ref. .125 Ref.
14.27 .562
SIDE VIEW P.C. VERSION
15.88 .625
16.94 .667
F036
.516 .203
SIDE VIEW
.250 - 28 UNF 2A Thread
3.18 .125
12.70 .500
6.35 .250
3.35 .132
15.88 .625
16.31 .642
FRONT VIEW
F036 P.C. VERSION
3.43 .135 Two Pole Commons Only
2.79 .110 One Pole Common and Contacts
.250 - 28 UNF 2A Thread
3.18 .125
6.35 .250
SIDE VIEW
0.55 Ref. .022 Ref.
15.88 .625
16.31 .532
V030
5.16 .203
3.18 .125
.250 - 28 UNF 2A Thread
15°
30° Typ
SIDE VIEW
12.70 .500
millimeters inches
6.35 .250
9.02 .355
15.88 .625
12.37 .487
FRONT VIEW
V036 P.C. VERSION
.250 - 28 UNF 2A Thread
3.43 .135 Two Pole Commons Only
2.79 .110
One Pole Common and Contacts
SIDE VIEW
3.18 .125
3.35 .132
6.35 .250
0.56 Ref .022 Ref.
15.88 .625
9.58 .377

12
UID
10
UID

SERIES RC
12 positions

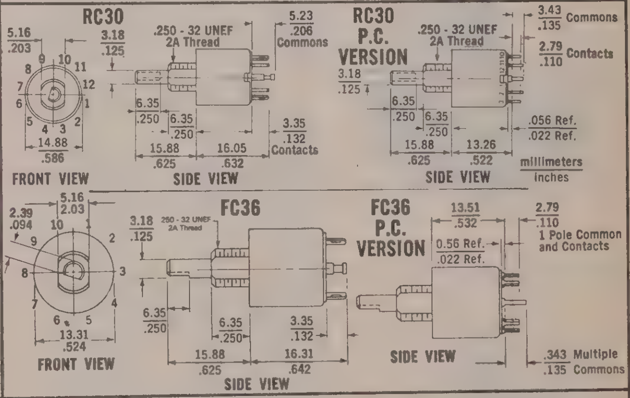
A high density rotary switch, providing the most switching poles per square inch available in a commercial product.

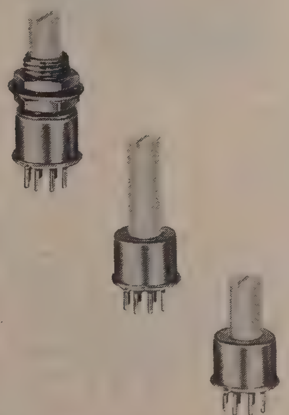
SERIES FC
10 positions

Combines all the switching reliability of the military products and cost effectiveness of commercial products.

SERIES RC & FC

- Up to 10 (FC); 12 (RC) active positions.
- Shorting or non-shorting contacts (RC & FC).
- Available with fixed or adjustable stops (RC & FC)
- Poles: up to 3 (FC); up to 6 (RC).
- Solder or P.C. terminals (RC & FC).
- 1" shaft length without flat (RC & FC).

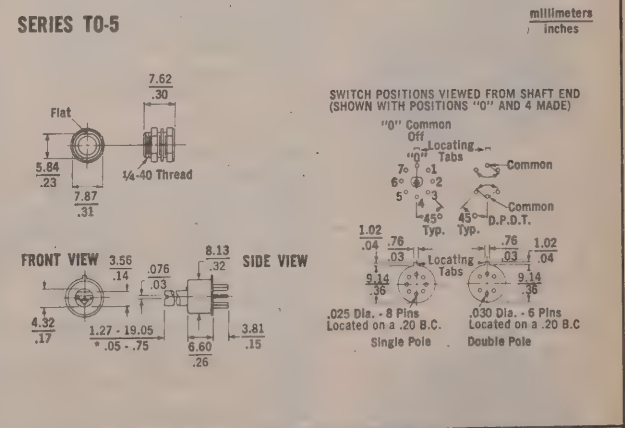

RC30
5.16 .203
3.18 .125
.250 - 32 UNEF 2A Thread
5.23 .206 Commons
6.35 .250
6.35 .250
3.35 .132 Contacts
14.88 .586
15.88 .625
16.05 .632
FRONT VIEW
SIDE VIEW
RC30 P.C. VERSION
.250 - 32 UNEF 2A Thread
3.43 .135 Commons
2.79 .110 Contacts
3.18 .125
6.35 .250
6.35 .250
.056 Ref. .022 Ref.
15.88 .625
13.26 .522
millimeters inches
SIDE VIEW
2.39 .094
5.16 2.03
3.18 .125
.250 - 32 UNEF 2A Thread
FC36
6.35 .250
6.35 .250
3.35 .132
13.31 .524
15.88 .625
16.31 .642
FRONT VIEW
SIDE VIEW
FC36 P.C. VERSION
13.51 .532
0.56 Ref. .022 Ref.
2.79 .110
1 Pole Common and Contacts
SIDE VIEW
.343 Multiple .135 Commons

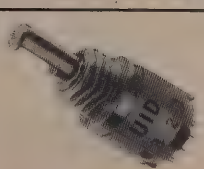


SERIES TO-5

This subminiature rotary switch has up to 8 positions into a TO-5 can. Gold contacts assure reliable switching over a long life. Mounting can be accomplished by soldering directly to P.C. board, by means of board sockets, or panel mounted with optional bushing. The actuator moves through 360° in detented steps of 45°. Also available with stops as required, from 2 to 8 positions. Contacts will switch 0.5 amps at 125 VAC (will carry 3 amps) with an operating temperature range of −30° to +65°C.

Applications of switches of this type are widely varied. One of the more popular uses is in manually programming a single standardized P.C. board for test or multi-function usage. With the switch mounted near the access edge, using a thumb wheel, the board does not have to be removed to change function or program. This type of application is used in test equipment, process control equipment, computer peripherals, input terminals and telephone switching equipment.

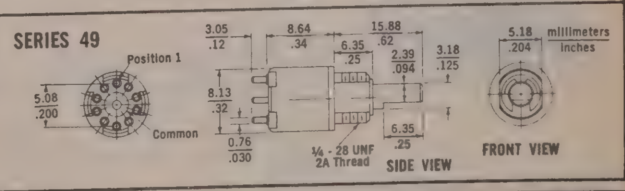

SERIES TO-5
millimeters inches
7.62 .30
Flat
5.84 .23
¼-40 Thread
7.87 .31
FRONT VIEW
3.56 .14
.076 .03
8.13 .32
SIDE VIEW
4.32 .17
1.27 - 19.05 * .05 - .75
6.60 .26
3.81 .15
SWITCH POSITIONS VIEWED FROM SHAFT END (SHOWN WITH POSITIONS "0" AND 4 MADE)
"0" Common Off
Locating Tabs
"0"
Common
Common D.P.D.T.
45° Typ.
45° Typ.
1.02 .04
.76 .03
Locating Tabs
.76 .03
1.02 .04
9.14 .36
9.14 .36
.025 Dia. - 8 Pins Located on a .20 B.C.
.030 Dia. - 6 Pins Located on a .20 B.C
Single Pole
Double Pole



SERIES 49

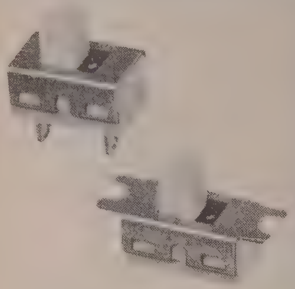
The Series 49 has up to 10 positions of rotary switching into a .320 body diameter and provides Military quality at commercial prices.

- Available 2 through 10 positions.
- Insert molded terminals.
- Non-shorting contacts.
- Sealed or unsealed.


SERIES 49
Position 1
5.08 .200
Common
3.05 .12
8.64 .34
15.88 .62
6.35 .25
2.39 .094
3.18 .125
8.13 .32
0.76 .030
¼ - 28 UNF 2A Thread
6.35 .25
SIDE VIEW
5.18 .204
millimeters inches
FRONT VIEW

ITW SLIDE SWITCHES

ITW SWITCHES • 6615 W. IRVING PARK RD. • CHICAGO, IL 60634 • (312) 282-4040

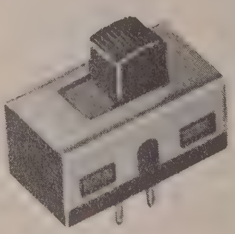


SPST MINI MIKE SLIDE SWITCH

Contact Rating: Dry Circuit to 1.0 amps inductive at 125 VAC
Contact Material: Hard Au over Ni barrier
Contact Resistance: 20 milliohms max. initially
Life Expectancy: 100,000 actuations
End of Life Criteria: 100 milliohms contact resistance
Stroke: .085″
Breakdown Voltage: 1,000V 60 Hz
Insulation Resistance: 60,000 megohms
Operating Force: 200-500 grams initially
Temperature Range: −40°C to +100°C
Contact Bounce: 1 millisecond max. initially; less than 2 milliseconds after 100,000 actuations.

Part Number	Mounting	Terminal Type	Button Height*	Button Color
23-021-013+	P.C.	Straight	.20	Black
23-021-020+	P.C.	Straight	.20	White
23-021-017+	Panel	Straight	.20	Black
23-021-019+	Panel	Straight	.20	White
23-021-025+	Panel	"T"	.20	Black
23-021-031+	P.C.	Rt. Angle	.20	Black
23-021-033+	P.C.	Rt. Angle	.20	White
23-021-040+	P.C.	P.C.	.20	Black
23-021-056	Panel	P.C.	.20	Black

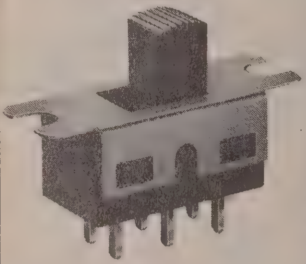
+U.L. Recognized for 1A, 125 VAC.



SPDT MINI MIKE SLIDE SWITCHES WITH SNAP ACTION CONTRACTS

Contact Rating: Dry Circuit to 250 milliamps resistive at 30 VDC
Contcat Material: Hard Au over Ni barrier
Contact Resistance: 20 milliohms max. initially
Life Expectancy: 100,000 actuations
End of Life Criteria: 100 milliohms contact resistance
Stroke: .085″
Breakdown Voltage: 1,500V 60 Hz
Insulation Resistance: 15,000 megohms
Operating Force: 100-500 grams
Temperature Range: −40°C to +100°C
Contact Bounce: 2 milliseconds max. initially

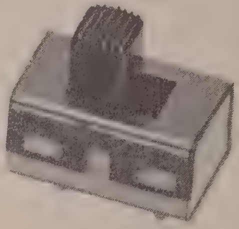
Part Number	Mounting	Terminal Length	Button Height*	Button Color
23-021-105	P.C.	.12	.20	Black
23-021-126	P.C.	.12	.20	White
23-021-112	Panel	.12	.20	Black
29-000-009	P.C.	Rt. Angle	.20	Black



DPDT MINI MIKE SLIDE SWITCHES WITH SNAP ACTION CONTACTS

Contact Rating: Dry Circuit to 100 ma at 125 VAC
Contact Material: Hard Au over Ni barrier
Contact Resistance: 20 milliohms max. initially
Life Expectancy: 100,000 actuations
End of Life Criteria: 50 milliohms contact resistance
Stroke: .085″
Breakdown Voltage: 1,000V 60 Hz
Insulation Resistance: 50,000 megohms
Operating Force: 200-500 grams
Temperature Range: −40°C to +100°C
Contact Bounce: 2 milliseconds max. initially

Part Number	Mounting	Terminal Length	Button Height*	Button Color
23-021-114	P.C.	.12	.20	Black
23-021-125	P.C.	.12	.20	White
23-021-113	Panel	.12	.20	Black

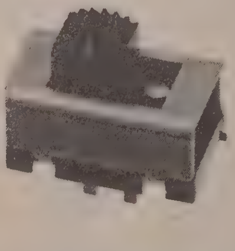


SPDT MINI MIKE 4 TERMINAL FORM "Z" SLIDE SWITCH SPST-NO + SPST-NC

"alternate circuit" slide switches with insert molded pins
Contact Rating: Dry Circuit to .5 amp at 125 VAC and 75 VDC
Contact Material: Hard Au over Ni barrier
Contact Resistance: 20 milliohms max. initially
Life Expectancy: 100,000 actuations
End of Life Criteria: 100 milliohms contact resistance
Stroke .085″
Breakdown Voltage: 1,500V 60 Hz
Insulation Resistance: 15,000 megohms
Operating Force: 100-500 grams
Temperature Range: −40°C to +100°C

Part Number	Mounting	Terminal Length	Button Height	Button Color
23-021-313	P.C.	.12	.10	Black•
23-021-319	P.C.	.12	.10	White
23-021-320	Panel	.12	.10	Black•
23-021-321	Panel	.12	.10	White
23-021-304+	P.C.	.12	.14	Black

• Includes white dot in button window.
+U.L. Recognized for 0.5A, 125 VAC, 75 VDC.



SPDT MINI MIKE 4 TERMINAL FORM "Z" SLIDE SWITCH SPST-NO + SPST-NC

"alternate circuit" slide switches
Contact Rating: UL Recognized for 0.5 amp 125 VAC, 75 VDC
Contact Material: Hard Au over Ni barrier
Contact Resistance: 20 milliohms max. initially
Life Expectancy: 50,000 actuations
End of Life Criteria: 100 milliohms contact resistance
Stroke: .11″
Breakdown Voltage: 250V 60 Hz
Insulation Resistance: 75,000 megohms initially
Operating Force: 100-500 grams initially
Temperature Range: −40°C to +100°C
Contact Bounce: 2 milliseconds max. initially

Part Number	Mounting	Terminal Length	Button Height*	Button Color
23-021-008	P.C.	.12	.14	Black
23-021-006	Panel	.12	.14	Black
23-021-005	P.C.	.12	.20	Black
23-021-009	Panel	.12	.20	Black

U.L. Recognized for 0.5A, 125 VAC, 75 VDC.

ITW SLIDE SWITCHES

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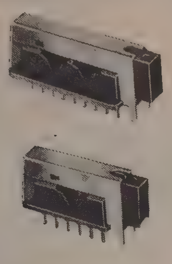
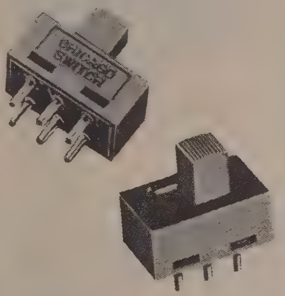


SERIES 23 — MODULE

Contact Rating: Dry Circuit to 250 ma at 125 VAC
Contact Material: Hard Au over Ni barrier
Contact Resistance: 25 milliohms max. initially
Life Expectancy: 250,000 actuations
End of Life Criteria: 100 milliohms contact resistance
Stroke: .136″
Breakdown Voltage: 750V 60 Hz
Insulation Resistance: 75,000 megohms initially
Operating Force: 500-800 grams

Part Number	Poles	Description
23-004-000	4	Momentary Action, Basic Switch Module, Plug-In
23-006-000	6	Momentary Action, Basic Switch Module, Plug-In
23-010-000	4	Push-On — Push-Off, Alternate Action, Plug-In
23-011-000	6	Push-On — Push-Off, Alternate Action, Plug-In
23-026-000	4	Rocker Activated — Push-On — Push-Off
23-026-000	6	Rocker Activated — Push-On — Push-Off



MR CLEAN II

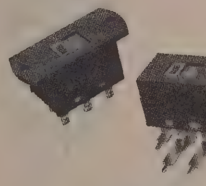
Contact Rating: Dry circuit to 250 ma at 125 VAC
Contacts: Hard gold over nickel barrier over brass
Life Expectancy (Mechanical): 10,000 actuations
End of Life Criteria: 100 milliohms
Contact Resistance: 20 milliohms initially
Insulation Resistance: 10,000 megohms
Temperature Range: −40°C to +100°C
Operating Force: 100-500 grams initially
Stroke: .090″
HiPot Breakdown Rating: Interterminal—1,000V 60 Hz

124·□□□·020

CIRCUIT
2—SPDT
3—Form "Z"
4—DPDT
5—SPST
6—DPST

ASSEMBLY MODE
3—Fully Assembled w/Stand-Off (.012″) Base
4—(2) Sub-Assemblies w/Stand-Off (.012″) Base

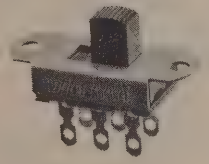
TERMINAL TYPE AND PLATING
0—P.C. Hard Gold—30 micro inches gold over 30 micro inches nickel
1—P.C. Silver
2—P.C. Hard Gold—50 micro inches gold over 100 micro inches nickel



SERIES SE 1022 (DPDT)

Contact Ratings: UL, CSA & SEV — 10 amp 125 VAC; 5 amp 250 VAC
VDE — 4A 125V ~ 2 (0.5)A 250 V ~ T85
Handle: 11/32″ or flush w/screwdriver slot
Electrical Life: 10,000 cycles
International Approvals: UL, CSA, VDE, SEV

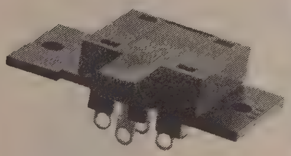
18-000-0016 Panel Mounting; Faston/Solder Terminals
18-000-0022 Printed Circuit Mounting, Printed Circuit Terminals
18-000-0019 Printed Circuit Side Mounting, Right Angle Printed Circuit Terminals.
Note: The above have Flush Screwdriver Slot and 115V/230V Nomenclature



SERIES SW

Current Ratings: Ratings from Low Level to 15A @ 125 VAC
Contact Arrangement: Configurations from SPST to 4P4T
Termination: Solder, P.C., Faston, Wire Wrap

A complete line of compact slide switches offering quality switching where space is at a premium. ITW's simple, trouble-free design assures long service under extreme conditions. A thorough contact wipe provides uniformly low contact resistance throughout the life of the switch. UL listing is available on all styles. CSA approvals are available on many units.



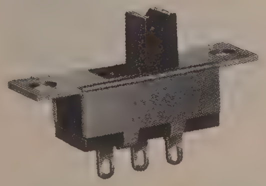
SERIES SL

The revolutionary new "SL" (Shell-Less)™ switch product provides a complete line of slide switches ingeniously designed to function perfectly without the conventional metal slide switch shell.

Standard switches are offered in single and double pole models with one, two or three throw configurations. UL & CSA listings of 4 and 10 amps are available. Precious metal plated contacts and terminals for low energy circuit applications are also available.

The "SL" offers:

- QUALITY — at lower cost.
- RELIABILITY — at lower cost. (The time tested reliability of sliding contacts.)
- LESS WEIGHT — at lower cost. (50% of the weight of most slide switches is in the metal shell which has been eliminated.)
- INCREASED SAFETY — at lower cost. (Absence of conductive shell is inherently safer electrically.)
- VERSATILITY — at lower cost.



SERIES M

Contact Resistance: 20 milliohms max. at 1 Ampere 5 Volts DC or 1 KHz
Dielectric Withstanding Voltage: 500V at 50-60 Hz for 1 min.
Electrical Endurance: 10,000 cycles
Rating: .5 Amperes 125 VAC resistive
Housing: Corrosion resistant plated steel
Terminal Board: Phenolic
Terminals: Silver plated brass
Button: Black plastic (ABS or Delrin depending on Series)
Contact: Silver plated phosphor bronze, copper or brass

MA Series: Smallest switch presently available. A dual wiping and a coil spring loaded contact combine to provide six points for lower energy transfer in a single pole on each throw.

MD Series: Dual wipe contact: Thorough contact and terminal wipe.

MH Series: Dual wipe contact, ball and spring type skid proof center detent. center off position.

MS Series: Dual wipe contacts. Positive skid proof ball and spring type side detent.

SERIES ST

ST 1032 (TPDT) 10A @ 125 VAC
ST 612 (SPDT) 6A @ 125 VAC
ST 622 (DPDT) 6A @ 125 VAC

This line of power switches is UL Recognized and CSA listed and have been approved in equipment submitted to BSI and VDE. Rugged construction for demanding applications, these enclosed housed switches are available in slide and rocker versions.

ITW ROCKER, SLIDE, & LEAF SWITCHES

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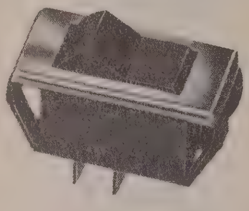
ECONOMITE® LINE

Contacts: Silver plated (Standard)
The Economite Line of low cost miniature slide switches is designed to save on cost without sacrificing quality. The switches are available in SPDT, SP3Position, DPDT and DP4Position circuits with a choice of actuators and terminals.

Part Number	Circuit
43-000-121	SPDT
43-901-121	SPDT
43-000-132	SP3Position
43-901-243	DP4Position
43-100-113	DPDT
43-200-222	SPDT
43-200-227	DPDT



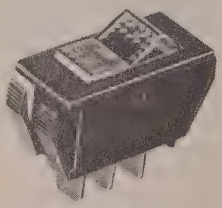
SERIES 16X — NON-LIGHTED

161-099-009 (10A SPST)
Rocker & Bezel — Black
161-000-009 (10A SPST)
Rocker & Bezel — White
163-099-009 (16A SPST)
Rocker & Bezel — Black
163-000-009 (16A SPST)
Rocker & Bezel — White

FEATURES

Panel: From .015″ to .125″ thick
Cut Out: .48″ x 1.08″

- UL Recognized and CSA Approved
  161 Series: 10A, ½ HP, 125 VAC; 8A, ½ HP, 250 VAC; 10A, 28 VDC
  162 Series: 12A, ½ HP, 125 VAC; 10A, ½ HP, 250 VAC; 12A, 28 VDC
  163 Series: 16A, ¾ HP, 125 VAC; 12A, ¾ HP, 250 VAC; 16A, 28 VDC
- Wide range of circuits some VDE approved
- Variety of colors — including custom
- Hot stamping & metal bezels
- Matching panel lights available
- Terminal options — quick connect or solder lugs
- Snap-in panel mount



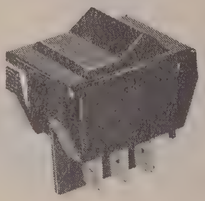
SERIES 16X — LIGHTED

161-029-006 (10A SPST)
125 Neon Red Rocker
161-049-006 (10A SPST)
125 Neon Amber Rocker
163-029-006 (16A SPST)
125 Neon Red Rocker
163-049-006 (16A SPST)
125 Neon Amber Rocker

FEATURES

Panel: From .015″ to .125″ thick
Cut Out: .48″ x 1.08″

- UL Recognized and CSA Approved
  161 Series: 10A, ½ HP, 125 VAC; 8A, ½ HP, 250 VAC; 10A, 28 VDC
  162 Series: 12A, ½ HP, 125 VAC; 10A, ½ HP, 250 VAC; 12A, 28 VDC
  163 Series: 16A, ¾ HP, 125 VAC; 12A, ¾ HP, 250 VAC; 16A, 28 VDC
- Wide range of incandescent and neon lamps
- Variety of colors — including custom
- Snap-in installation
- Terminal options — quick connect or solder lugs
- Hot stamping and metal bezels
- Matching panel lights available



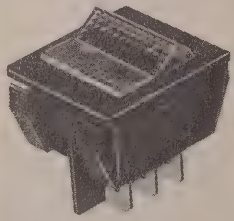
SERIES 17X — NON-LIGHTED

171-099-009 (10A SPST)
Black/Black
171-099-129 (10 DPDT)
Black/Black
173-099-129 (16A SPST)
Black/Black
173-099-129 (16A DPDT)
Black/Black

FEATURES

Panel: From .015″ to .125″ thick
Cut Out: .880″ x 1.08″
171 Series: 10A, ½ HP, 125 VAC; 8A, ½ HP, 250 VAC; 10A, 28 VDC
172 Series: 12A, ½ HP, 125 VAC; 10A, ½ HP, 250 VAC; 12A, 28 VDC
173 Series: 16A, ¾ HP, 125 VAC; 12A, ¾ HP, 250 VAC; 16A, 28 VDC

- UL Recognized and CSA Approved
- Wide range of circuits some VDE approved
- Variety of colors — including custom
- Hot stamping
- Matching panel lights
- Terminal options — quick connect or solder lugs
- Snap-in installation



SERIES 17X — LIGHTED

171-029-106 (10A DPST)
125 Neon Red Rocker
171-049-106 (10A DPST)
125 Neon Amber Rocker
173-029-106 (16A DPST)
125 Neon Red Rocker
173-049-106 (16A DPST)
125 Neon Amber Rocker

FEATURES

Panel: From .015″ to .125″ thick
Cut Out: .880″ x 1.08″
171 Series: 10A, ½ HP, 125 VAC; 8A, ½ HP, 250 VAC; 10A, 28 VDC
172 Series: 12A, ½ HP, 125 VAC; 10A, ½ HP, 250 VAC; 12A, 28 VDC
173 Series: 16A, ¾ HP, 125 VAC; 12A, ¾ HP, 250 VAC; 16A, 28 VDC

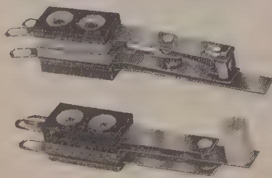
- UL Recognized and CSA Approved
- Wide range of incandescent and neon lamps
- Variety of colors — including custom
- Snap-in installation
- Terminal options — quick connect or solder lug
- Hot stamping and metal bezels
- Matching panel lights available

SERIES RSW

Current Ratings: Ratings from Low Level to 10.1A @ 125 VAC
Contact Arrangement: Configurations from SPST to 4P3T
Termination: Solder, P.C., Faston, Wire Wrap
Rocker or padle type actuators available

These switches are UL Recognized in various ratings. CSA Certified versions are also available. (Contact factory.) Both light and heavy duty rocker switches for today's fashionable products are available.

Stylish molded actuators in a spectrum of colors enhance the switches. Single and two piece steel housings provide numerous mountings to meet custom requirements. The thorough wiping contact guarantees extremely low contact resistance to meet advanced circuit switching specifications. A selection of terminals insure the proper choice for the most economical connection to Rocker Switches. For a solution to your switching problems, contact the factory direct or our nearest sales representative.



LEAF SWITCHES

Series 20
¼″ Mounting Centers
Series 21
⅜″ Mounting Centers
Series 37
3/16″ Mounting Centers

Custom designed leaf switches provide for low cost and long life. A variety of contacts and terminals are available for virtually any application. No matter what your requirement these switches are produced to perform.

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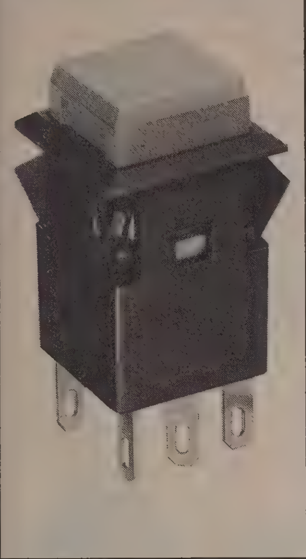
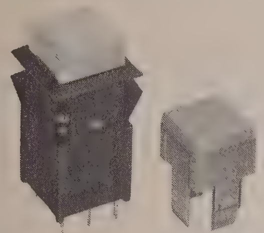




SERIES 05

Panel Cutout: .625″ Sq.

Panel Thickness Range: .031″-.093″

Illumination: LED or T-1¾ Wedge base incandescent lamp

Electrical Rating: 1 amp at 125 VAC. UL Recognized and CSA Certified

Circuitry Options: SPST-NO, SPDT and DPST-NO

Termination: .110 Quick Connect .025 x .015 PC Board

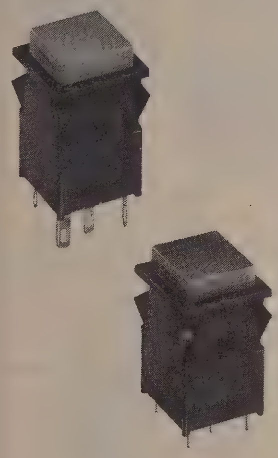
Other options including insertable legend buttons — Consult factory

SERIES 05

Part Number	Lamp Type	Term.	Circuitry/Action
05-105	Incand.	.110 QC	Indicator Only
05-115	Incand.	.110 QC	SPST-NO/Mom.
05-135	Incand.	.110 QC	SPDT/Mom.
05-145	Incand.	.110 QC	SPDT/Main.
05-165	Incand.	PCB	SPST-NO/Mom.
05-185	Incand.	PCB	SPDT/Mom.
05-195	Incand.	PCB	SPDT/Main.
05-215	None	.110 QC	SPST-NO/Mom.
05-265	None	PCB	SPST-NO/Mom.
05-46501	Red LED	PCB	SPST-NO/Mom.
05-48501	Red LED	PCB	SPDT/Mom.
05-49501	Red LED	PCB	SPDT/Main.

BUTTONS

Part Number	Lamp Type	Color
80-050007	Incand.	White
80-050008	Incand.	Red
80-050009	Incand.	Green
80-050010	Incand.	Blue
80-050011	Incand.	Yellow
80-050039	N/A	Black
86-050011	LED	White
86-050017	LED	Black



SERIES 05-6

Panel Cutout: .750″ Sq.

Panel Thickness Range: .062″-.125″

Illumination: T-1¾ Flange base incandescent lamp

Electrical Rating: 1 amp at 125 VAC or 3 amps at 125 VAC. UL Recognized and CSA Certified

Circuitry Options: SPST-NO, DPST-NO and DPDT

Termination: .110 Quick Connect .025 x .012 PC Board

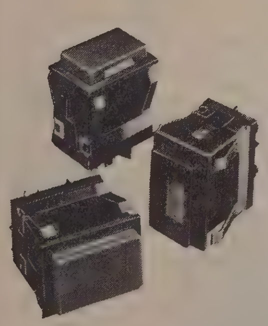
Other options including insertable legend buttons — Consult factory

SERIES 05-6

Part Number	Lamp Type	Term.	Rating	Circuitry/Action
05-61025	Incand.	.110 QC	N/A	Indicator Only
05-62115	None	.110 QC	1 amp	SPST-NO/Mom.
05-62125	Incand.	.110 QC	1 amp	SPST-NO/Mom.
05-62325	Incand.	.110 QC	1 amp	SPDT/Mom.
05-62425	Incand.	.110 QC	3 amp	SPST-NO/Mom.
05-63125	Incand.	.110 QC	1 amp	SPST-NO/Main.
05-63225	Incand.	.110 QC	1 amp	DPST-NO/Main.
05-63325	Incand.	.110 QC	1 amp	SPDT/Main.
05-63425	Incand.	.110 QC	3 amp	SPST-NO/Main.
05-65125	Incand.	PCB	1 amp	SPST-NO/Mom.
05-65325	Incand.	PCB	1 amp	SPDT/Mom.
05-66125	Incand.	PCB	1 amp	SPST-NO/Main.
05-66325	Incand.	PCB	1 amp	SPDT/Main.

BUTTONS

Part Number	Color
80-050602	White
80-050603	Red
80-050604	Green
80-050605	Blue
80-050606	Yellow
80-050641	Black



SERIES 05-7 POWER SWITCH

Panel Cutout: .750″ x 1.141″

Panel Thickness Range: .062″-.125″

Illumination: T-1¾ Flange base incandescent lamp or neon

Electrical Rating: 10 amps at 125/250 VAC

Circuitry Options: DPST-NO and SPST-NO

Termination: .187 Quick Connect

Styled for compatibility with Series 50 and Series 05-6

SERIES 05-7 POWER SWITCH

Part Number	Lamp Type	Button	Circuitry/Action
05-711009	None	—	DPST-NO/Mom.
05-712008	Incand.	—	DPST-NO/Mom.
05-722008	Incand.	—	DPST-NO/Main.
05-723002	125V Neon	Red	SPST-NO/Main.
05-723008	125V Neon	Black	SPST-NO/Main.
05-724002	250V Neon	Red	SPST-NO/Main.
05-724008	250V Neon	Black	SPST-NO/Main.

BUTTONS FOR NON-LIGHTED AND INCANDESCENT LIGHTED

Part Number	Color
80-057013	White
80-057014	Red
80-057015	Green
80-057017	Yellow
80-057020	Black

SERIES TO-5

Mounting: ¼″ bushing or PC Board

Electrical Rating: 100 milliamps at 125 VAC

Circuitry: SPST-NO Momentary

Termination: .025″ dia. PC Board

Button Styles:
- 10 button heights available
- Standard color is black — other colors available — Consult factory

SERIES TO-5

Part Number	Mounting	Button Length
34-550-001	PCB	.06″
34-550-005	PCB	.15″
34-550-015	PCB	.19″
34-550-006	PCB	.25″
34-550-010	PCB	.38″
34-550-007	PCB	.40″
34-550-002	PCB	.50″
34-550-016	Bushing	.08″*

* Length above bushing

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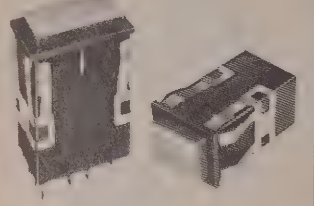
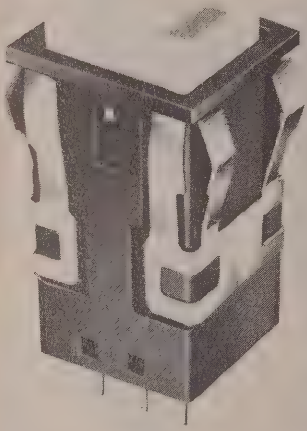


SERIES 50-1 SOLID STATE

Panel Cutout: .750″ Sq.
Panel Thickness Range: .060″-.190″
Illumination: LED or T-1¾ Wedge base incandescent lamp
Electrical: Switches feature a Hall Effect device for switching up to 40 ma at 5 VDC .110 QC Terminals. UL Recognized and CSA Certified
Other Options: Consult factory

SERIES 50-1 SOLID STATE

Part Number	Lamp Type	Switch Action
50-11CBA2AA	Incand.	Momentary
50-11CBA2AE	Incand.	Maintained
50-12CBC2AA	5V Red LED	Momentary
50-12CBC2AE	5V Red LED	Maintained
50-12CBJ2AA	5V Yellow LED	Momentary
50-12CBJ2AE	5V Yellow LED	Maintained
50-12CBS2AA	5V Green LED	Momentary
50-12CBS2AE	5V Green LED	Maintained



SERIES 50-2 ELECTROMECHANICAL

Panel Cutout: Square—.750″
Rect.—.750″ x 1.141″
Panel Thickness Range: .060″-.190″
Illumination: LED or T-1¾ Wedge base incandescent lamp

Electrical Ratings:
- Silver Contacts —
  3 amps at 125 VAC
  2 amps at 250 VAC
- Gold contacts —
  100 ma at 24 VDC resistive
  1 ma at .5 VDC resistive
- UL Recognized and CSA Certified

Circuitry Options:
- SPDT or DPDT
- Gold or silver contacts
- Momentary of maintained action

Termination: .110 Quick Connect
.025 x .025 PC Board

Other options including two light rectangular switch — Consult factory

SERIES 50-2 ELECTROMECHANICAL

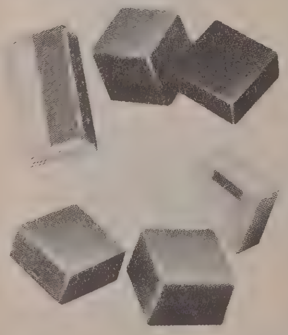
Part Number	Lamp Type	Style	Term.	Circuitry/Action
50-21BBA2AA	None	Square	.110 QC	SPDT Sil/Mom.
50-21BBA2AB	None	Square	.110 QC	SPDT Sil/Main.
50-21BBA2BA	None	Square	.110 QC	SPDT Gold/Mom.
50-21BBA3AA	None	Square	PCB	SPDT Sil/Mom.
50-21BBA3AB	None	Square	PCB	SPDT Sil/Main.
50-21CBA2AA	Incand.	Square	.110 QC	SPDT Sil/Mom.
50-21CBA2AB	Incand.	Square	.110 QC	SPDT Sil/Main.
50-21CBA2AC	Incand.	Square	.110 QC	DPDT Sil/Mom.
50-21CBA2AD	Incand.	Square	.110 QC	DPDT Sil/Main.
50-21CBA2BA	Incand.	Square	.110 QC	SPDT Gold/Mom.
50-21CBA2BB	Incand.	Square	.110 QC	SPDT Gold/Main.
50-21CBA3AA	Incand.	Square	PCB	SPDT Sil/Mom.
50-21CBA3AB	Incand.	Square	PCB	SPDT Sil/Main.
50-21CBA3BA	Incand.	Square	PCB	SPDT Gold/Mom.
50-21CBA3BB	Incand.	Square	PCB	SPDT Gold/Main.
50-21EBA2AA	None	Rect.	.110 QC	SPDT Sil/Mom.
50-21EBA2AB	None	Rect.	.110 QC	SPDT Sil/Main.
50-21FBA2AA	Incand.	Rect.	.110 QC	SPDT Sil/Mom.
50-21FBA2AB	Incand.	Rect.	.110 QC	SPDT Sil/Main.
50-21FBA2AC	Incand.	Rect.	.110 QC	DPDT Sil/Mom.
50-21FBA2AD	Incand.	Rect.	.110 QC	DPDT Sil/Main.
50-21FBA3BA	Incand.	Rect.	PCB	SPDT Gold/Mom.
50-21FBA3BB	Incand.	Rect.	PCB	SPDT Gold/Main.
50-22CBC2BA	5V Red LED	Square	.110 QC	SPDT Gold/Mom.
50-22CBC2BB	5V Red LED	Square	.110 QC	SPDT Gold/Main.
50-22CBJ2BA	5V Yel LED	Square	.110 QC	SPDT Gold/Mom.
50-22CBJ2BB	5V Yel LED	Square	.110 QC	SPDT Gold/Main.
50-22CBS2BA	5V Grn LED	Square	.110 QC	SPDT Gold/Mom.
50-22CBS2BB	5V Grn LED	Square	.110 QC	SPDT Gold/Main

SERIES 50-4 INDICATORS

Panel Cutout: Square—.750″
Rect.—.750″ x 1.141″
Panel Thickness Range: .060″-.190″
Illumination: LED or T-1¾ Wedge base incandescent lamp
Termination: .110 QC
Other Options: Consult factory

SERIES 50-4 INDICATORS

Part Number	Lamp Type	Style
50-41CBA2	Incandescent	Square
50-41FBA2	Incandescent	Rectangular
50-42CBC2	5V Red LED	Square
50-42CBJ2	5V Yellow LED	Square
50-42CBS2	5V Green LED	Square



SERIES 50-5 BUTTONS

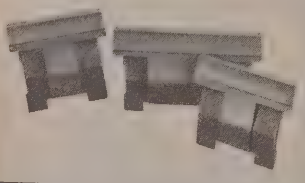
Button Height: Part numbers listed at right are all .19″ high above front panel, (.13 above bezel).

Other heights available—Consult factory

Display Options: Part numbers at right are all transmitted color. Insertable legend, dead front, projected color and two color rectangular buttons are available — Consult factory

SERIES 50-5 BUTTONS

Part Number	Switch Type	Color
50-51C10B	Square	Blue
50-51C10G	Square	Green
50-51C10K	Square	Black
50-51C10R	Square	Red
50-51C10W	Square	White
50-51C10Y	Square	Yellow
50-51F10B	Rectangular	Blue
50-51F10G	Rectangular	Green
50-51F10K	Rectangular	Black
50-51F10R	Rectangular	Red
50-51F10W	Rectangular	White
50-51F10Y	Rectangular	Yellow
50-52C10G	Square LED	Green
50-52C10K	Square LED	Black
50-52C10R	Square LED	Red
50-52C10W	Square LED	White



SERIES 50-7 BARRIERS

Help avoid accidental activation
Mount to switch prior to installation in panel

SERIES 50-7 BARRIERS

Part Number	Type	Barrier Length
50-71SCB	Center	Short — use with square devices and short side of rectangular devices
50-71SEB	End	
50-71LCB	Center	Long — use with long side of rectangular device
50-71LEB	End	

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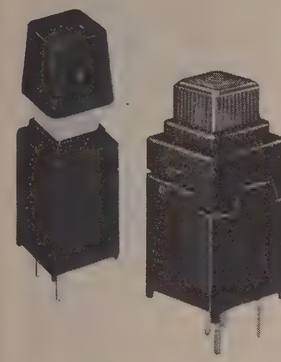
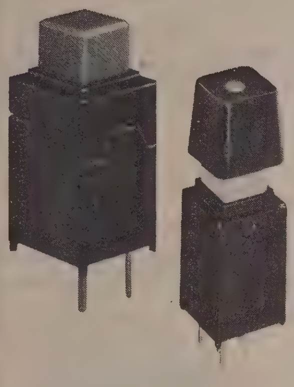




SERIES 39

Mounting: PC Board only. Switch is .380″ square

Illumination: T-1 LED

Electrical Rating: .25 amp at 30 VDC resistive. Reliably switches loads down to 5 microamps at 1 VDC

Circuitry: SPST-NO

Termination: .025″ x .012″ PC Board

Button Styles:
- Fully illuminated button
- Non-lighted button
- Keycap with light pipe
- Non-lighted keycap

Customer installable LED

Other options including a PCB mounted connector available — Consult factory

SERIES 39 STANDARD BUTTON STYLE

Part Number	Lighted	Button	Switch Action
39-11111	Yes	Red	Indicator Only
39-11112	Yes	Green	Indicator Only
39-11113	Yes	Yellow	Indicator Only
39-12111	Yes	Red	Momentary
39-12112	Yes	Yellow	Momentary
39-12113	Yes	Green	Momentary
39-13111	Yes	Red	Maintained
39-13112	Yes	Yellow	Maintained
39-13113	Yes	Green	Maintained
39-12502	No	White	Momentary
39-12503	No	Red	Momentary
39-12509	No	Black	Momentary
39-13502	No	White	Maintained
39-13503	No	Red	Maintained
39-13509	No	Black	Maintained

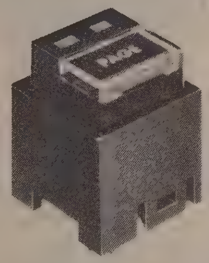
KEYCAP STYLE SWITCHES

Part Number	Lighted	Switch Action
39-22100	Yes	Momentary
39-22500	No	Momentary
39-23100	Yes	Maintained
39-23500	No	Maintained

KEYCAP STYLE BUTTONS

Part Number	Lighted	Color
80-390101	Yes*	White
80-390102	Yes*	Light Grey
80-390103	Yes*	Dark Grey
80-390104	Yes*	Black
80-390105	No	White
80-390106	No	Light Grey
80-390107	No	Dark Grey
80-390108	No	Black

* Requires Light Pipe: 80-390100



SERIES 38

Mounting: Printed Circuit Board only. Switches mount on .675 centers. Buttons are .600 square

Illumination: One or two T-1 LED's

Electrical Rating: 50 ma at 15 VDC

Circuitry: SPST-NO momentary only

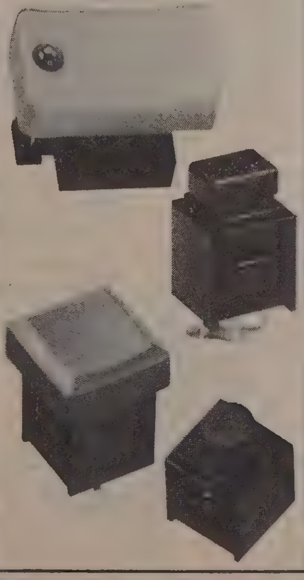
Termination: .012″ x .030″ PC Board

Display: One or two LED's with insertible legend. Ideal for PBX systems

Other options available — Consult factory

SERIES 38

Part Number	# of LEDs	# of Stations	Orientation
38-12003	1	4	Horizontal
38-12005	1	10	Horizontal
38-22011	2	1	Horizontal
38-22003	2	4	Horizontal
38-22005	2	10	Horizontal
38-22006	2	12	Horizontal
38-12010	1	4	Vertical
38-12007	1	10	Vertical
38-22007	2	4	Vertical
38-22009	2	10	Vertical

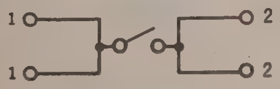


SERIES 60 DATASWITCH

Mounting: PC Board only. Switch is .39″ square

Illumination: T-1 LED when used with 60-1000 switch, 60-3000 LED support and rectangular button

Circuitry: SPST-NO Momentary



Termination: .020″ x .040″ PC Board

Button Styles: 60-1000 switch has integral .31″ x .24″ rect. black button

60-2000 switch has integral .24″ round black button

.48″ square button cap may be used with 60-1000 switches

.48″ x .86″ rectangular button cap to be used with 60-1000 switches and 60-3000 LED support

Additional button colors available — Consult factory

SERIES 60 DATASWITCHES

Part Number	Description
60-1000	Switch with rectangular button
60-2000	Switch with round button
60-3000	LED support only

SERIES 60 BUTTON CAPS*

Part Number	Shape	Color
60-4001	Square	Black
60-4002	Square	Red
60-4004	Square	Light Grey
60-4007	Square	Dark Grey
60-4011	Rectangular	Black
60-4012	Rectangular	Red
60-4014	Rectangular	Light Grey
60-4017	Rectangular	Dark Grey

* Button caps fit on 60-1000 switch.

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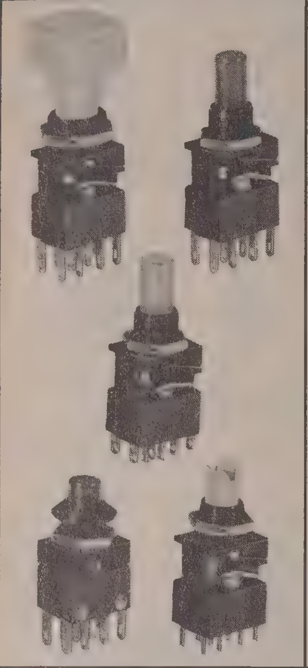


SERIES 01-7, 01-1, 01-3

Bushing Size: 15/32″ or 5/8″

Illumination: Neon, T-1¾ LED, T-1¾ Flange base or screw base incandescent lamp

Electrical Rating:
- 10.1 amps at 125/250 VAC — UL Recognized
- 10.0 amps at 125 VAC — CSA Certified

Circuitry Options:
- 1 or 2 poles
- Form C or Form Z
- Gold or Silver Contacts

Termination:
- .110 Quick Connect
- PC Board — Consult factory

Series 01-7 have a one piece plastic housing

Series 01-1 and 01-3 have a metal bushing and bracket assembly

Non-lighted version available — Consult factory

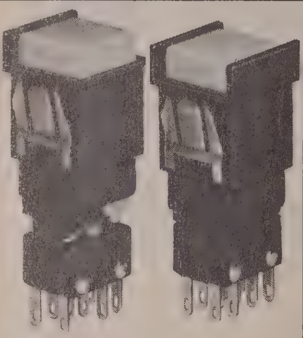
SERIES 01-7

Part Number	Bushing	Lamp Type	Contacts	Circuitry/Action
01-745110	15/32	Screw	Silver	1P Form C/Main.
01-745210	15/32	Screw	Silver	2P Form C/Main.
01-745510	15/32	Screw	Silver	1P Form C/Mom.
01-745530	15/32	Screw	Silver	1P Form Z/Mom.
01-745610	15/32	Screw	Silver	2P Form C/Mom.
01-745630	15/32	Screw	Silver	2P Form Z/Mom.
01-745000	15/32	Screw	N/A	Indicator Only
01-748110	15/32	Screw	Silver	1P Form C/Main.
01-748510	15/32	Screw	Silver	1P Form C/Mom.
01-748000	15/32	Screw	N/A	Indicator Only
01-768110	5/8	Flange	Silver	1P Form C/Main.
01-768210	5/8	Flange	Silver	2P Form C/Main.
01-768510	5/8	Flange	Silver	1P Form C/Mom.
01-768520	5/8	Flange	Gold	1P Form Z/Mom.
01-768530	5/8	Flange	Silver	1P Form Z/Mom.
01-768610	5/8	Flange	Silver	2P Form C/Mom.
01-768630	5/8	Flange	Silver	2P Form Z/Mom.
01-768000	5/8	Flange	N/A	Indicator Only
01-700152	15/32	Red LED*	Silver	1P Form Z/Mom.
01-700155	15/32	Red LED*	Silver	2P Form Z/Main.
01-700157	15/32	Red LED*	Gold	1P Form Z/Mom.
01-700163	15/32	Neon†	Silver	1P Form Z/Main.

* Includes cylindrical button
† Uses same buttons as Series 01-745 switches

SERIES 01-1 AND 01-3

Part Number	Bushing	Lamp Type	Contacts	Circuitry/Action
01-145210	15/32	Screw	Silver	2P Form C/Main.
01-145510	15/32	Screw	Silver	1P Form C/Mom.
01-145610	15/32	Screw	Silver	2P Form C/Mom.
01-365220	5/8	Flange	Gold	2P Form Z/Main.
01-365510	5/8	Flange	Silver	1P Form C/Mom.
01-365610	5/8	Flange	Silver	2P Form C/Mom.
01-365630	5/8	Flange	Silver	2P Form Z/Mom.



SERIES 01-665

Panel Cutout: .875″ Square

Illumination: T-1¾ Flange base incandescent lamp

Electrical Ratings:
- 10.1 amps at 125/250 VAC UL Recognized
- 10.0 amps at 125 VAC — CSA Certified

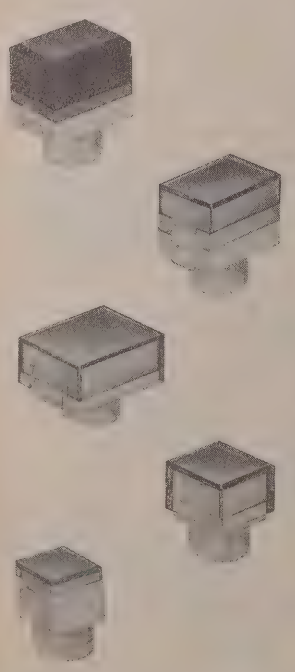
Circuitry Options:
- 1 or 2 poles
- Form C or Form Z
- Gold or Silver Contacts

Termination:
- .110 Quick Connect
- PC Board (Consult factory)

Other Options — Consult factory

SERIES 01-665

Part Number	Contacts	Circuitry/Action
01-665116	Silver	1 Pole Form C/Main.
01-665216	Silver	2 Pole Form C/Main.
01-665236	Silver	2 Pole Form Z/Main.
01-665516	Silver	1 Pole Form C/Mom.
01-665526	Gold	1 Pole Form Z/Mom.
01-665616	Silver	2 Pole Form C/Mom.
01-665636	Silver	2 Pole Form Z/Mom.
01-665006	N/A	Indicator Only



BUTTONS FOR 01 SERIES SWITCHES

All part numbers listed at the right are transmitted color buttons.

Other options including projected color, insertable legend and a variety of other colors are available — Consult factory

BUTTONS FOR 01 SERIES SWITCHES
FOR SERIES 01-745 SWITCHES

Part Number	Switch Action	Color
80-010764	Momentary	Green
80-010765	Momentary	Red
80-010768	Momentary	White
80-010890	Maintained	Green
80-010891	Maintained	Red
80-010894	Maintained	White

FOR SERIES 01-748 AND 01-145 SWITCHES

Part Number	Description	Color
01-911311	5/8″ Square	White
01-911312	5/8″ Square	Red
01-911313	5/8″ Square	Green
01-911411	3/4″ Square	White
01-911412	3/4″ Square	Red
01-911413	3/4″ Square	Green
01-931311	5/8″ Round	White
01-931411	3/4″ Round	White

FOR SERIES 01-768 AND 01-365 SWITCHES

Part Number	Description	Color
01-921311	5/8″ Square	White
01-921312	5/8″ Square	Red
01-921313	5/8″ Square	Green
01-921411	3/4″ Square	White
01-921412	3/4″ Square	Red
01-921413	3/4″ Square	Green
01-941311	5/8″ Round	White
01-941411	3/4″ Round	White

FOR SERIES 01-665 SWITCHES

Part Number	Color
01-921411	White
01-921412	Red
01-921413	Green

BASIC/SNAP-ACTION SWITCHES

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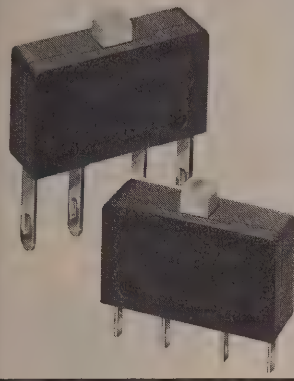


TYPE 16

Sub-Miniature, 5 Amp and 1 Amp Double-Break Snap-Action Switches

Licon's lower cost versions of its Type 16 switches incorporate a simplied contact design that reduces cost by using less precious metal. A 5 amp version uses silver inlay on the terminals in place of individual stationary contacts. A low level version uses gold inlay for both the stationary and movable contacts.

Both silver and gold inlay switches are available with either .110 quick disconnect or P.C. terminals.

Licon's Type 16 Switch with gold inlay is UL Recognized at 1 amp, 125 VAC. In low level applications, it is recommended for use at 15 Volts, 100 milliamps, max. UL File No. E27957.

TYPE 16 5 AMP AND 1 AMP

Part No.	16-438003	16-438006
Termination	P.C.	.110 Q.C.

MECHANICAL CHARACTERISTICS

Pretravel	1.27 max. (.050)
Overtravel	0.30 min. (.012)
Operating Force	1.4 +0.8 −0.6 N. (5 +3 −2 oz.)
Release Force	0.6 N. min (2 oz.)
Movement Differential: (5 amp)	0.51 ±0.13 (.020 ±.005)
(1 amp)	0.38 ±0.15 (.015 ±.006)

TYPE 16

Sub-Miniature, Integral Lever, Double-Break Snap-Action Switches

Series 16-47 INTEGRAL LEVER SWITCH features the Butterfly® double-break snap action mechanism with an integral actuator assembly. Additional features are 2 circuit control with 1 switch, and a higher current rating than comparable sized single-break switches.

A variety of integral levers are available to suit your individual switching requirements, in momentary and maintained action. Contact factory for special requirements.

The 16-47 is UL Recognized at 5 amp @ 125/250 VAC, ¼ HP at 125 VAC.

TYPE 16 INTEGRAL LEVER

Part No.	16-470101	16-470104
Termination	P.C.	.110 Q.C.

MECHANICAL CHARACTERISTICS

16-470101	Pretravel	.225 max.
	Overtravel	.060 min.
	Operating Force	43 grams max.
	Release Force	5 grams min.
	Movement Differential	.100 ±.015
16-470102	Pretravel	.125 max.
	Overtravel	.025 min.
	Operating Force	71 grams max.
	Release Force	28 grams min.
	Movement Differential	.047 ±.013

TYPE 16

Sub-Miniature, 10.1 Amp, Double-Break Snap-Action Switches

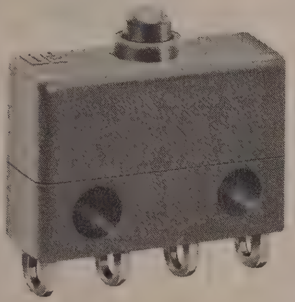
Licon's Type 16 switches feature the unique Butterfly® double-break momentary snap-action switch mechanism. Type 16 offers twice the electrical rating of most sub-miniatures and permits control of two isolated circuits with a single switch. Available in a wide variety of terminal configurations and styles with gold plated or silver contacts standard. Type 16 is UL Recognized and CSA Certified at 10.1 amps @ 125/250 VAC.

TYPE 16 10.1 AMP

Part Number	Circuit	Temperature Index	Contacts Fine Silver	Contacts Gold Plated
16-104	SPDT Form Z	To 275°F Ambient	X	
16-301	SPDT Form Z	To 275°F Ambient	X	
16-3042		To 400°F Ambient	X	
16-404	SPDT Form Z	To 275°F Ambient	X	
16-40401				X
16-403	SPDT Form C	To 275°F Ambient	X	
16-40301				X

MECHANICAL CHARACTERISTICS

Pretravel	.050 max.
Overtravel	.012 min.
Operating Force	5 oz. +3 oz. −2 oz.
Release Force	2 oz. min.
Movement Differential	.020 ±.005
Movement Differential Type 16-403 Only	.012 ±.005



TYPE 18

Sub-Miniature, 7 Amp, Double-Break Snap-Action Switches

Licon's Type 18 sub-miniature Butterfly® double-break switches are used when space is at a premium. Ideally suited for office, communications, computer systems and aircraft.

Series 18 is a single pole double-break snap-action switch utilizing the Licon Butterfly® double-break mechanism.

Gold plated contacts, solder lug, or P.C. terminals are standard features. External actuators are available. Consult factory.

UL Recognized File No. E27957. Seven amps 125/250 VAC 75-80% PF.

TYPE 18 7 AMP DOUBLE BREAK

ELECTRICAL CHARACTERISTICS

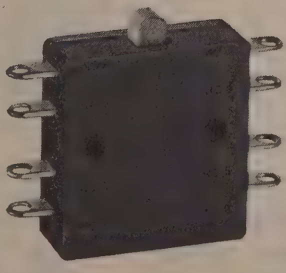
Form Z	Voltage	Current
Two Circuit (SPDT-DB)	28 VDC 28 VDC	5 amp RES. 3 amp IND.
Single Circuit	28 VDC 28 VDC	8 amp RES. 7 amp IND.

Form Z	Contacts Gold Plated
SPDT-DB Solder Lug Term.	18-40421
MS 27257-1	18-488051

MECHANICAL CHARACTERISTICS

Pretravel	.030 max.
Overtravel	.006 min.
Operating Force	5 +3 oz. −2 oz.
Release Force	1½ oz. min.
Movement Differential	.015 ±.005

U.L. Recognized File No. E27957. — 7 amps 125/250 VAC 7-80% PF.



TYPE 26

Sub-Miniature, Double Pole, 8 Amp, Snap-Action Switches

Type 26 is DPDT (Form ZZ) contact arrangement and provides the option of controlling up to 4 isolated circuits. It may be wired externally to provide two commons to form standard DPDT (Form CC) switch. Simultaneity of operation (within .004″ of plunger travel) is achieved by a special linkage mechanism. Simplified control is achieved by eliminating the need for multiple switches. Standard contacts are fine silver or gold plated.

UL Recognized File No. E27957. Eight amps @ 125/250 VAC. 75-80% PF. Meets requirements of MIL-S-8805/77.

TYPE 26 DOUBLE POLE

Part No.	Circuitry	Simultaneity	Contact Material	Terminal
26-804	DPDT-DB (Form ZZ)	Simultaneous	Silver	End Solder
26-804001	DPDT-DB (Form ZZ)	Simultaneous	Gold Plated	End Solder
26-904	DPDT-DB (Form ZZ)	Simultaneous	Silver	Side Solder
26-988051	DPDT-DB (Form ZZ)	Ret. M8805/77-008	Gold Plated	Side Solder

MECHANICAL CHARACTERISTICS

Pretravel	.050 max.
Overtravel	.012 min.
Operating Force	12 ±4 oz.
Release Force	5 oz. min.
Movement Differential	.020 +.010 −.005

BASIC/SNAP-ACTION SWITCHES

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TYPE 36

Sub-Miniature, Triple Pole, 7.5 Amp, Snap-Action Switches

Type 36 is 3PDT-DB Form ZZZ. Simultaneity of operation (within .004″ of plunger travel) is achieved by a special linkage mechanism. Standard contacts are fine silver or gold plated.

UL Recognized File No. E27957. 7.5 amps 125/250 VAC 75-80% PF. Meets requirements of MIL-S-8805/78.

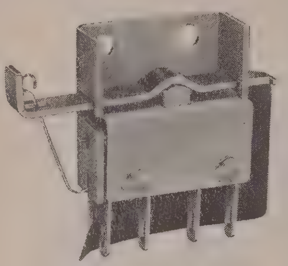
TYPE 36 TRIPLE POLE

Part No.	Contact Material	Terminal	Part No.	Contact Material	Terminal
36-604*	Silver	End Solder	36-704*	Silver	Side Solder
36-604001*	Gold Plated	End Solder	36-704001*	Gold Plated	Side Solder

* Circuitry: 3PDT-DB (ZZZ). Simultaneity: Simultaneous

MECHANICAL SPECIFICATIONS

Pretravel	.050 max.	Release Force	4 oz. min.
Overtravel	.012 min.	Movement Differential	.020 ±.010
Operating Force	16 ±4 oz.		



TYPE 76-6

Door Interlock Switches

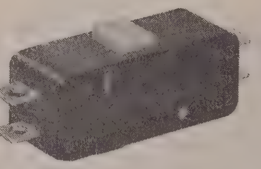
The Licon Type 76 Door Interlock Switches are for the protection of personnel involved in testing and servicing electronic equipment.

This design employs the Butterfly® double-break switching mechanism for automatic interruption of power when service door or cabinet drawer is opened, and features a manual set (pull to maintain) for restoration of power when servicing or testing circuits.

Following service when door is closed, the actuating rod returns to normal or reset position allowing power to continue. UL Recognized.

TYPE 76-6 DOOR INTERLOCK SWITCHES

Part Number	Electrical Rating	
76-6005 Single Pole	Form X or Y	10.1 amp 125/250 VAC 10 amp 28 VDC IND.
	Form A, B, or Z	5 amp 125/250 VAC 3 amp 28 VDC IND.
76-6009 Double Pole	Form XX or YY	8 amp 125/250 VAC 7.5 amp 28 VDC IND.
	Form ZZ	8 amp 125/250 VAC 5 amp 28 VDC IND.
76-6012 Triple Pole	Form XXX or YYY	7.5 amp 125/250 VAC 7.5 amp 28 VDC IND.
	Form ZZZ	7.5 amp 125/250 VAC 5 amp 28 VDC IND.



TYPE 11

Miniature, 10 Amp, Double-Break Snap-Action Switches

An ideal switch for military, commercial, and industrial applications. Type 11 is available in standard and low force momentary action, as well as reset action. Fine silver contacts are standard. A wide variety of terminals and actuators give Type 11 switches added flexibility. Gold plated contacts and external actuators are available. Contact factory.

UL Recognized File No. E27957 & CSA File No. 16388.

TYPE 11 10 AMP DOUBLE-BREAK

Part Number	Circuit	Terminal
11-104	SPDT-DB (Form Z)	End Solder
11-204	SPDT-DB (Form Z)	#4 Screw
11-304	SPDT-DB (Form Z)	Side Solder
11-504	SPDT-DB (Form Z)	Quick Disconnect .250
11-530029	SPDT-DB (Form Z)	Quick Disconnect .187
11-388051	SPDT-DB (Form Z)*	Side Solder

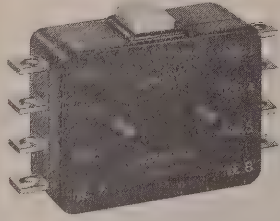
* Meets requirements of MIL-S-8805/11

ELECTRICAL CHARACTERISTICS

Circuitry	125/250 VAC	28 VDC
SPST-DB	10 amp (75-80% PF) ½ HP 125 VAC ¾ HP 250 VAC	10 amp IND.. 15 amp RES.
SPDT-DB		
SPDT-DB		4 amp IND. 6 amp RES.

MECHANICAL CHARACTERISTICS

Pretravel	.050 max.	Release Force	4 oz. min.
Overtravel	.015 min.	Movement Differential	.020 ±.007
Operating Force	8 ±3 oz.		



TYPE 22

Miniature 10 Amp, Double-Break Snap-Action Switches

This compact unit contains two individual switching elements which function simultaneously.* Fine silver contacts are standard as well as a wide variety of terminal styles and actuators.

UL Recognized File No. E27957. 10 amps @ 125/250 VAC, 75-80% PF ½ HP @ 125 VAC. ¾ HP @ 250 VAC. MIL-S-8805/15 listed units available.

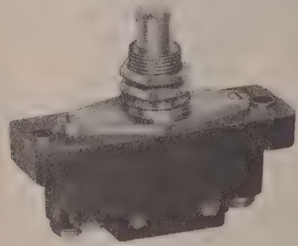
* Within .004″ of plunger travel for units listed.

TYPE 22 10 AMP DOUBLE BREAK

Part Number	Terminal	Circuit
22-104	End Solder	DPDT-DB (Form ZZ)
22-304	Side Solder	DPDT-DB (Form ZZ)
22-202	#4 Screw	DPST-NO (Form XX)
22-204	#4 Screw	DPDT-DB (Form ZZ)
22-504	¼″ Quick Disconnect	DPDT-DB (Form ZZ)

MECHANICAL CHARACTERISTICS

Pretravel	.060 max.	Release Force	4 oz. min.
Overtravel	.015 min.	Movement Differential	.030 ±.009
Operating Force	17 ±5 oz.	Terminals	Solder (side or end), #4 screw ¼″ quick disconnect



TYPE 14

20 Amp, Double-Break Snap-Action Switches

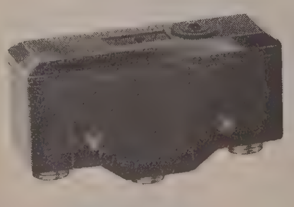
Type 14 switches feature double-break switching mechanisms. They are designed to handle loads up to 20 amps. Type 14 switches are available in standard and heavy duty mounting, with basic button, overtravel button or pivoted lever actuators. Semirefractory contacts and offset #6 screw type terminals with cup washers are standard.

UL Recognized File No. E27957. CSA Certified File No. 16388.

TYPE 14 DOUBLE-BREAK

Part No.	Circuitry	Act. Style	Oper. Force	Release Force	Pre-Travel	Over-Travel	Movmnt. Diff.
14-324	SPDT-DB Form Z	Overtrav. Button	12 ± 3 oz.	4 oz. Min.	.074 Max.	.219 Min.	.020 ± .007
14-124	SPDT-DB Form Z	Standard Button	12 ± 3 oz.	4 oz. Min.	.074 Max.	.030 Min.	.020 ± .007
14-1240	SPDT-DB Form Z	Standard Button	12 ± 3 oz.	4 oz. Min.	.074 Max.	.030 Min.	.020 ± .007
14-724 *	SPDT-DB Form Z	Roller Lever	5 ± 2 oz.	2 oz. Min.	.156 Max.	.060 Min.	.046 ± .012

* **Terminal:** #6 Screw with Cup Washer. **Operating Point:** 1.406 ±.031



TYPE 10

15 Amp, Precision Snap-Action Switches

Type 10 Series Switches for precise operation. This series includes a variety of plunger and lever actuators suited to many industrial applications. Fine silver contacts and a low movement differential are featured. Contact factory for additional information and catalog.

TYPE 10

Part No.	Circuit Form C	Descript.	Oper. Force	Release Force	Pre-Travel	Over-Travel	Movmnt. Diff.
10-1220000	SPDT	#6 Screw	11 ± 4 oz.	4 oz. Min.	.015 Max.	.005 Min.	.0004 to .002
10-3320000	SPDT	#6 Screw & Cup Washer	10 ± 3 oz.	4 oz. Min.	.015 Max.	.219 Min.	.0004 to .002
10-3220000	SPDT	#6 Screw	16 ± 4 oz.	4 oz. Min.	.015 Max.	.219 Min.	.0004 to .002

ELECTRICAL RATINGS

15 amps: (75-80% PF) 0.5 amp	125, 250 VAC 125 VDC	⅓ HP ½ HP	125 VAC 250 VAC

ITW SEALED SWITCHES

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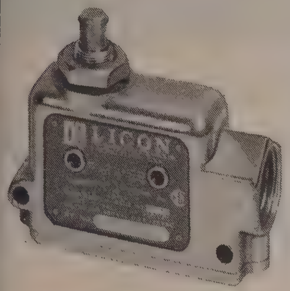
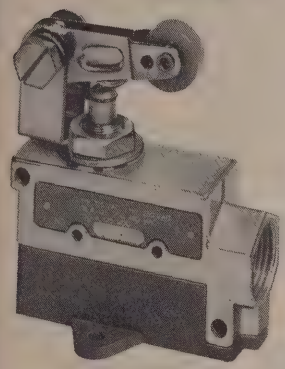




TYPE 30

Metal enclosed industrial limit switches

Licon® Type 30 Switches feature multiple mounting and actuating flexibility. The Type 30 is available with ITW Switches Type 10, Type 11 and Type 22 Basic Switches.

The internal basic switch is accessible for wiring or replacement by removing the bottom plate. Three mounting methods are available.

For additional information on T-30 limit switches, contact the factory or request ITW Switches Catalog #70.

HOW TO ORDER

30— ☐ ☐ ☐☐ ☐ ☐ ☐
1 2 3 4 5 6

1. ACTUATOR
1. Plunger
2. Sealed plunger
3. Roller lever
4. Sealed roller lever
5. Roller plunger
6. Sealed palm button
8. Sealed one-way roller arm
9. One-way roller arm

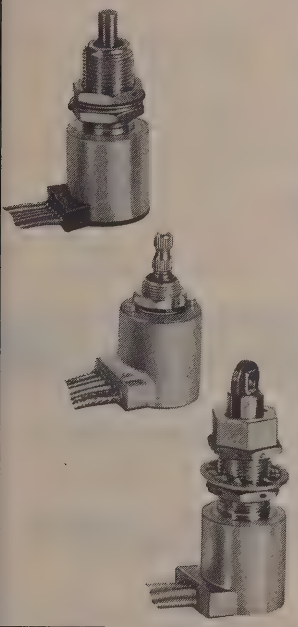
2. HOUSING/MOUNTING
0. Diecast housing, side mount
2. Diecast housing, base mount
3. Special switch
5. Split housing, base mount (Not UL Recognized)

3. SWITCH UNIT & CIRCUIT
00. Type 10 momentary (Form C) .020 gap
02. Type 10 momentary (Form A) .020 gap
12. Type 10 momentary (Form A) .040 gap
32. Type 10 momentary (Form A) .010 gap
54. Type 11 momentary (Form Z)
66. Type 22 momentary (Form CC)
68. Type 22 momentary (Form ZZ)
69. Type 22 momentary (Form XX)
**86. Type 22 maintained (Form CC)
**87. Type 22 maintained (Form YY)
**88. Type 22 maintained (Form ZZ)
**Not available with split housing.

4. PLUNGER SEAL, EXTERNAL
0. No external boot
1. External boot (Not available on 30-5XXX or 30-7XXX switches)

5. CONNECTOR
0. Standard ½-14 straight pipe thread

6. VOLTAGE RATING
0. 15A, 125, 250 VAC; ½HP 250 VAC, ⅓ HP 125 VAC; ½A, 125 VDC for T-10 only, i.e., 30-XX00XXX thru 30-XX42XXX only



TYPE 62 AND 63

Sealed Switches

The Licon Type 63 Series is an environment-free sealed switch designed for rugged duty and to conform to the rigid specications of military and standard designs.

A one piece housing with "O" ring seals at the plunger and epoxy at terminal base provides the true environment free sealing to comply with immersion requirements of MIL-S-8805 Design Symbol #3 and #4.

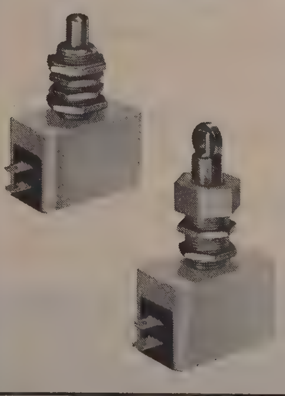
TYPE 62 HERMETICALLY SEALED SWITCHES

The Licon Type 62 Series is a true hermetically sealed environment-free snap-action switch with a maximum leak rate of 1 x 10^{-8} C.C./Sec. This switch enclosure is designed to meet the sealing requirements as defined per MIL-S-8805. Hermetic, design style 5. Ref.: 62-200021 per M8805/80-01.

For additional information on Type 62 or 63 hermetically sealed switches, contact the factory or request ITW Switches Catalog #70.

TYPE 62, 63 SEALED MILITARY APPROVED AND QPL SWITCHES

Licon® Part Number	Military Part Number	Military Spec. & Slash Number
62-200021	M8805/80-01	MIL-S-8805/80 (USAF)
63-210050	MS21321-1	MIL-S-8805/39
63-210055	MS21321-2	
63-210021	MS24331-1	MIL-S-8805/40
63-210029	MS24331-2	
63-210028	MS24331-3	
63-210026	MS24331-4	
63-210155	MS24331-6	
63-210099	MS27240-1	MIL-S-8805/43
63-210098	MS27240-2	
63-710037	MS27240-3	
63-710038	MS27240-4	
63-510031	M8805/85-001	MIL-S-8805/85
63-510058	M8805/85-002	
63-210175	M8805/100-001	MIL-S-8805/100 (USAF)
63-210176	M8805/100-002	
63-210177	M8805/100-003	
63-710085	M8805/100-004	
63-710086	M8805/100-005	
63-710087	M8805/100-006	
63-210178	M8805/100-007	
63-210179	M8805/100-008	
63-710088	M8805/100-009	
63-710089	M8805/100-010	
63-210014	M8805/100-011	
63-210015	M8805/100-012	
63-710009	M8805/100-013	
63-710010	M8805/100-014	
63-210016	M8805/100-015	
63-210017	M8805/100-016	
63-710011	M8805/100-017	
63-710012	M8805/100-018	



TYPE 65

Subminiature sealed switch with up to 15 amp rating

Licon's Type 65 Series offers environment-free snap action switching with ratings up to 15 amps resistive @ 28 VDC. The type 65 conserves design space and provides the ruggedness and reliability to meet the demands of industrial and military applications. Type 65 switches meet the (water-tight) requirements of MIL-S-8805 enclosure design symbol 3. Contact the factory for special requirements in terminals, actuators, basic switches and high temperature requirements or request ITW Switches Catalog #70. 65-230101, 102, 65-330101, 102, 65-430101, 102 are military approved per MIL-S-8805/84.

SUBMINIATURE SEALED SWITCHES ORDERING GUIDE (SOLDER LUG TERMINALS STANDARD)

Part No.	Actuator	Circuitry	P.T.	O.T.	O.F.	R.F.	M.D.
65-1010	Rigid Lever	SPDT-DB Form Z	.120 max.	.025 min.	16 oz. max.	4 oz. min.	.061 max.
65-2010	Pin Plunger	SPDT-DB Form Z	.050 max.	.012 min.	24 ± 8 oz.	8 oz. min.	.010-.030
65-3010	Roller Lever	SPDT-DB Form Z	.120 max.	.025 min.	16 oz. max.	5 oz. min.	.058 max
65-4012	Over Travel	SPDT-DB Form Z	.070 max.	.187 min.	2¼ lb. max.	8 oz. min.	.010-.030 max.

Electrical Ratings: 5A IND — 28 VDC 5A RES — 125, 250 VAC

MINIATURE SEALED SWITCHES ORDERING GUIDE

Part No.	Actuator	Circuitry	P.T.	O.T.	O.F.	R.F.
65-430098	Over Travel	SPDT-DB Form Z	.070 max.	.140 min.	4 lb. max.	1.8 lb. min.
65-430113	Roller	SPDT-DB Form Z	.070 max.	.120 min.	4.5 lb. max.	1.5 lb. min.

Electrical Ratings: 7.5A IND, 15R RES — 28VDC 10A RES — 125, 250 VAC

Series "A" Miniature Rotary Selector Switches

QPL MIL-S-3786
- TOTALLY ENCLOSED
- EXPLOSION PROOF

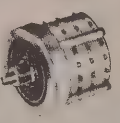
Series A-15 15°

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A15-1 Series	1 pole/deck
A15-2 Series	2 pole/deck
A15-3 Series	3 pole/deck
A15-4 Series	4 pole/deck
A15-6 Series	6 pole/deck

Max. Positions: 24
Body Diameter: 2″

Series A-20 20°

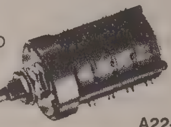


ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

Max. Positions: 18
Body Diameter: 2″

Available only in single pole per deck construction.

Series A-22 22½°

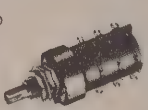


ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A22-1 Series	1 pole/deck
A22-2 Series	2 pole/deck
A22-4 Series	4 pole/deck

Max. Positions: 16
Body Diameter: 1.5″

Series A-30 30°



ELECTRICAL RATING:
2 amps 115 v ac Res.
1 amp 28 v dc Res.
0.5 amp 28 v dc Ind.

A30-1 Series	1 pole/deck
A30-2 Series	2 pole/deck
A30-3 Series	3 pole/deck
A30-4 Series	4 pole/deck
A30-6 Series	6 pole/deck

"M" Series
See MIL-S-3786/4

Max. Positions: 12
Body Diameter: 1.036″

Series A-36 36°

ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

A36-1 Series	1 pole/deck
A36-2 Series	2 pole/deck

"M" Series
See MIL-S-3786/4

Max. Positions: 10
Body Diameter: 1.036″

Series A-45 45°

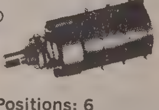
ELECTRICAL RATING:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.

A45-1 Series	1 pole/deck
A45-2 Series	2 pole/deck

"M" Series
See MIL-S-3786/4

Max. Positions: 8
Body Diameter: 1.036″

Series A-60 60°

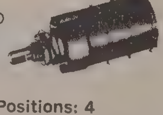


ELECTRICAL RATING:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.

Available only in single pole per deck construction.
"M" Series See MIL-S-3786/4

Max. Positions: 6
Body Diameter: 1.036″

Series A-90 90°



ELECTRICAL RATING:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.

Available only in single pole per deck construction.
"M" Series See MIL-S-3786/4

Max. Positions: 4
Body Diameter: 1.036″

Series	Index
AA30	30°
AA36	36°
AA45	45°

Directly interchangeable with "A" Series above.

ADJUSTABLE STOPS

Max. Positions: AA30-12 AA36-10 AA45-8
Body Dia.: 1.036″ Meets MIL-S-3786

janco CORPORATION

Series "B" Micro-Miniature Rotary Selector Switches

QPL MIL-S-3786

- TOTALLY ENCLOSED
- EXPLOSION PROOF
- UNITIZED CONSTRUCTION

All switches offer maximum protection against radio frequency interference.

Body Diameter: .623″

Electrical Rating Continuous:
8 amps at 28 v dc

Switching Rate:
0 to 0.25 amp resistive
0 to 28 v dc
0 to 0.25 amp resistive
0 to 115 v ac
0 to 0.12 amp inductive
0 to 28 v dc

Torque: 5 to 9″ ounces

Contact Resistance:
.005 ohms average

Insulation Resistance:
100,000 megohms minimum at 100 volts
10,000 megohms minimum at 500 volts

Designed and Built to meet the environmental and functional requirements of MIL-S-3786

Series B-30 30°

B30-1 Series	1 pole/deck
B30-2 Series	2 pole/deck
B30-3 Series	3 pole/deck

"M" Series
See MIL-S-3786/13

Max. Positions: 12
Body Diameter: .623″

Series B-36 36°

B36-1 Series	1 pole/deck
B36-2 Series	2 pole/deck

"M" Series
See MIL-S-3786/13

Max. Positions: 10
Body Diameter: .623″

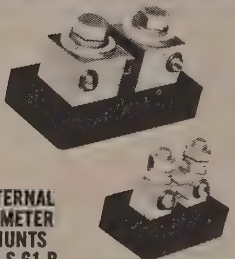
Series B-45 45°

B45-1 Series	1 pole/deck
B45-2 Series	2 pole/deck

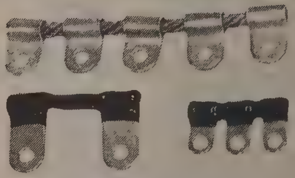
"M" Series
See MIL-S-3786/13

Max. Positions: 8
Body Diameter: .623″

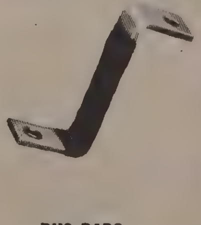
ELECTRICAL HARDWARE PRODUCTS FOR AIRCRAFT



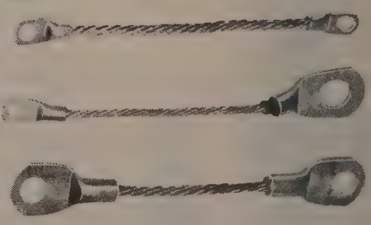
EXTERNAL AMMETER SHUNTS MIL-S-61-B



FLEXIBLE BUS ASSEMBLIES



BUS BARS

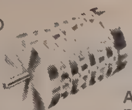


BONDING JUMPERS

JANCO CORPORATION
Box 3038 • 3111 Winona Ave., Burbank, CA 91504 • (818) 846-1800 • TWX 910-498-2701

Series "C" Rotary Selector Switches

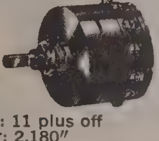
Series C-22 **22½°**



Max. Positions: 16
Body Diameter: 3″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available only in single pole per deck construction.
Screw terminals only.

Series C-30 **30°**



Max. Positions: 11 plus off
Body Diameter: 2.180″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
C30-1 Series 1 pole/deck
C30-3 Series 3 pole/deck
Screw terminals only.

Series C-36 **36°**

Max. Positions: 9 plus off
Body Diameter: 2.375″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
Available only in single pole per deck construction.
Screw terminals only.

Series C-45 **45°**

Max. Positions: 7 plus off
Body Diameter: 1.93″

ELECTRICAL RATING:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
5 amps 28 v dc Ind.
C45-1 Series 1 pole/deck
C45-2 Series 2 pole/deck
Screw terminals only.

Series C-90 **90°**

Max. Positions: 4
Body Diameter: 2.12″
Screw terminals only.

ELECTRICAL RATING:
1 pole construction:
15 amps Res. 115 v ac
15 amps Res. 28 v dc
10 amps Ind. 28 v dc
2 pole construction
7.5 amps Res. 115 v ac
7.5 amps Res. 28 v dc
5 amps Ind. 28 v dc
C90-1 Series 1pole/deck
C90-2 Series 2 pole/deck

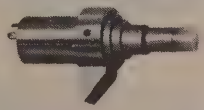
GENERAL SPECIFICATIONS

All switches offer maximum protection against radio frequency interference.
ELECTRICAL RATING:
Carry 10 amps continuous.
Make and Break — see individual switch data.
VOLTAGE DROP:
0.1 volt or less at rated amperage.
Initial Contact Resistance: .003 ohm.
LIFE:
10,000 double cycles make and break rated amperage.
TORQUE:
1 to 3 inch lbs.
SWITCHES DESIGNED AND BUILT IN ACCORDANCE WITH THE FOLLOWING SPECS.:
MIL-S-6807 (rotary switches enclosed)
MIL-S-3786 (rotary switches)
MIL-E-5272 (environmental testing)

ON MOST OF THE SWITCHES LISTED, THE FOLLOWING FEATURES ARE AVAILABLE:

- O-ring Shaft and Panel Seal
- Combination of Decks
- Bridging contacts
- Momentary positions
- Isolated positions
- Adjustable stops
- Solenoid driven
- Keylock
- Gang switches
- Concentric shaft switches

TYPICAL UNIQUE APPLICATIONS OF JANCO ROTARY SWITCHES



DOUBLE MOMENTARY ACTION

Push button switch designed for grip stick applications. Actuation to first momentary detented position closes first circuit. Second detented position completes second circuit.

FEATURES UNIQUE ON-OFF OPERATION

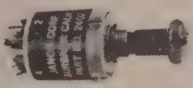
Actuated by pulling knob out and rotating to "on" positions. While in "on" positions, circuitry cannot be shut off until knob is returned to "off" position and depressed.

MASTER COMMUNICATIONS SWITCH

Provides standard coded outputs and offers unique switching functions by longitudinal shaft movement. Momentary or maintained contact positions actuated by pulling shaft.

JET ENGINE START SWITCH

Knob is depressed and contacts are held in by the solenoid. After jet engine reaches desired RPM, system removes power disengaging solenoid. Lighted knob indicates function.



Janco CORPORATION **Since 1947**

Series "D" Pushbutton Rotary Switches

QPL MIL-S-22710

FEATURES: • Totally enclosed, explosion proof. • Printed-circuit construction. • Black or white numbers on black or white background indicate switch positions (black numbers on white background for lighted switches). • All standard codes available. Available in 8, 10, 12 or 16 positions. • Plastic covered buttons, available in black, red, green, yellow, white or blue.

	Series	Indexing	No. of Positions
	D45U	45°	8
	D36U	36°	10
	D30U	30°	12
	D22B	22½°	16
	D22U		
	D45B	45°	8
	D36B	36°	10
	D30B	30°	12
	DA45U	45°	8
	DA36U	36°	10
	DA30U	30°	12

MAKE AND BREAK
.125 amp res. at 28 v dc and 115 v ac
.05 amp ind. at 28 vdc

PUSH FORCE:
55 oz. max.

CONTACT RESISTANCE:
Initial .100 ohms
After life .160 ohms

LIFE:
50,000 cycles
Cycle consists of 720° rotation

INSULATION RESISTANCE:
5,000 megohms

ALTITUDE:
70,000 ft.

TEMPERATURE RANGE:
−65°C to +85°C

PLUNGER TRAVEL:
.180 approx.

DIELECTRIC STRENGTH:
750 volts RMS

WEIGHT:
½ oz. approx.

Series "E" Rotary Selector Switches PRINTED CIRCUIT

	Series	Indexing	No. of Positions
 MINIATURE	EA45	45°	8
	EA36	36°	10
	EA30	30°	12
	EA22	22°	16
 MICRO-MINIATURE	EB45	45°	8
	EB36	36°	10
	EB30	30°	12
 MINIATURE	EC45	45°	8
	EC36	36°	10
	EC30	30°	12
	EC22	22°	16
	EC18	18°	20
	EC15	15°	24

- Totally enclosed, explosion proof.
- Printed circuit construction.
- Make and break:
  .125 amp Res. @ 28 v dc
  .125 amp Res. @ 115 v ac
  .05 amp Ind. @ 28 v dc
- All standard codes available.
- Current carrying capacity, 3 amps continuous.
- Will meet or exceed the environmental requirements of MIL-S-3786 and MIL-S-22710.

JANCO CORPORATION
Box 3038 • 3111 Winona Ave., Burbank, CA 91504 • (818) 846-1800 • TWX 910-498-2701

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms .... **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code .... **3**•1103
Batteries, Product Selection Guide .... **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide .... **2**•1003
Capacitors, Basic Formulas .... **1A**•1093
Capacitors, Miniglossary .... **1A**•1069
Capacitors, Product Selection Guide .... **1A**•1003
Circuit Boards (Printed), Product Selection Guide .... **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide .... **1A**•1219
Connectors, Miniglossary .... **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide .... **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide .... **1A**•1309
Delay Lines, Product Selection Guide .... **1A**•1445
Discrete Semiconductors, Product Selection Guide .... **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide .... **1B**•1021
EBCDIC Code .... **3**•1153
Encapsulation, Miniglossary .... **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide .... **2**•1801
Filters, Product Selection Guide .... **1A**•1577
Instruments, Graphic Recording, Product Selection Guide .... **3**•1381
Instruments, Panel Meters, Product Selection Guide .... **3**•1321
Instruments, Test & Measuring, Product Selection Guide .... **3**•1182
Interconnection Systems, Product Selection Guide .... **2**•1873
Keyboards & Keypads, Product Selection Guide .... **1B**•1759
Microwave Components, Product Selection Guide .... **1A**•1685
Military Qualified Products Lists .... **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide .... **1B**•1121
Opto Semiconductors, Miniglossary .... **1B**•1218
Oscilloscopes, Product Selection Guide .... **3**•1361
Panel Hardware, Product Selection Guide .... **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide .... **1A**•2017
Power Supplies, Miniglossary .... **3**•1455
Power Supplies, AC, Product Selection Guide .... **3**•1815
Power Supplies, DC, Product Selection Guide .... **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide .... **1B**•1255
Relay Contact Forms .... **1B**•1317
Relays, Electromechanical, Miniglossary .... **1•B**1292
Relays, Product Selection Guide .... **1B**•1289
Resistor Color Codes .... **1A**•1791
Resistors, Product Selection Guide .... **1A**•1789
Servo Components, Miniglossary .... **3**•1935
Solenoids, Product Selection Guide .... **1B**•1481
Switches, Product Selection Guide .... **1B**•1499
Thyristors/High Power Diodes, Miniglossary .... **1A**•1652
Transducers & Encoders, Product Selection Guide .... **1B**•1827
Transformers, Product Selection Guide .... **1A**•2115
Wire & Cable, Product Selection Guide .... **2**•1935

JUD·CO P.O. BOX 487-E84 24030 FRAMPTON AVENUE, HARBOR CITY, CALIF. 90710 (213) 534-0959

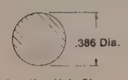
PUSHBUTTON SWITCHES

Presenting a varied line of smooth operating and low cost miniature pushbutton switches that will fit most any electrical/electronic applications. Numerous styles and colors of button caps, insulating boots, mounting nuts and related hardware are also available.
Contact materials can also be tailored to meet applications demands.
Consult JUDCO for assistance to meet your specific requirements.

ELECTRICAL RATINGS: 125 VAC 3 Amps Inductive 2A-L, 14 VDC 4 Amps. (UL File No. E70679, Switch Codes 1, 2 & 3 only). Other ratings are also available.
Dielectric Strength: 1000 VRMS

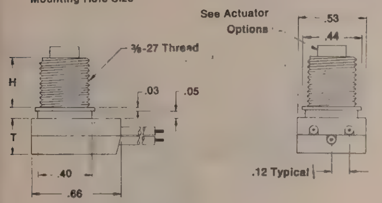
ELECTRICAL LIFE: Tested to suit requirements. **MECHANICAL LIFE:** 250,000 cycles.

SWITCH BODY STYLES



Mounting Hole Size

Body Style	H Dim.
A	.35
B	.12


See Actuator Options
⅜-27 Thread
H
T
.03
.05
.40
.66
.53
.44
.12 Typical

T dimension available in .27 or .31

Note: All dimensions in inches.

SWITCH FUNCTIONS

Code	Description
1	On-Off SPST
2	Normally Open
2S	Normally Open (Overtravel)
3	Normally Closed
4	On-On SPDT
5	3 Way (Off-On 1-Off-On 2)
6	Normally Open, Normally Closed
7	4-Way (On 1-On 1 & 2-On 2)

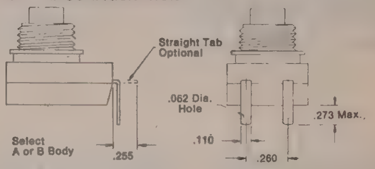
Molded Materials (Body & Actuator)
Acetal, Polyester, Nylon or others. Consult JUDCO.

Standard Colors:
Body: Black/White
Actuator: Black/White/Red
Consult JUDCO for other colors.

TERMINALS & LEADS

- Wire leads. Specify wire size (#22 thru #18 AWG), colors, length and strip.
- PCB solder tabs/quick connects.
- Consult JUDCO for other terminal requirements.

PCB TAB CONFIGURATION


Straight Tab Optional
.062 Dia. Hole
.273 Max.
Select A or B Body
.255
.110
.260

ACTUATOR STYLES

Style	Fig.	Body	D Dia.	L1	L2
P1	1	A	—	.17	—
		B	—	.14	—
P2	1	A	—	.28	—
		B	—	—	—
P3	2	A	.120	—	.30
		B	.120	—	.26
P4	2	A	.183	—	.28
		B	.183	—	.27

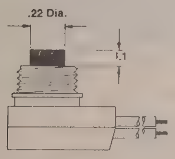


FIG. 1

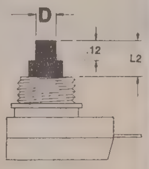
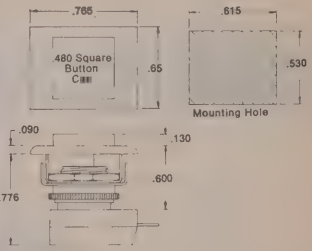


FIG. 2

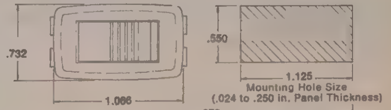
SNAP-IN PANEL MOUNTED SWITCHES


.765
.480 Square Button Cap
.65
.615
.530
Mounting Hole
.090
.130
.600
.776

ROCKER SWITCHES

A line of highly versatile and low cost snap-in mounted rocker switches. Possible applications include automotive, appliances, games & toys, instrumentation, motors, power tools, audio components and other electrical/electronic switching needs. Housing and actuators are molded of UL 94V-2 nylon.

ELECTRICAL RATINGS: Up to 16A at 125VAC, 10A at 250VAC and 8A Tungsten Filament Load at 125VAC. DC and other ratings also available.
Dielectric Withstand Voltage: 1500 VRMS.
Insulation Resistance: 1000 Megohms


.732
1.066
.550
1.125

Mounting Hole Size
(.024 to .250 in. Panel Thickness)

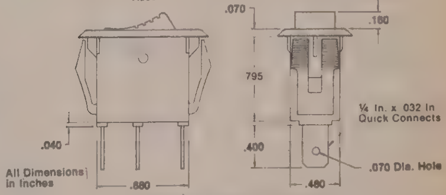
SWITCH FUNCTIONS

NON-LIGHTED SWITCHES

SPST	2 Positions	On	Off
SPDT	2 Positions	On	On
SPDT	3 Positions	On Off	On
SPST	Momentary	Normally On	
SPST	Momentary	Normally Off	

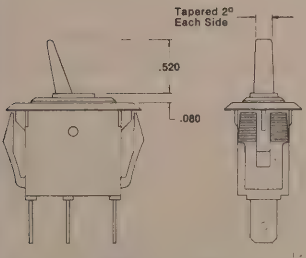
LIGHTED SWITCHES

SPST	2 Positions	On	Off
SPST	Momentary	Normally On	
Lamp Voltages: Incandescent 6V, 12V or 28V Neon 125 or 250V			

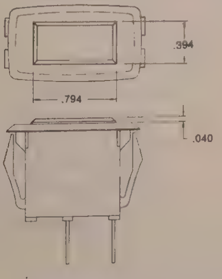

.070
.180
795
¼ In. x 032 In Quick Connects
.040
.400
.070 Dia. Hole
.680
.480

All Dimensions in Inches

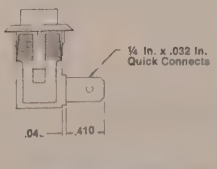
STANDARD CONFIGURATION


Tapered 2° Each Side
.520
.080

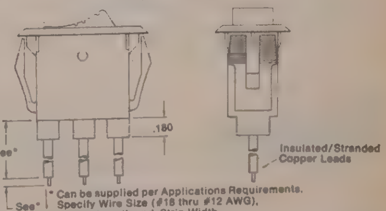
TOGGLE ACTUATOR



INDICATOR LIGHT

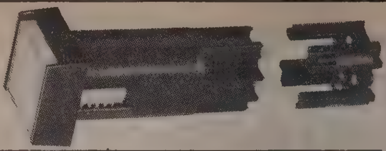

¼ In. x .032 In. Quick Connects
.04
.410

SIDE TERMINALS


.180
See*
See*
Insulated/Stranded Copper Leads

* Can be supplied per Applications Requirements. Specify Wire Size (#18 thru #12 AWG), Colors, Length and Strip Width.

LEAD TERMINALS



Series 75 Switches by Rafi*

Also available in watertight version.

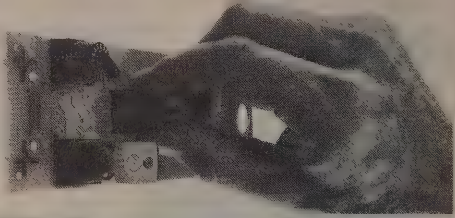
Switch	Series 75-SL	Series 75-SL (watertight)	Series 75-PC	Series 75-PC (watertight)
Housing with bezel	Makrolon	Durethan BKV	Makrolon	Durethan BKV
Contact enclosure	Thermosetting plastic	Thermosetting plastic	Durethan BKV	Thermosetting plastic
Outer lens	Makrolon	Makrolon	Makrolon	Makrolon
Key lock	Cylinder lock with 4 operating positions and 3 keys		Cylinder lock with 4 operating positions and 3 keys	
Operating stroke	2.5 mm (.1″)	2.5 mm (.1″)	2.5 mm (.1″)	2.5 mm (.1″)
Operating force	3 to 5 N (10.8 oz. to 18 oz.) max.	3 to 6.5 N (650p) (10.8 to 23.4 oz.)	3 N (10.8 oz.)	3 N (10.8 oz.)
Contacts	Spring-loaded silver contacts, non-shorting		Self-cleaning bridging contact, 5μ gold plated	Self-cleaning bridging contact, 8μ gold plated
Life (mechanical)	Momentary $>2 \times 10^6$ Push-Push $>1 \times 10^6$		Momentary $>2 \times 10^7$ Push-Push $>1 \times 10^6$	
Switching	4 amps at 250 VAC		250 mA @ 50 VAC or DC	
Weight	.53 oz. max. (lockable latching pushbutton 1.4 oz. max.)		.53 oz. max.	

For detailed specifications, order Catalog PB-5507.

Series RF 15/19 Flat Panel Switches by Rafi*

Housing	Actuator Cap	Reflector	Lens	Spring Contact	Fixed Contact	Voltage max.	Current max.
PBT (Pocan)	Polycarbonate (Makrolon)	PBT (Pocan)	PMMA (Resarit)	Au Model X 12 Cr Ni 177 $1.5\,\mu$ Au (contact material); Connection material 4… $8\,\mu$ Sn Pb 60/40; Ag model X 12 Cr Ni 177 $5\,\mu$ Ag (contact material); Connection material 4… $8\,\mu$ Ag	Cu Zn 28 F 43, $2\,\mu$ Ni, μ Au (contact material); Connection material 4… $8\,\mu$ Sn Pb 60/40; Ag Model Cu Zn 28 F 43, $2\,\mu$ Ni, $5\,\mu$ Au (contact material), Connection material $0.5\,\mu$ Ag	42 V⎓Au 60 V Ag	100 mA⎓Au 250 mA Ag

For further information, order Catalog 1519.



Series 74/76 Switches by Rafi*

Type	Housing	Base	Terminals	Contact	Load max.	Operating positions	Lock	Locking positions	Life
Rotary	Novodur	Pocan B 3235	(for PC board) 0.5x0.7mm (.020x.028″) 0.15x0.7mm (.006x.028″)	$> 5\mu$ Au Ag 10 on nickel	42 V 100 mA	max. 4			50,000 operations
Binary Selector	Novodur	Pocan B 3235	(for PC board) 0.8x0.2mm (0.031x.008″)	$> 5\mu$ Au Ag 26 Ni 3 self cleaning	42 V 100 mA	16			10,000 operations
Keylock	Novodur	Pocan B 3235	(for PC board) 0.5x0.7mm (.020x.028″) 0.15x0.7mm (.006x.028″)	50 m Ω silver 40 m Ω gold	42 V 100 mA	max. 4	cyl. key with pin tumblers and 2 keys	3 std.	50,000 operations

For further information, write for Bulletins 74/76.

LEDEX®

Ledex Inc.
P.O. Box 427
Vandalia, Ohio 45377-0427 U.S.A.

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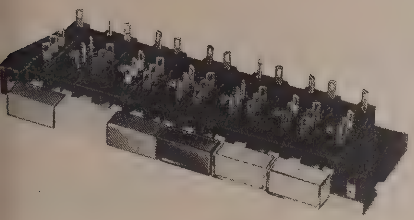
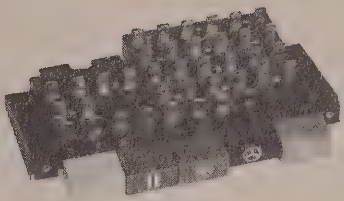
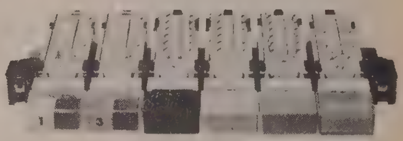
Pushbutton Switches by Rafi*

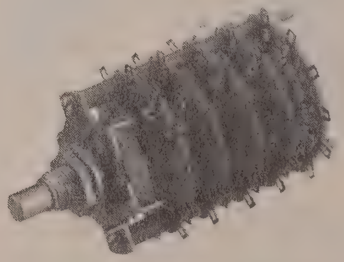






Series	Cap Size	Legend	Function	Cap Colors	Switching per module	Module capacity	Rating	Contact material	Terminals	Illumination
1400	⅜" x ¾" ¾" x ¾"	Hot stamp Engraved Film inserts	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear	2P 2T Non-shorting	1-20 per frame	4A/125 VAC 2A/250 VAC	Silver (std.) Gold (opt.)	Solder or PC	6,12,24V lamps
1500	.49" x .97"	Hot stamp Engraved	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear	1NO 3NC thru 4NO 1NC Non-shorting	1-15 per frame	16A/250 VAC	Silver plated Brass	Spade	Nonilluminated
1800	⅜" x ¾"	Hot stamp Engraved Film inserts	Momentary Push/push Reciprocal release Master release Reciprocal + master release Interlock	Red, yellow, green, blue, black, gray, white, clear, split screens	Lo-level to 4P 2T Hi-level to 1NO 2NC	1-20 per frame	10mA/5 VDC 6A/250 VAC	Silver plated Brass	Solder or PC	2,12,24V lamps Single or dual

For more information, write for Bulletins PB-5501, PB-5503, and PB-5505.



Rotary Manual Switches

Series	206	208	210	212	304	306	312	404	406	412	504	506	512	524
Poles—throws per deck	6P60°T	8P45°T	10P36°T	12P30°T	4P90°T	6P60°T	12P30°T	4P90°T	6P60°T	12P30°T	4P90°T	6P60°T	12P30°T	24P15°T
Combinations	6	4	5	6	2	6	6	2	6	7	2	6	7	8
Contact ratings	Brass, Silver plated		Solid Silver					Brass, Silver plated		Solid Silver				
Make/break	.5A/28VDC .25/110VAC		1A/28VDC .5A/110VAC					1A/28VDC .5A/110VAC		2A/28VDC 1A/110VAC				
Carry	5A		5A					5A		5A				
Dielectric	750 volts, contact to contact							1000 volts, contact to contact 500 volts when contacts are insulated back to back						

For more information, write for Catalog MS-5200.

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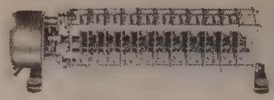
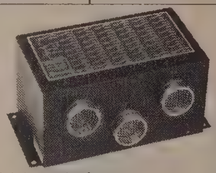
Stepping Switches (Stock Models)



Specifications

Electrical positions	4	6	8	10	10	12	12
Poles—throws per deck	3P4T	2P6T	3P8T	1P10T	2P10T	1P12T	1P12T
No. of load decks	4	5	2	7	4	5	9
Control deck Additional circuit on control deck	notch 1P4T	notch 1P6T	notch 1P8T	notch	notch	notch	notch
Total Circuitry	13P4T	11P6T	7P8T	7P10T	8P10T	5P12T	9P12T
Carry amperes, res. max.	5	5	5	5	5	5	10
Break amp. res. max @ 28 VDC (@120 VDC)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	2.5 (0.5)	5 (1)
Dielectric, clip-to-clip, VRMS Insulated back-to-back clips	1000 500	1000 500	1000 500	1000 500	1000 500	1000 500	1000 500
Coil to case dielectric	1200 VRMS	1200 VRMS	1200 VRMS	1200 VRMS	1200 VRMS	1000 VRMS	1200 VRMS
Weight	6 oz.	6½ oz.	1 lb. 4 oz.	1 lb. 5 oz.	1 lb. 4½ oz.	7 oz.	1 lb. 4 oz.

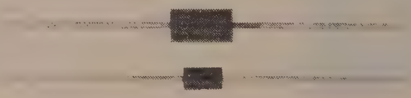
For more information, write for Catalog S-2001.

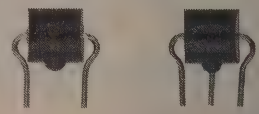


Packaged Switches (Stock Models)

Poles—throws per deck	5P2T	13P2T	18P2T	22P2T	26P2T	35P2T	40P2T
Operating Voltage	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC	28 VDC
Current @ rated coil voltage	2.5 amps	2.5 amps	3.5 amps	3.5 amps	4.9 amps	5 amps	3.6 amps
Coil Duty Cycle	1/10	1/10	1/10	1/10	1/10	1/10	1/4
Dielectric strength (VRMS) coil	1000	1000	1200	1200	1200	1200	1200
Coil resistance @ 20°C (Ohms ±5%)	11.03	11.03	8.02	8.02	5.67	5.67	7.72
Dielectric strengths (VRMS) decks	500	500	500	500	1000	500	500
Circuit deck ratings Carry amps resistive, max. Break amps, resistive, @ 28 VDC (@ 120 VAC)	 5 1 (.5)	 5 1 (.5)	 5 2 (1)	 5 2 (1)	 5 2 (1)	 5 2 (1)	 5 2 (1)
Weight	10 oz. max.	1 lb. max.	1 lb. 8 oz. max.	1 lb. 15 oz. max.	2 lb. 14 oz. max.	2 lb. 8 oz. max.	3 lb. 8 oz. max.

For more information, write for Catalog PS-3200.





Lucas Surge Suppressors

Series Data

Specific Device Data

Device Series	V_{BR} range (V)	P_{RSM} max. for $t_p = 0.7$ms (kW)	I_R max. @ V_{RSO} (μA)	Device	V_{BR} typ. (V)	V_{RSM} max. (kV) 1.2/50μs o.c. wave	100/700μs o.c. wave	I_{RSM} max. (A) 8/20μs s.c. wave	1/1000μs s.c. wave	Energy max. (J) 10/700μs o.c. wave	10/1000μs s.c. wave
ZP1000 CP1000 FP1000	10-1500 10-40 40-200	1	10	ZP1020	20	6	1.5			0.35	
ZP2000 CP2000 FP2000	10-1500 10-200 40-200	3	10	FP2065 FP2140	65 140	6 6	1.5 1.5			1.8 2.5	
ZP3000 CP3000 FP3000	10-1500 10-200 40-200	15	10	FP3140	140	12	5	1000	125	6.5	
DFP000	40-200	15	10	DFP140	140	12	5	1000	125	6.5	

For more information, write for Surge Suppressors.

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MARQUARDT

INTERNATIONAL APPROVALS

DVE D N S S KEMA EUR OVE UND.LAB. INC. LIST. SA

1800 SERIES...A COMPLETE FAMILY ROCKER • TOGGLE • PUSH BUTTON

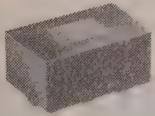
Midget switches, high quality matte finish ideal for electronic & instrumentation equipment available lighted and unlighted, in many color combinations, in 110 or 220 V bulb, 3 position and momentary.

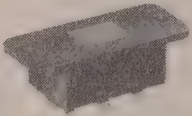
6 (4) A 250V~
10 (4) A 250V~ SPST; SPDT; DPST; DPDT

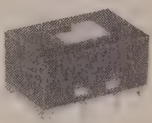
LINE VOLTAGE SELECTOR SWITCHES 4021 SERIES

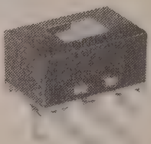
5A 250V AC
10A 125V AC

SPST SPDT DPDT 4PDT









ROCKER SWITCHES, 1600 SERIES

LIGHTED AND NON-LIGHTED

16(3)A 250V AC

3 POSITION AND MOMENTARY AVAILABLE

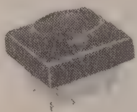
SPST; SPDT; DPST; DPDT

KEYBOARD SWITCHES

100mA 28V DC

Available with or without incandescent bulbs, with or without LED's; in alpha-numeric and special lettering; various colors.
Available with click to DIN specs; special modules to your specifications.

6450 SERIES



6400 SERIES

6430 SERIES

6150 SERIES

SWITCHES WITH INTERNATIONAL APPROVALS*

Please call us for further details on the above products or for any of your switch requirements.

Marquardt Switches produces the finest quality electrical/mechanical switches in the world. Our worldwide marketing and production capability means greater design and engineering flexibility. Rocker, slide, line voltage, push button, toggle, keyboard, micro, tool handle, and variable speed switches are ready to meet your design requirements. For guaranteed performance, durability and precision specify Marquardt. Write for the complete catalog to Marquardt Switches Inc., Cazenovia, New York 13035.

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67 ALBANY STREET
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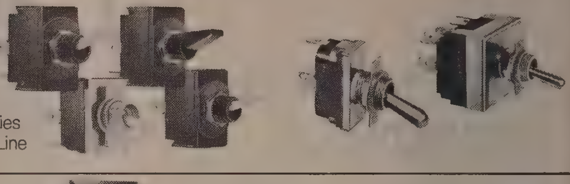
TEL: (315) 655-8050 /TWX: 710-541-1530

SPECIFY McGILL SWITCHES FOR RELIABILITY AND STYLE

toggle

Featuring **0151 Designer Line** toggle switches with your choice of lighted or unlighted bat caps in four different designer-styled configurations. Black, white and red caps standard. Special colors available. Die-cast zinc or plastic cover-plates. 15A, 125-250-277V AC; ¾ HP, 125-250V AC. DPST, DPDT circuitry. Other toggle switch series include 6 to 20A ratings in SP, DP, 3-pole and 4-pole models. Spade, screw or solder terminals. U.L. Listed. C.S.A. Approved.


0151 Series
Designer Line

rocker and paddle

Lighted rockers with fully illuminated separable caps or one or two lenses in a broad selection of colors are features of **0851 Series Rocker Switches.** 15A, 277V AC and 6A, 125V AC models in both SP and DP circuitry. Snap-in mounting for fast installation. Other McGill rocker and paddle switches include: **0801 SP and 0811 DP Series**—20A, 277V AC, 1½ HP 125-250V AC; **1801 SP and 1811 DP Series**—6A, 125V AC, 3A 250V AC, ¼ HP 125-250V AC; **0840 3-pole and 4-pole Series**—17A, 277V AC; 6A, 600V AC, 1 HP 125V AC, 2 HP 250-480-600V AC; 1, 2, or 3 phase. U.L. Listed. C.S.A. Approved.

0851 Series Lighted

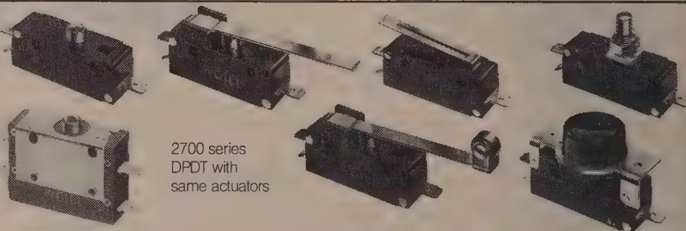
miniature rocker and paddle

0815 Series provides choice of **lighted** or **unlighted** rockers. 6 standard colors for lighted models, 3 for non-lighted. Plastic snap-in bezels, ¼" spade terminals. Ratings—12A, 125V AC, ½ HP 125-250V AC. Other series: **0805** has same electrical ratings as 0815 but in non-lighted models only. Bracket mounting and metal bezel standard. Plastic bezel and snap-in mounting optional. Rocker or paddle actuators. **0806 Series** has neon indicator light adjacent to rocker. Same ratings as 0815 and 0805 series. U.L. Listed. C.S.A. Approved.

0815 Series Lighted

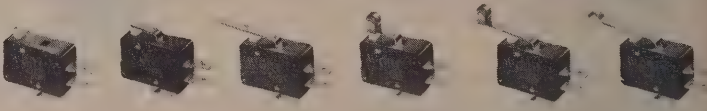
snap-action

High reliability through design simplicity. Fewer parts to wear—minimum spring flexing increases life. No coil springs. Less than .005" differential travel. SPDT, SPST. **2600 Series**—20A, 125-250V AC; 1 HP 125V AC; 2 HP 250V AC; 50/60 Hz. **2650 Series**—25A, 125-250V AC; 1½ HP 125V AC; 2 HP 250V AC. Operating force: 20 oz. max. **1600 Series**—Light operating force—10 oz. max. 15A 125-250V AC; ¾ HP 125V AC; 1½ HP 250V AC. Also available as **2700 Series** in DPDT models with same actuators and rated: 20A, 125-250V AC, 2 HP 250V AC, 50/60 Hz. U.L. Listed. C.S.A. Approved.


2700 series
DPDT with
same actuators

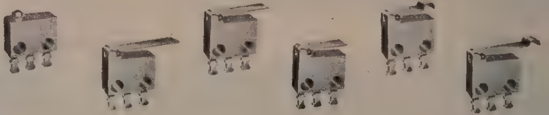
miniature snap-action

$1\frac{3}{32}$" x ⅝" x $\frac{13}{32}$" case. Oversize silver contacts. Excellent wiping action and low contact bounce. SPDT, SPST. **4600 Series**—6–14 oz. max. operating force. 15A, ½ HP 125-250V AC; ½A 125V DC, ¼A 250V DC; 4A "L" 125V AC. **4700 Series**—Light operating force—8 oz. and 75 gram max. 10A, ⅓ HP, 125-250V AC; 4A "L" 125V AC. U.L. Listed. C.S.A. Approved. **4613 Series** meets requirements for TV fire protection.


4775 Series with exclusive rolling cam design. An engineering breakthrough in light force switches that produces 150,000,000 cycle reliability, 1.5 millsec contact bounce, contact force that exceeds 50% of operating force.

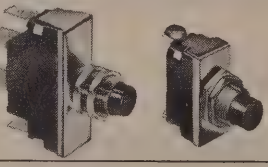
sub-miniature snap-action

4900 Series—smallest precision snap-action switches available. Case dimensions less than .250" x .300" x .100". Choice of contacts, terminals and actuators. SPDT, 2A 125-250V AC; 2A (Res.) 30V DC; 1A (Ind.) 30V DC. Meet MIL-S-8805 specifications. Temp. range −100° F to +185° F. Up to 250° F continuous duty temp. ratings available.



push button

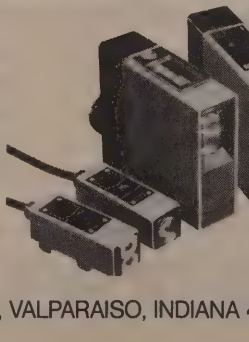
Momentary and maintained contact push-button switches up to 30A. Variety of mechanisms, including snap-action, SPST, SPDT, 2-circuit. U.L. Listed.



MODIFICATIONS OF BASIC SWITCHES
TO MEET APPLICATION REQUIREMENTS ALSO AVAILABLE

photoelectric sensors

Revolutionary integrated circuits eliminate separate plug-in modules or cards for performing optional functions. Time delay, normal and inverted logic, timing and sensitivity-adjustment circuitry are built into sensor. Operates on practically any AC or DC power source. **5000 Series**—Transmission and reflection types with built-in power supplies and relays. **4000 Series also available**—Transmission and reflecting types with built-in amplifiers.



Request Catalogs 89, 1720 and Bulletin C280 for complete specifications.

McGILL®
ENGINEERED SWITCHES

McGILL MANUFACTURING CO., INC., ELECTRICAL DIVISION, VALPARAISO, INDIANA 46383 PHONE: (219) 465-2200

MEI T-5 SERIES LIGHTED KEYSWITCHES

DESCRIPTION

The T-5 lighted keyboard switch has long life (greater than 10 million cycles), low bounce, gold-plated cross bar contacts usually found in more expensive switches.

Mechanically, the T-5 switch incorporates precision tracking surfaces providing a smooth "feel" throughout its .170 travel. Each switch has two alignment studs and four to six solder points. This makes hand or wave soldered PC board assemblies extremely rugged for the most demanding applications, while keeping the manufacturing costs down by eliminating the need for metal mounting frames.

Electrical configurations include normally open, normally closed, double pole normally open, and alternate action. MEI stocks a 5V, 60 milliamp, 100,000 hour bulb for these switches. Lamp terminal spacing is .100 inch, to fit T-1 size lamps which can be changed from the front panel by end users. Lenses are stocked in eight colors.

SPECIFICATIONS

CONTACT RATING, DC RESISTIVE: 3W max.

VOLTAGE: 24V max.

INITIAL CONTACT RESISTANCE: 100 mΩ max.

PLUNGER TRAVEL: .170 ±.010 in.

PRE-TRAVEL: .080 ±.030 in.

OPERATING FORCE
  SINGLE POLE, MOMENTARY: 3.5 ±0.5 oz.
  DOUBLE POLE AND/OR ALT. ACTION: 6.0 ±0.5 oz.

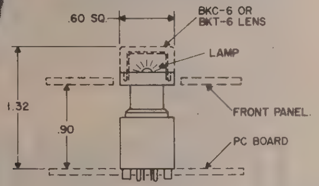
TEMPERATURE
  OPERATING: −25°C to +65°C
  STORAGE: −40°C to +70°C

CONTACT BOUNCE: 4 ms max.

MIN. ACTUATIONS, @ 5V, 100μ AMPS: 10 x 10^6

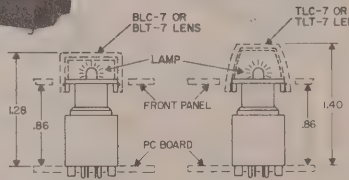
T-5K With Box Lens

- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED
- FOR ⅝″ CENTER MOUNTING


.60 SQ.
BKC-6 OR BKT-6 LENS
LAMP
1.32
.90
FRONT PANEL.
PC BOARD

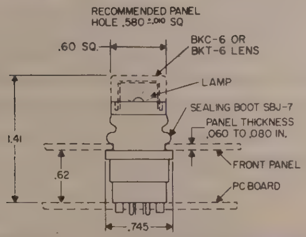
T-5L With Box Lens or Truncated Lens

- FOR ¾″ CENTER MOUNTING
- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED


BLC-7 OR BLT-7 LENS
TLC-7 OR TLT-7 LENS
LAMP
1.28
.86
FRONT PANEL
PC BOARD
.86
1.40

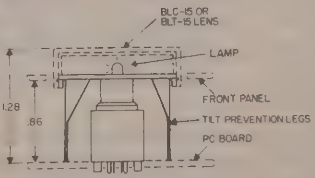
T-5J With Panel Sealing Boot and Box Lens

- ENVIRONMENTALLY SEALED ABOVE AND BELOW MOUNTING PANEL
- VINYL BOOT SEALS AGAINST LIQUID AND DUST
- FOR ¾″ CENTER MOUNTING
- LIGHTED WITH T-1 BI-PIN LAMP, SOCKETED


RECOMMENDED PANEL HOLE .580 ±.010 SQ
.60 SQ.
BKC-6 OR BKT-6 LENS
LAMP
SEALING BOOT SBJ-7
PANEL THICKNESS .060 TO .080 IN.
1.41
.62
FRONT PANEL
PC BOARD
.745

T-5Y With Double Width Box Lens

- LIGHTED WITH T1 BI-PIN LAMP SOCKETED
- OCCUPIES SPACE OF TWO T-5L W/BOX LENS


BLC-15 OR BLT-15 LENS
LAMP
1.28
.86
FRONT PANEL
TILT PREVENTION LEGS
PC BOARD

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MICRO SWITCH

TABLE OF CONTENTS

The products described in the following pages are representative of the thousands of position sensing and manual control products manufactured and distributed by MICRO SWITCH. For comprehensive catalogs write MICRO SWITCH, Freeport, Illinois 61032, Dept. 720E. Or, call (815) 235-6600. For application assistance, contact a nearby MICRO SWITCH Sales Office. See listing in this Directory. For off-the-shelf products, see your local MICRO SWITCH Authorized Distributor listed on pages 43 & 44.

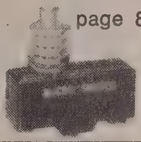
POSITION SENSORS

Hall effect position sensors
Hall effect sensors are operated by the magnetic flux from a permanent magnet or an electromagnet. The sensing element is a Hall sensor with a trigger and amplifier integrated on a silicon chip. These integrated circuits have been performance tested to over 19 billion operations. Operating speeds can exceed 100 kHz.

5SS .... page 2
6SS .... page 2
8SS .... page 2
9SS Linear output sensor .... page 3
SR threaded sensors .... page 3
AV vane sensors — MG magnets .... page 4
Application information .... page 5

VX solid state switches page 7
VX mechanically operated Hall effect switches combine mechanical switch operating and mounting convenience with solid state reliability. The mounting dimensions and mechanical characteristics are similar to the popular V3 snap-action switch.

Z and A standard switches page 8
Standard size switches. Ratings to 25 amps. High precision-long life. Wide choice of actuators and terminals. Use for general purpose applications.



SX subminiature switches page 11
Smallest snap-action switches from MICRO SWITCH. Rated to 7 amperes. Choice of actuators and terminal styles. Use where the smallest and least weight, snap acting switch is essential.

SM subminiature switches page 13
Slightly larger than SX switches. Rated to 11 amperes. Choice of contacts, actuators and terminal styles. Use for communications/office equipment and other smaller application needs.

V3 miniature switches page 15
Standard or low operating forces. Rated to 15 amperes. Use for appliance-vending machine and similar applications.

MANUAL SWITCHES

TP sealed rockers page 17
Sealed rocker toggle series. Standard size 1, 2 and 4 poles. Various actuators, termination and circuitry. Military and UL listings.

TK industrial toggles page 18
Sealed toggle series. Standard size. 1, 2 and 4 poles. Various actuators, termination, and circuitry. UL listings.

TL sealed toggles .... page 19
As above but mil. listed.

TS standard toggles page 20
Standard size toggles, 1 or 2 pole. Various actions, circuitry and termination. Use where a lower cost standard size toggle is required.

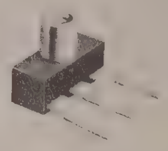
AT toggle assemblies page 21
Toggle switch assemblies using basic switches. Wide variety of ratings, contacts, actuators, terminals, and sealing. Mil listings available.

AML advanced manual line page 22
AML provides a choice of solid state, electronic, or power controls with pushbutton, rocker, paddle or keylock actuation. Incandescent, LED or neon lighting illuminate a wide variety of display options. Single level termination with all common types available. Choice of snap-in front mount, strip or matrix mount.

MML miniature manual line page 33
MML miniature pushbuttons provide a choice of solid state, electronic or power duty controls. Plus incandescent or LED illumination with printed wiring board or snap in panel mounting. Operating modes include momentary, two level alternate action or multi-switch interlock.

Other MICRO SWITCH Products .... page 42
Authorized Distributor Directory .... page 43

SS Miniature magnetically operated position sensors



.29H x .40W x .20D plus term.

5SS

.21 sq. plus term.

6SS

.30 sq. plus term.

8SS

FEATURES

- *Hall effect sensing*
- *Single digital output . . . current sinking or sourcing*
- *3 pin solder/quick-connect terminals . . . easy wiring as remote sensor*
- *Internally threaded flux concentrator . . . also used as mounting means*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*

FEATURES

- *Hall effect sensing*
- *Dual digital outputs . . . current sinking or sourcing*
- *4 pin dual-in-line terminals . . . printed circuit board or standard DIP socket mounting*
- *Optional flux concentrator*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*
- *Linear output sensor available . . . 4 to 10VDC supply voltage*

FEATURES

- *Hall effect sensing*
- *Single digital output . . . current sinking or sourcing*
- *3 pin in-line printed circuit board terminals . . . standard .100″ mounting centers*
- *Smallest ceramic package . . . 0.3″ square*
- *4.5 to 5.5VDC or 6 to 16VDC supply voltages*
- *Standard or precision magnetic characteristics*

SS ORDER GUIDE

Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Magnetic Characteristics 25°C Typical			Catalog Listing
					Op. Gauss	Rel. Gauss	Dif. Gauss	
4.5 to 5.5	3.4	Source	10mA	0 to 70	100	−50	150	8SS9
	4.0			0 to 70	430	260	170	6SS2
				0 to 70	350	215	135	6SS4*
			20mA	0 to 70	245	150	95	5SS16
		Sink	4mA	0 to 70	430	260	170	65SS2
				0 to 70	350	215	135	65SS4*
			8mA	0 to 70	245	150	95	55SS16
				−40 to 100	100	−50	150	8SS1
				0 to 70	100	−50	150	8SS1E
	6.0		20mA	0 to 70	400	300	100	8SS7
				0 to 70	400	300	100	8SS7E
6 to 16	13.0	Source	10mA	−40 to 150	400	300	100	612SS2
				−40 to 150	330	245	85	612SS4*
			20mA	−40 to 150	230	170	60	512SS16
		Sink	10mA	−40 to 150	400	300	100	613SS2
				−40 to 150	330	245	85	613SS4*
				−40 to 150	60	−60	120	617SS2
				−40 to 150	50	−50	100	617SS4*
			20mA	−40 to 150	230	170	60	513SS16
				−40 to 150	35	−35	70	517SS16
				−40 to 150	400	300	100	8SS3
				0 to 70	400	300	100	8SS3E
				−40 to 150	60	−60	120	8SS5
				0 to 70	60	−60	120	8SS5E
4 to 10	3.5 Typ.	Linear: Differential outputs		−40 to 150	Sensitivity (−400 to +400 gauss) 0.75 to 1.06mV/gauss			634SS2

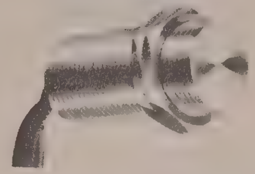
*With flux concentrator.

MICRO SWITCH, a Honeywell division

For more information, see Catalog 20, Solid State Sensors.

Magnetically operated position sensors 9SS LOHET™/SR

.60 H x .30 W x .07 D
9SS



15/32 thread x 1.00 L
103SR

FEATURES

- *Hall effect sensing*
- *Single linear output*
- *3 pin in-line printed circuit board terminals . . . standard. 100" mounting centers*
- *Thin ceramic package*
- *4.5 to 8 VDC or 8 to 16 VDC supply voltages*
- *Laser trimmed thick film resistors . . . minimize sensitivity variations, compensate for temperature variations*
- *Tight specifications on output as function of magnetic induction*

FEATURES

- *Hall effect sensing*
- *Single output . . . digital current sinking or sourcing*
- *Sealed threaded aluminum bushing housing . . . meets NEMA 3, 3R, 3S, 4, 4X, 6, 12 and 13*
- *20 gage, 6 inch stranded leadwires . . . color coded, teflon insulated*
- *Adjustable mounting*
- *4.5 to 5.5 VDC or 6 to 16 VDC supply voltages*
- *Linear output available*

For more information, see Catalog 20, Solid State Sensors.

9SS ORDER GUIDE

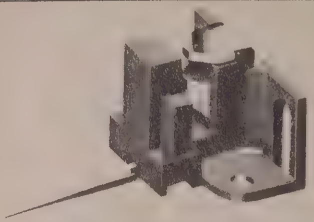
Supply Voltage (VDC)	Output Type	Supply Current (mA max.)	Span (−400 to +400 gauss)	Null (Offset at 0 gauss)	Sensitivity (mV/gauss)	Linearity (% span)	Null Shift (Max. %)	Catalog Listing
8 to 16 (Performance at 12 VDC)	Ratiometric 2	15.0	6.0V ① ②	6.0 ±0.6V ① ②	7.5 ±0.2 ① ②	±1.5 ① ②	−40 to 150°C ±5	91SS12-2
8 to 16	Regulated 3	15.0	3.0V ① ③	3.0 ±0.6V ① ③	3.75 ±0.1 ① ③	±5.0 ① ③	−40 to 150°C ±7	92SS12-2
4.5 to 8 (Performance at 5 VDC)	Unregulated 4	15.0	1.5V ④ ⑤	2.25 ±0.5V ④ ⑤	1.875 ±0.1 ④ ⑤	±2.5 ⑤	0 to 85°C ±5	93SS12-2

① At 25°C, 2200 Ohm load. ② Span, null, sensitivity vary in proportion to supply voltage over range of 12 ±4 VDC.
③ Characteristics apply over supply voltage range of 8 to 16 VDC.
④ Span, null, sensitivity approximately proportional to supply voltage over range of 4.5 to 8 VDC. ⑤ At 25°C, 1000 Ohm load.

SR ORDER GUIDE

Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Magnetic Characteristics 25°C Typical			Catalog Listing
					Op. Gauss	Rel. Gauss	Dif. Gauss	
4.5 to 5.5	4.0	Source	20 mA	0 to 70	350	215	135	103SR11A-1
		Sink	8 mA		350	215	135	103SR5A-1
6 to 16	13.0	Source	20 mA	−40 to 100	330	245	85	103SR12A-1
		Sink			330	245	85	103SR13A-1
					50	−50	100	103SR17A-1
4 to 10	3.5 Typ.	Linear			Sensitivity (−400 to +400 gauss) 0.75 to 1.06 mV/gauss			103SR3F-5

AV Vane operated position sensors

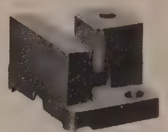


.75H x 1.23W x .58D plus term.
1AV

FEATURES

- *Hall effect sensor*
- *Single digital output . . . current sinking or sourcing*
- *Versatile mounting*
- *3 pin solder/quick-connect terminals or leadwires*
- *6 to 16VDC power supply*
- *Lower operating force*
- *UL Recognized housing and leadwires*

For more information, see Catalog 20, Solid State Sensors.



.43H x .75W x .52D plus term.
3AV/4AV

FEATURES

- *Hall effect sensor*
- *Dual digital outputs . . . current sinking*
- *Small size*
- *4 pin in-line printed circuit board terminals or leadwires*
- *Closely controlled differential to predict pulse width*
- *4.5 to 5.5VDC or 6 to 16VDC power supply*
- *Connector block available*

Principle of operation

AV vane sensors are operated by passing a ferrous vane through the gap between the Hall sensor and the magnet, shunting the magnetic flux away from the sensor.* AV's can be used as limit switches by operating with a single large vane; as tachometer sensors by using a toothed wheel; or, as machinery synchronizing elements by using cams or sectors. 1AV and 4AV Series have many features in common, such as:

- *Operation by a low cost, easy to fabricate ferrous vane*
- *Magnet and sensor incorporated in same rugged package*
- *Sealed construction . . . unaffected by dust or dirt*
- *0 to 100kHz operating speed . . . no minimum speed of operation*
- *On and Off times programmable by vane dimensioning*
- *Precision mechanical operating characteristics*

*See Catalog 20 for vane actuation information.

AV ORDER GUIDE

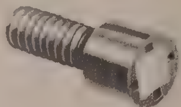
Supply Voltage (VDC)	Supply Current (mA max.)	Type	Current per Output	Operating Temperature °C	Termination	Catalog Listing	
						w/o Conn.	w/Conn.
4.5 to 5.5	7.0	Sink	4 mA	−40 to 85	PC Board	3AV1C	
				−40 to 125		4AV11C	4AV11C-T1
			8 mA	−40 to 85	Leadwires	3AV2C	
				−40 to 125		4AV12C	
6 to 16	13.0	Sink	10 mA	−40 to 85	PC Board	3AV1A	
				−40 to 125		4AV11A	4AV11A-T1
		Source	20 mA	−40 to 125	Leadwires	1AV2B	
					Solder/Q.C.	1AV3B	
		Sink	20 mA	−40 to 125	Leadwires	1AV2A	
					Solder/Q.C.	1AV3A	
				−40 to 85	PC Board	3AV2A	
				−40 to 125		4AV12A	

MG Magnets

101MG3/101MG4

102MG11

102MG15



106MG10

105MG5R2

101MG2L1

MICRO SWITCH does not manufacture magnets. However, we do supply bar and ring magnets for operating our Hall effect sensors. The most common form of magnet used to operate a Hall effect sensor is the bar magnet. The magnet should provide at least 10% flux overdrive above "Max. Operate", when at minimum distance from the sensing surface.

Ring Magnets

Outside Diameter	# Pole Pairs	Catalog Listing
44,4/1.75	10	105MG2R10
15,9/0.625	2	105MG5R2
15,9/0.625	4	105MG5R4

MG ORDER GUIDE

Bar Magnets

Outside Diameter	Length	Catalog Listing
6,3/0.25	31,7/1.25	101MG3
6,3/0.25	31,7/1.25	101MG4*
6,3/0.25	6,3/0.25	101MG7
3,2/0.125	9,5/0.375	101MG2L1
7,9/0.31	17,0/0.67	102MG11
7,9/0.31	12,2/0.48	102MG15
2,0/.078	2,0/.078	103MG5**
10,2/0.40	23,6/0.93	106MG10

*Reference magnet, calibrated to close tolerances. Useful for in-house inspection.
**125 pieces per tube. Poles not marked. Not illustrated.

Application information

DETERMINING MAGNETIC OPERATING CHARACTERISTICS

Magnetic sensing characteristics of Hall effect devices are specified within particular ranges. For example, assume an application with a temperature range of −40° to 100°C using a 513SS16. Referring to the table on page 2, the operate point may be up to 330 gauss and the release point may be 85 to 305 gauss. To insure reliable operation, **at least** 330 gauss must be presented to the sensor. The gauss level must then be reduced below 85 gauss to insure that the sensor will release. Therefore, it is necessary to know the flux density (gauss) measured at the chip to be able to 1) select a device with the best magnetic characteristics for your application; 2) select the best magnet; and 3) verify the desired mechanical characteristics.

The Calibrated Hall Element is used to determine the flux density produced at the sensor by the magnet. The package as well as the sensitive area is identical in size and location to the actual device. The output voltage of the Hall element, as a function of magnetic flux density, is linear, providing an electrical output which is proportional to flux density. A millivoltmeter with a one megohm input impedance should be used to measure the output. A Calibration Curve is furnished with each element, showing the Hall voltage versus flux density. When the magnetic field decreases, the output voltage decreases in a like manner. Referring to the calibration curve, a reading on the voltmeter is easily converted to gauss. Mechanical characteristics can be verified by first plotting a gauss versus distance graph. By comparing the curve to the magnetic characteristics of the sensor the possible mechanical ranges of operate point and release point can be determined.

Once the operating limits of the magnet and sensor combination have been established, feeler gages, etc., may be used during installation to insure that the correct gap is maintained.

CALIBRATED HALL ELEMENTS

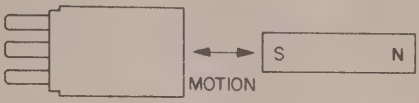
Magnetic characteristics for Hall effect devices are specified within particular ranges. To insure that all devices will operate and release in your application, gauss levels should be verified. Calibrated Hall Elements are available to measure the gauss levels produced in your application. These elements are available in packages similar to the corresponding Hall sensor. The elements are intended for laboratory use only.

METHODS OF ACTUATION

There are many ways to apply MICRO SWITCH solid state sensors. Some of the more common sensing methods are described. Further information is as near as your telephone. Just call your nearest MICRO SWITCH sales office, and one of our trained field engineers will be happy to discuss your application with you.

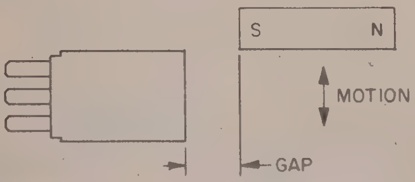
Head-on

The target is centered over the point of maximum sensitivity and is moved "head-on" to the sensor, then backed off.



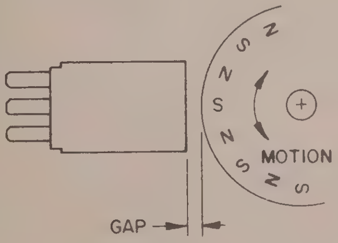
Slide-by

The target is moved across the face of the sensor at a specified distance.



Rotary

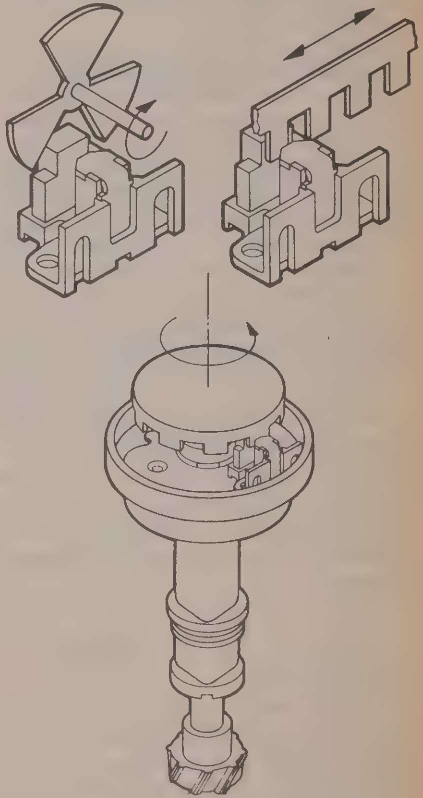
A rotating target, such as a ring magnet, provides an alternating pattern of On-Off actuation.



If you need more information, the handbook Hall Effect Transducers, How to apply them as sensors, is available from MICRO SWITCH. It is intended to assist you in understanding and applying Hall effect devices.

Vane

The target, a ferrous metal vane, slides through (or rotates through) the gap between magnet and sensor.



CALIBRATED HALL ELEMENT ORDER GUIDE

Supply Voltage	Supply Current	Output Voltage	Sensitivity	Use With Series	Catalog Listing
5 VDC	10mA max.	0 to 10mV @ 0 gauss	0.031mV/gauss	6SS..2	632SS2
			0.038mV/gauss	6SS..4	632SS4
			0.054mV/gauss	5SS..	532SS11
	5mA max.	−11 to +5mV @ 0 gauss	0.034mV/gauss	8SS.. 9SS.. 200SR....	732SS21-1*
	15mA max.	0 to 10mV @ 0 gauss	0.031mV/gauss	103SR.... 400SR....	103SR2-3

*Actual magnetic field strength seen by the Hall effect chip can vary. Distance from sensing surface of chip can vary by ± .003" (0,08mm).

Application information

CURRENT SINKING AND CURRENT SOURCING

Two types of output circuits are common to solid state circuitry . . . current sinking and current sourcing. The names are derived from the location of the load in the output circuit.

Current sourcing (open emitter): The load is connected between the output and ground. The load is isolated from the supply voltage when the sensor is Off. When the sensor turns On, current flows from the power supply through the sensor, into the load. The sensor supplies a "source" of power to the load. A current sourcing output is Normally Low and goes High when the sensor is On.

Current sinking (open collector): The load is connected between the power supply and the sensor. In this circuit, the load is isolated from ground when the sensor is Off. When the sensor turns On, the circuit is complete and current flows from the supply through the load, through the sensor and then to ground. The sensor switches, or "sinks" the output current to ground. A current sinking output is Normally High and goes Low when the sensor is On.

INTERFACING FOR MICRO SWITCH HALL EFFECT SENSORS

The schematics shown are typical of the outputs with which MICRO SWITCH Hall effect sensors can be interfaced. Values shown are representative only.

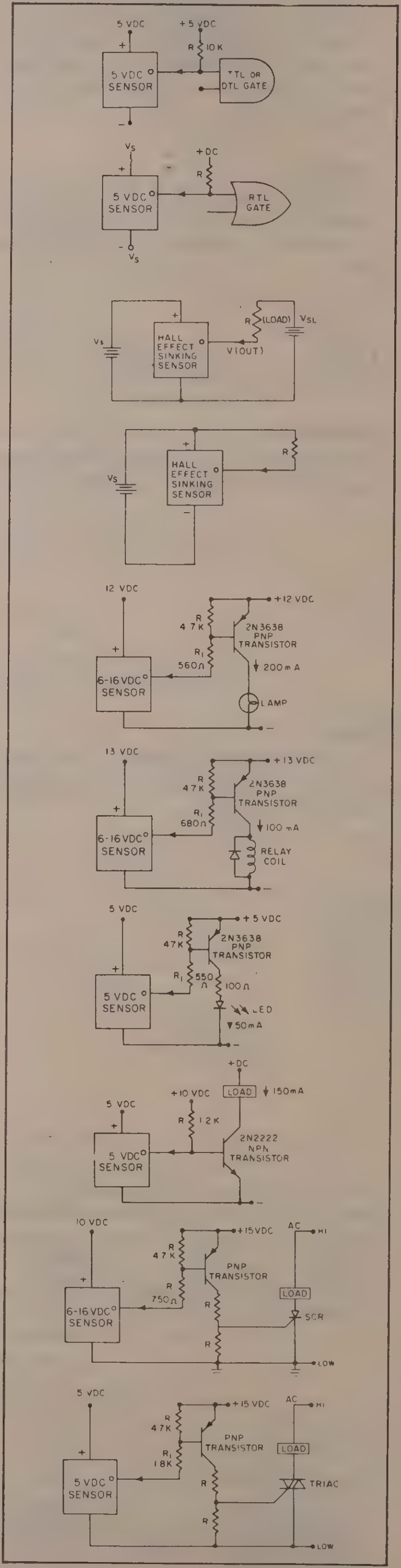
PULL-UP AND PULL DOWN RESISTORS

It is common practice to use a pull-up resistor for current sinking and a pull-down resistor for current sourcing. These resistors minimize the effect of small leakage current from the output of the device or from the electronics with which it is interfaced. In addition, they provide better noise immunity and faster rise and fall times.

The current sinking output is open collector and the current sourcing is open emitter. These outputs are floating, so the pull-up or pull-down resistor helps establish a solid quiescent voltage level. When checking sensors, a load is essential. See interface drawings.

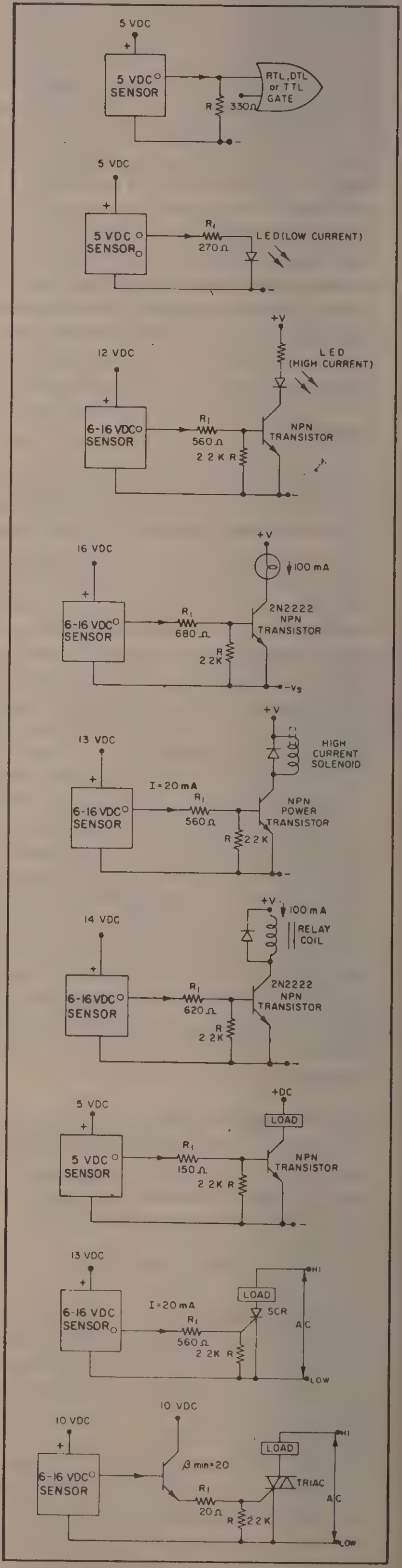
CURRENT SINKING OUTPUTS

(Current flow through load into sensor). Output terminal is open collector. In the unoperated condition ($I_L = 0$), the output voltage is normally High.

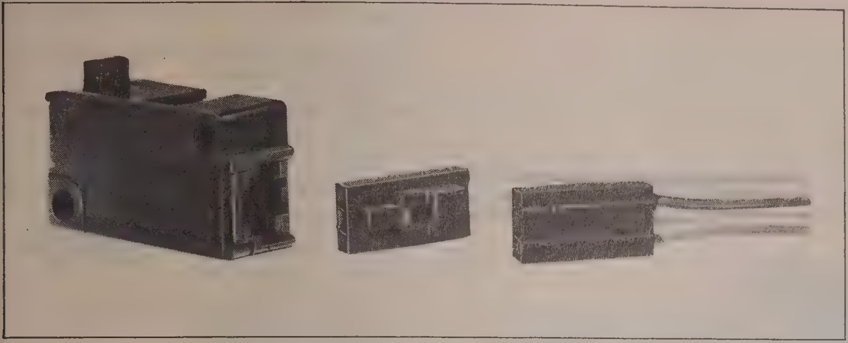

5 VDC
+5 VDC
R
10 K
5 VDC SENSOR
TTL OR DTL GATE
Vs
+DC
R
5 VDC SENSOR
RTL GATE
Vs
Vs
HALL EFFECT SINKING SENSOR
R (LOAD)
VSL
V(OUT)
Vs
HALL EFFECT SINKING SENSOR
R
12 VDC
+12 VDC
R 4 7K
2N3638 PNP TRANSISTOR
R1 560Ω
200 mA
6-16 VDC SENSOR
LAMP
13 VDC
+13 VDC
R 4 7K
2N3638 PNP TRANSISTOR
R1 680Ω
100 mA
RELAY COIL
6-16 VDC SENSOR
5 VDC
+5 VDC
R 47K
2N3638 PNP TRANSISTOR
R1 550Ω
100Ω
LED
50 mA
5 VDC SENSOR
+DC
+10 VDC
LOAD
150mA
5 VDC
R 1 2K
2N2222 NPN TRANSISTOR
5 VDC SENSOR
10 VDC
+15VDC
AC
HI
R 4 7K
PNP TRANSISTOR
R 750Ω
R
LOAD
SCR
6-16 VDC SENSOR
R
LOW
5 VDC
+15 VDC
AC
HI
R 4 7K
PNP TRANSISTOR
R1 1 8K
LOAD
R
TRIAC
5 VDC SENSOR
R
LOW

CURRENT SOURCING OUTPUTS

(Current flow from sensor through the load). Output terminal is open emitter. In the unoperated condition ($I_L = 0$), the output voltage is normally Low.

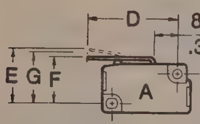

5 VDC
5 VDC SENSOR
RTL, DTL or TTL GATE
R 330Ω
5 VDC
5 VDC SENSOR
R1 270Ω
LED (LOW CURRENT)
+V
LED (HIGH CURRENT)
12 VDC
6-16 VDC SENSOR
R1 560Ω
2 2K R
NPN TRANSISTOR
+V
16 VDC
100 mA
6-16 VDC SENSOR
R1 680Ω
2 2K
2N2222 NPN TRANSISTOR
-Vs
+V
13 VDC
HIGH CURRENT SOLENOID
I=20mA
R1 560Ω
R 2 2K
NPN POWER TRANSISTOR
6-16 VDC SENSOR
+V
100 mA
RELAY COIL
14 VDC
6-16 VDC SENSOR
R1 620Ω
R 2 2K
2N2222 NPN TRANSISTOR
5 VDC
+DC
LOAD
5 VDC SENSOR
R1 150Ω
2 2K R
NPN TRANSISTOR
13 VDC
HI
LOAD
SCR
6-16 VDC SENSOR
I=20mA
R1 560Ω
2 2K R
AC
LOW
10 VDC
10 VDC
HI
LOAD
β min=20
TRIAC
6-16 VDC SENSOR
R1 20Ω
R 2 2K
AC
LOW

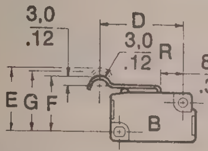
Mechanically Operated Solid State Switches VX

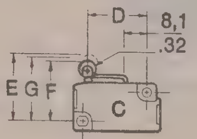


FEATURES

- *Low force operation*
- *Solid state reliability*
- *4.5 to 24 VDC supply voltage*
- *−40°C to +70°C operating temperature*
- *Direct interface to solid state circuits*
- *Reverse voltage protection*
- *Digital current sinking, normally high or normally low output (10 mA)*
- *Rugged construction*
- *Wide variety of standard levers and actuators available*
- *Lever external to switch body*
- *Industry standard mounting holes*
- *No external terminals . . . uses standard keyed and locking plug-in connectors*







GENERAL INFORMATION

The VX Series combines a miniature size mechanical switch's construction, operating and mounting convenience with solid state reliability. The switching element is a Hall effect transducer with a trigger and amplifier integrated on a silicon chip. An integral magnet molded in the plunger actuates the transducer and produces a digital logic level output.

Mounting dimensions and mechanical characteristics are similar to those of MICRO SWITCH's V3 Series snap-action switches.

Over 500 actuators are available including pin plunger, straight levers, simulated roller levers and roller levers.

ORDERING GUIDE AND OPERATING CHARACTERISTICS

Catalog Listings Accepts Amp. Con.	Catalog Listings Accepts Molex Con.	Force At Operate Point		"D" Lever Actuation Point	Lever Type	"E" Free Position (Max.)	"F" Operating Point (Min.)	"G" Release Point (Max.)	Over Travel (Min.)	Diff. Travel (Min.)
		Ounces	Grams*							
Pin Plunger										
VX10	VX12	$.35^{+.18}_{-.14}$	10^{+5}_{-4}			16,38 .645	14,22 .560	15,54 .612	1,02 .040	0,05 .002
VX80	VX82	3.0 ±.88	85 ±25							
Short Lever										
VX10-A1	VX12-A1	.35 ±.2	10 ±5	21,8 .860	A	17,27 .680	14,71 .579	16,33 .643	1,02 .040	0,05 .002
VX80-A1	VX82-A1	2.8 ±1.1	80 ±30							
Medium Lever										
VX10-A2	VX12-A2	0.2 ±.1	5^{+3}_{-2}	35,6 1.400	A	19,28 .759	13,94 .549	17,32 .682	2,16 .085	0,10 .004
VX80-A2	VX82-A2	1.41 ±.50	40 ±15							
Long Lever										
VX10-A3	VX12-A3	.10 ±.07	3 ±2	59,4 2.340	A	22,58 .889	12,62 .497	18,97 .747	4,06 .160	0,20 .008
VX80-A3	VX82-A3	$.75^{+.35}_{-.25}$	21^{+9}_{-7}							
Simulated Roller Lever										
VX10-B1	VX12-B1	$0.20^{+.15}_{-.10}$	5^{+4}_{-2}	32,6 1.285	B	22,23 .875	17,02 .670	20,52 .808	1,91 .075	0,10 .004
VX80-B1	VX82-B1	1.55 ±.53	44 ±15							
Short Roller Lever										
VX10-C1	VX12-C1	.40 ±.20	12 ±15	20,6 .810	C	22,48 .885	19,99 .787	21,62 .851	1,02 .040	0,05 .002
VX80-C1	VX82-C1	3.0 ±1.06	85 ±30							

TERMINATION

Terminal pins accept either AMP 102241-1 or MOLEX 70066-0177 connectors (not furnished) depending on the switch housing design. See Ordering Guide.

Note: *The output transistors of the listings shown are "normally Off" i.e., they are not conducting and the output voltage is High with plunger in free position. To order devices which are "normally On" and the output voltage is Low (conducting with plunger in free position), change the second digit from 0 to a 1 or 2 to a 3 in the catalog listing.

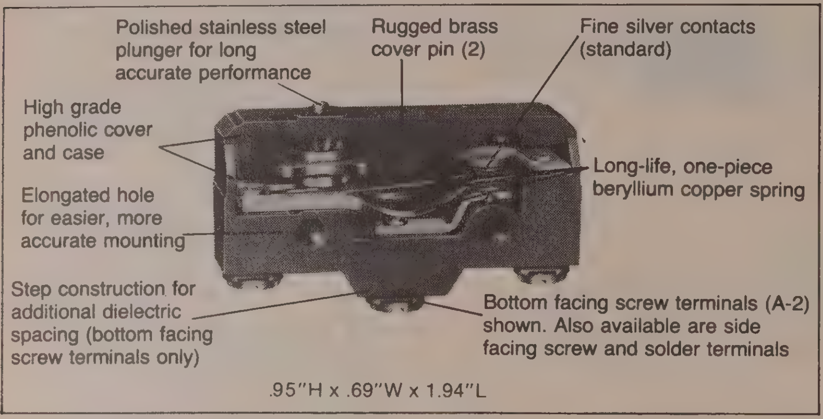
Examples VX10-A1 (VX11-A1); VX12-A1 (VX13-A1).

MICRO SWITCH, a Honeywell division

BZ/BA Standard basic switches

STANDARD BASIC SWITCH CUT-A-WAY

The cut-a-way shown is representative of the BZ/BA standard basic switches described.


Polished stainless steel plunger for long accurate performance
Rugged brass cover pin (2)
Fine silver contacts (standard)
High grade phenolic cover and case
Long-life, one-piece beryllium copper spring
Elongated hole for easier, more accurate mounting
Step construction for additional dielectric spacing (bottom facing screw terminals only)
Bottom facing screw terminals (A-2) shown. Also available are side facing screw and solder terminals
.95"H x .69"W x 1.94"L

FEATURES

- *Operating force as low as 4 oz. (113 grams) maximum*
- *Sensitive differential travel as low as .0002 to .0003 inches (0,005 to 0,008 mm)*
- *Power load switching capability to 25 amperes*
- *Motor handling capacity to 2 horsepower at 250 VAC*
- *High temperature constructions for up to +400°F (204°C)*
- *Alloy contacts available for special application needs*
- *Variety of integral actuators*
- *Variety of auxiliary actuators*
- *Variety of terminal designs*
- *Optional sealed plunger and cover*
- *Over 50 listings available which meet MIL-S-8805 Qualified products list*

PIN PLUNGER

MICRO SWITCH

MICRO SWITCH

MICRO SWITCH

ORDER GUIDE

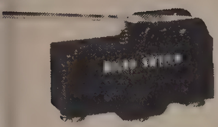
Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2R-A2	Most applications. Screw terminals	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
BZ-2R	Same as above, Solder terminals	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
BZ-R21-A2	Lower force	10 Amps **L8**	1,11 **4**	0,7 **2.5**	0,30 **.012**	0,13 **.005**	0,005-0,013 **.0002-.0005**	15,88 **.625**
BZ-R-A2	Less differential travel	15 Amps **L103**	1,95-2,5 **7-9**	1,11 **4**	0,30 **.012**	0,13 **.005**	0,005-0,008 **.0002-.0003**	15,88 **.625**
BZ-R19-A2	Best repeatability	15 Amps **L103**	1,95-3,34 **7-12**	1,11 **4**	0,30 **.012**	0,13-0,2 **.005-.008**	0,005-0,02 **.0002-.0008**	16,26 **.640**
BZ-7RT04	MIL-S-8805/1-008 application requirements	15 Amps —	6,0- **12,0**	1,67 **6**	0,76 **.030**	0,13 **.005**	0,063-0,13 **.0025-.0050**	15,88 **.625**
YZ-2R-A2	SPST (normally open)	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	0,13 **.005**	0,01-0,05 **.0004-.0020**	15,88 **.625**
WZ-R	SPST (normally closed) Solder terminals	15 Amps **L103**	1,95-2,5 **7-9**	1,11 **4**	0,30 **.012**	0,13 **.005**	0,005-0,009 **.0002-.00035**	15,88 **.625**

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2R5551-A2	Dustproof and splash resistant seal	15 Amp **L96**	2,5-4,17 **9-15**	1,11 **4**	— —	0,13 **.005**	0,01-0,06 **.0004-.0025**	15,88 **.625**
BZ-2R55-A2-S	Best service for sealed construction. Stainless steel spring.	15 Amps **L96**	2,5-4,17 **9-15**	1,11 **4**	— —	0,13 **.005**	0,01-0,06 **.0004-.0025**	15,88 **.625**
BA-2R	Up to 20 ampere load handling. Solder terminals	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**
BA-2R-A2	Up to 20 ampere load handling	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**
BE-2R-A2	Up to 25 ampere load handling	25 Amps —	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	0,25 **.010**	0,05-0,19 **.0020-.0075**	16,26 **.640**
BZ-RX	Manual reset (maintained contact) applications, solder terminals	15 Amps **L67**	1,95-2,5 **7-9** 0,56-2,78 **2-10**	— — — —	0,30 **.012** — —	0,13 **.005** 0,38 **.015**	— —	15,88 **.625**

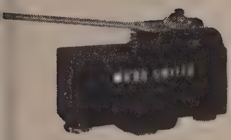
* ±0.38 mm
±.015 in.

Standard basic switches **BZ/BA**

STRAIGHT LEVER ORDER GUIDES



Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RW80-A2	2.5 inch (63,5 mm) lever requirements	15 Amps L96	0,7 2.5	0,14 0.5	—	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BZ-2RW84-A2	Lower force (without external return spring)	15 Amps L96	0,28 1	0,03 0.125	8,33 .328	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BZ-2RW863-A2	6 inch (152 mm) long lever requirements	15 Amps L96	0,28 1	—	—	14,68 .578	0,46-3,68 .018-.145	19,1 ± 1,52 .750 ± .060
BZ-2RW805551-A2	Dustproof and splash resistant seal. 2.5 inch lever	15 Amps L96	0,7 2.5	0,14 0.5	—	5,56 .219	0,18-1,27 .007-.050	19,1 .750
BA-2RV-A2	Up to 20 ampere load handling	20 Amps L23	0,7 2.5	0,14 0.5	15,88 .625	1,98 .078	2,77 .109	19,1 .750
BE-2RV-A4	Up to 25 ampere load handling	25 Amps —	0,7 2.5	0,14 0.5	15,88 .625	1,98 .078	2,77 .109 max.	19,1 .750



Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RW899-A2	Adjustable operating point (17 mm to 22 mm) .670" to 880"	15 Amps L96	0,7 2.5	0,14 0.5	—	3,54† .125	0,18-1,27 .007-.050	17,02-22,35 .670-.880

†From 17 mm O.P.
670 in

Except where stated * ± 0,76 mm
± .030 in.

ROLLER LEVER ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RW822	1.05 inch (26,7 mm) steel roller lever application Solder terminal	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.118
BZ-2RW822-A2	1.05 inch (26,7 mm) steel roller lever applications	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BZ-2RW8225551-A2	As above with dustproof and splash resistant seal	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BZ-2RW82255-A2-S	Dustproof and splash resistant seal with stainless steel spring	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0,51 .003-.020	30,17 1.188
BM-1RW822-A2	Up to 22 ampere load handling	22 Amps L68	1,67 6	0,42 1.5	—	2,39 .094	0,025-0,33 .001-.013	30,17 1.188
BA-2RV22-A2	Up to 20 ampere load handling	20 Amps L23	1,67 6	0,42 1.5	6,35 .250	0,76 .030	1,14 .045 max.	29,77 1.172
BE-2RV22-A4	Up to 25 ampere load handling	25 Amps —	1,67 6	0,42 1.5	6,35 .250	0,76 .030	1,14 .045 max.	29,77 1.172

Except where stated ** ± 0,38 mm
± 015 in

ROLLER LEVER ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RW82-A2	1.90 inch (48.3 mm) steel roller lever applications	15 Amps L96	0,97 3.5	0,21 0.75	—	3,96 .156	0,10-1,0 .004-.040	30,17 ± 0,76 1.188 ± .030
BA-2RV2-A2	Up to 20 ampere load handling	20 Amps L23	0,97 3.5	0,14 0.5	11,89 .468	1,52 .060	2,16 .085	30,17 ± 0,76 1.188 ± .030
BZ-2RW826-A2	One-way roller (9,4 mm x 3,8 mm) .37" dia. x .15" wide roller	15 Amps L96	1,67 6	0,42 1.5	—	2,39 .094	0,08-0.51 .003-.020	41,34 1.625
BZ-2RW925-A2	One-way roller (4,83 mm x 4,83 mm) .19" dia. x .19" wide roller	15 Amps L96	2,22 8	0,42 1.5	—	1,52 .060	0,38 .015	28,96 1.14

* ± 0,38 mm
± 0.15 in

MICRO SWITCH, a Honeywell division

BZ/BA Standard basic switches

LARGE OVERTRAVEL PLUNGER

MICRO SWITCH

MICRO SWITCH

ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RD-A2	Added overtravel. For manual operation and slow 20° (max.) cam rise	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	1,52 **.060**	0,01-0,05 **.0004-.0020**	21,21 **.835**
BA-2RB-A2	Up to 20 ampere load handling	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	2,39 **.094**	0,05-0,19 **.0020-.0075**	26,20 **1.03**
BE-2RB-A2	Up to 25 ampere load handling	25 Amps —	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	2,39 **.094**	0,05-0,19 **.0020-.0075**	26,20 **1.03**

BZ-2RDS-S	Dustproof and splash resistant seal. Solder terminals	15 Amps **L96**	3,61-5,28 **13-19**	1,11 **4**	—	1,5 **.062**	0,01-0,063 **.0004-.0025**	28,20 **1.110**
BZ-2RDS-A2-S	Applications requiring dustproof and splash resistant seal	15 Amps **L96**	3,61-5,28 **13-19**	1,11 **4**	—	1,5 **.062**	0,01-0,063 **.0004-.0025**	28,20 **1.110**

** ±0,51 mm
±.020 in.

SMALL OVERTRAVEL PLUNGER

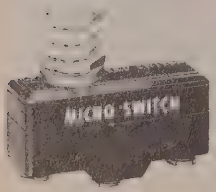
MICRO SWITCH

ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons, ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.* mm inches
BZ-2RS-A2	Added overtravel. For in-line operation and with JR auxiliary actuators	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	1,52 **.060**	0,01-0,063 **.0004-.0025**	28,20 **1.110**
BZ-2RS5551-A2	Dustproof and splash resistant seal	15 Amps **L96**	2,5-4,17 **9-15**	1,11 **4**	—	1,52 **.060**	0,01-0,063 **.0004-.0025**	28,20 **1.110**

* ±0,51 mm
±.020 in.

BUSHING MOUNT OVERTRAVEL PLUNGER



MICRO SWITCH

ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
BZ-2RQ1	Applications with bushing mount. Solder terminals	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.15**	5,56 **.219**	0,01-0,05 **.0004-.0020**	21,82 **.859**
BZ-2RQ1-A2	Applications with bushing mount.	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	5,56 **.219**	0,01-0,05 **.0004-.0020**	21,82 **.859**
BA-2RQ1	Up to 20 ampere load handling. Solder terminals	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	5,56 **.219**	0,05-0,19 **.0020-.0075**	21,82 **.859**
BA-2RQ1-A2	Up to 20 ampere load handling	20 Amps **L23**	3,89-6,12 **14-22**	2,78 **10**	1,27 **.050**	5,56 **.219**	0,05-0,19 **.0020-.0075**	21,82 **.859**

BZ-2RQ18-A2	Added overtravel. Roller plunger for rapid cam (30° max) rise and slide operation	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	3,56 **.140**	0,01-0,05 **.0004-.0020**	33,32 ±1,14 **1.312 ±.045**
BZ-2RQ181-A2	Applications requiring roller plunger 90° to major axis of switch	15 Amps **L96**	2,5-3,61 **9-13**	1,11 **4**	0,38 **.015**	3,56 **.140**	0,01-0,05 **.0004-.0020**	33,32 ±1,14 **1.312 ±.045**

Except where stated ** ±0.76 mm
±.030 in.

FLEXIBLE LEAF

MICRO SWITCH

ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Codes	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.** mm inches
BZ-2RL-A2	Force and stability of the flexible leaf actuator	15 Amps **L96**	1,39 **5**	0,14 **0.5**	—	1,52 **.060**	1,27 **.050**	17,48 **.688**
BA-2RL-A2	Up to 20 ampere load handling	20 Amps **L23**	2,5 **9**	0,28 **1**	—	1,57 **,062**	1,57 **.062**	17,48 **.688**

FLEXIBLE ROLLER LEAF

MICRO SWITCH

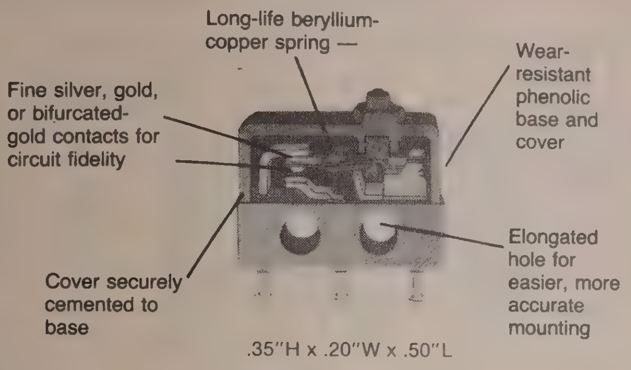
ORDER GUIDES

BZ-2RL2-A2	Force and stability of the flexible leaf with roller	15 Amps **L96**	1,39 **5**	0,14 **0.5**	—	1,52 **.060**	1,27 **.050**	28,6 **1.125**
BA-2RL2-A2	Up to 20 ampere load handling	20 Amps **L23**	2,5 **9**	0,28 **1**	—	1,52 **.060**	1,65 **.065**	28,6 **1.125**

** ±0 76 mm
±.030 in

MICRO SWITCH, a Honeywell division

Subminiature basic switches SX


Long-life beryllium-copper spring
Wear-resistant phenolic base and cover
Fine silver, gold, or bifurcated-gold contacts for circuit fidelity
Elongated hole for easier, more accurate mounting
Cover securely cemented to base
.35″H x .20″W x .50″L

Mounting holes accept pins or screws of .087 inch diameter (2,21 mm) on .19 inch (4,8 mm) centers.

GENERAL INFORMATION

SX subminiature basic switches are the smallest snap-action switches from MICRO SWITCH. These switches are ideal where savings in space and weight are important. Unless otherwise noted, all listings have silver contacts.

FEATURES

- *Low operating force to 3 oz. (85 grams) maximum*
- *Sensitive differential travel as low as .001 inch maximum*
- *Power load switching capability up to 7 amperes — silver contacts*
- *Optional gold contacts for low energy applications*
- *Optional bifurcated gold contacts for maximum reliability*
- *Long mechanical life of 10,000,000 cycles — 95% survival for 11SX series*
- *Temperature tolerance −65° to +250°F (−54 to 121°C) on standard construction*
- *High temperature designs for up to +400°F (204°C)*
- *Variety of integral and auxiliary actuators*
- *Choice of several terminal styles*
- *Listing available which meet MIL-S-8805 Qualified products list*
- *UL and CSA listed*

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGER

ORDER GUIDE

Catalog Listing	Recommended for	Electrical Data And UL Code	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
11SX21-T	Most applications	5 Amps L4	0,70-1,39 2.5-5	0,28 1	0,51 .020	0,1 .004	0,051 .002	8,13 .320
1SX1-T	Up to 7 amps load handling	7 Amps L7	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
2SX1-T	Lower force	7 Amps L7	0,83 3	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
11SX1-T	Lowest differential travel	3 Amps L122	0,97 3.5	0,21 0.75	0,51 .020	0,1 .004	0,025 .001	8,13 .320
21SX1-T	Best stability under varying humidity	7 Amps L7	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8.13 .320
3SX1-T	Applications requiring gold contacts	1 Amp L22	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
21SX39-T (MS24547-1)	MIL-S-8805 application requirements + 180°F (82°C) maximum use	7 Amps —	1,39 5	0,28 1	0,51 .020	0.1 .004	0,13 .005	8,13 .320
23SX39-T (MS24547-2)	MIL-S-8805 application requirements for gold contacts + 180°F (82°C) maximum use	1 Amp L22	1,39 5	0,28 1	0,51 .020	0,1 .004	0,13 .005	8,13 .320
4SX1-T	Operating in temperature to + 400°F (204°C)	7 Amps L7	1,39 5	0,28 1	0,51 .020	0.1 .004	0.13 .005	8,13 .320
12SX2-T	Best reliability (Bifurcated gold contacts)	1 Amp L22	0,70-1,39 2.5-5	0,28 1	0,51 .020	0,1 .004	0,051 .002	8,13 .320
12SX1-T	Best reliability with higher current rating (28 VDC) (Bifurcated gold contacts)	1 Amp L22	1,39 5	0,28 1	0.51 .020	0.1 .004	0.076 .003	8.13 .320

* ±0,38 mm
+ .015 in.

MICRO SWITCH, a Honeywell division

SX Subminiature basic switches

INTEGRAL LEVER ORDER GUIDES

Catalog Listing	Description	Electrical Data And UL Code	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P. mm inches
311SX1-T	.135 inch (3,43 mm) straight lever (shown)	5 Amps L4	0,49 1.76	0,09 .32	1,65 .065	0,36 .014	0,51 .020	8,43 ±1,14 .332 ±.045
311SX2-T	.505 inch (12,8 mm) straight lever	5 Amps L4	0,31 1.1	0,05 .18	2,92 .115	0,64 .025	0,89 .035	8,26 ±1,91 .325 ±.075
311SX3-T	.965 inch (24,5 mm) straight lever	5 Amps L4	0,20 .71	0,03 .11	4,70 .185	1,17 .046	1,52 .060	7,75 ±2,92 .305 ±.115
311SX4-T	.042 inch (1,1 mm) simulated roller lever (shown)	5 Amps L4	0,58 2.1	0,11 .39	1,27 .050	0,25 .010	0,38 .015	14,15 ±0,91 .557 ±.036
311SX5-T	.459 inch (11,7 mm) simulated roller lever	5 Amps L4	0,31 1.1	0,05 .18	2,67 .105	0,56 .022	0,89 .035	14,86 ±1,65 .585 ±.065

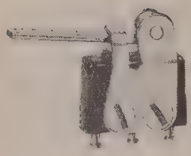
Auxiliary actuators

Switches are not included with actuators

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position; F.P. — Free Position

* All characteristics are taken with actuator assembled on Catalog Listing 1SX1-T as shown.

ORDER GUIDES



Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. mm inches	O.T. mm inches	D.T. max. mm inches	O.P.†† mm inches	F.P. mm inches
JX-20	Straight lever (shown)	1,83 .72	0,28 1 approx.	0,04 .14	—	0,76 .030 approx.	0,76 .030 approx.	10,8 .425 approx.	12,3 .485 approx.
JX-25	Roller lever	16,5 .65	0,42 1.5	0,04 .14	—	0,51 .020	0,76 .030	14,9 ±1,14 .585 ±.045	16,8 .660 max.
JX-40	Straight leaf	9,4 .37	1,95 7	0,56 2	.225 approx.	0,38 .015	0,64 .025	7,5 .295	12,3 .485 ref.
JX-45	Roller leaf	6,1 .24	1,95 7	0,28 1	.225 approx.	0,38 .015	0,64 .025	12,2 .480	16,5 .650 ref.
JX-41**	Reverse leaf	9,4 .37	1,67 6	0,28 1	.110 approx.	0,38 .015	0,64 .025	7,5 .295	9,4 .370 ref.
JX-51**	Reverse roller leaf	7,6 .30	1,67 6	0,56 2	.110 approx.	0,38 .015	0,64 .025	12,8 .505	14.7 .580 ref.

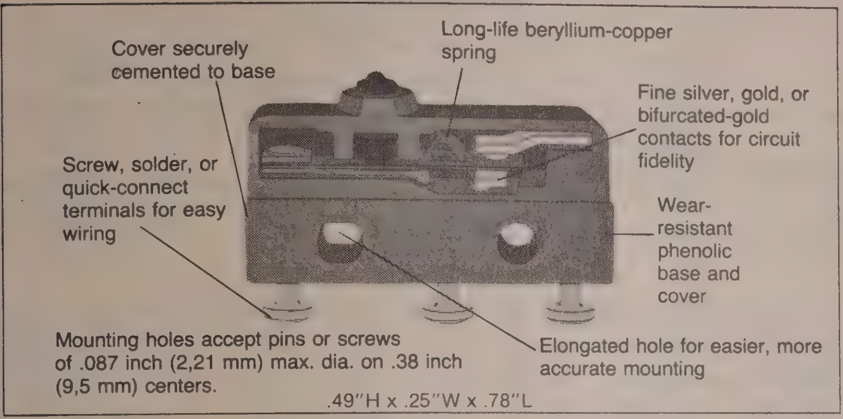
** Switch is mounted with plunger end reversed from JX-40.
NOTE: Above actuators should be used at temperatures below +300°F (149°C)

Except where stated †† ±0.76mm ±.030 in.

MICRO SWITCH, a Honeywell division

Subminiature basic switches SM

CUT-A-WAY SM SUBMINIATURE BASIC SWITCH


Cover securely cemented to base
Long-life beryllium-copper spring
Fine silver, gold, or bifurcated-gold contacts for circuit fidelity
Screw, solder, or quick-connect terminals for easy wiring
Wear-resistant phenolic base and cover
Mounting holes accept pins or screws of .087 inch (2,21 mm) max. dia. on .38 inch (9,5 mm) centers.
Elongated hole for easier, more accurate mounting
.49"H x .25"W x .78"L

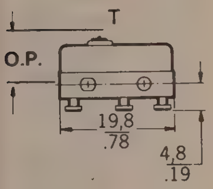
FEATURES

- *Low operating force to 2 ounces maximum.*
- *Sensitive differential travel as low as .001 inch (0,025 mm) maximum*
- *Power load switching capability available to 11 amps (VAC) — silver contacts*
- *Motor load handling capacity to ¼ horse power (VAC)**
- *Optional gold contacts for low energy applications*
- *Optional bifurcated gold contacts for maximum reliability**
- *Long mechanical life of 10,000,000 cycles — 95% survival for 11SM series*
- *Standard temperature range −65° to +180°F (−54 to 85°C)*
- *High temperature construction available for use to +400°F (204°C)**
- *Variety of integral and auxiliary actuators*
- *Choice of several terminal styles*
- *2 listings available which meet MIL-S-8805 Qualified products list.*
- *UL and CSA listed*
- *BEAB and TV-2 construction available**

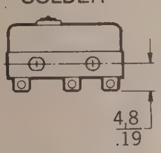
*Ordering information in Catalog 10.

AVAILABLE TERMINALS

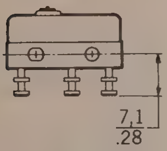
T


O.P.
19,8
.78
4,8
.19

SOLDER



T2



GENERAL INFORMATION

SM subminiature switches are slightly larger than SX switches. These switches combine small size and light weight with ample electrical capacity, precision operation and long life. Unless otherwise noted, all listings have silver contacts.

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGERS

ORDER GUIDE

Catalog Listing	Recommended For	Electrical Data And UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
1SM1	Original design. Solder posts.	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,76 **.030**	0,13 **.005**	0,1 **.004**	8,38 **.330**
1SM1-T	Original design. Solder terminals.	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,76 **.030**	0,13 **.005**	0,1 **.004**	8,38 **.330**
11SM1	Most applications,long life Solder posts.	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,51 **.020**	0,13 **.005**	0,1 **.004**	8,38 **.330**
11SM1-T	Same as above. Solder terminals	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,51 **.020**	0,13 **.005**	0,1 **.004**	3,38 **.330**
11SM1-T2	Same as above. Double terminals	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,51 **.020**	0,13 **.005**	0,1 **.004**	8,38 **.330**
11SM3-T	Operating in temperatures to +250°F (121°C)	5 Amps **L4**	0,83-1,39 **3-5**	0,28 1	0,51 **.020**	0,13 **.005**	0,1 **.004**	8,38 **.330**
11SM23-T	Application requiring gold contacts	1 Amp **L22**	0,83-1,39 **3-5**	0,28 1	0,51 **.020**	0,13 **.005**	0,1 **.004**	8,38 **.330**
11SM401-T	Less differential travel	5 Amps **L4**	0,97 **3.5 max.**	0,28 1	0,51 **.020**	0,13 **.005**	0,025 **.001**	8.38 **.330**
11SM701-T	Lower force	4 Amps **L119**	0,56 **2**	0,14 .5	0,51 **.020**	0,13 **.005**	0,051 **.002**	8,38 **.330**
21SM284 (MS25085-2)	MIL-S-8805 application requirements	5 Amps **—**	0,83-1,39 **3-5**	0,28 1	0.76 **.030**	0,13 **.005**	0,1 **.004**	8.38 **.330**

Except where stated * ±0,38mm ±.015 in

MICRO SWITCH, a Honeywell division

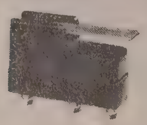
SM Subminiature basic switches

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position; F.P. — Free Position

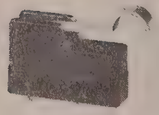
PIN PLUNGER ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
411SM1	Sealed plunger construction	5 Amps L4	0,83-2,09 3-7.5	0,28 1	0,51 .020	0,13 .005	0,1 .004	8,38 .330

INTEGRAL LEVER ORDER GUIDES



311SM1-T	.285 inch (7,24 mm) straight lever (shown)	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,51 .020	0,48 .019	8,64 ±1,5 .340 ±.060
311SM2-T	.565 inch (14,35 mm) straight lever	5 Amps L4	0,31 1.1	0,05 .18	3,05 .120	0,66 .026	0,69 .027	8,51 ±2 .335 ±.080
311SM3-T	1.765 inch (44,8 mm) straight lever	5 Amps L4	0,15 .53	0,02 .07	7,87 .310	1,45 .057	2,8 .110	7,11 ±4,3 .280 ±.170



311SM4-T	.251 inch (6,38 mm) simulated roller lever	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,46 .018	0,48 .019	11,7 ±1,5 .460 ±.060
311SM5-T	.535 inch (13,6 mm) simulated roller lever	5 Amps L4	0,31 1.1	0,05 .18	3,05 .120	0,66 .026	0,69 .027	11,56 ±2 .455 ±.080

311SM6-T	.251 inch (6,38 mm) roller lever	5 Amps L4	0,39 1.4	0,07 .25	2,16 .085	0,46 .018	0,48 .019	14,2 ±1,5 .560 ±.060
311SM706-T	.251 inch (6,38 mm) roller lever. Lower force	4 Amps L119	0,16 .57	0.03 .11	2,16 .085	0,46 .018	0,33 .013	14,2 ±1,5 .560 ±.060

INTEGRAL LEAF ORDER GUIDES

111SM1-T	Force and stability of flexible leaf actuator (shown)	5 Amps L4	1,95 7	0,56 2	5,54 .218	0,76 .030	0,76 .030	8,89 ±0,76 .350 ±.030
111SM2-T	Flexible leaf with roller	5 Amps L4	1,95 7	0,56 2	5,56 .219	0,76 .030	0,64 .025	14,3 ±0,76 .562 ±.030

Except where stated * ±0,38 mm ±.015 in.

AUXILIARY ACTUATORS ORDER GUIDES

Switches are not included with actuators.*

Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P. mm inches	F.P. max. mm inches
JS-2	Straight leaf (shown)	16,8 .66	2,78 10	0,56 2	1,98 .078	0,38 .015	0,38 .015	8,89 ±0,76 .350 ±.015	11,3 .445
JS-5	Roller leaf (Bronze roller)	15 .59	2,78 10	0,83 3	1,98 .078	0,38 .015	0,38 .015	14,2 ±0,76 .560 ±.015	16,9 .665

JS-7	Formed leaf (Simulated roller)	14,7 .58	2,78 10	0,56 2	2,39 .094	0.79 .031	0,38 .015	9,65 ±0,76 .380 ±.015	12,1 .475

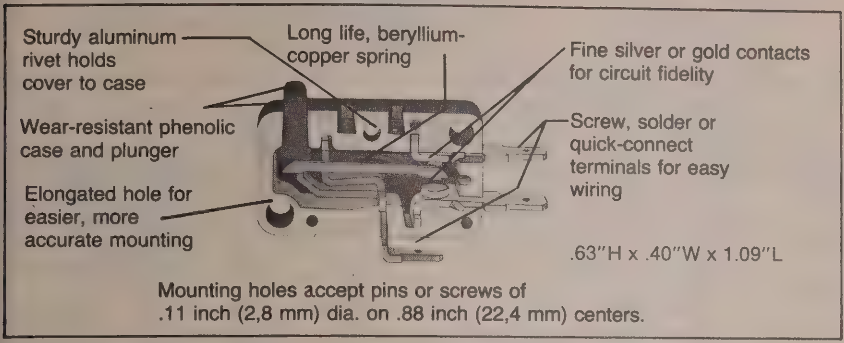
JS-220	Straight lever	26,2 1.03	0,28 1	0,04 .14	3,18 .125 approx.	0.76 .030	0,76 .030	10,3 .406 approx.	–
JS-246	Roller lever (shown) (Steel roller)	25,4 1.00	0,28 1	0,04 .14	3,18 .125 approx.	0,76 .030	0,76 .030	14,3 .562 approx.	–

NOTE: Above actuators should be used below +300°F (149°C)

* All characteristics are taken with actuator assembled to Catalog Listing 11SM3-T as shown.

Miniature basic switches V3

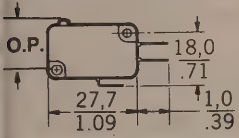
CUT-A-WAY V3 MINIATURE BASIC SWITCH


Sturdy aluminum rivet holds cover to case
Long life, beryllium-copper spring
Fine silver or gold contacts for circuit fidelity
Wear-resistant phenolic case and plunger
Screw, solder or quick-connect terminals for easy wiring
Elongated hole for easier, more accurate mounting
.63″H x .40″W x 1.09″L

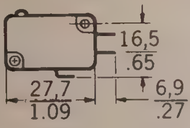
Mounting holes accept pins or screws of .11 inch (2,8 mm) dia. on .88 inch (22,4 mm) centers.

AVAILABLE TERMINALS

D8 QUICK CONNECT

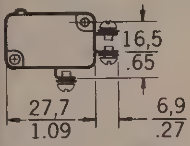

O.P.
18,0
.71
27,7
1.09
1,0
.39

SOLDER


16,5
.65
27,7
1.09
6,9
.27

.188″ wide by .020″ thick terminals

SCREW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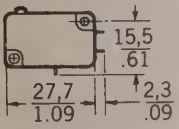
27,7
1.09
6,9
.27

SHORT SOLDER


15,5
.61
27,7
1.09
2,3
.09

GENERAL INFORMATION

V3 miniature basic switches feature high electrical capacity and long life. Their size and shape meet design requirements in all types of applications.

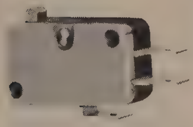
FEATURES

- *Low operating force to .53 ounce maximum*
- *Sensitive differential travel as low as .008 inch maximum**
- *Power load switching capability up to 15 amperes — silver contacts*
- *Motor handling capacity of ½ horsepower — silver contacts*
- *Gold alloy contacts for special applications*
- *Long mechanical life of 10,000,000 cycles — 95% survival for V3-100 Series.*
- *Temperature tolerance up to +180°F (82°C) on standard construction*
- *High temperature construction for use up to +600°F (316°C)**
- *3,1 mm mounting holes available*
- *UL and CSA listed*

*Ordering information in Catalog 10.

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

PIN PLUNGER



ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data And UL Code	O.F. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. mm inches	O.P.** mm inches
V3-1-D8	Best for use under shock and vibration	15 Amps L83	1,67-3,89 6-14	1,11 4	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-101-D8	Most applications	11 Amps L156	2,22 8 max.	0,56 2	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-1101-D8	Added overtravel	10 Amps L112	0,72 max. 2.6	0,10 .35	1,2 .047	1,27 .050	0,051-0,25 .002-.010	14.7 .578
V3-2101-D8	Lower force, added overtravel	10 Amps L131	0,50 max. 1.8	0,05 .18	1,2 .047	1,27 .050	0,051-0,25 .002-.010	14,7 .578
V3-2401-D8	Lower force	5 Amps L162	0,24 .9	—	1,2 .047	1,27 .050	0,051-0,25 .002-.010	14,7 .578
V3-2451-D8	Lowest force	3 Amps L163	0,15 .53	—	1.2 .047	1,27 .050	0,051-0,25 .002-.010	14,7 .578
V3-3001-D8	Up to 15 amps load handling	15 Amps L83	1,33 max. 4.8	0,15 .53	1,2 .047	1,27 .050	0,051-0,25 .002-.010	14,7 .578
V3-343-D8*	Applications requiring gold alloy contacts	1 Amp L22	2,22 8 max.	0,56 2	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578

V3-1	Best for use under shock and vibration	15 Amps L83	1,67-3,89 6-14	1,11 4	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-15	Same as V3-1 except short solder terminals	15 Amps L83	1,67-3,89 6-14	1,11 4	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-19	Same as V3-1 except solder terminals	15 Amps L83	1,67-3,89 6-14	1,11 4	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-101	General use.	11 Amps L156	2,22 8 max.	0,56 2	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578
V3-1001 (MS25253-1)	MIL-S-8805 application requirements (SPDT)	10 Amps —	1,67-3,89 6-14	1,11 4	1,2 .047	1,02 .040	0,15-0,41 .006-.016	14,7 .578

** ±0,38
±0,15

MICRO SWITCH a Honeywell division

V3 Miniature basic switches

Characteristics: O.F. — Operating Force; R.F. — Release Force; P.T. — Pretravel; O.T. — Overtravel; D.T. — Differential Travel; O.P. — Operating Position.

STRAIGHT LEVER ORDER GUIDES

Catalog Listing	Recommended For	Electrical Data and UL Code	Length of Lever "A" mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P.* mm inches
V3L-101-D8	Most applications Short lever	11 Amps **L156**	21,3 **.860**	2,50 **9**	0,56 **2**	1,5 **.060**	1,02 **.040**	0,41 **.016**	15,2 ±0,51 **.600 ±.020**
V3L-104-D8	Most applications (Shown) med.	11 Amps **L156**	35,6 **1.40**	1,11 **4**	0,14 **.5**	3,18 **.125**	2,29 **.090**	1,27 **.050**	15,2 ±1,5 **.600 ±.060**
V3L-131-D8	Most applications long lever	11 Amps **L156**	59,4 **2.34**	0,58 **2.1**	0,12 **.42**	6,6 **.260**	3,81 **.150**	2,29 **.090**	14,7 ±2 **.580 ±.080**
V3L-3013-D8	Up to 15 amps load handling. Best performance under shock and vibration	15 Amps **L83**	59,4 **2.34**	0,39 **1.4**	0,03 **.11**	5,33 **.210**	4,06 **.160**	1,52 **.060**	15,2 ±1,9 **.600 ±.075**

SIMULATED ROLLER ORDER GUIDE

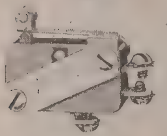
V3L-121-D8	Most applications	11 Amps **L156**	32,6 **1.285**	1,11 **4**	0,14 **.5**	3,18 **.125**	2,03 **.080**	1,27 **.050**	18,5 **.730**

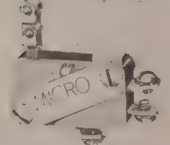
ROLLER LEVER ORDER GUIDES

V3L-139-D8	Most applications (Shown)	11 Amps **L156**	20.6 **.81**	2,22 **8**	0,56 **2**	1,5 **.060**	1,02 **.040**	0,41 **.016**	20,6 ±0,76 **.810 ±.030**
V3L-3003-D8	Up to 15 amps load handling. Best for performance under shock and vibration	15 Amps **L83**	20,6 **.81**	1,33 **4.8**	0,15 **.53**	1,2 **.047**	1,02 **.040**	0,33 **.013**	20,6 ±0,76 **.810 ±.030**
V3L-111-D8	Most applications longer lever	11 Amps **L156**	34 **1.34**	1,11 **4**	0,14 **.5**	3,18 **.125**	2,16 **.085**	1,27 **.050**	20,6 ±1,5 **.810 ±.060**
V3L-3004-D8	Up to 15 amps load handling. Best for performance under shock and vibration	15 Amps **L83**	34 **1.34**	0,70 **2.5**	0,14 **.49**	3,18 **.125**	2,16 **.085**	0,76 **.030**	20,6 ±1,5 **.810 ±.060**

AUXILIARY ACTUATORS ORDER GUIDES

Switches are not included with actuators.*





Catalog Listing	Description	Actuator Length mm inches	O.F. max. newtons ounces	R.F. min. newtons ounces	P.T. max. mm inches	O.T. min. mm inches	D.T. max. mm inches	O.P. mm inches	F.P. max. mm inches
JV-1	Leaf type (shown)	21,3 **.84**	3,34 **12**	1,11 **4**	1,19 **.047**	0,79 **.031**	0,41 **.016**	15 ±0,38 **.590 ±.015**	16,4 **.645**
JV-7	Long leaf	32,3 **1.27**	2,50 **9**	1,11 **4**	1,57 **.062**	1,27 **.050**	0,64 **.025**	14,5 ±0,76 **.570 ±.030**	17,4 **.685**
JV-5	Roller leaf (shown)	20,6 **.81**	3,34 **12**	1,11 **4**	1,52 **.060**	0,79 **.031**	0,41 **.016**	20,3 ±0,64 **.800 ±.025**	22,1 **.870**
JV-91**	Tandem leaf (shown)	20,6 **.81**	5,00 **18**	1,67 **6**	1,57 **.062**	0,89 **.035**	—	14,9 ±0,76 **.588 ±.030**	16,5 **.650**
JV-82**	Tandem roller leaf	20,6 **.81**	5,00 **18**	1,67 **6**	1,57 **.062**	0,89 **.035**	—	20,5 ±0,76 **.806 ±.030**	21,8 **.860**
JV-20	Roller lever	19,1 **.750**	0,83 **3**	0,14 **.5**	4,78 **.188**	1,57 **.062**	1,98 **.078**	19,5 ±1,4 **.766 ±.055**	23,8 **.936**
JV-26	Long lever	44,5 **1.75**	0,39 **1.4**	0,06 **.21**	8,33 **.328**	3,58 **.141**	4,75 **.187**	12,7 ±3,18 **.500 ±.125**	—
JV-30	One-way roller lever	20,6 **.81**	3,34 **12**	1,11 **4**	2,03 **.080**	0,51 **.020**	0,38 **.015**	25,7 ±0,76 **1.010 ±.030**	27,7 **1.09**

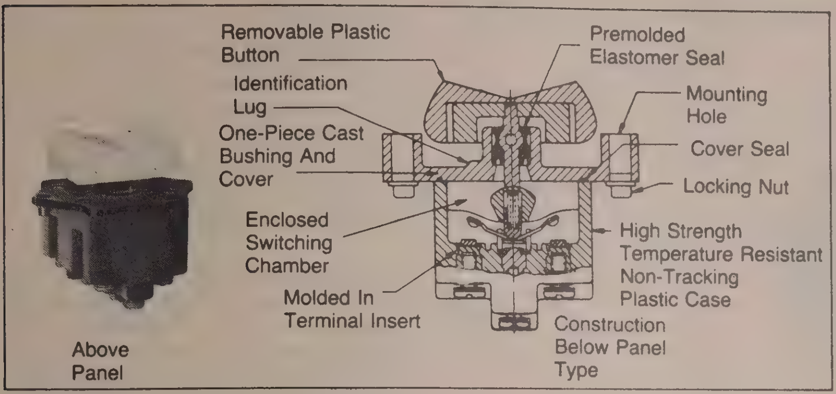
*Characteristics taken with actuator assembled on Catalog Listing V3-100 switch as shown.

NOTE: Contact a MICRO SWITCH Sales Office for application assistance when actuators will be used at temperatures above 300°F (149°C).

**Travel characteristics on tandem actuators vary with actual basic switch characteristics. These shown are typical for the assembly.

MICRO SWITCH, a Honeywell division

Rocker button switches TP


Removable Plastic Button
Identification Lug
One-Piece Cast Bushing And Cover
Enclosed Switching Chamber
Molded In Terminal Insert
Premolded Elastomer Seal
Mounting Hole
Cover Seal
Locking Nut
High Strength Temperature Resistant Non-Tracking Plastic Case
Construction Below Panel Type
Above Panel

FEATURES

- *2 and 3 position pushbutton action*
- *Various button colors*
- *1, 2, and 4 pole circuitry*
- *Flush panel and above panel mounting*
- *Temperature range is from −54°C to +71°C (−65°F to +160°F)*
- *UL listed, CSA certified*

SWITCHES WITHOUT BUTTONS

To order switches without buttons, convert catalog listings shown in the order guides. Substitute **TP7** for TP4 and TP16 above panel mounted switches; substitute **TP8** for TP1 and TP12 flush panel mounted switches. Order buttons separately from the chart below.

BUTTON ORDER GUIDE

Color	Catalog Listing
Translucent	12PA6
Transparent	12PA4
White*	12PA5-W
Yellow*	12PA5-Y
Black*	12PA5-BK
Green*	12PA5-G
Red*	12PA5-R
Blue*	12PA5-BL

*Opaque

ELECTRICAL RATINGS

(In amperes)

Elec. Rating Code	28 Volts DC			115 VDC	250 VDC	115 Volts AC 60 & 400 HZ			230 VAC
	Ind.	Res.	Lamp	Res.	Res.	Ind.	Res.	Lamp	Res.
1	15	20	5	0.75	0.5	10	15	3	6
2	10	15	4	0.75	0.5	7	15	2	6
3	15	20	7	0.75	0.5	15	15	4	6
4	10	18	5	0.75	0.5	8	11	2	6
5	12	20	5	0.75	0.5	15	15	4	6
6	10	18	4	0.75	0.5	8	11	2	6

2-POSITION ORDER GUIDE

Furnished with buttons.

No. of Poles	Circuits Made with Button At:		UL/CSA Rating Code	Elec. Rating Code	Catalog Listings			
					Flush Panel		Above Panel	
	Ident. Lug Position	Opposite Ident. Lug			Translucent Button	Transparent Button	Translucent Button	Transparent Button
1	OFF	2-3	L191	1	1TP201-2	1TP12-2	1TP216-2	1TP4-2
	1-2	2-3	L191	1	1TP201-3	1TP12-3	1TP216-3	1TP4-3
2	OFF	2-3, 5-6	L191	3	2TP201-2	2TP12-2	2TP216-2	2TP4-2
	1-2, 4-5	2-3, 5-6	L191	3	2TP201-3	2TP12-3	2TP216-3	2TP4-3
4	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-2	—	—	—
	1-2, 4-5, 7-8, 10-11	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-3	—	—	—

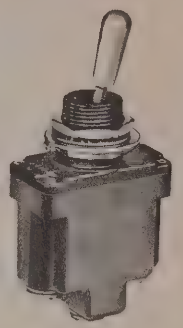
3-POSITION ORDER GUIDE

Furnished with buttons.

No. of Poles	Circuits Made with Button At:			UL/CSA Rating Code	Elec. Rating Code	Catalog Listings			
						Flush Panel		Above Panel	
	Ident. Lug Position	Center Position	Opposite Lug Lug Pos.			Translucent Button	Transparent Button	Translucent Button	Transparent Button
1	1-2	OFF	2-3	L191	1	1TP201-1	1TP12-1	1TP216-1	1TP4-1
	1-2*	OFF	2-3*	L192	2	1TP201-7	1TP12-7	1TP216-7	1TP4-7
2	1-2, 4-5	OFF	2-3, 5-6	L191	3	2TP201-1	2TP12-1	2TP216-1	—
	1-2, 4-5*	OFF	2-3, 5-6	L192	4	2TP201-5	—	—	—
	1-2, 4-5*	OFF	2-3, 5-6*	L192	4	2TP201-7	2TP12-7	2TP216-7	—
4	1-2, 4-5, 7-8, 10-11	OFF	2-3, 5-6, 8-9, 11-12	L191	5	4TP201-1	—	—	—
	1-2, 4-5, 7-8, 10-11*	OFF	2-3, 5-6, 8-9, 11-12*	L192	6	4TP201-7	4TP12-7	—	—

*These positions only are momentary. All others are maintained.

TK Toggle switches



ELECTRICAL RATINGS

UL/CSA Rating Code	Electrical Rating
L192	10 amps — 125, 250, 277 VAC; ¼ Hp — 125 VAC; ½ Hp — 250, 277 VAC; 3 amps — 125 VAC "L"
L191	UL Code L-191: 15 amps — 125, 250, 277 VAC; ½ Hp — 125 VAC; 1 Hp — 250, 277 VAC; 5 amps — 125 VAC "L"

2-POSITION ORDER GUIDE

No. Of Poles	Circuit(s) Made With Toggle At:			
	Keyway Position	Opposite Keyway	UL/CSA Rating Code	Catalog Listing
1	OFF	2-3	L191	1TK1-2
	1-2	2-3	L191	1TK1-3
2	OFF	2-3, 5-6	L191	2TK1-2
	1-2, 4-5	2-3, 5-6	L191	2TK1-3

3-POSITION ORDER GUIDE

No. Of Poles	Circuit(s) Made With Toggle At:				
	Keyway Position	Center Position	Opposite Keyway	UL/CSA Rating Code	Catalog Listing
1	1-2	OFF	2-3	L191	1TK1-1
	1-2*	OFF	2-3*	L192	1TK1-7
2	1-2, 4-5	OFF	2-3, 5-6	L191	2TK1-1
	1-2, 4-5*	OFF	2-3, 5-6*	L192	2TK1-7

*These positions only are momentary. All others are maintained.

FEATURES

- *Environment sealed enclosure*
- *1 and 2-pole circuitry*
- *2 and 3-position, maintained and momentary toggle action*
- *Temperature range: −40° to +71.1°C (−40° to +160°F)*
- *UL listed, CSA certified*

TK toggles answer the need for an environment sealed industrial grade toggle switch. When mounted with a 15PA87 seal accessory, they meet NEMA 4 requirements on food processing and other industrial panels subjected to periodic washdowns. TK's withstand heavy morning dew found in the cabs of construction and farm vehicles, and beverage spillage.

CONSTRUCTION

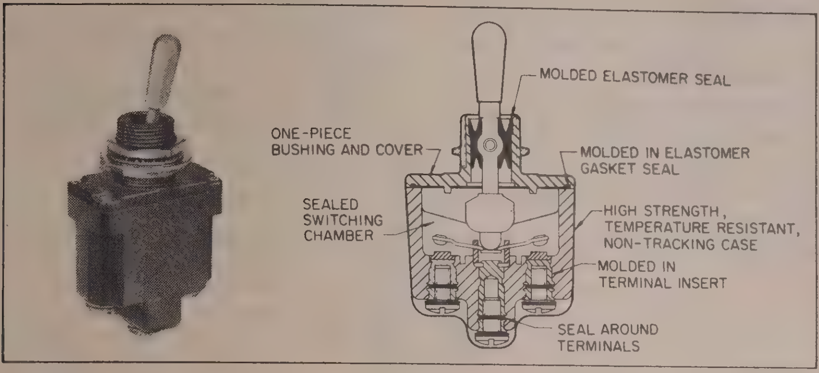
There is a premolded elastomer seal between the toggle lever and bushing, and an elastomer gasket seal between the cover and case. Terminal inserts are molded into the case.

TK's embody many of the time-proven construction features of the TL design, such as: spring-loaded actuating mechanism for direct-action operation and excellent tactile feedback; stepped terminals, which aid non-shorting wiring connections; and a high strength non-tracking case, which promotes electrical stability.

TERMINAL CIRCUIT IDENTIFICATION

Terminal identifications are refered to in the Ordering Charts to indicate which circuits are made in each toggle position (i.e. 1-2 reference indicates circuit closure through terminals 1 and 2.)

Toggle switches TL


MOLDED ELASTOMER SEAL
ONE-PIECE BUSHING AND COVER
MOLDED IN ELASTOMER GASKET SEAL
SEALED SWITCHING CHAMBER
HIGH STRENGTH, TEMPERATURE RESISTANT, NON-TRACKING CASE
MOLDED IN TERMINAL INSERT
SEAL AROUND TERMINALS

FEATURES

- *Qualified to MIL-S-3950*
- *Environment-proof sealing*
- *1, 2, and 4 pole circuitry*
- *Standard and pull to unlock levers*
- *2 and 3 position, maintained, and momentary toggle action*
- *Temperature range: −65°C to +71°C (−85°F to +160°F)*
- *UL listed, CSA certified*

2-POSITION ORDER GUIDE

No. of Poles	Circuit(s) Made w/Toggle At: Keyway Position	Opposite Keyway	Electrical Rating Code	UL/CSA Rating Code	Standard Toggle: Catalog Listing	Military Number	Pull-to-Unlock Toggle: Add Suffix to Standard Listing	Military Number**
1	OFF	2-3	1	L191	1TL1-2	MS24523-22	D, F, G	MS24658-22
	OFF*	2-3	2	L192	1TL1-4	MS24523-29	F	MS24658-29
	1-2*	OFF	2	L192	1TL1-6	MS24523-30	F	MS24658-30
	1-2	2-3	1	L191	1TL1-3	MS24523-23	D, F, G	MS24658-23
	1-2*	2-3	2	L192	1TL1-8	MS24523-26	F	MS24658-26
2	OFF	2-3, 5-6	3	L191	2TL1-2	MS24524-22	D, F, G	MS24659-22
	1-2, 4-5*	OFF	4	L192	2TL1-6	MS24524-30	F	MS24659-30
	1-2, 4-5	2-3, 5-6	3	L191	2TL1-3	MS24524-23	D, F, G	MS24659-23
	1-2, 4-5*	2-3, 5-6	4	L192	2TL1-8	MS24524-26	F	MS24659-26
4	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-2	MS24525-22	D, F, G	MS24660-22
	1-2, 4-5 7-8, 10-11	2-3, 5-6 8-9, 11-12	5	L191	4TL1-3	MS24525-23	D, F, G	MS24660-23

*These positions only are momentary. All others are maintained

**Also add the appropriate suffix letter to the Military number

3-POSITION ORDER GUIDE

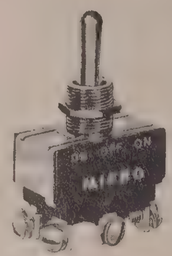
No. of Poles	Circuit(s) Made w/Toggle At: Keyway Position	Center Position	Opposite Keyway	Electrical Rating Code	UL/CSA Rating Code	Standard Toggle: Catalog Listing	Military Number**	Pull-to-Unlock Toggle: Add Suffix to Standard Listing	Military Number**
1	1-2	OFF	2-3	1	L191	1TL1-1	MS24523-21	ALL TYPES	MS24658-21
	1-2*	OFF	2-3	2	L192	1TL1-5	MS24523-31	E, F, K, L, M, N	MS24658-31
	1-2*	OFF	2-3*	2	L192	1TL1-7	MS24523-27	E, L, N	MS24658-27
2	1-2, 4-5	OFF	2-3, 5-6	3	L191	2TL1-1	MS24524-21	ALL TYPES	MS24659-21
	1-2, 4-5*	OFF	2-3, 5-6	4	L192	2TL1-5	MS24524-31	E, F, K, L, M, N	MS24659-31
	1-2, 4-5	OFF	2-3, 5-6*	4	L192	2TL1-7	MS24524-27	E, L, N	MS24659-27
	1-2, 4-5	1-2, 5-6	2-3, 5-6	3	L191	2TL1-10	MS27407-4	ALL TYPES	MS27408-4
	1-2, 4-5*	1-2, 5-6	2-3, 5-6	4	L192	2TL1-50	MS27407-5	E, F, K, L, M, N	MS27408-5
	1-2, 4-5*	1-2, 5-6	2-3, 5-6*	4	L192	2TL1-70	MS27407-6	E, L, N	MS27408-6
4	1-2, 4-5 7-8, 10-11	OFF	2-3, 5-6 8-9, 11-12	5	L191	4TL1-1	MS24525-21	ALL TYPES	MS24660-21
	1-2, 4-5 7-8, 10-11	OFF	2-3, 5-6 8-9, 11-12*	6	L192	4TL1-7	MS24525-27	E, L, N	MS24660-27
	1-2, 4-5 7-8, 10-11	2-3, 4-5 7-8, 11-12	2-3, 5-6 8-9, 11-12	5	L191	4TL1-12	MS27406-1	ALL TYPES	MS27409-1

*These positions only are momentary. All others are maintained

**Also add appropriate suffix letter to the Military number

MICRO SWITCH, a Honeywell division

TS Toggle switches



FEATURES

- *2 or 3-position, momentary and maintained action*
- *1 and 2-pole circuitry*
- *Rated up to 15 amps*
- *Lever-to-bushing seal*
- *Solder, screw, or quick-connect terminals*
- *UL listed, CSA certified*

ELECTRICAL RATINGS

UL/CSA Rating Code	Electrical Rating
L192	10 Amps, 125, 250, 277 VAC; ¼ HP — 125 VAC; ½ HP — 250, 277 VAC; 3 amps — 125 VAC "L"
L191	15 amps, 125, 250, 277 VAC; ½ HP — 125 VAC; 1 HP — 250, 277 VAC; 5 amps — 125 VAC "L"

2-POSITION ORDER GUIDE

No. of Poles	Circuit(s) Made w/Toggle At:		UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
	Keyway Position	Opposite Keyway				
1	OFF	2-1 ON	L191	11TS15-2	11TS115-2	11TS95-2
	2-1 ON	2-3 ON	L191	11TS15-3	11TS115-3	11TS95-3
2	OFF	2-3 & 5-6 ON	L191	12TS15-2	12TS115-2	12TS95-2
	2-1 & 5-4 ON	2-3 & 5-6 ON	L191	12TS15-3	12TS115-3	12TS95-3

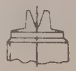
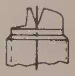
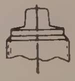
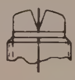
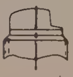
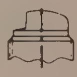
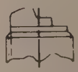
3-POSITION ORDER GUIDE

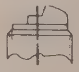
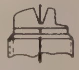
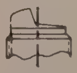
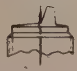
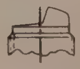
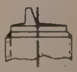
No. of Poles	(Circuits) Made w/Toggle At:			UL/CSA Rating Code	Screw Terminals	Solder Terminals	Quick-Connect Terminals
	Keyway Position	Center Position	Opposite Keyway				
1	2-1 ON	OFF	2-3 ON	L191	11TS15-1	11TS115-1	11TS95-1
	2-1 ON*	OFF	2-3 ON	L192	11TS15-5	11TS115-5	11TS95-5
	2-1 ON*	OFF	2-3 ON*	L192	11TS15-7	11TS115-7	11TS95-7
2	2-1 & 5-4 ON	OFF	2-3 & 5-6 ON	L191	12TS15-1	12TS115-1	12TS95-1
	2-1 & 5-4 ON*	OFF	2-3 & 5-6 ON*	L192	12TS15-7	12TS115-7	12TS95-7

*Marked toggle positions are momentary. All other positions are maintained.

LOCKING CONFIGURATIONS FOR TL, 13AT AND 23AT SERIES ONLY

When ordering pull-to-unlock toggle listings, add the suffix letter shown in the chart below to the standard toggle listing and the MS number. For example, to order a 1TL1-1 pull-to-unlock toggle switch with the lever locked in the center position, add the letter **E**; i.e., 1TL1-1**E**, MS-24658-21**E**.

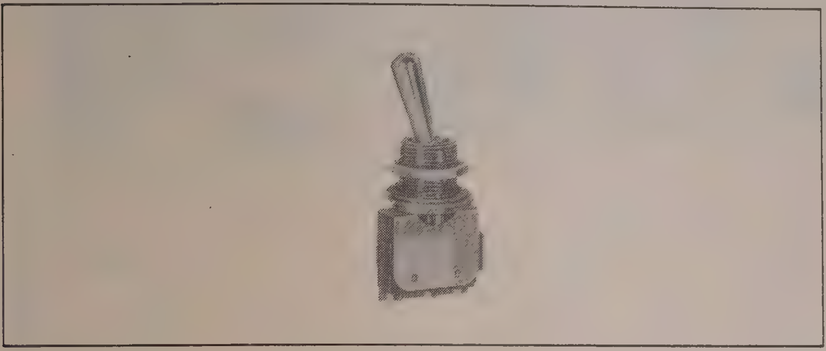
A	B	D	E	F	G	H
 Locked In Three Positions	 Locked In Center and Extreme Position (Keyway Side)	 Locked Out Of Center Position	 Locked In Center Position	 Locked In Extreme Position (Opposite Keyway)	 Locked In Extreme Position (Keyway Side)	 Locked Out Of Center And Extreme Position (Keyway Side)

J	K	L	M	N	P
 Locked Out Of Center And Extreme Position (Opposite Keyway)	 Locked In Center And Extreme Position (Opposite Keyway)	 Locked Out Of Extreme Position (Keyway Side)	 Locked Out Of And Into Extreme Position (Opposite Keyway)	 Locked Out Of Extreme Position (Opposite Keyway)	 Locked Out Of And Into Extreme Position (Keyway Side)

MICRO SWITCH, a Honeywell division

Toggle switch assemblies **AT**

6AT SERIES



FEATURES

- 2-position, momentary and maintained action
- 1, 2 or 3 SPDT precision basic switches
- Short behind-panel depth
- Choice of ¼ or 15/32-inch bushings
- Silver contacts (gold available)
- UL listed, CSA certified basic switches

6AT ORDER GUIDE

Mounting Style	No. of Poles	Solder Terminals*
¼″ bushing with key tab	1	6AT2
	2	6AT3
	3	6AT501
¼″ bushing without key tab	1	6AT1
	2	6AT4
15/32″ bushing with key washer	1	6AT6
	2	6AT7
	3	6AT10

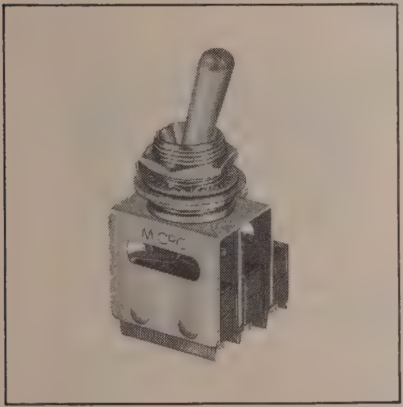
*"T" and "T2" terminal versions, gold contact versions for low energy circuits: See Catalog 30.

ELECTRICAL RATINGS

For 6AT, 13AT, 23AT switches

UL/CSA Rating	30VDC Rating		
		Amps	
	Load	Sea Level	50,000 ft.
5 amps, 125-250VAC	Inductive Resistive Max. Inrush	3 5 24	2.5 5 24

13AT/23AT SERIES



FEATURES

- 2 or 3 position, momentary or maintained action
- 2, 3 or 4 SPDT precision basic switches
- Standard toggle, tab or pull-to-unlock levers
- Silver contacts (gold available)
- 15/32-inch bushing
- UL listed, CSA certified basic switches
- Lever-to-bushing seal option

23AT 2-POSITION ORDER GUIDE

Toggle Lever Position		No. of Poles	Solder Terminals*
Keyway	Opposite Keyway		
Maint.	Maint.	2	23AT1
		3	23AT2
		4	23AT3

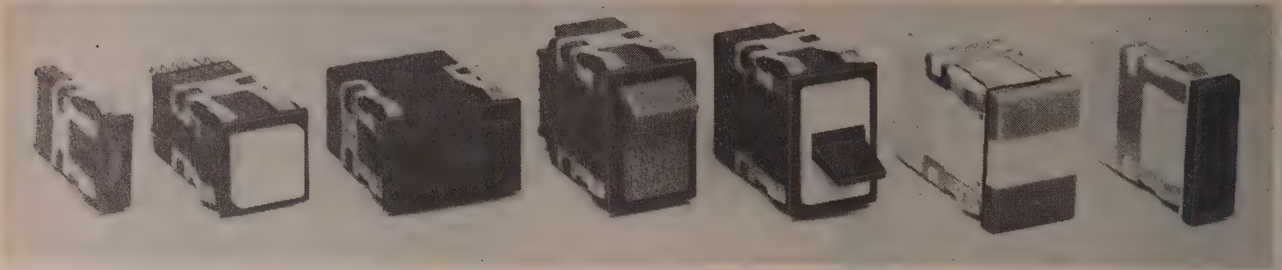
13AT 3-POSITION ORDER GUIDE

Toggle Lever Position			No. of Poles*	Solder Terminals*
Keyway	Center	Opposite Keyway		
Maint.	Maint.	Maint.	2	13AT2
Mom.	Maint.	Mom.	2	13AT1
Maint.	Maint.	Mom.	2	13AT3

*Pull-to-unlock lever, tab lever, 3 and 4-pole versions, M8805 types, gold contacts, and "T" or "T2" terminals: see Catalog 30, Manual Switches.

MICRO SWITCH, a Honeywell division

AML Advanced manual line



AML's classic design blends with other panel components to enhance total display harmony. Well-accepted as the only comprehensive line of its kind, AML features uniformly functional and attractive pushbuttons, paddles, rockers, indicators, and annunciators. LED, incandescent, and neon illumination . . . solid state to electronic and power duty control.

AML electrical data . . . . p. 22
Solid state pushbuttons AML11/12 . . . . p. 23
Power duty pushbuttons AML31/32 . . . . p. 23
Electronic control pushbuttons AML21/22 . . . . p. 24
LED application notes/panel cutouts . . . . p. 24
Lighted indicators AML41/42 . . . . p. 25
Buttons, lenses, lamps AML51/52/91 . . . . p. 26
Solid state paddles & rockers AML13/14/15/16 . . . . p. 27
Electronic control paddles & rockers AML23/24/25/26 . . . . p. 28
Power duty paddles & rockers AML33/34/35/36 . . . . p. 29
Paddle covers AML53/55 . . . . p. 30
Rocker operators AML54/56 . . . . p. 31
AML accessories . . . . p. 32

A companion line of MIL-S-22885 qualified products is available. Ask for information on M22885 series.

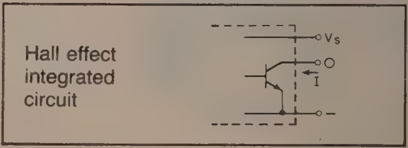
ELECTRICAL SPECIFICATIONS

AML10 SERIES SOLID STATE SWITCHES

Electrical Characteristics						Absolute Maximum Rating			
Integrated Circuit Function	Supply Current (Max.)	Output Voltage (Operated)	Output Leakage Current Max. (Released)	Switching Time Max.		Supply Voltage (V_s)	Voltage Externally Applied to Output	Loads to Output	Storage Temperature
				Rise 10% to 90%	Fall 90% to 10%				
5 VDC Sinking[1]	3.5 mA (Released) 6.5 mA (Operated — no load)	+.4 Volt (Sinking 8 mA)	2.0 μ A	1.0 μ sec. (Sinking 8 mA)	1.0 μ sec (Sinking 8 mA)	−.5 to +7.0 VDC 0° to +65°C (+32° to +149°F)	−.5 Volt min. +15 Volts Max. (Off condition)	20 mA (Sinking)	−40°C to +65°C (−40° to +149°F)
6-16 VDC Sinking[2]	6.5 mA @ 6 VDC. 10.0 mA @ 16 VDC (Plus load current)[3]	+.4 Volt (Sinking 20mA max.)	20 μ A	1.5 μ sec (Sinking 20 mA)	0.5 μ sec (Sinking 20 mA)	−1.2 to +20 VDC	+20 VDC max. in Off condition only −0.5 VDC min. in Off or On condition	40 mA	−40°C to +65°C (−40° to +149°F)

[1] Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage of 4.5 to 5.5 VDC.
[2] Over temperature range of 0° to +55°C (+32° to +131°F) and supply voltage to 16 VDC.
[3] At 24°C (+75°F).

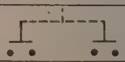
A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking output.



AML20 SERIES ELECTRONIC CONTROL SWITCHES

Contacts	Voltage	Current	Load Type	Contact Arrangement
Silver	250 VAC 125 VAC 24 VDC	2 Amps 3 Amps 2 Amps	75% Power Factor 75% Power Factor Resistive	1, 2, Or 4 poles: Form C
Gold	24 VDC 5 VDC .5 VDC	100 mA 10 mA 1 mA	Resistive Resistive Resistive	

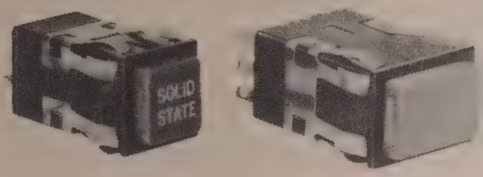
AML30 SERIES POWER DUTY SWITCHES

	Voltage	Current	Load Type	Contact Arrangement
Pushbutton Switches	125 VAC* 250 VAC*	10 amps 10 amps	60% Power Factor 60% Power Factor	2 poles: Form X 
Rocker & Paddle Switches	125 VAC 250 VAC	15 amps 15 amps	60% Power Factor 60% Power Factor	1 Or 2 poles: Form A

*10 amps, ⅓ hp.

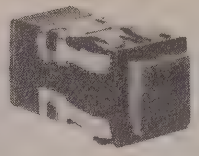
MICRO SWITCH, a Honeywell division

Solid state pushbutton switches AML11/12



AML11 non-lighted or incandescent illuminated

Buttons (AML51) and incandescent lamps (AML91) are ordered separately.



AML12 w/integral LED indicator

LED "window" buttons (AML52) are ordered separately.

FEATURES

- *Hall effect reliability. (For electrical specifications, refer to facing page.)*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *UL recognized.*

AML11 B

Housing Type
Standard Bezel:
AML11B Square Non-Lighted
AML11C Square 1 Lamp Ckt.
AML11E Rect. Non-Lighted
AML11F Rect. 1 Lamp Ckt.
Standard Bezel:
AML12C Square 1 LED

B

Bezel Color
B Black

A

Lamp Type	
A	No Lamp Installed
LED Color/ Voltage	
Red	
B	V*
C	5 V
Yellow	
H	V*
J	5 V
Green	
R	V*
S	5 V

2

Terminal Type
2 .110 x .020 (Solder or Quick-Connect)
3 .025 x .025 (Printed Circuit or Push-On)

AA

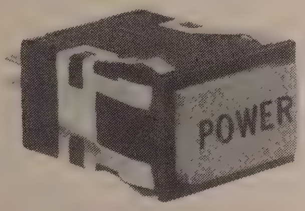
Circuitry Codes	
5 VDC Sinking	**AA** Momentary Action
6-16 VDC Sinking	**BA** Momentary Action

*See LED Application Notes.

Additional AML11 options: Full guard bezel, two-level alternate action, and rectangular housings with two lamp circuits.

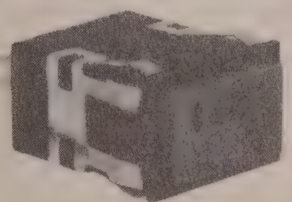
Additional AML12 options: Full guard bezel, integral diode LED protection, 15 V LED voltage, and two-level alternate-action.

Power duty pushbutton switches AML31/32



AML31 non-lighted or incandescent illuminated

Buttons (AML51) and incandescent lamps (AML91) are ordered separately.



AML32 w/integral neon indicator

Neon "window" buttons (AML52) are ordered separately.

FEATURES

- *Up to 10 amps, 125/250 VAC.*
- *UL listed, CSA certified.*

Additional AML31 Options: Momentary action, full guard bezel.

Additional AML32 Options: Full guard bezel, momentary action.

AML31 E

Housing Type
Standard Bezel:
AML31E Rect. Non-Lighted
AML31F Rect. 1 Lamp Ckt.
Standard Bezel:
AML32F Rect. 1 Neon Lamp

B

Bezel Color
B Black

A

Lamp Type	
A	No Lamp Installed
Neon Lamp Voltage/Color	
Red	
B	125 VAC
C	250 VAC
Clear	
K	125 VAC
L	250 VAC

4

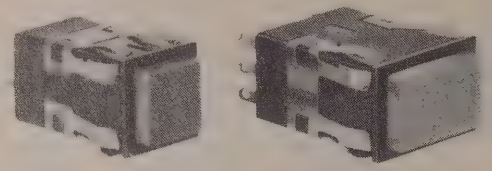
Terminal Type
4 .187 x .020 (Solder or Quick-Connect)
Terminal Type Lamp Circuit
4 .187 x .020 (Solder or Quick-Connect) with isolated lamp circuit
7 .187 x .020 with integral lamp circuit

AD

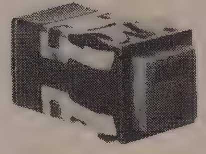
Circuitry Codes
2-Pole, Single-Throw Normally-Open, Form X:
AD Alternate Action

MICRO SWITCH, a Honeywell division

AML21/22 Electronic control pushbutton switches



AML21 non-lighted or incandescent illuminated Buttons (AML51) and incandescent lamps (AML91) are ordered separately.



AML22 w/integral LED indicator LED "window" buttons (AML52) are ordered separately.

FEATURES

- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts.*
- *Momentary or 2-level alternate-action.*
- *UL listed, CSA certified.*

AML21 B **B** **A** **2** **AA**

Housing Type
Standard Bezel: **AML21B** Square Non-Lighted **AML21C** Square 1 Lamp Ckt. **AML21E** Rect. Non-Lighted **AML21F** Rect. 1 Lamp Ckt.
Standard Bezel: **AML22C** Square 1 LED

Bezel Color
B Black

Lamp Type	
A	No Lamp Installed
LED Color/ Voltage	
Red	
B	V*
C	5.0 V
Yellow	
H	V*
J	5.0 V
Green	
R	V*
S	5.0 V

Terminal Type
2 .110 x .020 (Solder or Quick-Connect)
3 .025 x .025 (Printed Ckt. or Push-On)

Circuitry Codes (Each pole has double-throw)		
Silver Contacts	Mom. Action	**AA** 1-Pole **AC** 2-Pole
	Alt. Action	**AB** 1-Pole **AD** 2-Pole
Gold Contacts	Mom. Action	**BA** 1-Pole **BC** 2-Pole
	Alt. Action	**BB** 1-Pole **BD** 2-Pole

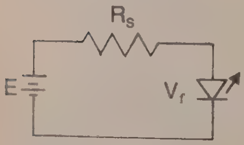
*See LED Application Notes.

Additional AML21 Options: Full guard bezel, 4 poles, and rectangular housings with two lamp circuits.

Additional AML22 Options: Full guard bezel, integral diode protection for LED, 15 V LED voltage, and 4 poles.

LED Application Notes:

1. Internal resistors control LED current to nominal 20 mA on 5 VDC devices.
2. Devices without internal current-limiting resistors require suitable external control of the LED current.
3. A minimum of 5 VDC open circuit voltage with an appropriate series resistance should drive the LED. This minimizes effect of temperature (current variation) on forward voltage of LED.
4. Reverse breakdown voltage of LED is 5 volts min.
5. Following example includes a simple DC drive circuit and equation used to determine value of series resistance.



$$R_S = \frac{E - V_f}{I_f}$$

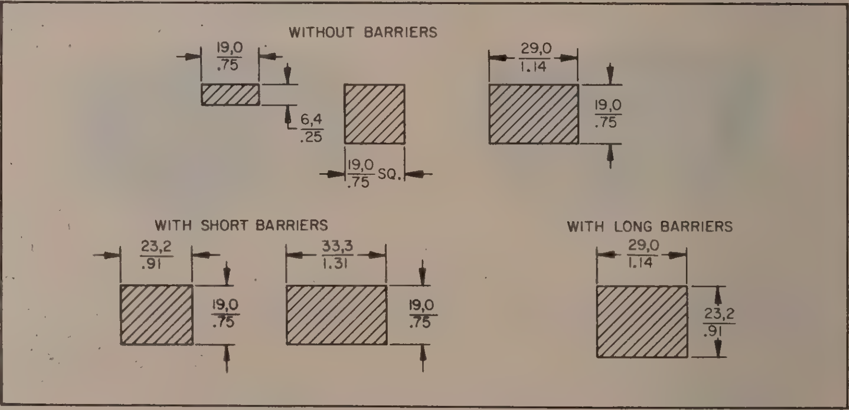
Where: R_S = Series Resistance
E = Supply Voltage
V_f = Forward Voltage of LED
I_f = Circuit Current

If a diode is added in series for reverse polarity protection then:

$$R_S = \frac{E - V_f - V_{PD}}{I_f}$$

Where: V_{PD} = Forward Voltage of Protection Diode

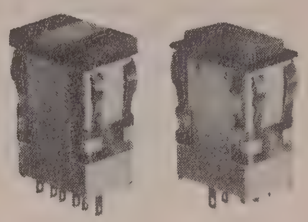
PANEL CUTOUTS FOR SINGLE SWITCHES/INDICATORS



Lighted indicators AML41/42

FEATURES

- *Choice of incandescent or LED illumination.*
- *UL listed, CSA certified (except LED indicators, which are UL recognized).*



AML41 incandescent illuminated pushbutton style (left) and lens style.

AML42 LED pushbutton style (left) and compact style.

AML41 pushbutton style indicators match display of incandescent illuminated switches.

Lens style indicators use a special cap-like button which covers the bezel to present a larger display area, without affecting family appearance. Up to 3-lamp split screen capability.

Note: Buttons (AML51) and incandescent lamps (AML91) ordered separately.

AML41 ORDER GUIDE

AML41 C **B** **A** **2**

Housing Type	
Pushbutton Style:	**Lens Style:**
AML41 C Square 1 lamp ckt.	(Use AML51-J, -K, and -L buttons only)
AML41 D Square 2 lamp ckts.	**AML41 J** Rectangular 1 lamp ckt.
AML41 F Rectangular lamp ckt.	**AML41 K** Rectangular 2 lamp ckts.
AML41 G Rectangular 2 lamp ckts.	**AML41 L** Rectangular 3 lamp ckts.

Bezel Color
B Black

Lamp Type
A No lamp installed

Terminal Type
2 .110 x .020 (Solder or Quick-Connect)
3 .025 x .025 (Printed Circuit or Push-On)

AML42C housings have an integral LED indicator which is flush with the button face. Note: LED "window" buttons (AML52) are ordered separately.

AML42S feature a compact (.9 x .3") package. The LED is flush with the bezel.

AML42 ORDER GUIDE

AML42 S **B** **C** **2**

Housing Type
AML42 C Square 1 LED
AML42 S Compact 1 LED

Bezel Color
B Black

LED Color/ Voltage	
Red	
B	V*
C	5 V
Yellow	
H	V*
J	5 V
Green	
R	V*
S	5 V

Terminal Type	
2 .110 x .020 (Solder or Q.C.)	**3** .025 x .025 (Printed Circuit or Push-On)

*See LED Application Notes.

Additional Indicator Options: 15 V LED voltage, neon indicators which match the display of neon power duty pushbutton switches.

MICRO SWITCH, a Honeywell division

AML51/52 Buttons/lenses/lamps

AML51 ORDER GUIDE

AML51 buttons are for non-lighted or incandescent illuminated display.

Specify AML51-J, AML51-K, and AML51-L buttons for use with AML41J, AML41K, and AML41L **lens style indicators only.** They do not fit other AML pushbutton switches or indicators.

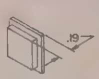
Split colors for display/legend types 10, 11, 20, and 21 are visible whether lighted or unlighted. On all other types, split colors are only visible when lighted.

AML51-C — **10** — **R** — **—** — **—**

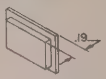
Button Type

For Pushbuttons Or Indicators

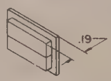
AML51-C



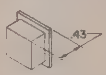
AML51-F



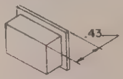
AML51-G



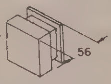
AML51-B



AML51-E



AML51-M

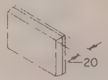


Button Types B, E, and M are available with Display/ Legend Types 10 and 20 only.

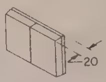
For Indicators Only

Lens Style:

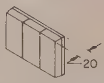
AML51-J



AML51-K

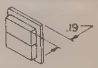


AML51-L



Pushbutton Style:

AML51-D



Display Legend/Type

Transmitted Color
10 No legend
20 With legend

Transmitted Color
(Clear cap and color insert)
11 No legend
21 With legend

Dead Front
(Smoky gray cap and color insert)
30 No legend
40 With legend

Projected Color
(White cap and color insert)
50 No legend
60 With legend

Full Color or 1st Color Split	**2nd Color Split**	**3rd Color Split**
R Red	**R** Red	**R** Red
Y Yellow	**Y** Yellow	**Y** Yellow
G Green	**G** Green	**G** Green
B Blue	**B** Blue	**B** Blue
W White	**W** White	**W** White

INCANDESCENT LAMPS
AML91 ORDER GUIDE

Lamp Type	Industry Lamp No.	Voltage	Catalog Listing
Incandescent T-1¾ wedge base	86	6.3	AML91LA86
	73	14.0	AML91LA73
	85	28.0	AML91LA85

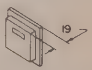
AML52 ORDER GUIDE

AML52 buttons have an open window which allows the LED or neon lamp lens to be flush with the button face.

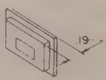
AML52-N — **10** — **R**

Button Type

For LED Devices
AML52-C



For Neon Devices
AML52-N



Display/Legend Type

Transmitted Color
10 No Legend
20 With Legend

Button Color

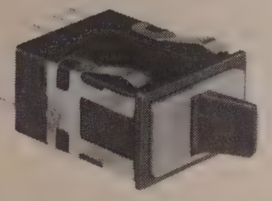
R Red
Y Yellow
G Green
B Blue
W White
K Black

Note: Dimensions include the .060 in. bezel.

MICRO SWITCH, a Honeywell division

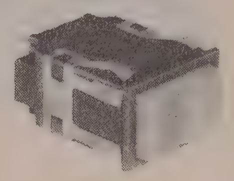
Solid state paddle and rocker switches Non-lighted or incandescent illuminated

AML13/14



AML13

Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.



AML14

Rockers (AML54) and incandescent lamps (AML91) ordered separately.

FEATURES

- *Hall effect reliability.*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL recognized.*

Additional Options: Two lamp circuits; other two and three-position operating actions; printed circuit or push-on terminals; and two 6-16V sinking IC's.

AML13 E **B** **A** **2** **AA** **01**

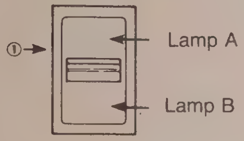
Housing Type
AML13 E Rect. Paddle Non-Lighted
AML13 F Rect. Paddle 1 Lamp Ckt. (A)
AML14 E Rect. Rocker Non-Lighted
AML14 F Rect. Rocker 1 Lamp Ckt. (A)

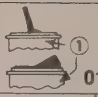
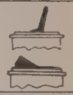
Operator/Bezel Color
B Black

Lamp Type
A No Lamp Installed

Terminal Type
2 .110 x .020 (Solder or Quick-Connect)

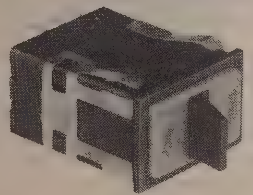
Circuitry
One IC (Ckt. A): **AA** 5 V Sinking
BA 6-16 V Sinking
Two IC's (Ckts. A & B): **AC** 5 V Sinking



Operating Action		
Circuit Output States	 ① 01 **Maint.**	 **Maint.**
Ckt. A	Low (operated)	High
Ckt. B	High	Low (operated)

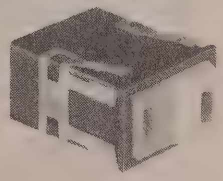
Solid state paddle and rocker switches With integral LED indicators

AML15/16



AML15

LED "window" covers (AML55) are ordered separately.



AML16

LED "window" rockers (AML56) are ordered separately.

FEATURES

- *Hall effect reliability.*
- *Low voltage signal interfaces with nearly all DC logic.*
- *5 or 6-16 supply voltage.*
- *UL recognized.*

Additional Options: Two LED's, integral diode LED protection, 15V LED voltage, printed circuit/push-on terminals, other two and three-position operating actions.

AML15 F **B** **B** **2** **AA** **01** **R** **X**

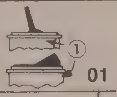
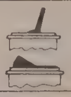
Housing Type
AML15 F Rect. Paddle 1 LED
AML16 F Rect. Rocker 1 LED

Operator/Bezel Color
B Black

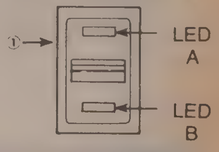
LED Voltage
B V*
C 5 V

Terminal Type
2 .110 x .020 (Solder or Quick-Connect)

Circuitry
One IC (Ckt. A): **AA** 5 V Sinking
BA 6-16 V Sinking
Two IC's (Ckts. A & B): **AC** 5 V Sinking

Operating Action		
Circuit Output States	 ① 01 **Maint.**	 **Maint.**
Ckt. A	Low (operated)	High
Ckt. B	High	Low (operated)

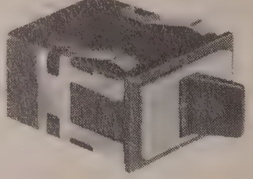
LED Color	
LED A	**LED B**
R Red **Y** Yellow **G** Green	**X** No LED



*See LED Application Notes.

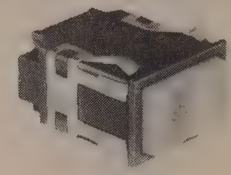
① The "MICRO SWITCH" identification is shown on this side of the switch housings.

AML23/24 Electronic control paddle and rocker switches Non-lighted or incandescent illuminated



AML23

Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.



AML24

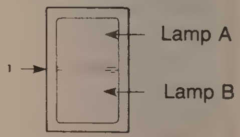
Rockers (AML54) and incandescent lamps (AML91) ordered separately.

FEATURES

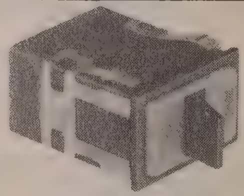
- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL listed, CSA certified.*

Additional Options: Two lamp circuits, printed circuit/push-on terminals, other two and three-position operating actions, and additional circuitry.

AML23 E	B	A	2	AA	01
Housing Type	**Operator/Bezel Color**	**Lamp Type**	**Terminal Type**	**Circuitry**	**Operating Action**
AML23 E Rect. Paddle Non-Lighted **AML23 F** Rect. Paddle 1 Lamp Ckt. (A) **AML24 E** Rect. Rocker Non-Lighted **AML24 F** Rect. Rocker 1 Lamp Ckt. (A)	**B** Black	**A** No Lamp Installed	**2** .110 x .020 (Solder or Quick-Connect)	Insert Code Letters from chart below	Insert Code Numbers from chart below

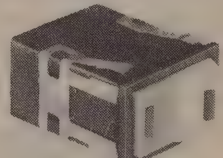


AML25/26 Electronic control paddle and rocker switches With integral LED indicator



AML25

LED "window" covers (AML55) are ordered separately.



AML26

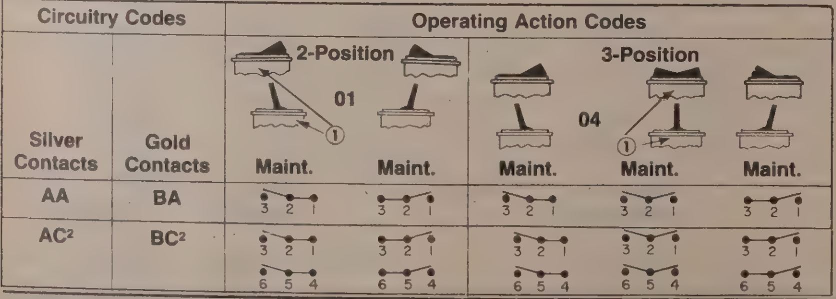
LED "window" rockers (AML56) are ordered separately.

FEATURES

- *Up to 3 amps, 125 VAC.*
- *Silver or gold contacts.*
- *UL listed, CSA certified.*

Additional Options: Two LED's, 15V LED voltage, printed circuit/push-on terminals, other two and three-position operating actions, and additional circuitry.

AML25 F	B	B	2	AA	01	R	X
Housing Type	**Operator/ Bezel Color**	**LED Voltage**	**Terminal Type**	**Circuitry**	**Operating Action**	**LED Color**	
						LED A	**LED B**
AML25 F Rect. Paddle 1 LED **AML26 F** Rect. Rocker 1 LED	**B** Black	**B** V* **C** 5.0 V	**2** .110 x .020 (Solder or Quick-Connect)	Insert Code Letters from chart below	Insert Code Numbers from chart below	**R** Red **Y** Yellow **G** Green	**X** No LED

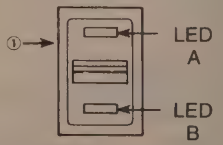


Circuitry Codes		Operating Action Codes				
		2-Position		3-Position		
		01		04		
Silver Contacts	**Gold Contacts**	**Maint.**	**Maint.**	**Maint.**	**Maint.**	**Maint.**
AA	**BA**	3 2 1	3 2 1	3 2 1	3 2 1	3 2 1
AC²	**BC²**	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4	3 2 1 6 5 4

*See LED Application Notes.

① The "MICRO SWITCH" identification is shown on this side of the switch housings.

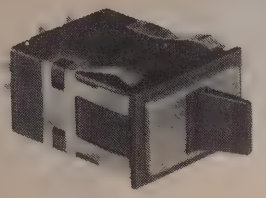
② For non-illuminated switches only



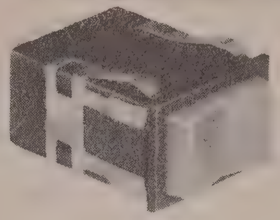
MICRO SWITCH, a Honeywell division

Power duty paddle and rocker switches Non-lighted or incandescent illuminated

AML33/34



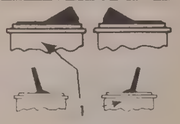
AML33
Paddle covers (AML53) and incandescent lamps (AML91) ordered separately.

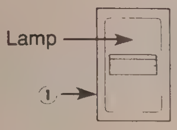


AML34
Rocker operators (AML54) and incandescent lamps (AML91) ordered separately.

FEATURES

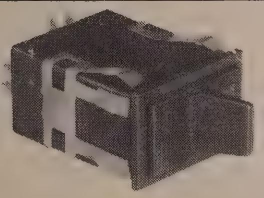
- *Up to 15 amps, 125/250 VAC.*
- *Black toggle type paddle operators. (Switch covers provide color display.)*
- *UL listed, CSA certified.*

AML33 E	B	A	4	AA	01
Housing Type	Operator/Bezel Color	Lamp Type	Terminal Type	Circuitry Codes	Operating Action
AML33 E Rect. Paddle Non-Lighted **AML33 F** Rect. Paddle 1 Lamp Ckt. **AML34 E** Rect. Rocker Non. Illum. **AML34 F** Rect. Rocker 1 Lamp Ckt	**B** Black	**A** No Lamp Installed	**4** .187 x .020 (Solder or Quick-Connect)	**Silver Contacts:** **AA** 1-Pole (One Form A Single-Throw, Normally-Open) **AC** 2-Pole (Two Form A)	 **01** Maint. ON Maint. OFF

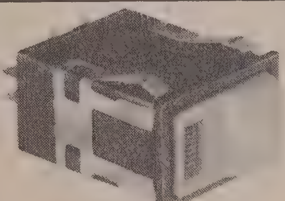


Power duty paddle and rocker switches With integral LED indicator

AML35/36



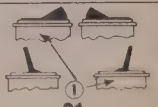
AML35
Neon "lens" covers (AML55) ordered separately.

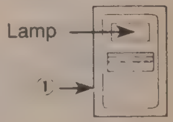


AML36
Neon "lens" rockers (AML56) ordered separately.

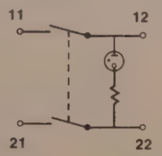
FEATURES

- *Up to 15 amps, 125/250 VAC.*
- *UL listed, CSA certified.*

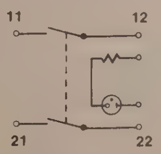
AML35 F	B	B	4	AA	01
Housing Type	Operator/Bezel Color	Lamp Voltage	Terminal Type/ Lamp Circuit	Circuitry Codes	Operating Action
AML35 F Rect. Paddle 1 Neon Lamp **AML36 F** Rect. Rocker 1 Neon Lamp	**B** Black	**B** 125 VAC **C** 250 VAC	**4** .187 x .020 (Solder or Quick-Connect) With Isolated Lamp Circuit **7** .187 x .020 With Integral Lamp Circuit (Available with 2-Pole devices only)	**Silver Contacts:** **AA** (One Form A Single-Throw) Available only with isolated lamp circuit, term. type 4. **AC** 2-Pole (Two Form A)	 **01** Maint. ON Maint. OFF



Integral Neon Circuit



Isolated Neon Circuit



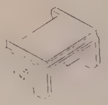
① The "MICRO SWITCH" identification is shown on this side of the switch housings.

AML53/55 Covers for paddle switches

Colored covers simply snap into the top of paddle switch housings.

AML53 ORDER GUIDE

AML53 covers are for non-lighted or incandescent illuminated display.

AML53-E **Paddle Switch Cover Type**	**10** **Display/Legend Type**	**R** **Cover Color**
 **AML53-E** ½ Cover	**Transmitted Color** **10** No legend **20** With legend **Transmitted Color** (Clear cap and color insert) **11** No legend **21** With legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K*** Black

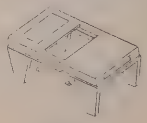
*Not recommended for lighted display.

AML55 ORDER GUIDES

AML55 covers are used with LED and neon display paddle switches. AML55-E covers have a "window" which allows the LED to be flush with the top surface of the cover. AML55-N covers have a colored lens which extends over the neon lamp.

AML55-E **Paddle Switch Cover Type**	**10** **Display/Legend Type**	**Y** **Cover Color**
 AML55-E ½ Cover (For One LED)*	**Transmitted Color** **10** No legend **20** With legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black

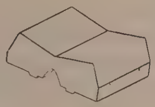
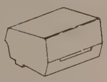
*To order a ½ cover without the LED "window", specify an AML53-E listing.

AML55-N **Paddle Switch Cover Type**	**10** **Display/Legend Type**	**R** **Lens Color**	**K** **Cover Color**
 **AML55-N** Full Neon Cover, with Colored lens	**Transmitted Color** **10** No Legend **20** With Legend	**T** Clear **R** Red	**R** Red **K** Black **L** Gray

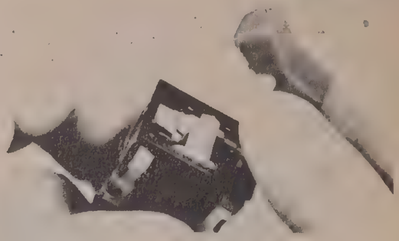
Rocker operators AML54/56

AML54 ORDER GUIDE

AML54 rockers are for non-lighted or incandescent illuminated display.

AML54-F	**10**	**R**
Rocker Operator Type	**Display/Legend Type**	**Rocker Color**
AML54-F Full Rocker  **AML54-E** ½ Rocker 	**Transmitted Color** **10** No legend **20** With legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K*** Black

*Not recommended for lighted display.



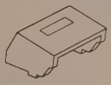
Rocker operators are assembled to the switches by simply snapping them into recesses in the switch actuator sockets.

INCANDESCENT LAMPS AML91 ORDER GUIDE

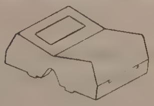
Lamp Type	Industry Lamp No.	Volt-age	Catalog Listing
Incandescent T-1¾ wedge base	86	6.3	AML91LA86
	73	14.0	AML91LA73
	85	28.0	AML91LA85

AML56 ORDER GUIDES

AML56 rockers are used with LED and neon display switches. AML56-E rockers have a "window" which allows the LED to be flush with the top surface of the rocker. AML56-N rockers have a colored lens which extends over the neon lamp.

AML56-E	**10**	**R**
Rocker Operator Type	**Display/Legend Type**	**Rocker Color**
AML56-E ½ Rocker* (For one LED) 	**Transmitted Color** **10** No Legend **20** With Legend	**R** Red **Y** Yellow **G** Green **B** Blue **W** White **K** Black

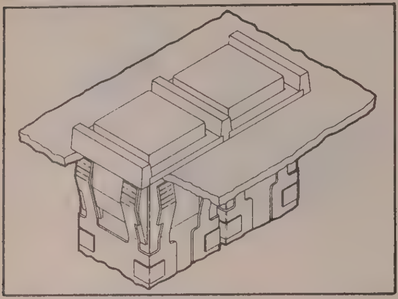
*To order a ½ rocker without the LED "window", specify an AML54-E listing.

AML56-N	**10**	**R**	**R**
Rocker Operator Type	**Display/Legend Type**	**Lens Color**	**Rocker Color**
AML56-N Full Rocker with Colored Lens 	**Transmitted Color** **10** No Legend **20** With Legend	**T** Clear **R** Red	**R** Red **K** Black

MICRO SWITCH, a Honeywell division

AML Advanced manual line accessories

BARRIERS



When mounting an individual unit, an end barrier is attached to each side of housing. The center barrier is used in a slot mount array (see drawing).

FEATURES

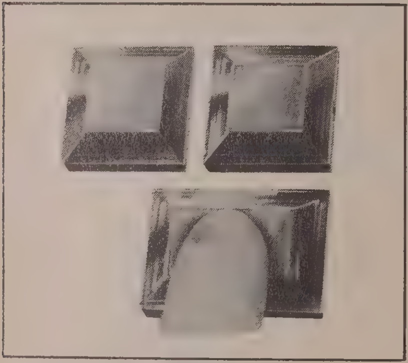
- *Helps prevent inadvertent actuation of two pushbuttons with a single push.*
- *Front of panel mounting simplifies installation.*

AML71 ORDER GUIDE

Barriers shown in order guide are black. They are not for use with AML61 mounting hardware; or with AML41J, AML41K, or AML41L lens type indicators or AML45 annunciators.

Barrier Length	Type	Catalog Listing
Short Barrier (For use with square devices and short side of rectangular devices.)	Center	AML71SCB
	End	AML71SEB
Long Barrier (For use with long side of rectangular devices.)	Center	AML71LCB
	End	AML71LEB

PANEL SEAL



AML75 panel seals are used to help protect pushbutton switches and indicators from contamination from accidental beverage spills, dust and dirt.

FEATURES

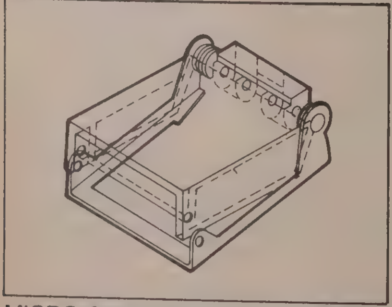
- *Easy to install, without tools.*
- *No effect on display color, light intensity, or legend quality.*
- *Replace seal or lamps without demounting switch.*

AML75 ORDER GUIDE

Panel seals are not for use with AML61 mounting hardware: or with AML41J, AML41K, or AML41L lens type indicators.

Description	For Use With:	
	Square .19″ high buttons	Rectangular .19″ high buttons
Base & Seal	AML75ABC	AML75BBC
Base Only	AML75ABN	AML75BBN
Seal Only	AML75ANC	AML75BNC

SWITCH GUARD



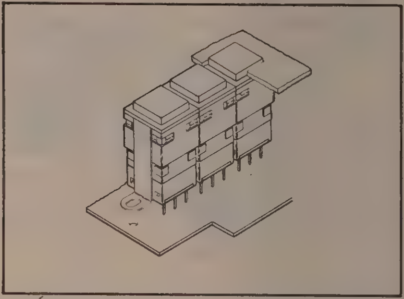
AML76 switch guard protects square and rectangular .19-inch standard height pushbuttons from inadvertent actuation. Not for use with AML61 mounting hardware, AML71 barriers or full guard bezel housings.

AML76 ORDER GUIDE

Guard Type	Catalog Listing
Square	AML76C10T01P
Rectangular	AML76F10T01P

MICRO SWITCH, a Honeywell division

MOUNTING HARDWARE

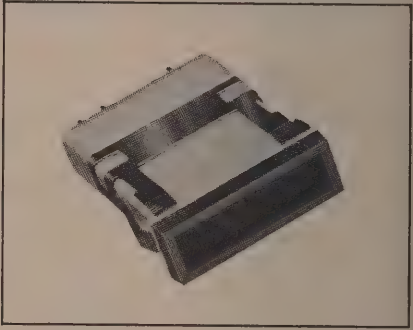


AML61 mounting hardware enables subpanel mounting of devices in factory assembled metal cans which are welded together in strips or matrices.

FEATURES

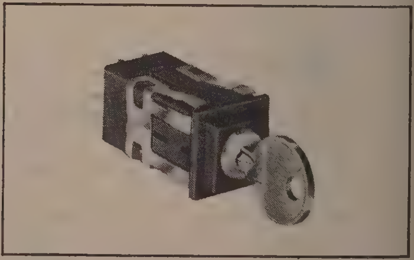
- *L-shaped mounting brackets conform to various panel thicknesses, using spacers.*
- *Simplifies panel fabrication, since only one large cutout is required.*
- *Facilitates printed circuit board mounting. For ordering information, refer to Catalog 30.*

SOLID STATE ANNUNCIATOR



AML45/59 solid state annunciators display messages which are backlighted by two LED's. Choice of full face one-color or two-color display, in red, green, and yellow.

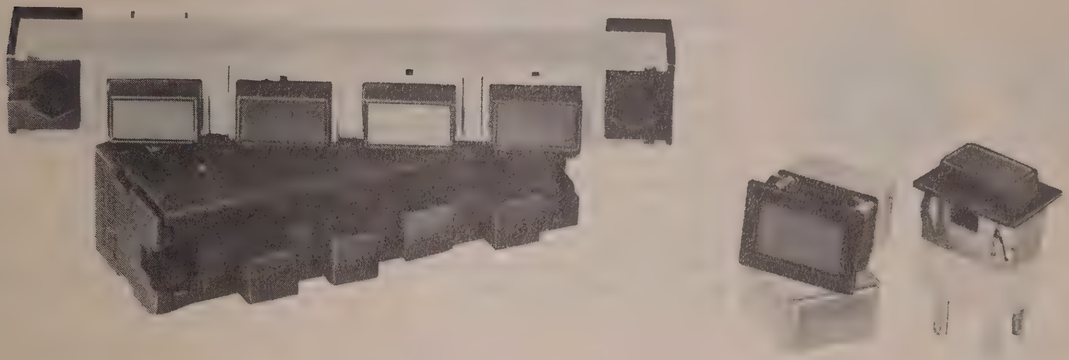
KEYLOCK SWITCH



AML27 keylock switches enable control of access to computer peripherals, keyboards, point-of-sale terminals, security systems and other locations where tampering must be discouraged.

For ordering information, refer to Catalog 30.

Miniature manual line pushbutton switches MML



MICRO SWITCH MML Series Miniature Manual Line pushbutton switches deliver a large measure of design freedom in a miniature size package. Their attractive low-profile appearance answers space and styling needs of your future computer/business, instrument, and communication equipment. MML's many design options and modular ordering system provides you flexibility to choose the mounting options, lens colors, illumination means, electrical ratings, and circuitry/operating action combinations (including multi-switch interlock) that best meet your application needs.

HOW TO ORDER

Switches, indicators, lenses, LED's, incandescent lamps, bezels/mounting clips, strip mounting frames, end rails for matrix mount, and multi-switch interlock assemblies are ordered as separate items. To order assembled combinations to meet your special needs, contact your nearest MICRO SWITCH sales office.

Refer to the order guides to specify desired MML catalog listings.

ORDER GUIDES

Page
MML11 Solid State Switches . . . 34
MML21 Electronic Control Switches . . 34
MML31 Power Duty Switches 35
MML44 Indicators/LED Display 36
MML46 Indicators/LED or Incandescent Display . . 36
MML51 Lenses/Incandescent or Non-lighted Display . . 35
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MML82 Electronic Control Interlock Switches . . . 40
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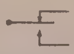
MML88 Multi-Switch Interlock Assemblies . . . 40
MML91 Incandescent Lamps/Receptacles 37
MML92 LED's 37
MML93 Receptacles 37

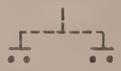
ELECTRICAL SPECIFICATIONS — SOLID STATE SWITCHES

Electrical Characteristics		Absolute Maximum Ratings	
Integrated Circuit Function	5 VDC Sinking ①	Supply Voltage (V_s)	−1.2 to +10.0 VDC
Supply Current (Max.)	3.0 mA (Released) 4.0 mA (Operated no load)	Voltage Externally Applied to Output	−0.5 Volt min. +10.0 Volts max. (Off condition)
Output Voltage (Operated)	0.3 Volt (Sinking 8 mA)	Loads to Output	20 mA (Sinking)
Output Leakage Current Max. (Released)	5.0 μA	Storage Temperature	−40° to +85°C (−40° to +185°F)
Switching Time Max. Rise 10% to 90% Fall 90% to 10%	 1.5 μsec (Sinking 8 mA) 0.5 μsec (Sinking 8 mA)		① Over temperature range of −18° to +65°C (0° to +149°F) and supply voltage of 4.5 to 5.5 VDC.

ELECTRONIC CONTROL SWITCHES

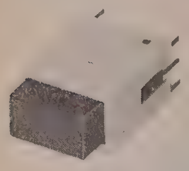
ELECTRICAL RATING	LIFE	CONTACT ARRANGEMENT
Gold contacts: Up to 0.1 amp, 30 VDC, resistive. Silver contacts: Up to 1 amp, 125 VAC	No load @ −20°C (−40°F): 500,000 operations.* Full load @ +65°C (+149°F): 25,000 operations.* * 95% survival.	1 or 2 poles, Form C. 

POWER DUTY SWITCHES

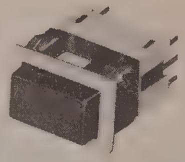
ELECTRICAL RATING	LIFE	CONTACT ARRANGEMENT
Up to 6 amps, 125 VAC; 4 amps inductive, 250 VAC.	No load @ −20°C (−40°F): 500,000 operations.* Full load @ +65°C (+149°F): 25,000 operations.* * 95% survival.	1 or 2 poles, Form X. 

MICRO SWITCH, a Honeywell division

MML11 Solid state pushbutton switches



PWB Mount



Panel Mount

Use as an unlighted pushbutton or add one LED or incandescent lamp for lighted display.

Order LED's (MML92) and lenses (MML52) or incandescent lamps (MML91) and lenses (MML51) separately.

CURRENT SINKING OUTPUT
A permanent magnet plunger moves adjacent to the Hall effect integrated circuit to give a digital, current sinking (normally high and normally low) output.

FEATURES

- LED, incandescent, or non-lighted display
- Hall effect reliability
- Provides low voltage signals that interface with nearly all DC logic
- 5 VDC supply voltage
- Momentary action or 2-level alternate action
- Printed wiring board or panel mounting
- Legendable lenses
- Designed to comply with UL, CSA

MML11 ORDER GUIDE

MML11E A 3 AA K

Housing Type (Rectangular)
MML11E White housing
MML11K Black housing

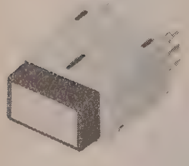
Mounting
A No bezel, printed wiring board mounting

Terminals
3 Printed wiring board

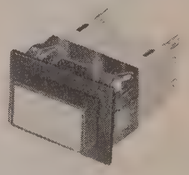
Circuitry/Action
AA 5 VDC sinking, mom.action
AE 5 VDC sinking, alt. action

Plunger
K Black

MML21 Electronic control pushbutton switches



PWB Mount



Panel Mount

Use as an unlighted pushbutton or add one LED or incandescent lamp for lighted display.

Order LED's (MML92) and lenses (MML52) or incandescent lamps (MML91) and lenses (MML51) separately.

FEATURES

- LED, incandescent, or non-lighted display
- 1 or 2 poles
- Silver or gold contacts
- Momentary action or 2-level alternate action
- Printed wiring board or panel mounting
- PWB or solder terminals
- Legendable lenses
- Designed to comply with UL, CSA

MML21 ORDER GUIDE

MML21E A 3 AA K

Housing Type (Rectangular)
MML21E White housing
MML21K Black housing

Mounting
A No bezel, printed wiring board mounting

Terminals
3 Printed wiring board
2 Solder

Circuitry/Action (Each pole is double throw)

Silver Contacts
AA 1 pole, mom. action
AB 1 pole, alt. action
AC 2 poles, mom. action
AD 2 poles, alt. action

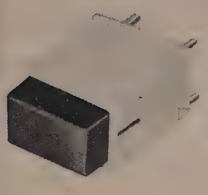
Gold Contacts:
BA 1 pole, mom. action
BB 1 pole, alt. action
BC 2 poles, mom. action
BD 2 poles, alt. action

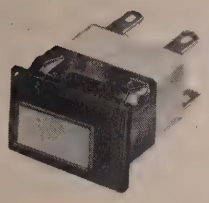
Plunger
K Black

For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

Power duty pushbutton switches MML31


PWB Mount


Panel Mount

MML31 switches do not have a provision for illumination of buttons. Visual feedback can be achieved by using a 2-level alternate action switch. Or add a companion lighted indicator.

Order lenses (MML51) separately.

FEATURES

- 1 or 2 poles
- Momentary or 2-level alternate action
- Printed wiring board or panel mounting
- PWB or solder/quick-connect terminals
- Legendable lenses
- Designed to comply with UL, CSA, and international standards.

MML31 ORDER GUIDE

MML31E A 3 AA K

Housing Type (Rectangular)

MML31E White housing non-lighted

MML31K Black housing non-lighted

Mounting

A No bezel, printed wiring board mounting

For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

Terminals

3 Printed wiring board

2 Solder/Quick-connect

Circuitry/Action (Each pole is single-throw, normally open)

AA 1 pole, mom. action

AB 1 pole, alt. action

AC 2 poles, mom. action

AD 2 poles, alt. action

Plunger

K Black

Switch and indicator lenses for incandescent or non-lighted display MML51

MML51 ORDER GUIDE

MML51E 20 R

Lens Type

MML51E Switch lens

MML51G Indicator lens

Display/Legend Type

Transmitted Color

10 No legend

20 With legend

Color

R Red

Y Yellow

G Green

B Blue

W White

K Black*

*Opaque

Switch and indicator lenses for LED display MML52

MML52 ORDER GUIDE

MML52G 10 Y

Lens Type

MML52E Switch lens

MML52G Indicator lens

Display/Legend Type

Transmitted Color

10 No legend

20 With legend

Color

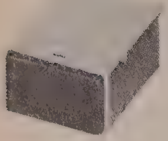
R Red

Y Yellow

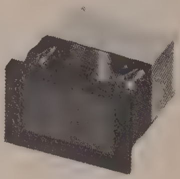
G Green

MICRO SWITCH, a Honeywell division

MML44 Indicators



PWB Mount



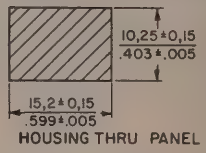
Panel Mount

FEATURES

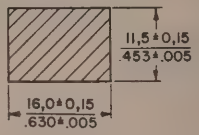
- Illumination by one LED
- Legendable lenses

MML44 indicators are for use with **one LED only:** Order LED's (MML92) and lenses (MML52) separately.

PANEL CUTOUTS
PRINTED WIRING BOARD MOUNT



PANEL MOUNT



MML44 ORDER GUIDE
(No LED included)

MML44F A A

Housing Type
(Rectangular)

MML44F
White housing, accommodates one LED

MML44K
Black housing,accommodates one LED

Mounting

A No bezel, printed wiring board mounting

For snap-in panel mounting, order **MML72** bezels/mounting clips.

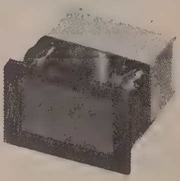
For strip mounting, order **MML61** mounting frames.

LED

A None

MML46 Indicators

PWB Mount



Panel Mount

FEATURES

- Illumination by one or two LED's or incandescent lamps
- Legendable lenses

Order LED's (MML92) and lenses (MML52) or incandescent lamps (MML91) and lenses (MML51) separately.

MML46 ORDER GUIDE
(No LED's or incandescent lamp included)

MML46F A 3

Housing Type
Rectangular)

MML46F
White housing, provision for two LED's or incand. lamps

MML46K
Black housing, provision for two LED's or incand. lamps

Mounting

A No bezel, printed wiring board mounting

For snap-in panel mounting, order **MML72** bezels/mounting clips.

For strip mounting, order **MML61** mounting frames.

Termination

0 None
For panel mount

3 Support terminals
for PWB mount

Incandescent lamps/receptacles MML91/93

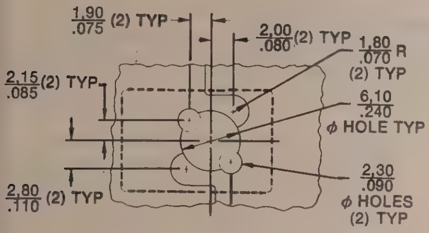
T-1 INCANDESCENT LAMP AND PWB RECEPTACLE

MML91 ORDER GUIDES

Catalog Listing

MML91C
T-1 6V lamp and receptacle, with printed wiring board, ⅛-turn base.

PWB Pad Location For Receptacle



T-1 INCANDESCENT LAMP AND SOLDER RECEPTACLE (Separate)

Catalog Listing

MML91B
T-1 bi-pin 6V lamp only
(Industry Lamp No. 7683)

MML93 ORDER GUIDE

Catalog Listing

MML93J
Incandescent T-1 bi-pin lamp receptacle, with solder terminals, ⅛-turn base. No lamp furnished.

LED's/receptacles MML92/93

MML92 T-1¾ LED's

MML92 ORDER GUIDE

Note: LED's should be the same color as the button/lens they illuminate. LED's are packaged 10 per listing, including stand-off spacers for mounting on printed wiring board.

MML93 ORDER GUIDE

Catalog Listing

MML93K
LED receptacle, with printed wiring board, ⅛-turn base. No LED furnished.

LED APPLICATION INFORMATION

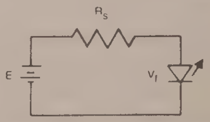
To insure stable conditions, suitable external control of the LED current must be provided. It is recommended that a minimum of 5 VDC open circuit voltage with an appropriate series resistance be used to drive LED devices. This minimizes current variation and its effect on temperature and forward voltage of the LED.

Catalog Listing	LED Color	Forward Characteristics Typ. @ 20 mA	Forward Characteristics Max.	LED Manufacturers' Part Numbers
				Stanley
MML92ERS	Red	1.7V	2.0V	ESBR5633
MML92EGS	Green	2.1V	2.5V	ESBG5633
MML92EYS	Yellow	2.1V	2.5V	ESPY5633
				Hewlett-Packard:
MML92ERH	Red	2.2V	3.0V	HLMP-3366
MML92EGH	Green	2.3V	3.0V	HLMP-3568
MML92EYH	Yellow	2.2V	3.0V	HLMP-3466

Maximum drive current is 30 mA. Reverse voltage breakdown of the LED's is 4 volts (min).

Resistor values can be determined by supply voltage or current for LED:

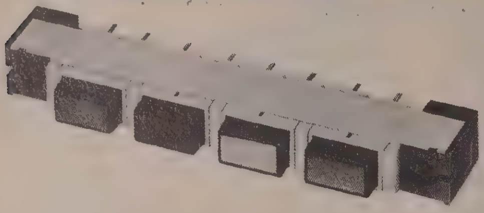
$$R_s = \frac{E - V_f}{I_f}$$



WHERE: R_s = Series Resistance
E = Supply Voltage
V_f = Forward Voltage of LED
I_f = Circuit Current

MML61/62/72 Mounting hardware

MML61 STRIP MOUNTING FRAMES



Switches and indicators are ordered as separate items.

FEATURES

- Provides back of panel or printed wiring board mounting in a multi-unit strip of switches/indicators.
- Devices can be pre-wired prior to installation.
- Holes at each end of frame will accept No. 4 screws.

MML61 ORDER GUIDE

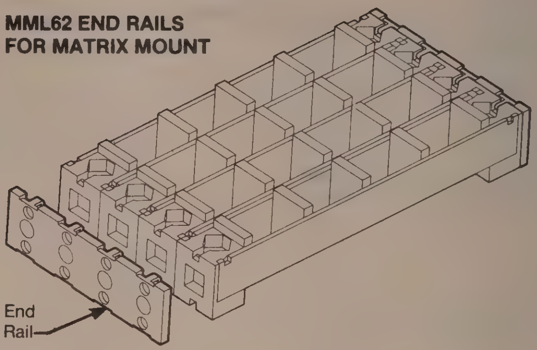
MML61E 5

Orientation/Color	
MML61E	Horizontal, white
MML61K	Horizontal, black

No. of Stations	
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten

Example: **MML61E5**
White 5-station strip mounting frame, horizontal orientation.

MML62 END RAILS FOR MATRIX MOUNT



FEATURES

- Fasten up to ten MML61 strip frames together to form matrix array.
- End rails snap fit into slots at each end of the strip frames.

MML62 ORDER GUIDE

Each catalog listing includes a pair of end rails.

MML62E 4

Color	
MML62E	For horizontal strips, white
MML62K	For horizontal strips, black

No. of MML61 Strip Frames in Matrix	
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten

Example: **MML62E4**
White end rails for fastening four horizontal strips.

MML72 BEZELS/MOUNTING CLIPS

Bezels and mounting clips are assembled to switches and indicators to provide snap-in front panel mounting in horizontal rows or discrete arrays.

1. Slip mounting clip over top of switch/indicator housing.

2. Snap bezel onto mounting clip.

MML72 ORDER GUIDE

(Includes mounting clip.)

MML72EE W

Bezel Type	
MML72EE	Switch
MML72EG	Indicator

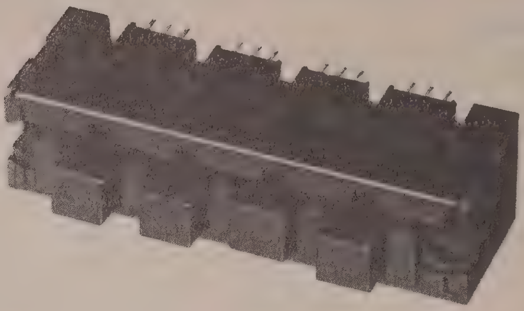
Color	
K	Black
L	Gray
W	White

Example: **MML72EEW**
White switch bezel with mounting clip.

NOTE:
To order mounting clips separately, specify **MML73EA**.

MICRO SWITCH, a Honeywell division

Interlock assemblies MML



MECHANICAL INTERLOCK

Mechanically interlocked switches with 1-4 pole circuitry provide latching functions. They are furnished **factory assembled** in a strip frame — ready for back of panel and/or printed wiring board mounting. Each end of the strip frame has mounting holes which will accept No. 4 screws.

Operating Mode. Depressing a switch button will release any previously operated button within a group of interlocked switches. One button is always being held down by a mechanical detent. This provides a "key-down memory" feature which indicates which switch was last operated. Circuit transfer is maintained until another button is depressed.

Override release. If two or more interlocked switches are inadvertently engaged at the same time, fully depressing any engaged switch button will release the others. (An increased actuation force is necessary for override.)

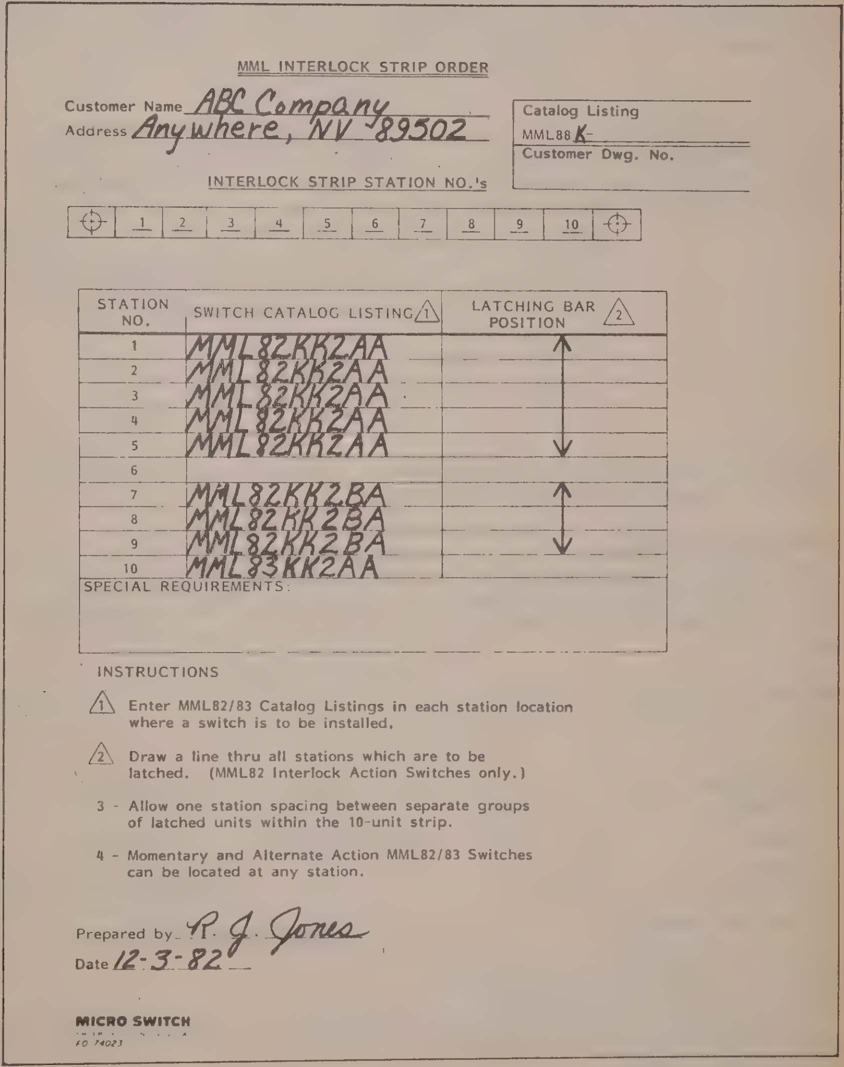
Assembly options. The following options are possible:

1. A strip of two to ten interlocked switches.
2. More than one group of two or more switches can be independently interlocked, providing there is a one-unit spacing between the groups. For example, the first four switches and the last five switches in the strip can be interlocked as separate groupings, with a one-station spacing between them.
3. A strip can include both interlocked groups of switches and switches which operate in their normal momentary or alternate action mode.

HOW TO ORDER

Only the momentary action **MML82** Electronic Control interlock switches can be used for interlocking. **MML82** alternate action switches and **MML83** Power Duty switches function as individually isolated units when added to the interlock strip.

Use the **MML88** Interlock Strip Assembly Order Sheet (FO-74023) on page 41 to specify the desired switch listings and their location in the strip. Reproduce it on your office copier or request a pad of forms from your nearest MICRO SWITCH Sales Office. (See completed example.)



MML INTERLOCK STRIP ORDER

Customer Name ABC Company
Address Anywhere, NV 89502

Catalog Listing
MML88 K-
Customer Dwg. No.

INTERLOCK STRIP STATION NO.'s

⌖	1	2	3	4	5	6	7	8	9	10	⌖

STATION NO.	SWITCH CATALOG LISTING △1	LATCHING BAR POSITION △2
1	MML82KK2AA	↑
2	MML82KK2AA	│
3	MML82KK2AA	│
4	MML82KK2AA	│
5	MML82KK2AA	↓
6		
7	MML82KK2BA	↑
8	MML82KK2BA	│
9	MML82KK2BA	↓
10	MML83KK2AA	

SPECIAL REQUIREMENTS:

INSTRUCTIONS

△1 Enter MML82/83 Catalog Listings in each station location where a switch is to be installed.

△2 Draw a line thru all stations which are to be latched. (MML82 Interlock Action Switches only.)

3 - Allow one station spacing between separate groups of latched units within the 10-unit strip.

4 - Momentary and Alternate Action MML82/83 Switches can be located at any station.

Prepared by R. J. Jones
Date 12-3-82

MICRO SWITCH
FO 74023

MICRO SWITCH, a Honeywell division

MML82/83/88 Interlock switches and assemblies

MML82 ELECTRONIC CONTROL INTERLOCK PUSHBUTTON SWITCHES

MML82 ORDER GUIDE

Enter MML82 catalog listings in space provided in Interlock Strip Assembly Order Sheet (FO-74023), and indicate the stations which are to be interlocked. These switches do not have a provision for adding LED's or incandescent lamps.

MML82K K 2 AA

Housing Type
(Rectangular)

MML82K
Black housing, non-lighted

Button Type

K Black square button

Terminals

3 Printed wiring board
2 Solder

Circuitry/Action
(Each pole is double-throw)

Silver Contacts
AA 1 pole, mom. action*
AC 2 poles, mom. action*
CA 3 poles, mom. action*
CC 4 poles, mom. action*
AB 1 pole, alt. action**
AD 2 poles, alt. action**
CB 3 poles, alt. action**
CD 4 poles, alt. action**

Gold Contacts:
BA 1 pole, mom. action*
BC 2 poles, mom. action*
DA 3 poles, mom. action*
DC 4 poles, mom. action*
BB 1 pole, alt. action**
BD 2 poles, alt. action**
DB 3 poles, alt. action**
DD 4 poles, alt. action**

Example: **MML82KK2AA**
Electronic control interlock switch (black housing and button), non-lighted; solder terminals; 1 pole, momentary action, silver contacts.

*When not used in a group of interlocked switches, these devices function as individually isolated momentary action switches.

**Although alternate-action switches can be used in interlock strip assemblies, they cannot be latched. They will function as individually isolated alternate-action switches.

MML83 POWER DUTY INTERLOCK SWITCHES

MML83 ORDER GUIDE

MML83 power switches function as individually isolated units when added to an interlock strip. They are **not** for use in an interlocking mode.

Enter MML83 catalog listings in space provided in Interlock Strip Assembly Order Sheet (FO-74023). These switches do not have a provision for adding LED's or incandescent lamps.

MML83K K 2 AA

Housing Type
(Rectangular)

MML83K
Black housing, non-lighted

Button Type

K Black square button

Terminals

3 Printed wiring board
2 Solder/quick-connect

Circuitry/Action
(Each pole is single-throw, normally open)

AA 1 pole, mom. action
AB 1 pole, alt. action
AC 2 poles, mom. action
AD 2 poles, alt. action

Example: **MML83KK2AA**
Power duty interlock switch (black housing and button), non-lighted; solder termination; 1 pole, momentary action, silver contacts.

MML88 INTERLOCK SWITCH ASSEMBLIES

MML88 ORDER GUIDE

MML88K ________

Type

MML88K
Black interlock strip

Serial Number
Note: MICRO SWITCH will assign a serial number to code your desired combination of switches and their location on the strip. (Per your instructions on the Interlock Strip Order Sheet, F0-74023.)

MICRO SWITCH, a Honeywell division

Interlock ordersheet MML

MML INTERLOCK STRIP ORDER

Customer Name______________________________

Address ______________________________

Catalog Listing MML88 - ____________
Customer Dwg. No.

INTERLOCK STRIP STATION NO.'s

⌖	1	2	3	4	5	6	7	8	9	10	⌖

STATION NO.	SWITCH CATALOG LISTING △1	LATCHING BAR POSITION △2
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
SPECIAL REQUIREMENTS:		

INSTRUCTIONS

△1 Enter MML82/83 Catalog Listings in each station location where a switch is to be installed.

△2 Draw a line thru all stations which are to be latched. (MML82 Interlock Action Switches only.)

3 - Allow one station spacing between separate groups of latched units within the 10-unit strip.

4 - Momentary and Alternate Action MML82/83 Switches can be located at any station.

Prepared by____________________

Date _______________

MICRO SWITCH
FREEPORT ILLINOIS U S A
FO-74023

Other MICRO SWITCH products

MICRO SWITCH's reputation as an innovator in the design and manufacture of quality position sensing and manual control products spans 40 years. Shown is a cross-section of the many varieties. This broad selection offers a wide range of technologies, sizes, actuation means, circuitries, electrical capacities, and terminations, for in-plant and original equipment needs.

Contact your nearest MICRO SWITCH Sales Office or Authorized Distributor for complete catalog information. Sales Office location's are shown in this Directory. Authorized Distributors are listed on the next pages.

Limit and enclosed switches

MICRO SWITCH offers the world's most advanced line of heavy duty limit switches and a wide selection of application proven enclosed switches (precision snap-acting switches sealed in rugged metal housing). Sealed versions keep out moisture and other contaminants. Explosion-proof types are designed for use in hazardous locations.

Request Catalog 40.

Proximity sensors

Proximity sensors detect the presence of metals or react to a magnetic field. Cylindrical, cannister, and limit switch style housings provide application versatility. Their high speed operation keeps pace with production. Models are available for operation at AC line voltage or 8.5 to 30 VDC. Optional LED indicators signal on-off condition.

Request Catalog 50.

Photoelectric sensors

MICRO SWITCH has a complete offering of modulated LED and incandescent controls. These no-touch devices detect opaque or translucent material at long or short range.

Single unit retroreflective and separate emitter/receiver styles fill a variety of application requirements. High intensity models penetrate foggy, dusty, and other poor visibility conditions. Scanning capability ranges from a fraction of an inch to hundreds of feet.

Request Catalog 60.

Oiltight manual controls

Featuring a contemporary square appearance and lighted display, these families offer a wide selection of industrial pushbuttons, selectors, and indicators. Standard, miniature, and compact sizes provide flexibility in format and circuitry. Contact blocks feature heavy duty, standard or electronic duty capabilities plus solid state.

Request Catalog 70.

Environmentally protected switches

Rugged, high performance designs; environment-proof or hermetically sealed. A complete selection includes miniature limit switches, miniature and standard size basic switches, sealed toggle switches and the highest quality lighted pushbuttons.

Request Catalog 80.

Manual control switches

Whether you're prototyping a new design or planning to face-lift an existing panel, you'll benefit by considering the wide selection of pushbuttons, indicators, toggles, rockers, paddles, rotary selectors and interlock switches available from MICRO SWITCH. Developed with adherence to good human factors principles, these products aid the designer by offering almost limitless options in visual display techniques, operators, and arrangement of components. Many are military qualified.

Request Catalog 30.

Keyboards

MICRO SWITCH offers the world's widest selection of keyboard designs. It includes capacitance membrane and contact membrane keyboards in standard or low-profile versions; touch panels; and time-proven solid state Hall effect keyboards. With our experienced application engineers and complete capabilities, we can handle virtually any keyboard application. See Section 5150.

For further information contact your local MICRO SWITCH sales office.

Current Sensors

MICRO SWITCH current sensors monitor AC or DC current flow and in turn produce either a digital or linear output signal.

Built in voltage regulation and temperature compensation assure reliable operation. Thru hole design permits maximum currents limited only by conductor size. For more information on listings and custom current sensors, see our insert in section 5500.

Temperature Sensors

MICRO SWITCH temperature sensors are precision interchangeable sensors that operate on a change in resistance as a function of temperature. Fast linear sensing of air or liquid temperature, at a low cost, with long-term stability is featured. For standard and custom packaging capabilities see our insert in section 5300.

Pressure transducers

MICRO SWITCH piezoresistive pressure transducers accurately measure gaseous pressure as the sensitive silicon diaphragm integral to the IC chip distorts ever so slightly, resulting in linear output voltage directly proportional to pressure.

Both signal conditioned (amplified and temperature-compensated) and unamplified transducers of aboslute, differential, and gage pressure design are available. Applications range from medical instruments to home appliances to altimeters. Accurate repeatability, low hysteresis, and long-term stability are characteristics of these transducers, whose pressure range extends to 250 psi. See Section 5500.

MICRO SWITCH AUTHORIZED DISTRIBUTOR DIRECTORY

ALABAMA

Birmingham
MG Electronics and Equip.
Phone: 205/328-4525

Decatur
Frazier Electrical Supply
Phone: 205/353-6131

Dothan
Mack Electric Supply Co.
Phone: 205/792-2111

Mobile
Southern Electric Supply Co.
Phone: 205/342-5072

ARIZONA

Phoenix
BeSwitched
Phone: 602/275-4805

East Side Electric Supply, Inc.
Phone: 602/273-1415

Electric Supply, Inc.
Phone: 602/252-2343

Kierulff Electronics
Phone: 602/243-4101

Tucson
Tucson Electric Supply Inc.
Phone: 602/624-8241

ARKANSAS

Fort Smith
Carlton-Bates Company
Phone: 501/646-8201

Little Rock
Carlton-Bates Company
Phone: 501/562-9100

CALIFORNIA

Anderson
Industrial Electric Service Co.
Phone: 916/365-3381

Arcata
Industrial Electric Service Co.
Phone: 707/822-2485

Bakersfield,
Controlco
Phone: 805/323-8111

Carson
Nunn-Royal Wholesale
Electric, Inc.
Phone: 213/637-6377

Crescent City
Industrial Electric Service Co.
Phone: 707/464-4123

El Monte
Howland Electric Wholesale
Phone: 213/444-0503

Fresno
Electric Motor & Supply Co.
Phone: 209/486-0960

Gardena
California Switch & Signal
Phone: 213/770-2330

Los Angeles
Argo Electric Supply
Phone: 213/588-8233

Electric Switches, Inc.
Phone: 213/660-1310

Kierulff Electronics
Phone: 213/725-0325

Minarik Electric Co.
Phone: 213/624-3161

Richey Western
Electronics , Inc.
Phone: 213/820-3777

Modesto
Wille Electric Supply Co., Inc.
Phone: 209/527-6800

Oakland
Western Electro-Mechanical
Phone: 415/452-1936

Orange
County Wholesale Electric
Phone: 714/633-6440

Pico Rivera
Amfac Electrical Supply Co.
Phone. 213/949-7841

Riverside
Consolidated Electrical Dist.
Phone: 714/684-7811

CALIFORNIA — Cont'd

Sacramento
Kaman Bearing &
Supply Corporation
Phone: 916/444-0700

Sacramento Electronics
Supply
Phone: 916/441-4821

Salinas
Electric Supply of Salinas
Phone: 408/422-4786

San Diego
Amfac Electrical Supply Co.
Phone: 714/268-1020

County Wholesale
Electric Co.
Phone: 714/578-0210

San Jose
Buckles-Smith Electric Co.
Phone: 408/280-7777

Consolidated Parts, Inc.
Phone: 408/263-9521

Powell Electronics
Phone: 408/943-9020

Quement Electronics
Phone: 408/998-5900

San Leandro
Nunn Royal Electric
Supply Co.
Phone: 415/895-9810

So. San Francisco
Consolidated Electrical Dist.
Phone: 415/871-2893

Steven Engineering
Phone: 415/588-9200

Stockton
Valley Electric Co. of Stockton
Phone: 209/948-1911

Ukiah
Industrial Electric Service
Phone: 707/485-0376

Visalia
Medallion Supply, Inc.
Phone: 209/625-0333

COLORADO

Denver
Integrated Electronics Co., Inc.
Phone: 303/292-6121

Newark Electronics
Phone: 303/757-3351

Ryall Electric Supply Co.
Phone: 303/629-7721

TESSCO
Phone: 303/778-1119

CONNECTICUT

Bridgeport
Electric Maintenance Service
Phone: 203/333-6163

Danbury
Spring & Buckley
Phone: 203/743-0034

Hartford
Frank A. Blesso Inc.
Phone: 203/527-6461

New Britain
Spring & Buckley
Phone: 203/224-2451

Norwalk
Machine Drives &
Controls, Inc.
Phone: 203/846-2007

Wallingford
Marshall Industries
Phone: 203/265-3822

DELAWARE

Wilmington
United Electric Supply Inc.
Phone: 302/322-3333

FLORIDA

Ft. Lauderdale
Peerless Radio Corp.—
Florida
Phone: 305/973-4141

Powell Electronics
Phone: 305/972-4300

Jacksonville
Turner Electric Works
Phone: 904/757-7790

Lakeland
A.A. Electric Div. of AEC
Phone: 813/665-6941

Miami
Hummel Industrial Sales, Inc.
Phone: 305/651-0196

Orlando
Brownell Electro, Inc
Phone: 305/843-6770

Hammond Electronics, Inc.
Phone: 305/849-6060

Pensacola
Trio Electric Supply Co., Inc.
Phone: 904/476-5580

Tampa
Tampa Armature Works, Inc.
Phone: 813/621-5661

GEORGIA

Albany
Mack Electric Supply Co.
Phone: 912/883-5156

Atlanta
A-A Electric, Inc.
Phone: 404/449-8670

A-C Equipment Co.
Phone: 404/451-2747

Brownell Electro, Inc.
Phone: 404/762-5181

Augusta
Electrical Equipment Co.
Phone: 404/722-6685

Macon
Lowe Electric Company
Phone: 912/743-8661

Rome
Battey Machinery Company
Phone: 404/291-4141

Savannah
Lakeland Engineering
Equipment Co.
Phone: 912/964-7318

West Point
Georgia Alabama Supply Co.
Phone: 404/645-1321

HAWAII

Honolulu
ATECS Corporation
Phone: 808/845-2991

ILLINOIS

Addison
LCOMP, Inc.
Phone: 312/628-1400

Aurora
Electric Supply Corporation
Phone: 312/897-8663

Champaign
Klaus Radio Co.
Phone: 217/356-1896

Chicago
Revere Electric Co.
Phone: 312/738-3636

Danville
Danville Electric Supply Co.
Phone: 217/442-5282

ILLINOIS — Cont'd

Decatur
Englewood Electrical Supply
Phone: 217/875-7300

Lakeland Engineering Equip.
Phone: 217/423-2531

Elgin
Fox Electric Supply Company
Phone: 312/695-7400

Revere Electric Supply Co.
Phone: 312/741-8900

Freeport
Koym Electric Supply
Phone: 815/235-7595

Joliet
Englewood Electrical Supply
Phone: 815/725-3900

Kankakee
Blitz Electrical Supply Co.
Phone: 815/933-5536

Lombard
MacGregor and Co.
Phone: 312/629-5752

Melrose Park
Electric Supply Corp.
Phone: 312/450-3211

Peoria
Kiefer Electrical Supply Co
Phone: 309/674-1143

Klaus Radio, Inc
Phone: 309/691-4840

Peru
Englewood Electrical Supply
Phone: 815/223-2650

Quincy
Heintz Electric Company
Phone: 217/222-0113

Rockford
Forest City Electric
Supply Co
Phone: 815/968-5781

Skokie
Electric Supply Corporation
Phone: 312/673-1600

INDIANA

Anderson
Ralph David Inc.
Phone: 317/649-3504

Columbus
Daniel Hayden Electric Co.
Phone: 812/372-2596

Evansville
Evansville Supply Company
Phone: 812/424-7541

Fort Wayne
Graham Electronics
Phone: 219/423-3422

National Mill Supply, Inc
Phone: 219/484-0575

Hammond
Electric Supply Corp
Phone: 312/374-6000
219/932-8840

Indianapolis
Graham Electronics Supply
Phone: 317/634-8202

Peerless Electric Supply Co.
Phone: 317/635-2361

Logansport
Ralph David, Inc.
Phone: 219/722-2200

South Bend
Koontz-Wagner Electric Co
Phone: 219/232-2051

IOWA

Cedar Rapids
Hupp Electric Motors, Inc.
Phone: 319/366-0761

Davenport
Industrial Eng. Equip. Co.
Phone: 319/323-9721

Des Moines
Electrical Engineering
& Equipment
Phone: 515/282-0431

A-C Supply Co., Inc.
Phone: 515/243-3102

IOWA — Cont'd

Sioux City
Lakeland Engineering Equip.
Phone: 712/252-3611

KANSAS

Kansas City
Kornfeld Thorp Electric Co.
Phone: 913/321-7070

Lakeland Engineering Equip.
Phone: 913/384-0050

Wichita
Kriz-Davis, Inc.
Phone: 316/267-4354

LCOMP, Inc.
Phone: 316/265-8501

KENTUCKY

Bowling Green
Randolph, Hale &
Meredith, Inc.
Phone: 502/781-1460

Lexington
Radio Electronic Equip. Co.
Phone: 606/255-6661

Louisville
E & H Electric Supply Co., Inc.
Phone: 502/587-0991

Paducah
Hannan Supply Company
Phone: 502/442-5456

LOUISIANA

Baton Rouge
A.W.C. Inc.
Phone: 504/275-5480

Industrial Electronic Supply
Phone: 504/357-4249

Harahan
MG Electronics & Equip. Co.
Phone: 504/733-0070

Shreveport
Industrial Electronic Supply
Phone: 318/222-9459

MAINE

Newport
Gilman Electrical Supply
Phone: 207/368-4306

Portland
The Leen Company
Phone: 207/774-6266

MARYLAND

Baltimore
Automation Industrial Control
Phone: 301/944-8400

Lee Electric Company
Phone: 301/752-4080

Beltsville
Powell Electronics
Phone: 301/621-4070

Cumberland
Clayton Electric, Inc
Phone: 301/724-6321

Kensington
Marine Air Supply Co., Inc.
Phone: 301/949-9560

MASSACHUSETTS

Boston
Controller Service & Sales Co.
Phone: 617/269-1300

Burlington
Marshall Industries
Phone: 617/272-8200

Springfield
T. F. Cushing, Inc.
Phone: 413/788-7341

Westborough
Powell Electronics
Phone: 617/366-6100

MASSACHUSETTS — Cont'd

Woburn
Brownell Electro, Inc.
Phone: 617/935-7820

Worcester
Coghlin Electric Company
Phone: 617/791-7861

MICHIGAN

Ann Arbor
McNaughton-McKay
Electric Co
Phone: 313/995-9511

Wedemeyer Electronic
Supply
Phone: 313/665-8611

Battle Creek
All-Phase Electric Supply Co.
Phone: 616/962-7557

Benton Harbor
All-Phase Electric Supply Co.
Phone: 616/926-6194

Flint
Advance Electric Supply Co.
Phone: 313/238-5611

Grand Rapids
RS Electronics
Phone: 616/241-3483

United Electric Supply Co.
Phone: 616/531-5310

Jackson
Fulton Radio Supply Co.
Phone: 517/784-6106

Kalamazoo
RS Electronics
Phone: 616/381-5470

Lansing
All-Phase Electric Supply Co.
Phone: 517/482-4449

Livonia
RS Electronics
Phone: 313/525-1155

Madison Heights
McNaughton-McKay Electric
Phone: 313/399-7500

Muskegon
Fitzpatrick Electric Supply Co.
Phone: 616/722-6621

Saginaw
Fischer-Flack Inc.
Phone: 517/752-4181

Southfield
Michigan Lectrols Corp.
Phone: 313/353-1350

Traverse City
William J. Becker Co.
Phone: 616/947-4440

MINNESOTA

Duluth
Mielke Electric Works, Inc.
Phone: 218/727-7411

Minneapolis
Lakeland Eng. Equip. Co.
Phone: 612/544-0321

Northland Electric Supply Co.
Phone: 612/341-6100

St. Paul
Gopher Electronics Co.
Phone: 612/483-3322

Power/Mation Divn.
Phone: 612/645-0781

MISSISSIPPI

Jackson
Ellington Electronic Supply
Phone: 601/355-0561

MISSOURI

Bridgeton
Van Dusen Aircraft Supplies
Phone: 314/731-1700

Joplin
Four State Radio Supply Co.
Phone: 417/624-0368

Kansas City
LCOMP, Inc
Phone: 816/221-2400

Maryland Heights
Barrett Electrical Supply Co
Phone: 314/878-1300

French Gerleman Electric Co
Phone: 314/569-3122

LCOMP, Inc
Phone: 314/291-6200

St. Louis
Crescent Electric Supply Co.
Phone: 314/533-6161

Springfield
Southern Materials Company
Phone: 417/865-2822

MONTANA

Billings
Glacier State Electric Supply
Phone: 406/252-4663

Missoula
West Electric Distributors
Phone: 406/728-4020

NEBRASKA

Omaha
Enterprise Electric Company
Phone: 402/592-7500

Lakeland Engineering Equip
Phone: 402/734-2600

NEVADA

Reno
WEDCO, Inc
Phone: 702/329-1131

NEW HAMPSHIRE

Manchester
Controller Service & Sales Co
Phone: 603/623-7225

NEW JERSEY

Cherry Hill
Fromm Electric Supply
Phone: 609/662-8300

Dover
Kahant Electrical Supply Co
Phone: 201/366-2966

Edison
Miller Knapp Incorporated
Phone: 201/985-2600

Hanover
State Electronics Parts Corp
Phone: 201/887-2550

Linden
Turtle & Hughes, Inc
Phone: 201/574-3600

Newark
Keer Electrical Supply Co
Phone: 201/484-7400

Piscataway
Fromm Electric Supply Corp
Phone: 201/981-0400

Saddlebrook
Ribble Engineering Co
Phone: 201/791-0233

Secaucus
Franklin & Smith, Inc
Phone: 201/864-0555

South Plainfield
Brownell Electro, Inc
Phone: 201/753-4600

Trenton
Griffith Electric Supply Co
Phone: 609/695-6121

Vineland
Kay Electric Supply Company
Phone: 609/692-2020

NEW MEXICO

Albuquerque
Sterling Electronics
Phone: 505/884-1900

Carlsbad
H & E Electric Supply Co
Phone: 505/887-1146

NEW YORK

Albany
Edwin E. Taylor Co., Inc.
Phone: 518/438-7811

Henzel Powers, Inc.
Phone: 518/465-2351

Brooklyn
Coleman Electrical Supply
Phone: 212/272-1313

Buffalo
Genesee Radio & Parts Co.
Phone: 716/873-9661

Wehle Electric Company, Inc.
Phone: 716/854-3270

Elmira
Brady Supply Corporation
Phone: 607/733-6591

Forest Hills
The Jack Miller Company
Phone: 212/263-4446

Jamestown
Westburgh Electric Inc.
Phone: 716/488-1172

Lynbrook
Peerless Radio Corporation
Phone: 516/593-2121

Mamaroneck
Logicomp Electronics
Phone: 914/698-9332

New York
Baitinger Electric Co., Inc.
Phone: 212/431-6400

Blan Electronics Corporation
Phone: 212/233-6288

Brownell Electro, Inc.
Phone: 212/924-5000

City Electric Distributors, Inc.
Phone: 212/564-5454

Plainview L.I.
Mid Island Electrical Sales Co.
Phone: 516/293-9300

Rochester
Requa Electrical Supply Co.
Phone: 716/475-1600

Simcona Electronics Corp.
Phone: 716/328-3230

Wehle Electric Company, Inc.
Phone: 716/461-0200

Syracuse
Baldwin Hall Co., Inc.
Phone 315/463-9251

Utica
M & L Electric Supply Corp.
Phone: 315/733-2326

Vestal
Wholesale Electric Supply Co.
Phone: 607/729-1526

White Plains
H. H. Benfield Elec. Supply
Phone: 914/948-6660

NORTH CAROLINA

Charlotte
Brownell Electro, Inc.
Phone: 704/597-1270

Lakeland Engrg. Equip. Co.
704/597-0044

Mill Power Supply Company
Phone: 704/527-2800

Greensboro
Hammond Electronics
Phone: 919/275-6391

Laurinburg
Electrical Equipment Co.
Phone: 919/272-2141

Raleigh
Electrical Equipment Co.
Phone: 919/828-5411

Southeastern Electronics
Phone: 919/828-2311

Shelby
Shelby Supply Co., Inc.
Phone: 704/482-6781

OHIO

Akron
Akron Electronic Supply
Phone: 216/762-8818

The Sacks Electrical
Supply Co.
Phone: 216/253-2141

Cincinnati
Graham Electronics, Inc.
Phone: 513/772-1661

Hughes-Peters, Inc.
Phone: 513/351-2000

The Johnson Electric Supply
Phone: 513/421-3700

Columbus
Basic Distribution Corp.
Phone: 614/481-8801

Hughes-Peters, Inc.
Phone: 614/294-5351

Dayton
John A. Becker Electric Co.
Phone: 513/226-1341

The Stotts-Friedman Co.
Phone: 513/298-5555

Lancaster
Basic Distribution Corp.
Phone: 614/653-9231

Lima
LPR Electronics Corp.
Phone: 419/228-1220

Mansfield
Mansfield Electric Supply Co.
Phone: 419/529-2750

Newark
Basic Distribution
Corporation
Phone: 614/522-1116

Sandusky
Brohl & Appell Inc.
Phone: 419/625-6761

Solon
Midland Electric Co.
Phone: 216/248-3800

REPCO
Phone: 216/248-8900

Toledo
The H. Poll Electric Company
Phone: 419/255-1660

Warren
REM Electronics Supply Co.
Phone: 216/373-1300

OKLAHOMA

Oklahoma City
Electro Enterprises, Inc.
Phone: 405/427-6591

Hunzicker Brothers
Phone: 405/239-7771

Tulsa
Genesis Electronics, Inc.
Phone: 918/622-8520

OREGON

Beaverton
Almac Electronics
Phone: 503/641-9070

Bend
Eoff Electric Company
Phone: 503/388-1544

Eugene
North Coast Electric Co.
Phone: 503/343-7701

Klamath Falls
North Coast Electric Co.
Phone: 503/884-4171

Medford
North Coast Electric Co.
Phone: 503/772-7131

Portland
North Coast Electric Co.
Phone: 503/228-5111

Platt Electric Supply Inc.
Phone: 503/228-6121

Tek-Electric Controls, Inc
Phone: 503/246-5451

OREGON — Cont'd

Roseburg
Roseburg Electric Wholesale
Phone: 503/673-6657

Salem
Stusser Elec. Co.
Phone: 503/581-3711

PENNSYLVANIA

Allentown
Crowder Jr. Company
Phone: 215/791-1551

Altoona
Allegheny Electronics, Inc.
Phone: 814/946-0871

Bradford
McKean Supply Division
Phone: 814/362-3523

Erie
Erie Industrial Elec. Supply
Phone: 814/455-8051

Kingston
ANESCO
Phone: 717/287-2101

Philadelphia
Powell Electronics, Inc.
Phone: 215/365-1900

Royal Electric Supply Co.
Phone: 215/221-1200

Rumsey Electric Company
Phone: 215/456-2500

Pittsburgh
CAM/RPC Electronics
Phone: 412/782-3770

McCullough Electric Co.
Phone: 412/261-2420

Reading
Barbey Electronics
Phone: 215/376-6116

St. Marys
B & R Electric Company
Phone: 814/834-2814

West Chester
West Chester Electric Supply
Phone: 215/696-7500

York
Graybill's Incorporated
Phone: 717/843-0786

PUERTO RICO

Bayamon
Caribbean Contracting Corp.
Phone: 809/786-7815

RHODE ISLAND

Providence
Controller Services &
Sales Co.
Phone: 401/781-7100

William Dandreta & Company
Phone: 401/861-2800

Leavitt-Colson Company
Phone: 401/521-8800

SOUTH CAROLINA

Charleston
Wholesale Industrial
Electronics
Phone: 803/722-2634

Columbia
Dixie Electronics, Inc.
Phone: 803/779-5332

Greenville
Hammond Electronics
Phone: 803/233-4121

Shealy Electrical Wholesale
Phone: 803/242-6880

SOUTH DAKOTA

Aberdeen
McLaughlin Electric Supply
Phone: 605/225-7100

TENNESSEE

Chattanooga
Mills & Lupton Supply Co.
Phone: 615/266-6171

Kingsport
Wholesale Electric, Inc.
Phone: 615/246-2900

Knoxville
Brownell Electro, Inc.
Phone: 615/966-3441

Stokes Electric Company
Phone: 615/525-0351

TENNESSEE — Cont'd

Memphis
Bluff City Distributing Co.
Phone: 901/345-9500

Brownell Electro, Inc.
Phone: 901/795-8483

Nashville
Brownell Electro, Inc.
Phone: 615/889-8230

Carlton-Bates
Phone: 615/244-3562

Electra Distributing
Phone: 615/329-3971

TEXAS

Amarillo
Snook & Aderton, Inc.
Phone: 806/374-5229

Austin
Harrison Equipment Co.
Phone: 512/458-3555

Beaumont
Ralph's Industrial Electronics
Phone: 409/833-9443

Warren Electric Company
Phone: 409/833-9405

Corpus Christi
Nunn Electric Supply Corp.
Phone: 512/884-0311

Dallas
Associated Aircraft
Supply Co.
Phone: 214/331-4381

King Bearing, Inc.
Phone: 214/630-7600

Norvell Electronics, Inc.
Phone: 214/233-0020

Wilkinson Brothers
Phone: 214/941-9963

Denton
Lakeland Engrg. Equip. Co.
Phone: 817/566-5084

El Paso
Midland Specialty Company
Phone: 915/533-9555

Triangle Electric Supply Co.
Phone: 915/533-5981

Fort Worth
SWIECO, Inc.
Phone: 817/335-6521

Harlingen
Bush Supply Co., Inc.
Phone: 512/428-1613

Houston
Industrial Equipment
of Houston
Phone: 713/928-3181

King Bearing, Inc.
Phone: 713/688-5701

Norvell Electronics, Inc.
Phone: 713/777-1666

Summers Buffalo Electric Co.
Phone: 713/688-2300

Lubbock
Snook & Aderton, Inc.
Phone: 806/763-9323

Odessa
Western Controls Co.
Phone: 915/332-0771

San Antonia
Blackburn Drives & Ctrls., Inc.
Phone: 512/349-2621

Stafford
Harrison Equipment Co., Inc.
Phone: 713/879-2727

UTAH

Salt Lake City
Stuart Electric Supply, Inc.
Phone: 801/466-8603

Western Controls
Phone: 801/328-4302

VIRGINIA

Lynchburg
ECK Supply Co.
Phone: 804/846-6555

Norfolk
Priest Electronics, Inc.
Phone: 804/855-0105

VIRGINIA — Cont'd

Richmond
Electrical Equipment Co.
Phone: 804/353-7841

Roanoke
Williams Supply, Inc.
Phone: 703/343-9333

WASHINGTON

Aberdeen
Industrial Electric Service Co.
Phone: 206/533-2792

Bellevue
Almac Electronics
Phone: 206/643-9992

Bellingham
North Coast Electric Co.
Phone: 206/671-1100

Clarkston
AMFAC Electrical Supply
Phone: 509/758-5563

Everett
North Coast Electric Co.
Phone: 206/259-7263

Longview
North Coast Electric Co.
Phone: 206/423-1550

Pasco
AMFAC Electrical Supply Co.
Phone: 509/547-9733

Seattle
North Coast Electric Co.
Phone: 206/682-4444

Platt Electric Supply, Inc.
Phone: 206/624-4083

Tek-Electric Control, Inc.
Phone: 206/283-7100

Spokane
Amfac Electrical Supply
Phone: 509/534-0611

Tacoma
Consolidated Electrical Dist.
Phone: 206/383-5961

Yakima
Picatti Brothers, Inc.
Phone: 509/248-2540

WEST VIRGINIA

Clarksburg
Tolley Electric Company
Phone: 304/624-7468

Dunbar
State Electric Supply Co.
Phone: 304/768-8856

Huntington
West Virginia Electric Supply
Phone: 304/525-0361

Wheeling
Gee Electric Company
Phone: 304/233-3200

WISCONSIN

Appleton
Langstadt Electric Supply Co.
Phone: 414/733-3791

Cedarburg
A.A. Electric, Inc.
Phone: 414/377-8000

Green Bay
A.A Electric Division
Phone: 414/499-0258

Beemster Electric Company
Phone: 414/437-3238

Janesville
Cole Electric Supply, Inc.
Phone: 608/752-9496

Madison
Satterfield Electronics, Inc.
Phone: 608/257-4801

Manitowoc
Englewood Electric Supply
Phone: 414/684-6653

Milwaukee
Standard Electric Supply Co.
Phone: 414/272-8100

Racine
Nelson Electric Supply Co.
Phone: 414/637-7661

Waukesha
Power/Mation Division
Phone: 414/542-2868

NKK nikkai

There's only one thing we haven't changed in 30 years.

Our quality. We developed the first super-subminiature washable switches, the first 10-Amp rated miniature toggles and the first miniature lighted snap-in rockers—just to name a few. But while innovation became an NKK trademark, quality remained a tradition. Today, you'll find that quality in over 500,000 different switches. In fact, we can offer you just about every type of switch you'd expect from a major manufacturer, plus a lot you won't find anywhere else. Send for our 50-page catalog, then compare the performance specs, construction materials and standard features of our switches with those of the ones you are now using. You'll see why, dollar for dollar, NKK is the standard of comparison.

We put our 30 years of experience to good use—just so you could do the same.

ILLUMINATED SWITCHES (TOGGLE, LEVER, ROCKER AND PUSHBUTTON TYPES)

M-2112TRM

M-2112LR

M-2112NR

LW-3122

LW-3021A

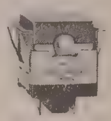
With AT-405

MLW-3022

With AT-426

MLW-3022

INDICATOR LIGHT


P-01

DLB-2141

LIGHTED DEVICES

A variety of lighted devices are offered which include pushbutton, rockers, paddle and L.E.D. lighted toggles and rockers. The pushbuttons are available in DPDT momentary or alternate actions. The lighted rockers and paddles, "MLW" Series, are available in SPDT or DPDT in all normal circuit configurations. The LW Series is a 10 Amp device with dual lamp capabilities. All units incorporate a variety of lens colors and all are provided with isolated lamp terminations offering more user flexibility. Optional colored bezels are available for rocker configurations. The single L.E.D. toggles and rockers can be provided with the L.E.D. as part of the switching circuit or isolated from the circuit.

L.E.D. ILLUMINATED TOGGLE

Model No.	Poles	Position			Rating
		Up keyway	Center	Down	Resistive AC 125V
M2112T□	SPOT	ON	—	ON	6A
∗M2112L□	//	ON	—	ON	6A
M2113T□	//	ON	OFF	ON	6A
∗M2113L□	//	ON	OFF	ON	6A

∗ Isolated lamp circuit

□ should be filled with SUFFIX for L.E.D. color selection.
Example: R for RED, M for GREEN & Y for YELLOW.

NEW Bicolor L.E.D. toggles are now available. Specify 2 colors. Example: RM for RED/GREEN, RY for RED/YELLOW & YM for YELLOW/GREEN.

L.E.D. ILLUMINATED ROCKER

Model No.	Poles	Position			Rating
		Up	Center	Down	Resistive AC 125V
M2112N□	SPOT	ON	//	ON	6A
∗M2112R□	//	ON	//	ON	6A
M2113N□	//	ON	OFF	ON	6A
∗M2113R□	//	ON	OFF	ON	6A

∗Isolated lamp circuit

□ should be filled with SUFFIX for L.E.D. color selection. Example: R for RED, M for GREEN & Y for YELLOW.

ILLUMINATED ROCKER

Model No.	Poles	Position 〈 〉=Momentary			Rating Resistive Load	
		Up	Center	Down	AC 125V	AC 250V
LW-3122	DPDT	ON	—	ON	10A	6A
LW-3123	//	ON	OFF	ON	10A	6A
LW-3125	//	ON	—	〈ON〉	10A	6A
LW-3128	//	〈ON〉	OFF	〈ON〉	10A	6A
LW-3129	//	ON	OFF	〈ON〉	10A	6A
LW-3021A	DPST	ON	—	OFF	20A(100V)	
MLW-3022	DPDT	ON	—	ON	5A	
MLW-3023	//	ON	OFF	ON	5A	
MLW-3025	//	ON	—	〈ON〉	5A	
MLW-3028	//	〈ON〉	OFF	〈ON〉	5A	
MLW-3029	//	ON	OFF	〈ON〉	5A	

ILLUMINATED PUSHBUTTON

Model No.	Poles	Position 〈 〉=Momentary		Rating Resistive Load AC 125V
DLB-2141	DPDT	ON	〈ON〉	5A
DLB-2145	//	ON	ON	5A

Contact Factory for lens styles and colors.

NKK switches OF AMERICA INC.

NKK SWITCHES OF AMERICA, INC.
14415 N. Scottsdale Road, Suite 600, Scottsdale, AZ 85260
TEL. (602)991-0942 TWX: 910-950-1167

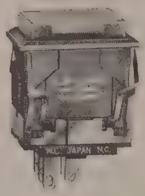
NKK nikkai

Series LB PUSHBUTTON SWITCHES AND INDICATORS

ROUND

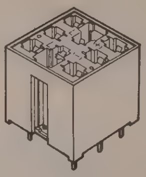
LB-26CKSI

RECTANGULAR



LB-15RGSI

PCB SOCKET



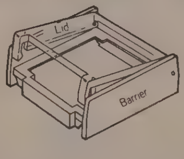
AT-711

SQUARE

LB-25SK
NC JAPAN NC

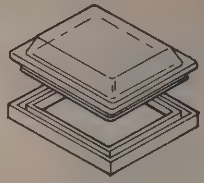
LB-25SKSI

PROTECTIVE GUARD



AT-499

SPLASH COVER



AT-4011

FEATURES

The LB Series is a compact front panel snap-in switchlight available in round, square or rectangular configurations. The round unit snaps into a .866″ diameter hole, the square, a .638″ square panel cutout and the rectangular, a .638″ × .882″ cutout. These units can be provided with front panel relampable incandescent lamps or L.E.D.s. The terminals can be soldered or used as a #110 quick-connect terminal. Gold plated versions are available for dry circuit applications. Protective guards, splash covers, barriers and sockets for P.C. mounting are optional.

SPECIFICATIONS

SPDT and DPDT, momentary or alternate action. Contact rating: 3Amps @125 or 250Vac or 30Vdc (Resistive). 0.4 VA 28V MAX. ac/dc. Contact resistance: 50 milliohms max. @ 2-4V 0.1A DC. Insulation resistance: 200 milliohms min. 500VDC. Dielectric strength: 1000V AC terminals to terminals, 1500V terminals to ground. Endurance: 1,000,000 cycles min. (momentary), 200,000 min. (alternate action) mechanical, 100,000 cycles min. electrical.

PUSHBUTTON SWITCHES

Confi-gulations	MODEL NUMBER		CIRCUIT	ACTION
	SILVER CONTACT/TERM.	GOLD CONTACT/TERM.		
Round	LB-15C🄺S1	LB-15C🄺G4	SPDT	Mom.
	LB-16C🄺S1	LB-16C🄺G4	SPDT	Alt.
	LB-25C🄺S1	LB-25C🄺G4	DPDT	Mom.
	LB-26C🄺S1	LB-26C🄺G4	DPDT	Alt.
Square	LB-15S🄺S1	LB-15S🄺G4	SPDT	Mom.
	LB-16S🄺S1	LB-16S🄺G4	SPDT	Alt.
	LB-25S🄺S1	LB-25S🄺G4	DPDT	Mom.
	LB-26S🄺S1	LB-26S🄺G4	DPDT	Alt.
Rectan-gular	LB-15R🄺S1	LB-15R🄺G4	SPDT	Mom.
	LB-16R🄺S1	LB-16R🄺G4	SPDT	Alt.
	LB-25R🄺S1	LB-25R🄺G4	DPDT	Mom.
	LB-26R🄺S1	LB-26R🄺G4	DPDT	Alt.

*Suffix 🄺 means Black Housing, Use 🄶 for Gray.

MATCHING INDICATOR LIGHT

MODEL NO.	DESCRIPTION
LB-01🄺S1	Square Lens Face
LB-02🄺S1	Round Lens Face
LB-03🄺S1	Rectangular Lens Face

*Use 🄶 for Gray Housing.

BUTTONS

Configu lations	LENS STYLE		COLORS	
	MODEL NO.	DESCRIPTION	Cover	Filter
Round	AT-4012	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-4013	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4014	For Single L.E.D.	Trans.	M,R,Y.
	AT-4015	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-4016	L.E.D./Spot	K,M,R.	(L.E.D.) G,R,Y.
	AT-4017	Non-Illuminated	B,M,R,W,Y.	—
Square	AT-476	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-477	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-478	For Single L.E.D.	Trans.	M,R,Y.
	AT-479	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-480	L.E.D./Spot	K,M,R.	(L.E.D.) G,R,Y.
	AT-484	Non-Illuminated	B,M,R,W,Y.	—
Retangular	AT-4026	For Incandescent Lamp	B,M,R,W,Y.	Trans.
	AT-4027	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4028	For Single L.E.D.	Trans.	M,R,Y.
	AT-4029	For 4 L.E.D. Array	Trans.	M,R,Y.
	AT-4030	Non-Illuminated	B,M,R,W,Y.	—

*B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

LAMPS or L.E.D.

MODEL NO.	DESCRIPTION	COLORS
AT-607	Incandescent Lamp 5V,12V,28V.	—
AT-608	Single L.E.D./Square	Red,Green,Yellow.
AT-609	4 L.E.D. Array w/o Ballast Resistor	Red,Green,Yellow.
AT-610	4 L.E.D. Array w/Ballast Resistor.	Red,Green,Yellow.
AT-614	Single L.E.D./Round & Rectangular	Reb,Green,Yellow.

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-109	Lens Extractor
AT-497	End Barrier Strip
AT-498	Center Barrier Strip
AT-499	Protective Guard/Square
AT-711	Socket for PCB Mtg. (Single Pole)
AT-712	Socket for PCB Mtg. (Double Pole)
AT-4001	Splash cover Square
AT-4002	Splash cover/Round
AT-4011	Splash cover/Rectangular

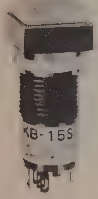
NKK SWITCHES OF AMERICA, INC. 14415 N. Scottsdale Road, Suite 600, Scottsdale, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

NKK switches OF AMERICA INC.

KB Series PUSHBUTTON SWITCHES AND INDICATORS

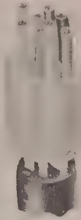
BUSHING MOUNTING

KB-15CKS1


KB-15SKS1

KB-15RKS1

INSULATION COVER



SNAP-IN MOUNTING

KB-15MKS1

KB-15KKS1

KB-15NKS1

FEATURES

This compact lighted series is provided in a round, square or rectangular lens face which mounts into a .484″ diameter panel cutout for bushing or snap-in mounting. The unit can be provided with front panel replaceable incandescent lamps or LED's. Gold plated designs are available for dry circuit applications. Matching indicator lights are available. Protective guards, splash covers and sockets for P.C. mounting are optional.

SPECIFICATIONS

SPDT and DPDT, momentary or alternate action, Contact rating: 1Amps @125 or 250Vac or 30Vdc (Resistive). 0.4 VA 28V MAX. ac/dc. Contact resistance: 50 milliohms max. @ 2-4V 0.1A DC. Insulation resistance: 1000 megohms min. 500 V DC; Dielectric Strength: 1000V AC terminals to terminals, 1500V terminals to ground. Endurance: 40,000 cycles mechanical, 20,000 cycles electrical min.

PUSHBUTTON SWITCHES

Configurations		MODEL NUMBER		CIRCUIT	ACTION
		SILVER CONTACT/TERM.	GOLD CONTACT/TERM.		
Bushing Mounting	.551 Dia. Round	KB-15CKS1	KB-15CKG4	SPDT	Mom.
		KB-16CKS1	KB-16CKG4	SPDT	Alt.
		KB-25CKS1	KB-25CKG4	DPDT	Mom.
		KB-26CKS1	KB-26CKG4	DPDT	Alt.
	.551 Square	KB-15SKS1	KB-15SKG4	SPDT	Mom.
		KB-16SKS1	KB-16SKG4	SPDT	Alt.
		KB-25SKS1	KB-25SKG4	DPDT	Mom.
		KB-26SKS1	KB-26SKG4	DPDT	Alt.
	.728 × .551 Rectangular	KB-15RKS1	KB-15RKG4	SPDT	Mom.
		KB-16RKS1	KB-16RKG4	SPDT	Alt.
		KB-25RKS1	KB-25RKG4	DPDT	Mom.
		KB-26RKS1	KB-26RKG4	DPDT	Alt.
Snap-in Mounting	.551 Dia. Round	KB-15MKS1	KB-15MKG4	SPDT	Mom.
		KB-16MKS1	KB-16MKG4	SPDT	Alt.
		KB-25MKS1	KB-25MKG4	DPDT	Mom.
		KB-26MKS1	KB-26MKG4	DPDT	Alt.
	.551 Square	KB-15KKS1	KB-15KKG4	SPDT	Mom.
		KB-16KKS1	KB-16KKG4	SPDT	Alt.
		KB-25KKS1	KB-25KKG4	DPDT	Mom.
		KB-26KKS1	KB-26KKG4	DPDT	Alt.
	.728 × .551 Rectangular	KB-15NKS1	KB-15NKG4	SPDT	Mom.
		KB-16NKS1	KB-16NKG4	SPDT	Alt.
		KB-25NKS1	KB-25NKG4	DPDT	Mom.
		KB-26NKS1	KB-26NKG4	DPDT	Alt.

MATCHING INDICATOR LIGHT

Configulations	LENS STYLE	
	MODEL NO.	DESCRIPTION
Bushing Mtg.	KB-01KS1	Square Lens Face
	KB-02KS1	Round Lens Face
	KB-03KS1	Rectangular Lens Face
Snap-in Mtg.	KB-04KS1	Square Lens Face
	KB-05KS1	Round Lens Face
	KB-06KS1	Rectangular Lens Face

BUTTONS

Configulations	LENS STYLE		COLORS	
	MODEL NO.	DECRIPTION	COVER	FILTER
Round	AT-486	For Incandescent Lamp	B,M,R,W,Y,	B,M,W.
	AT-488	For Incandescent Lamp	Trans.	B.M,R,W,Y.
	AT-490	For L.E.D. Lamp	Trans.	M,R,Y.
Square	AT-485	For Incandescent Lamp	B,M,R,W,Y.	B,M,W
	AT-487	For Incandescent Lamp	Trans.	B,M,R,W,Y
	AT-489	For L.E.D. Lamp	Trans.	M,R,Y
Rectangular	AT-4021	For Incandescent Lamp	B,M,R,W,Y.	B,M,W.
	AT-4022	For Incandescent Lamp	Trans.	B,M,R,W,Y.
	AT-4023	For L.E.D. Lamp	Trans.	M,R,Y

* B = Blue, M = Green, R = Red, W = White, Y = Yellow.

LAMPS or L.E.D.

MODEL NO.	DESCRIPTION	COLORS
AT-608	Single L.E.D. for Round/ Square Types	Red,Green,Yellow
AT-611	Incandescent Lamp 5V, 12V or 28V.	—
AT-612	Dual L.E.D. with IC Chip 5~28V w/o Ballast Resistor	Red,Green,Yellow.
AT-614	Single L.E.D. for Rectangular Types	Red,Green,Yellow
AT-615	Neon Lamp 85V min.	—

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-108	Socket Wrench/Bushing Mtg.
AT-494	Protective Guard/Round/Square
AT-495	Splash Cover/Round/Square
AT-701	Socket for PCB Mtg. (Single Pole)
AT-702	Socket for PCB Mtg. (Double Pole)
AT-4024	Protective Guard/Rectangular
AT-4025	Splash Cover/Rectangular

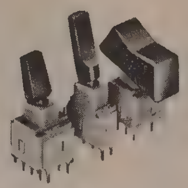
NKK nikkai

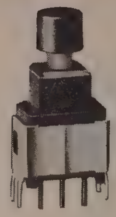
WASHABLE! Series A SUPERSUBMINIATURE'S

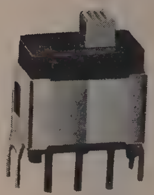
A-22AV

A-12JH

A-01BR


With Paddles & Rocker on A-12KB etc.


AB-15AB


AS-12AB

FEATURES

This supersubminiature family of SPDT, SP3T, & DPDT "Washable" PCB switches with Sliding/Twin/Cross-Bar Contacts are available in toggle, paddle/rocker & pushbutton versions. The series incorporates a bushing seal and the back is sealed which allows the unit to be subjected to wave soldering and flux cleaning operations. The series is available with a variety of toggle styles, colored paddles and rockers in all switching actions including "ON-ON-ON". All normal printed circuit board terminations are offered. Optional caps are for the pushbutton types.

SPECIFICATIONS

SPDT, SP3T and DPDT in 5 different actions. Contact rating: 0.4VA MAX. 28V ac/dc MAX. Contact resistance: 50 milliohms max. @10mA /20mV. Insulation resistance: 500 megohms min. 500V dc. Dielectric strength: 500V ac min. Endurance: 50,000 ~ 100,000 cycles mechanical, 50,000 cycles electrical min.

		TYPE NBR.	LEVER POSITION ‹ ›=Momentary		
		TOGGLE	Up	Center	Down
VERTICAL MTG. PC	SPDT	A-12☐V	ON		ON
		A-13☐V	ON	OFF	ON
		A-15☐V	ON	—	‹ON›
		A-1R☐V	‹ON›	—	ON
		A-18☐V	‹ON›	OFF	‹ON›
		A-19☐V	ON	OFF	‹ON›
		A-1S☐V	‹ON›	OFF	ON
	DPDT	A-22☐V	ON		ON
		A-23☐V	ON	OFF	ON
		A-25☐V	ON	—	‹ON›
		A-2R☐V	‹ON›	—	ON
		A-28☐V	‹ON›	OFF	‹ON›
		A-29☐V	ON	OFF	‹ON›
		A-2S☐V	‹ON›	OFF	ON
		SP-3T	—	—	—
		A-24☐V	ON	ON	ON
		A-26☐V	‹ON›	ON	‹ON›
		A-27☐V	ON	ON	‹ON›
RIGHT ANGLE MTG. PC	SPDT	A-12☐H	ON	—	ON
		A-13☐H	ON	OFF	ON
		A-15☐H	ON	—	‹ON›
		A-1R☐H	‹ON›	—	ON
		A-18☐H	‹ON›	OFF	‹ON›
		A-19☐H	ON	OFF	‹ON›
		A-1S☐H	‹ON›	OFF	ON
	DPDT	A-22☐H	ON	—	ON
		A-23☐H	ON	OFF	ON
		A-25☐H	ON	—	‹ON›
		A-2R☐H	‹ON›	—	ON
		A-28☐H	‹ON›	OFF	‹ON›
		A-29☐H	ON	OFF	‹ON›
		A-2S☐H	‹ON›	OFF	ON
		SP-3T	—	—	—
		A-24☐H	ON	ON	ON
		A-26☐H	‹ON›	ON	‹ON›
		A-27☐H	ON	ON	‹ON›

		TYPE NBR.	LEVER POSITION ‹ ›=Momentary		
		TOGGLE	Up	Center	Down
STRAIGHT MTG. PC with SUPPORT BRACKET	SPDT	A-12☐B	ON		ON
		A-13☐B	ON	OFF	ON
		A-15☐B	ON	—	‹ON›
		A-18☐B	‹ON›	OFF	‹ON›
		A-19☐B	ON	OFF	‹ON›
	DPDT	A-22☐B	ON	—	ON
		A-23☐B	ON	OFF	ON
		A-25☐B	ON	—	‹ON›
		A-28☐B	‹ON›	OFF	‹ON›
		A-29☐B	ON	OFF	‹ON›
		SP-3T	—	—	—
		A-24☐B	ON	ON	ON
		A-26☐B	‹ON›	ON	‹ON›
		A-27☐B	ON	ON	‹ON›
STRAIGHT MTG. PC	SPDT	A-12☐P	ON	—	ON
		A-13☐P	ON	OFF	ON
		A-15☐P	ON	—	‹ON›
		A-18☐P	‹ON›	OFF	‹ON›
		A-19☐P	ON	OFF	‹ON›
	DPDT	A-22☐P	ON	—	ON
		A-23☐P	ON	OFF	ON
		A-25☐P	ON	—	‹ON›
		A-28☐P	‹ON›	OFF	‹ON›
		A-29☐P	ON	OFF	‹ON›
		SP-3T	—	—	—
		A-24☐P	ON	ON	ON
		A-26☐P	‹ON›	ON	‹ON›
		A-27☐P	ON	ON	‹ON›

		TYPE NBR.	LEVER POSITION		
		SLIDE	Side A	Center	Side B
RIGHT ANGLE MTG. PC	SPDT	AS-12AH	ON		ON
		AS-13AH	ON	OFF	ON
	DPDT	AS-22AH	ON	—	ON
		AS-23AH	ON	OFF	ON
STRAIGHT PC with BRACKET	SPDT	AS-12AB	ON	—	ON
		AS-13AB	ON	OFF	ON
	DPDT	AS-22AB	ON	—	ON
		AS-23AB	ON	OFF	ON
STRAIGHT PC	SPDT	AS-12AP	ON		ON
		AS-13AP	ON	OFF	ON
	DPDT	AS-22AP	ON	—	ON
		AS-23AP	ON	OFF	ON
		PUSH BUTTON	Normal	Center	Down
VERTICAL		○ AB-15AV	ON	—	‹ON›
		◎ AB-25AV	ON		‹ON›
RIGHT ANGLE		○ AB-15AH	ON		‹ON›
		◎ AB-25AH	ON	—	‹ON›
STR.PC W.BRACKET		○ AB-15AB	ON	—	‹ON›
		◎ AB-25AB	ON		‹ON›
STRAIGHT PC		○ AB-25AP	ON	—	‹ON›
		◎ AB-25AP	ON	—	‹ON›

○ = SPDT ◎ = DPDT ‹ › = Momentary

NOTE: ACTUATOR STYLES
☐ Should be filled with SUFFIX for selection of toggles like
A = (.394" long/STANDARD),
J = (.248" long/SHORT),
E = (.394" long/FLAT),
H = (.248" long/FLAT & SHORT) and
K = (For Rocker or Paddle types).

MATCHING INDICATOR LIGHT

MODEL NO.	DESCRIPTION	COLOR
A-01P	.118"dia. L.E.D./Straight PC	Red, Green & Yellow
A-01B	.118"dia. L.E.D./Straight PC with Support Bracket	Red, Green & Yellow
A-01V	.118"dia. L.E.D./Vertical Mtg. PC	Red, Green & Yellow
A-01H	.118"dia. L.E.D./Right Angle Mtg. PC	Red, Green & Yellow
A-02P	.197"dia. L.E.D./Straight PC	Red, Green & Yellow

Provided in Gray only

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-467	Paddle .370" long
AT-468	Paddle .559" long
AT-469	Rocker .748" x 528"
AT-475	Button .201"dia.
AT-496	Button .295"dia.
AT-4003	Cap for toggle .394" long.
Red, White & Black are available	
AT-530	Snap-in Mounter/Single Pole
AT-531	Snap-in Mounter/Single & Double Pole

Provided in Gray only

NKK SWITCHES OF AMERICA. INC. 14415 N. Scottsdale Road, Suite 600, Scottsdale, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

nkk switches OF AMERICA INC.

WASHABLE! B Series *"Static-proof" Top* SUPERSUBMINIATURE'S

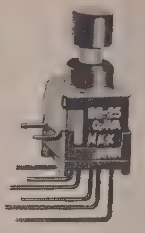
B-12AV

B-12JH

B-22HB

B-22EP

BB-15AB


BB-25AV

FEATURES

This is a supersubminiature family of "Static-proof", "Washable" PCB switches with Sliding/Twin/Gross-Bar Contacts. The family is available in toggle and pushbutton versions in SPDT and DPDT in 5 different switching actions. The units have a bushing made of a carbon impregnated resin, which when used with a support bracket and the bracket is taken to ground provides a path to ground for "static" electricity. The series incorporates a bushing seal and the backs are ultrasonically welded offering a unit which can be subjected through wave soldering and flux cleaning operations. The toggle versions are offered in a variety of toggle shapes and sizes. The devices are available in all normal printed circuit board terminal configurations. Optional caps are available for the pushbutton types.

SPECIFICATIONS

SPDT and DPDT in 5 different actions. Contact rating: 0.4VA MAX. 28V MAX. ac/dc Contact resistance: 500 milliohms max. @10mA/20mV. 50 milliohms max. @10mA/20mV. Insulation resistance: 500 megohms min. 500V dc. Dielectric strength: 500V ac min. Endurance: 50,000~100,000 cycles mechanical, 50,000 cycles electrical min.

TOGGLE		BASIC TYPE NBR.	LEVER POSITION ‹ › = Momentary Up (Slot)	Center	Down
VERTICAL MTG. PC	SP•DT	B-12☐V	ON	—	ON
		B-13☐V	ON	OFF	ON
		B-15☐V	ON	—	‹ON›
		B-18☐V	‹ON›	OFF	‹ON›
		B-19☐V	ON	OFF	‹ON›
	DP•DT	B-22☐V	ON	—	ON
		B-23☐V	ON	OFF	ON
		B-25☐V	ON	—	‹ON›
		B-28☐V	‹ON›	OFF	‹ON›
		B-29☐V	ON	OFF	‹ON›
RIGHT ANGLE MTG. PC	SP•DT	B-12☐H	ON	—	ON
		B-13☐H	ON	OFF	ON
		B-15☐H	ON	—	‹ON›
		B-18☐H	‹ON›	OFF	‹ON›
		B-19☐H	ON	OFF	‹ON›
	DP•DT	B-22☐H	ON	—	ON
		B-23☐H	ON	OFF	ON
		B-25☐H	ON	—	‹ON›
		B-28☐H	‹ON›	OFF	‹ON›
		B-29☐H	ON	OFF	‹ON›

TOGGLE		BASIC TYPE NBR.	LEVER POSITION ‹ › = Momentary Up (Slot)	Center	Down
STRAIGHT MTG. PC with SUPPORT BRACKET	SP•DT	B-12☐B	ON	—	ON
		B-13☐B	ON	OFF	ON
		B-15☐B	ON	—	‹ON›
		B-18☐B	‹ON›	OFF	‹ON›
		B-19☐B	ON	OFF	‹ON›
	DP•DT	B-22☐B	ON	—	ON
		B-23☐B	ON	OFF	ON
		B-25☐B	ON	—	‹ON›
		B-28☐B	‹ON›	OFF	‹ON›
		B-29☐B	ON	OFF	‹ON›
STRAIGHT MTG. PC	SP•DT	B-12☐P	ON	—	ON
		B-13☐P	ON	OFF	ON
		B-15☐P	ON	—	‹ON›
		B-18☐P	‹ON›	OFF	‹ON›
		B-19☐P	ON	OFF	‹ON›
	DP•DT	B-22☐P	ON	—	ON
		B-23☐P	ON	OFF	ON
		B-25☐P	ON	—	‹ON›
		B-28☐P	‹ON›	OFF	‹ON›
		B-29☐P	ON	OFF	‹ON›

	TYPE NBR. PUSH BUTTON	OPERATOR POSITION Normal (Slot)	Down (Slot)
VERTICAL	BB-15AV	ON	‹ON›
	◯ BB-25AV	ON	‹ON›
RIGHT ANGLE	BB-15AH	ON	‹ON›
	◎ BB-25AH	ON	‹ON›
STR. PC W.BRACKET	BB-15AB	ON	‹ON›
	◎ BB-25AB	ON	‹ON›
STRAIGHT PC	BB-15AP	ON	‹ON›
	BB-25AP	ON	‹ON›

◯ = SPDT ◎ = DPDT

NOTE: ACTUATOR STYLES
☐ should be filled with SUFFIX for selection of toggles like

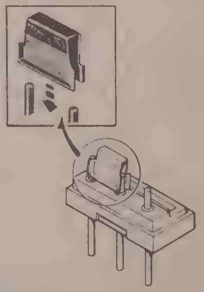
A = (.394" long/STANDARD)
J = (.248" long/SHORT)
E = (.394" long/FLAT)
H = (.248" long/FLAT & SHORT)

ACCESSORIES

MODEL NO.	DESCRIPTION
AT-475	Button .201"dia.
AT-496	Button .295"dia.
AT-4003	Cap for toggle .394"long

Red, White & Black are available

HIGH CONTACT STABILITY BY S.T.C. CONTACT (Series A & B)



Unique Sliding action with Twin/Cross-Bar Contact mechanism in the totally sealed body assures higher stability than usual electo-mechanical contact systems.

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NKK nikkai

Series M

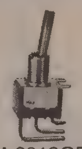
Over 440,000 types

TOGGLE, LEVER, ROCKER AND PADDLE SWITCHES

M-2012SSW01

M-2012URW06

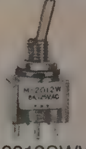
M-2012RPG24

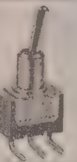

M-2012CPG12

M-2012DRW06

M-2012EPG12

M-2012APG24


M-2012SWW01


M-2012SPG24

M-2012NRW06

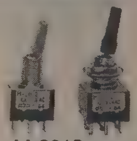
M-2012BBW01

M-2012LMG12

M-2012TNW01

M-2012TZW06

M-2012SSW13

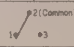

M-2012
KSW01 etc.

FEATURES

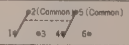
This competitively priced subminiature family of toggles, rockers and paddle switches is available in SPST to 4PDT in all switching actions, including ON-ON-ON configurations. The wide variety of toggles, rockers, paddles, bushing shapes, sizes, brackets for printed circuit versions and terminal configurations offer up to 440,000 possible combinations. The switches are provided with epoxied terminals, hi-torque bushings have a built-in anti-jamming mechanism as standard features. Included in this series are leverlocks, watertight bushings and panel sealed versions.

POLES AND FUNCTIONS

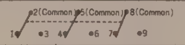
	Switching Position		
SPDT	Up	Center	Down
M-2012	ON	—	ON
M-2013	ON	OFF	ON
M-2015	ON	—	⟨ON⟩
M-2018	⟨ON⟩	OFF	⟨ON⟩
M-2019	ON	OFF	⟨ON⟩
Term. Conn.	2-3	Open	1-2

Schematic


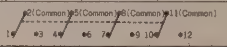
DPDT (INCL SP3T)			
M-2022	ON	—	ON
M-2023	ON	OFF	ON
M-2025	ON	—	⟨ON⟩
M-2028	⟨ON⟩	OFF	⟨ON⟩
M-2029	⟨ON⟩	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6	Open	2-1, 5-4
M-2020	ON	ON	ON
M-20208	⟨ON⟩	ON	⟨ON⟩
M-20209	ON	ON	⟨ON⟩
Term. Conn.	2-3, 5-6	2-3, 5-4	2-1, 5-4

Schematic


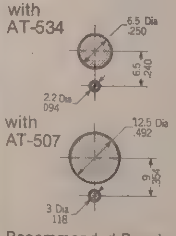
	Switching Position		
3PDT	Up	Center	Down
M-2032	ON	—	ON
M-2033	ON	OFF	ON
M-2035	ON	—	⟨ON⟩
M-2038	⟨ON⟩	OFF	⟨ON⟩
M-2039	ON	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6 8-9	Open	2-1, 5-4 8-7

Schematic


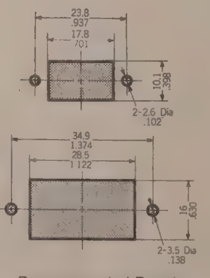
4PDT (INCL DP3T)			
M-2042	ON	—	ON
M-2043	ON	OFF	ON
M-2045	ON	—	⟨ON⟩
M-2048	⟨ON⟩	OFF	⟨ON⟩
M-2049	ON	OFF	⟨ON⟩
Term. Conn.	2-3, 5-6 8-9,11-12	Open	2-1, 5-4 8-7,11-10
M-2040	ON	ON	ON
M-20408	⟨ON⟩	ON	⟨ON⟩
M-20409	ON	ON	⟨ON⟩
Term. Conn.	2-3,5-6 8-9,11-12	2-3,5-6 8-9,11-10	2-1,5-4 8-7,11-10

Schematic


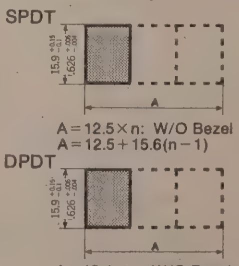
PANEL LAYOUT



Recommended Panel Thickness
1mm·32mm W/O Bezel
1mm·25mm With Bezel



Recommended Panel Thickness 3.2mm Max.



A = 12.5 × n: W/O Bezel
A = 12.5 + 15.6(n − 1)

A = 13.1 × n: W/O Bezel
A = 13.1 + 15.6(n + 1)

SPECIFICATIONS

SPST, SPDT, SP3T, DPST, DPDT, DP3T, 3PST, 3PDT, 4PST and 4PDT in 5 different actions. Contact rating: 6Amp @125Vac or 30Vdc (Silver/Resistive) 0.4VA 28V MAX. ac/dc (Gold). Contact resistance: 10 milliohms max. (Silver) 50 milliohms max. (Gold). Insulation resistance: 1,000 megohms min. 500Vdc. Di-electric strength: 1,000Vac min. Endurance: 100,000 cycles min. mechanical, 25,000 (Silver)~50,000 (Gold) cycles min. electrical.

ACTUATORS (Option)
S = STANDARD TOGGLE (.413)
U = SHORT TOGGLE (.256)
V = EXTRA SHORT T. (.201)
Q = MEDIUM LONG T. (.550)
R = LONG TOGGLE (.839)
L = LOCKING LEVER
C = COLOR TIP TOGGLE
D = LONG/COLOR TIP TOGGLE
M = COLUMN LEVER
N = COLUMN/COLOR TIP LEVER
A = SHORT FLAT TOGGLE
F = STANDARD FLAT TOGGLE
E = LONG FLAT TOGGLE
B = LARGE TOGGLE/.472 BUSH
G = LONG/LARGE TOGGLE/.472 BUSH
T = SPECIAL FOR PADDLE/ROCKER
K = SPECIAL FOR PLASTIC LEVER

BUSHINGS (Option)
S = STANDARD (1/4-40: .315 LONG)
A = SHORT (1/4-40: .245 LONG)
C = STANDARD with BRACKET
X = SPECIAL FOR BENT TERMINALS (1/4-40: .310 LONG)
D = D FLAT (1/4-40: .315)
F = NON-THREADED (.244: .350)
H = NON-THREADED (.244: .245)
R = SPECIAL with BRACKET (N.-T.)
P = SPECIAL with SUPPORT (N.-T.)
W = WATERTIGHT (1/4-40: .291)
L = LOCKING (1/4-40: .256)
K = LOCKING with BRACKET (N.-T.)
M = LOCKING with SUPPORT (N.-T.)
T = LOCKING/WATERTIGHT (1/4-40)
B = LARGE (.472: .472)
G = LARGE/WATERTIGHT (.472)
N = SPECIAL with FLAT FRAME
J = SPECIAL with SNAP-IN FRAME
V = SPECIAL with BRACKET
Q = SPECIAL with SUPPORT
Z = SPECIAL with LARGE BRACKET
Y = SPECIAL with LARGE FLAT FRAME

TERMINALS/CONTACT MATERIALS (Option)
W 01 = SOLDER LUG/SILVER/SILVER
W 02 = SOLDER LUG/SILVER/GOLD
G 03 = SOLDER LUG/COPPER/GOLD
W 04 = .150 LONG PC/SILVER/GOLD
G 05 = .150 LONG PC/COPPER/GOLD
W 06 = .150 LONG PC/SILVER/SILVER
W 07 = .964 Wirewrap/SILVER/GOLD
G 08 = .964 Wirewrap/B RASS/GOLD
W 34 = .964 Wirewrap/SILVER/SILVER
W 11 = .100 PITCH VERTICAL/SILVER/GOLD
G 12 = .100 PITCH VERTICAL/BRASS/GOLD
W 25 = .100 PITCH VERTICAL/SILVER/SILVER
W 23 = RIGHT ANGLE MTG PC/SILVER/GOLD
G 24 = RIGHT ANGLE MTG PC/BRASS/GOLD
W 28 = RIGHT ANGLE MTG PC/SILVER/SILVER
W 26 = .150 PITCH VERTICAL/SILVER/GOLD
G 27 = .150 PITCH VERTICAL/BRASS/GOLD
W 29 = .150 PITCH VERTICAL/SILVER/SILVER
W 36 = QUICK CONNECT/SILVER/SILVER
W 37 = QUICK CONNECT/SILVER/GOLD
G 38 = QUICK CONNECT/COPPER/GOLD

ACCESSORIES

MODEL NO.	DESCRIPTION	COLOR
AT-415	Lever Cap/.472″long/Round Top	B, K, M, R, W, Y.
AT-428	Waterproof Boot/.563″long	K.
AT-426	Lever Top/.315″long	B, K, R.
AT-444	Lever Cap/.453″long/Flat Top	B, K, M, R, W, Y.
AT-448	Rocker/.531″ X .366″	B, G, K, M, R. W, Y.
AT-449	Paddle/.740″long	B, G, K, M, R, W, Y.
AT-450	Rocker/.350″ X .453″	B, G, K, M, R, W, Y.
AT-451	Paddle/.650″long	B, G, K, M, R, W, Y.
AT-456	Rocker/.913″ X .598″	B, G, K, M, R, W, Y.
AT-457	Paddle/1.173″long	B, G, K, M, R, W, Y.
AT-460	Lever Cap/.646″long	B, K, M, R, W, Y.
AT-461	Paddle/.866″long	B, G, K, M, R, W, Y.

B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

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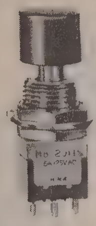
nkk switches OF AMERICA INC.

Series ML PUSHBUTTON SWITCHES

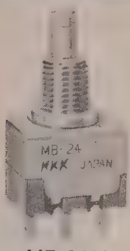
Over 440,000 types

MB-2011
SW01

MB-2061
WW01

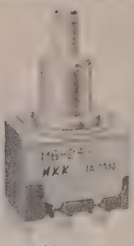


MB-2011
BW01



MB-2411
E3W1-0

MB-2411
E3W1-1



MB-2411
HIG24-0

MB-2411
JW01-3

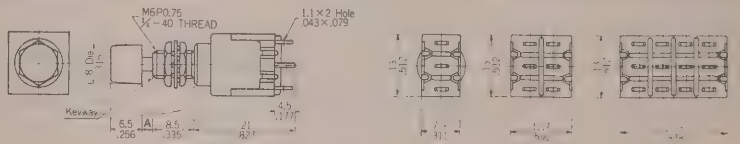
MB-2000 SERIES

This is a competitively priced pushbutton family of switches available in SPDT, DPDT and 4PDT circuits in momentary or alternate action models. A wide range of bushing types and terminal configurations for power or dry circuit applications are available. The 1/4″ bushing versions are provided with a metal plunger. Large bushing (12 mm) sizes are available. A variety of colored caps in three(3) different sizes, a wide range of bushing types, brackets for printed circuit board mounting and termial configuration offers a broad product line. This series can be provided with a watertight bushing and a panel seal.

ML series
PUSHBUTTON
SWITCHES

SPECIFICATIONS

RATING: 6A 125V ac or 30V dc (Silver) 0.4VA MAX. 28V MAX. ac de (Gold)
MECHANICAL LIFE: 100.000 operations min
ELECTRICAL LIFE: 25,000 operations min (Silver) 50,000 operations min (Gold)



POLE	TYPE	Solder Lug SILVER	Straight PC SILVER	PC/Bracket SILVER	Large Toggle SILVER	Water-tight SILVER	Wire-Wrap GOLD
SPDT	Momentary Push ON/ON	MB-2011-SW01 MB-2065-SW01	MB-2011-SW06 MB-2065-SW06 (P)	MB-2011-RW06 MB-2065-RW06 (B)	MB-2011-BW01 MB-2065-BW01 (L/B)	MB-2011-WW01 MB-2065-WW01 (W)	MB-2011-SG13 MB-2065-SG13 (W/W)
DPDT	Momentary Push ON/ON	MB-2061-SW01 MB-2085-SW01	MB-2061-SW06 MB-2085-SW06 (P)	MB-2061-RW06 MB-2085-RW06 (B)	MB-2061-BW01 MB-2085-BW01 (L/B)	MB-2061-WW01 MB-2085-WW01 (W)	MB-2061-SG13 MB-2085-SG13 (W/W)
4PDT	Momentary Push ON/ON	MB-2181-SW01 MB-2185-SW01	MB-2181-SW06 MB-2185-SW06 (P)		MB-2181-BW01 MB-2185-BW01 (L/B)	MB-2181-WW01 MB-2185-WW01 (W)	MB-2181-SG13 MB-2185-SG13 (W/W)

Washable! NEW
ML series
PUSHBUTTON SWITCHES

MB-2400 SERIES

This is also competitively priced pushbutton family of switches available in SPDT and DPDT in momentary action with precision type mechanism. Bushing seal by rubber ring, terminal seal by epoxy and flexible molded housing allow this series to be withstood to wave soldering and flux cleaning operations.

SPECIFICATIONS

SPDT and DPDT in momentary action. Contact rating: 3Amp @125Vac or 30Vdc (Silver/Resistive) 0.4VA 28V MAX. ac/dc. Contact resistance: 20 milliohms max. (Silver) 30 milliohms max. (Gold). Insulation resistance: 1,000Vac min. 500Vdc. Di-electric strength: 1,000Vac min. Endurance: 200,000 cycles min. mechanically, 25,000 (Silver) 100,000 (Gold) cycles min. electrical.

SOLDER LUG TERMINALS

(Bushing: .250″ long; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411E3W01	MB-2411E3G03
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461E3W01	MB-2461E3G03

⟨ ⟩=Momentary

STRAIGHT PC TERMINALS

(Bushing: .250″ long; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411E3W06	MB-2411E3G05
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461E3W06	MB-2461E3G05

⟨ ⟩=Momentary

STRAIGHT PC TERMINALS with SUPPORT BRACKET

(Bushing: .280″ long; .244″dia. Non-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411H2W06	MB-2411H2G05
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461H2W06	MB-2461H2G05

⟨ ⟩=Momentary

RIGHT ANGLE MTG. PC TERMINALS with SUPPORT

(Bushing: .280″ long; .244″dia. Mon-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411H1W28	MB-2411H1G24
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461H1W28	MB-2461H1G24

⟨ ⟩=Momentary

VERTICAL MTG. PC TERMINALS with SUPPORT

(Bushing: .280″ long; .244″dia. Non-threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411H1W25	MB-2411H1G12
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461H1W25	MB-2461H1G12

⟨ ⟩=Momentary

WIREWRAP TERMINALS (.750″ long)

(Bushing: .250″ long; 1/4-40 Threaded)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411E3W35	MB-2411E3G13
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461E3W35	MB-2461E3G13

⟨ ⟩=Momentary

SNAP-IN MTG. with SOLDER LUG TERMINALS

(Bushing: Special with Snap-in Bracket)

POLE	CIRCUIT		Silver Contacts	Gold Contacts
	Up	Down	6Amp 125VAC	.4VA Max. 28V Max.
SP	1-2 ON	1-3 ⟨ON⟩	MB-2411JW01	MB-2411JG03
DP	1-2 4-5 ON	1-3 4-6 ⟨ON⟩	MB-2461JW01	MB-2461JG03

⟨ ⟩=Momentary

ACCESSORIES

MODEL NO.	DESCRIPTION	COLOR
AT-207	Bezel	B, G, K, M, R, W, Y.
AT-465	Button/.453″ square	B, K, M, R, W, Y.
AT-475	Button/.201″ dia.	K, R, W.
AT-496	Button/.295″ dia.	K, R, W.

B = Blue, G = Gray, K = Black, M = Green, R = Red, W = White, Y = Yellow

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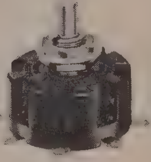
NKK nikkai

Wide Variety

ROTARY SWITCHES

PS-2

TS-2


HS-13Z

MRX-108

MR-A112

MR-K112

MR-F112

NEW DR series BINARY CODED DIP ROTARY SWITCHES

FEATURES

The new binary coded rotaries have terminals on a .100×.300 grid and are DIP socket compatible. The terminals are formed to insure device security in board insertion eliminating float during wave soldering. These decimal or hexidecimal codec devices are offered in real or complement codings.

DR-FR10P
(Real Coded)

DR-KC16P
(Complement Coded)

*CIRCUIT FORMAT
● = ON
RATING : 0.4VA MAX. 28V ac/dc MAX.

Model No.	Model No.		Code 1	Code 2	Code 4	Code 8	Model No.	Model No.		Code 1	Code 2	Code 4	Code 8
DR-FR16P DR-KR16P	DR-FR10P DR-KR10P	0	●				DR-FC16P DR-KC16P	DR-FC10P DR-KC10P	0	●	●	●	●
		1	●						1		●	●	●
		2	●	●					2	●		●	●
		3	●	●					3			●	●
		4	●		●				4	●	●		●
		5	●		●				5		●		●
		6	●	●	●				6	●			●
		7	●	●	●				7				●
		8	●			●			8	●	●	●	
		9	●			●			9		●	●	
		A	●	●		●			A	●		●	
		B	●	●		●			B			●	
		C	●		●	●			C	●	●		
		D	●		●	●			D	●	●		
		E		●	●	●			E	●			
		F	●	●	●	●			F				

SUBMINIATURE ROTARY SWITCHES

NEW Washable!

Model No.	Poles	Applicable Stopper Setting Terminal No.	Rating Resistive Load AC 125V
MR-A112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,10,11,12.	250mA
MR-A206	2 Pole/2~6 Positions	2,3,4,5,6.	250mA
MR-A403	4 Pole/2~3 Positions	2,3.	250mA
MR-F112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,11,12.	0.4VA 28V MAX.
MR-F206	2 Pole/2~6 Positions	2,3,4,5,6.	0.4VA 28V MAX.
MR-F403	4 Pole/2~3 Positions	2,3.	0.4VA 28V MAX.
MR-K112	1 Pole/2~12 Positions	2,3,4,5,6,7,8,9,10,11,12.	0.4VA 28V MAX.
MR-K206	2 Pole/2~6 Positions	2,3,4,5,6.	0.4VA 28V mAX.
MR-K403	4 Pole/2~3 Positions	2,3.	0.4VA 28V MAX.
MRX-108	1 Pole/2~8 Positions	2,3,4,5,6,7,8.	2A
MRX-204	2 Pole/2~4 Positions	2,3,4.	2A
MRX-402	4 Pole/ 2 Positions	Unadjustable	2A
MRY-106	1 Pole/2~6 Positions	2,3,4,5,6.	3A
MRT-22	DPDT ON 2-3 5-6 — 1-2 4-5 ON		10A
MRT-23	// ON 2-3 5-6 OFF 1-2 4-5 ON		6A

ROTARIES

Rotary switches are available in a variety of family types from large 30 Amp devices to sealed dry circuit binary coded rotaries. With the exception of the binary coded rotaries all are provided with adjustable stops. The MR-A Series, MR-F, MR-K and the binary coded rotaries are "washable" types. These units have been designed to be subjected to wave soldering and flux cleaning operations.

MINIATURE ROTARY SWITCHES

Model No.	Poles	Rating Resistive Load AC 125V	Rating Resistive Load AC 250V
HS-13X	1 Pole/2 Positions	6A	3A
HS-13Y	1 Pole/2~3 Positions	6A	3A
HS-13Z	1 Pole/2~4 Positions	6A	3A
HS-13W	1 Pole/2 Positions	6A	3A

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
TS-1	1 Pole/2~11 Positions	6A	6A
TS-2	2 Pole/2~11 Positions	6A	6A
TS-3	3 Pole/2~11 Positions	6A	6A
TS-4	4 Pole/2~11 Positions	6A	6A
TS-5	5 Pole/2~11 Positions	6A	6A

ROTARY SWITCHES

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
HS-16-1	1 Pole/2~11 Positions	12A	6A
*HS-16-1S	1 Pole/2~11 Positions	12A	6A
HS-16-2	2 Pole/2~11 Positions	12A	6A
*HS-16-2S	2 Pole/2~11 Positions	12A	6A
HS-16-3	3 Pole/2~11 Positions	12A	6A
*HS-16-3S	3 Pole/2~11 Positions	12A	6A
HS-16-4	4 Pole/2~11 Positions	12A	6A
*HS-16-4S	4 Pole/2~11 Positions	12A	6A
HS-16-5	5 Pole/2~11 Positions	12A	6A
*HS-16-5S	5 Pole/2~11 Positions	12A	6A
HS-16-6	6 Pole/2~11 Positions	12A	6A
*HS-16-6S	6 Pole/2~11 Positions	12A	6A

Model No.	Poles	Rating (Resistive) AC 125V	Rating (Resistive) AC 250V
PS-1	1 Pole/2~11 Positions	30A	30A
PS-2	2 Pole/2~11 Positions	30A	30A
PS-3	3 Pole/2~11 Positions	30A	30A
PS-4	4 Pole/2~11 Positions	30A	30A
PS-5	5 Pole/2~11 Positions	30A	30A

*marked items are BREAK BEFORE MAKE types.

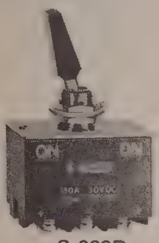
NKK SWITCHES OF AMERICA, INC. 14415 N. Scottsdale Road, Suite 600, Scottsdale, AZ 85260 TEL: (602)991-0942 TWX: 910-950-1167

TOGGLE, PUSHBUTTON AND ROCKER SWITCHES

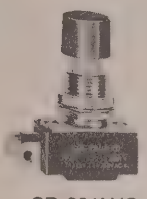
STANDARD SIZE SWITCHES

These product lines offer a variety of devices with current carrying capacity from 3Amps to 50 Amps. The families include pushbutton, toggle and rocker types.

TOGGLE SWITCHES

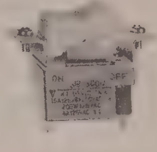

S-822D

PUSHBUTTON SWITCHES

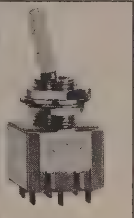

SB-221N/O

SDB-222

ROCKER SWITCHES


SW-3001A

SW-3822


P-2022L/D

UL/CSA/SEV/SEMKO/VDE APPROVED TOGGLE SWITCH

The "P" series, our 10Amps toggle, rocker or paddle family has U/L, CSA, SEV, SEMKO and VDE approvals. A variety of toggle configuration and bushing types are available along with colored rockers and paddles. Optional terminals configuration in solder lug, straight PC or 0.187 spade are offered.

Model No.	Poles	Positions			Rating			
					Resistive		Inductive	
		Up Keyway	Center	Down	AC 125V	AC 250V	AC 125V	AC 250V
P-2021☐	DPST	ON	—	OFF	10A	6A	6A	6A
P-2022☐	DPDT	ON	—	ON	10A	6A	6A	6A
P-2023☐	—	ON	OFF	ON	10A	6A	6A	6A

Wide variation of operator is available on request.
Straight PC terminal & 187 QC terminal are also available on request.

Model No.	Poles	〈 〉=Momentary			Rating		
					Resistive Load		
		Up Keyway	Center	Down	AC 125V	AC 250V	DC 30V
S-1A	SPST	ON	—	OFF	15A	6A	20A
S-1B	//	ON	—	OFF	10A	5A	10A
S-2A	SPDT	ON	—	ON	15A	6A	20A
S-2B	//	ON	—	ON	10A	5A	10A
S-3A	//	ON	OFF	ON	15A	6A	20A
S-21A	DPST	ON	—	OFF	15A	15A	15A
S-21B	//	ON	—	OFF	10A	5A	10A
S-6A	DPDT	ON	—	ON	20A	10A	20A
S-6B	//	ON	—	ON	10A	5A	10A
S-7A	//	ON	OFF	OK	20A	10A	20A
S-7B	//	ON	OFF	ON	5A	3A	5A
S-114	DPST	ON	—	OFF	5A		5A
S-116	DPDT	ON	—	ON	5A	3A	4A
S-211	SPST	ON	—	OFF	5A	1.5A	1.5A
S-31	3PST	ON	—	OFF	3A	9A	20A
S-32	3PDT	ON	—	ON	25A	9A	20A
S-33	//	ON	OFF	ON	25A	9A	20A
S-35	//	ON	—	〈ON〉	25A	6A	20A
S-38	//	〈ON〉	OFF	〈ON〉	15A	6A	15A
S-39	//	ON	OFF	〈ON〉	15A	6A	15A
S-41	4PST	ON	—	OFF	15A	9A	20A
S-42	4PDT	ON	—	ON	25A	9A	20A
S-43	//	ON	OFF	ON	25A	9A	20A
S-45	//	ON	—	〈ON〉	25A	6A	20A
S-48	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-49	//	ON	OFF	〈ON〉	15A	6A	20A
S-301	SPST	ON	—	OFF	15A	6A	20A
S-301T	//	ON	—	OFF	15A	6A	20A
S-302/302T	SPDT	ON	—	ON	15A	6A	20A
S-303/303T	//	ON	OFF	ON	15A	6A	20A
S-305/305T	//	ON	—	〈ON〉	15A	6A	20A
S-308/308T	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-309/309T	//	ON	OFF	〈ON〉	15A	6A	20A
S-331	DPST	ON	—	OFF	25A	25A	25A
S-332	DPDT	ON	—	ON	25A	15A	25A
S-333	//	ON	OFF	ON	25A	15A	25A
S-335	//	ON	—	〈ON〉	15A	6A	20A
S-338	//	〈ON〉	OFF	〈ON〉	15A	6A	20A
S-339	//	ON	OFF	〈ON〉	15A	6A	20A
S-532	//	ON	—	ON	30A	15A	30A
S-533	//	ON	OFF	ON	30A	15A	40A
S-732	DPDT	ON	—	ON	50A	30A	50A
S-532-D	//	ON	—	ON	30A	15A	30A
S-533-D	//	ON	OFF	ON	30A	15A	30A
S-821	DPST	ON	—	OFF	30A	30A	—
S-822	DPDT	ON	—	OFF	30A	30A	—
S-823	//	ON	OFF	ON	30A	30A	—
S-821D	DPST	ON	—	OFF	39A	30A	30A
S-822D	DPDT	ON	—	ON	30A	30A	30A
S-823D	//	ON	OFF	ON	30A	30A	30A
S-831	3PST	ON	—	OFF	30A	30A	—
S-832	3PDT	ON	—	ON	30A	30A	—
S-833	//	ON	OFF	ON	30A	30A	—
S-831D	3PST	ON	—	OFF	30A	30A	30A
S-832D	3PDT	ON	—	ON	30A	30A	30A
S-833D	//	ON	OFF	ON	30A	30A	30A

Model No.	Poles	〈 〉=Momentary		Rating	
				Resistive Load	
				AC125V	AC250V
SB-61A	DPDT	ON	〈ON〉	10A	5A
SB-61B	// //	ON	〈ON〉	3A	1.5A
SB-63A	//	ON	〈ON〉	10A	5A
SB-221N/O	SPST	OFF	〈ON〉	3A	1.5A
SB-221N/O	//	ON	〈OFF〉	3A	1.5A
SB-265	//	ON	OFF	6A	3A
SB-285	DPDT	ON	ON	6A	3A
SB-25	//	ON	ON	15A	9A
MS-V -B	SPDT	ON	ON	15A	15A
SDB-222S/F/M	DPDT	ON	ON	15A	10A
SB-4011N/O	SPST	OFF	〈ON〉	3A	–
SB-4011N/O	//	ON	〈OFF〉	3A	–
SB-4015	//	ON	OFF	3A	

ModelrNo.	Poles	〈 〉=Momentary			Rating			
					Resistive Load			Inductive Load
		Up	Center	Down	AC 125V	AC 250V	DC 30V	AC125V (P.F, 0.5)
SW-3012	SPST	ON	—	OFF	6A	1.5A	4A	–
SW-3211	// //	ON	—	OFF	3A	1.5A	1.5A	1.5A
SW-3001A	//	ON	—	OFF	15A	5A	15A	10A
SW-3001B	//	ON	—	OFF	10A	6A	–	—
SW-3002A	SPDT	ON	—	ON	15A	5A	15A	10A
SW-3002B	//	ON	—	ON	10A	6A	—	
SW-3003A	//	ON	OFF	ON	15A	6A	15A	10A
SW-3003B	//	ON	OFF	ON	10A	5A	—	
SW-3006A	DPDT	ON	—	ON	20A	10A	20A	10A
SW-3008B	//	ON	—	ON	10A	5A	10A	5A
SW-3007A	//	ON	OFF	ON	15A	6A	15A	10A
SW-3007B	//	ON	OFF	ON	5A	3A	5A	5A
SW-3008A	//	ON	OFF	〈ON〉	15A	6A	15A	10A
SW-3008B	//	ON	OFF	〈ON〉	5A	3A	5A	5A
SW-3116	//	ON	—	ON	5A	2A	5A	3A
SW-3532	//	ON	—	ON	30A	15A	30A	15A
SW-3533	//	ON	OFF	ON	30A	15A	30A	15A
SW-3821	DPST	ON	—	OFF	30A	30A	—	—
SW-3822	DPDT	ON	—	ON	30A	30A	—	
SW-3823	//	ON	OFF	ON	30A	30A	-	
SW-3831	3PST	ON	—	OFF	30A	30A	—	—
SW-3832	3PDT	ON	—	ON	30A	30A		
SW-3833	//	ON	OFF	ON	30A	30A	—	-

OAK SWITCHES

OAK ANTI-STATIC KEYLOCK SECURITY SWITCH

¾″ diameter security switches provide up to 20 kV static protection for sensitive electronic circuitry. Supplied with stainless steel bezel and two brass keys. Keyed alike for each part number. Key pull in all positions. Single pole only.

SPECIFICATIONS

Operating Life: Tested to 10,000 cycles.
Switching: Enclosed; SPST, SPDT, SP3T
Throw: 90°.
Operating Torque: 7 to 16 in. oz.
Temperature Range: 0° to +85°C
Positive Detenting Stops: Integral with lock.
Housing: Zytel 101, Gray.
Switch Terminals: Copper alloy, silver plated.
Contact Material: Copper alloy, silver-plated.
Barrel: Zinc alloy, chromate dipped.
Bezel: Stainless steel.
Keys: Brass (2)
Hex Mtg. Nut: Cadmium plated steel.
Elec. Ratings: 1.0 A @ 28 Vdc
4.0 A @ 120 Vac
2.0 A @ 240 Vac
Contact Resistance: 10 milliohms (nominal).

All switches make before break. UL and CSA listed. Specifications through rated life after break in.

OAK TYPE AM (ACORN) ROTARY SWITCH

1″ diameter with patented Unidex® detent action. Double-wiping and self-cleaning contacts.

SPECIFICATIONS

Size: 1″ dia. (nom.), 1 to 3 sections.
Mounting: ⅜″ dia. with locating key.
Shaft: 0.250″ dia. x 1½″ grooved (breakoff).
Indexing: Dual ball 30°.
Stop Strength: Fixed — 15 in. lbs.
Adjustable — 10 in. lbs.
Terminal Strength: 2½ lb. pull.
Stator: Diallyl phthalate (MIL-M-14).
Rotor: Thermoplastic.
Contacts: Brass, silver plated and protected.
Contact Resistance: 0.003 to 0.015 Ohms between adjacent clips.
Elec. Rating: Break 0.5 A @ 28 Vdc, 0.25 A @ 110 Vac (resistive). Carry 5.0 A.
Life: 10,000 cycles at rated load (min.).
Temperature: −65° to +85°C.
Hardware: Nut, lockwasher, stopwasher.
Finish: Withstands 50 hr. MIL-S-3786 salt spray.

OAK ½″ ROTARY SWITCH

A superior subminiature switch with negligible contact noise and circuit resistance.

SPECIFICATIONS

Size: ½″ (nominal).
Mounting: "D" hole, ¼″ bushing.
Shaft: ⅛″ dia. x ¾″.
Indexing: 30°, up to 11 detents.
Stop Strength: 5 in. lbs.
Terminal Strength: 1 lb. pull.
Stator & Spacers: Diallyl phthalate.
Rotor: Thermoplastic.
Contacts: Silver alloy, gold plated.
Contact Resistance: 10-20 milliohms.
Insulation Resistance: 10 megohms (min.).
Elec. Rating: 0.25 A @ 110 Vac resistive.
0.50 A @ 30 Vdc resistive.
Life: 10,000 cycles at rated load (min.) room
Temperature: −65° to +85°C
Hardware: Nut, lockwasher, stopwasher.
Finish: Withstands 50 hr. MIL-S-3786 salt spray.

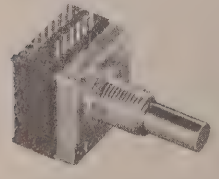
OAK TYPE 500 ½″ ROTARY SWITCH

Superior longlife subminiature switches are designed to meet MIL-S-3786/20. Sealed.

SPECIFICATIONS

Size: ½″ (nom), single pole.
Positions: 4, 6, 8, 10 & 12.
Detent: 90°, 60°, 45°, 36° & 30°.
Base: Diallyl phthalate, MIL-M-14.
Rotor: Phenolic, MIL-M-14.
Contacts: Copper alloy w/silver crown, gold plate.
Terminals: Copper alloy, silver crown, gold plate.
Contact Resistance: 20 milliohms (max) MIL.
50 milliohms (max) non-MIL
Stops: Fixed or adjustable.
Shaft & Panel Seal: Neoprene.
Voltage: 600 Vac breakdown (min).
Current Rating: 6.0 A @ 30 Vdc & 110 Vac. Resistive.
Mechanical: Stainless steel & nickel plated steel detent balls.

Write for Bulletin F-1096 for complete details and specifications.



OAK TYPE 850 PROGRAMMABLE ROTARY SWITCH

0.850″ square, sealed programmable switch with up to 28 positions, 4 sections and/or 7 outputs plus common per section. Dual-concentric shafts available. Can be wave soldered.

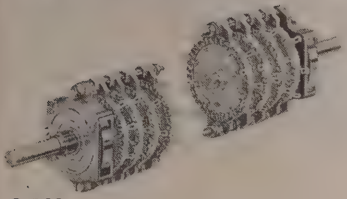
SPECIFICATIONS

Rating: 250 mA @ 28 Vdc resistive.
Contact Resistance: 100 milliohms (max).
Voltage Breakdown: 500 V (min) between common and open contact. 1000 V (min) between any contact and housing.
Contacts: Make before break. Break before make.
Detent Angles: 36°, 30°, 22.5°, 18°, 15°, 12.86°.
Operating Temperature: −55° to +85°C.
Stops: Available to limit rotation.
Coding: Hexidecimal, BCD, Grey and others.
Shafts: Steel, zinc plated, chromate treated.

Write for Bulletin F-1093.

OAK SWITCH SYSTEMS INC. P.O. Box 517, Crystal Lake, IL 60014
(815) 459-5000 • TWX 910-634-3353 • TLX 72-2447

OAK SWITCHES



OAK MULTIDEX ROTARY SWITCH

Oak Multidex Switches replace older models with a completely new design. Multidex switches are smaller than older models yet provide more contacts (up to 32 and 36 positions). The patented Unidex detent system has one or two balls riding on the starwheel for smooth and positive action. The detent housing is a one-piece molding. They meet or exceed the requirements of MIL-S-3786, SR32 (latest issue).

Multidex rotors and stators are molded of diallyl phthalate and meet MIL-M-14 requirements. Contacts are silver plated brass (standard) or silver alloys (other available).

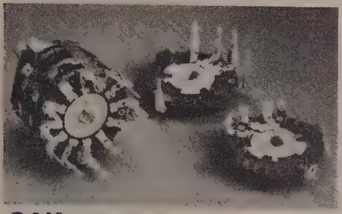
The contacts are self-cleaning, double-wiping types and are coated to resist corrosion.

Terminals are Type "A" clips for easy wire insertion and soldering.

Rated at 0.5 A @ 28 Vdc and 0.25 @ 110 Vac with silver plated contacts. Silver contacts are rated 1.0 @ 28 Vdc and 0.5 A @ 110 Vac. All ratings are for resistive loads.

Temperature ratings are:
MIL: −65° to +85°C.
Commercial: −25° to +85°C.

Both types are made of materials which meet or exceed the requirements of MIL-S-3786 50 hour salt spray test.



OAK TYPE FJ 1.421″ DIAMETER ROTARY SWITCH

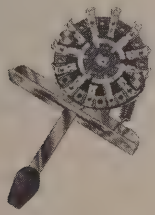
This series of Oak switches is a product expansion of the standard "F" series. They are designed to meet the requirements of MIL-S-3786/SR03.

The FJ series offers terminal clips which are offset on the rear 15° from those on the front. Each section can accommodate up to 22 clips in 30°, 60° or 90° throw. The FJ series utilizes Oak's durable high pressure double wiping contacts which are self-cleaning and corrosion resistant. Terminals are available for both hard soldering and printed circuit board mounting.

Rotation may be either continuous, with a fixed stop or with an adjustable stop.

FJ switches are rated 1.0 A @ 28 Vdc and 5.0 A @ 110 Vac with silver plated brass contacts. Ratings for silver alloy contacts are: 2 A @ 28 Vdc and 1.0 A @ 110 Vac. Contacts can be make before break or break before make or any combination of these.

All FJ switches are made of the highest quality material to meet or exceed all military and commercial requirements.



OAK TYPE 184 LEVER SWITCHES

Oak Type 184 lever switches are designed for reliable operation over thousands of cycles. The proven Type 184 offers a number of options. They are available as either 2, 3, or 4 position styles and with up to 12 terminals per side so that 12 pole 2 position circuits can be used or up to 8 poles with the 3 position style.

Mounting requires a slot and 2 holes to accept the two #4-40 mounting screws. The face of the switch is tapped. The switches require only $1\frac{7}{64}$″ of space behind the panel.

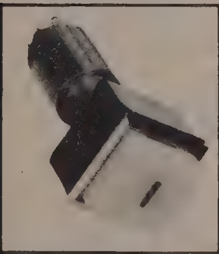
Contacts are silver plated brass and are rated at 0.5 A @ 28 Vdc and 0.25 A @ 110 Vac, resistive. The contacts will carry 5 Amps continuously.

The life of this series is rated at 10,000 cycles under standard conditions as a minimum.

The switches are supplied with a standard knob. Other designs are possible.

Write for complete details or contact your nearest Oak distributor or sales office. These are listed in EEM's "Yellow Pages" in this Volume.

OAK OPTOLITE™ PUSHBUTTON SWITCHES



FRICTION CAP PRESSLITES

Momentary & Alternate Action

LOW PROFILE PRESSLITES

Momentary & Alternate Action

SNAP-IN PRESSLITES

Momentary Action Only

WATERTIGHT & EMI SUPPRESSED PRESSLITES

Momentary & Alternate Action

SPLIT LEGEND

Momentary & Alternate Action

MACROFLEX

Momentary & Alternate Action

OAK SWITCH SYSTEMS INC.
P.O. Box 517, Crystal Lake, IL 60014
(815) 459-5000 • TWX 910-634-3353 • TLX 72-2447

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC	alternating current
A/D	analog to digital
ADC	analog to digital converter
ADP	automatic data processing
AF	audio frequency
AFC	automatic frequency control
ALGOL	algorithmic language
AM	amplitude modulation
AND	a logical operator
AQL	acceptable quality level
ASCII	American national standard code for information interchange
AWG	American wire guage

B

BALUN	balanced to unbalanced
BASIC	beginners' all-purpose symbolic instruction code
BCD	binary-coded decimal
BNC	baby "N" connector
BUS	basic utility system

C

CAD	computer aided design
CAM	computer aided manufacture
CATV	cable television or community antenna television
CERMET	ceramic metal element
Comm.	communications
CMOS	complementary metal-oxide semiconductor
CPS	characters per second
CPU	central processing unit

D

D/A	digital to analog
DAC	digital to analog converter
DC	direct current
DIL	dual in-line
DIP	dual in-line package
DPM	digital panel meter
DTL	diode transistor logic

E

EDP	electronic data processing
EBCDIC	extended binary coded decimal interchange code
EEPROM	electrically erasable PROM
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPROM	electrically programmable ROM
ESR	equivalent series resistance

F

FEP	fluorinated ethylene propylene Copolymar, 200° Teflon
FET	field-effect transistor
FM	frequency modulation
FORTRAN	formula translator

G

GaAsFET	gallium arsenide field effect transistor
GPIB	general purpose interface bus

H

HF	high frequency (3 to 30 MHz)
HIPOT	test, measurement and diagnostic equipment
HLL	high level language
HV	high voltage
Hz	Hertz

I

IC	integrated circuit
IF	intermediate frequency
IO	input/output (devices)
IR	insulation resistance (or) infrared

J

JFET	junction field effect transistor
JMOS	junction metal oxide semiconductor

K

kHz	kilohertz (10^3 hertz)
KSR	keyboard send receive

L

LC	inductance capacitance
LCD	liquid crystal display
LED	light-emitting diode
LF	low frequency (30 to 300 kHz)
LSI	large scale integration
LVDT	linear velocity displacement transformer

M

MATV	master antenna television
μF	microforad
MHz	megahertz
MOS	metal oxide semiconductor
MOSFET	metal oxide semiconductor field effect transistor
MOV	metal oxide varistor
MPU	microprocessor unit
MSI	medium scale integration

N

NBS	National Bureau of Standards
NIM	nuclear instrumentation module
NOR	not OR

O

OEM	original equipment manufacturer
OR	a logical operator

P

pF	picofarad
PC	printed circuit
PCB	printed circuit board
PIN	positive-intrinsic-negative (transistor)
PLA	programmable logic array
PPI	plan position indicator
PROM	programmable read only memory
PUT	programmable unijunction transistor

Q

QAM	quadrature amplitude modulation
Q (meter)	quality-factor meter

R

RAM	random access memory
RC	resistance-capacitance
RFI	radio frequency interference
RMS	root mean square
ROM	read only memory
RF	radio frequency
RFC	radio-frequency choke
RFI	radio-frequency interference
RTD	resistance-temperature detector
RTL	resistor transistor logic
RTV	room temperature vulcanizing
RW	read/write

S

SAS	silicon asymmetrical switch
SBC	single board (micro) computer
SBS	silicon bilateral switch
SCR	silicon-controlled rectifier
SIP	single in-line package
SSI	small scale integration
SSR	solid state relay
STL	Schottky transistor logic

T

TC	temperature coefficient
TCXO	temperature compensated crystal oscillator
TFE	tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL	transistor-transistor logic
TTY	teletypewriter

U

UHF	ultra high frequency (300 MHz to 3 GHz)
UL	Underwriters Laboratory
UPS	uninterruptible power supply

V

VAC	volts (of) alternating current
VAR	volt-ampere reactive
VCR	video cassette recorder
VDC	volts (of) direct current
VHF	very high frequency
VHSIC	very high speed integrated circuit
VLF	very low frequency (3 to 30 kHz)
VLSI	very large scale integration
VRM	voice recognition module
VTVM	vacuum tube volt meter
VU	volume unit
VSWR	voltage standing wave ratio

W

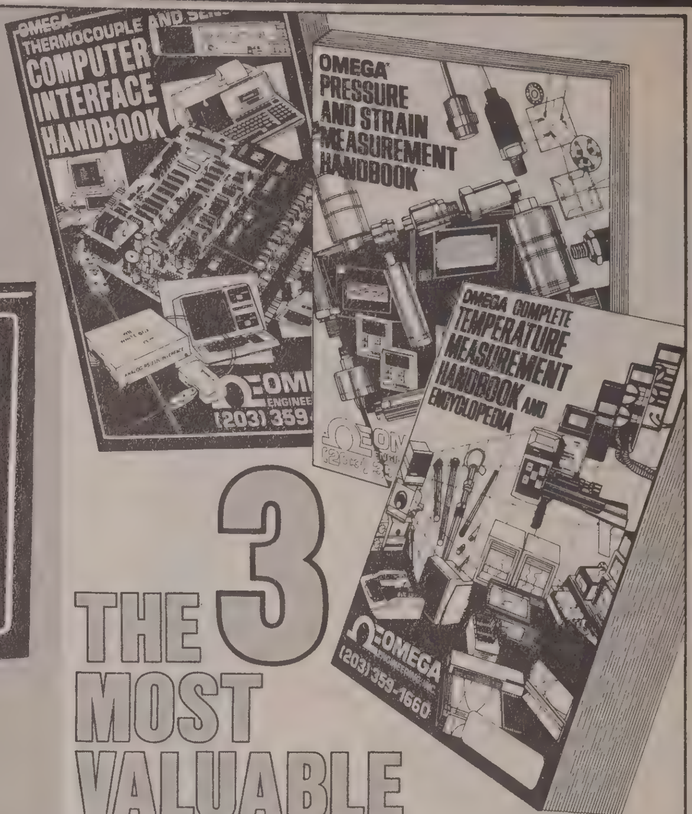
WPS	word processing software

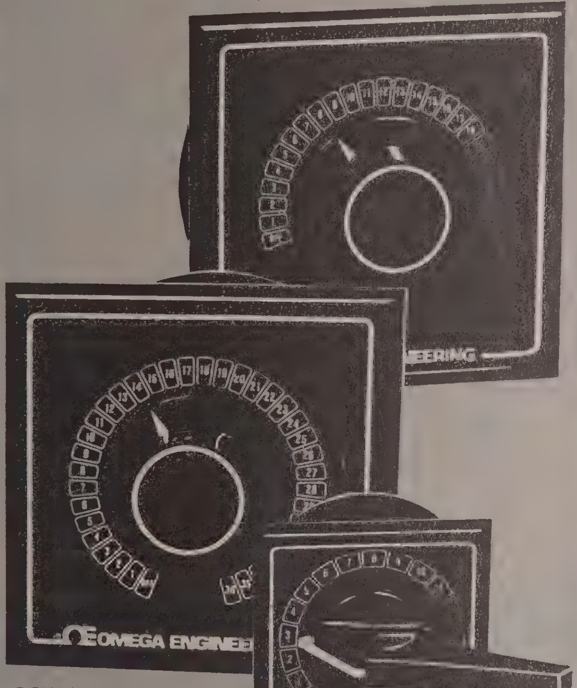
Y

YIG	yttrium iron garnet

SWITCHES

For Temperature, Pressure and Strain


OMEGA THERMOCOUPLE AND SENSOR COMPUTER INTERFACE HANDBOOK
OMEGA ENGINEERING
(203) 359
OMEGA PRESSURE AND STRAIN MEASUREMENT HANDBOOK
OMEGA COMPLETE TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA
OMEGA
(203) 359-1660


OMEGA ENGINEERING

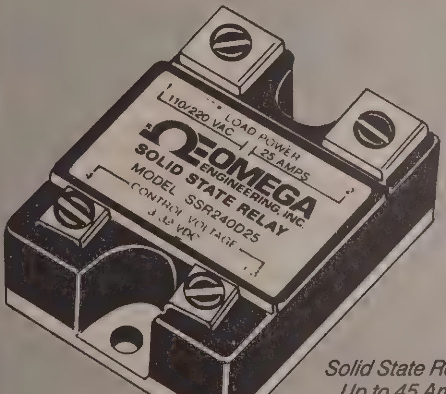
OSW Two and Three Pole Switches for RTD, Thermistor and Thermocouple Connections

THE 3 MOST VALUABLE HANDBOOKS IN MEASUREMENT AND CONTROL!

***ALL NEW! FULL COLOR! ABSOLUTELY, POSITIVELY* FREE!**

Prices Are Listed!!

- ☑ **TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA™**
  Over 670 pages! Over 15,000 products!
- ☑ **PRESSURE AND STRAIN MEASUREMENT HANDBOOK™**
  Over 175 pages of new pressure and strain products.
- ☑ **THERMOCOUPLE AND SENSOR COMPUTER INTERFACE HANDBOOK™**
  Over 200 products for interfacing sensors with PC and mainframe computers.


LOAD POWER
110/220 VAC
25 AMPS
OMEGA ENGINEERING, INC.
SOLID STATE RELAY
MODEL SSR240D25
CONTROL VOLTAGE
3-32 VDC

Solid State Relays Up to 45 Amps

OMEGA® Features Multiposition, 2 and 3 Pole Switches for Thermocouples, RTD's and Thermistor Circuits designed for rugged Industrial Environments.

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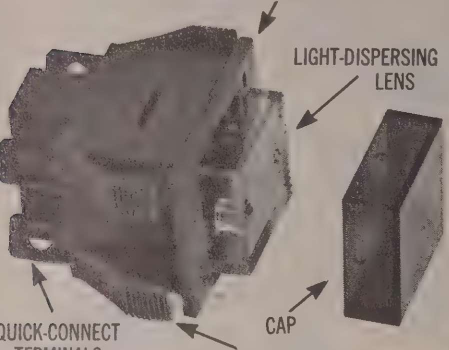
OSLO • PUSHBUTTON SWITCHES



ELECTRICAL FEATURES

Load rating: 10 amperes 125/250 volts ac.
Contacts: fine silver, double-break, break-before-make
Circuits: single-pole and double-pole
Dielectric strength: 2000 volts ac rms.
Life: 25,000 operations at maximum rating

MECHANICAL FEATURES

One-piece molded-nylon body has integral, serrated, spring-lock clips.
Bezel molded integral with body.
Metal bezel available.
Molded-in light-dispersing lens.
Interchangeable lens-caps in wide choice of colors.
Positive mechanical indication of switch-contact position.
100,000 mechanical operations.

TERMINALS

Style A—1/4-inch quick-connect
Style B—3/16-inch quick-connect
Style C—Solder-lug, for #12 wire

STANDARD LAMPS

Integral with switch;
Internally connected per diagrams above.
6, 12, and 28 volt incandescent lamps standard.
125 and 250 volt neon lamps standard.

SPECIAL ORDER LAMPS

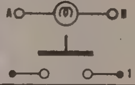
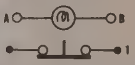
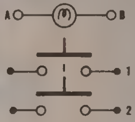
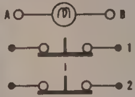
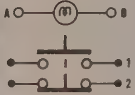
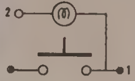
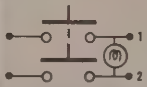
125 and 250 volt Blue or Green neon lamps available. Consult factory for price and delivery information.

COLOR DESIGNATIONS

Body and integral bezel
White—C7, Grey—C8, Black—C9,

Transparent lens-cap
Red—1, Clear—2, Amber—3, Green—4, Blue—5

Opaque pushbutton-cap
White—7, Grey—8, Black—9, Blue—10, Green—11, Red—12

			TYPE DL LIGHTED		TYPE DP NON-LIGHTED	
Circuit Number	Circuit Diagram	Switching	CATALOG NUMBER		CATALOG NUMBER	
			Momentary Action	Alternating Action	Momentary Action	Alternating Action
1		single-pole single-throw normally open	DLM1	DLA1	DPM1	DPA1
2		single-pole single-throw normally closed	DLM2	DLA2	DPM2	DPA2
3		double-pole single-throw normally open	DLM3	DLA3	DPM3	DPA3
4		double-pole single-throw normally closed	DLM4	DLA4	DPM4	DPA4
5		double-pole cir. #1 normally open cir. #2 normally closed	DLM5	DLA5	DPM5	DPA5
6		single-pole single-throw normally open	DLM6	DLA6	Above types do not include lamp-circuit.	
7		double-pole single-throw normally open	DLM7	DLA7		

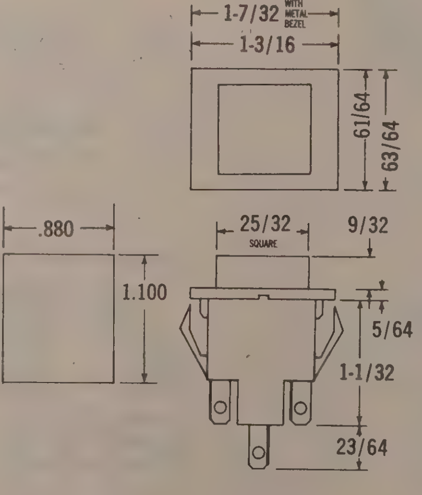
TYPE DG – Lighted Indicators

Type DG Lighted Indicators are identical in size and mounting with Type DL and DP switches and can be grouped easily with them without need for special mounting provision. A choice of different lens-cap heights is available.

TYPE DGS the low-profile indicator extends the same distance from the panel as the Type DL or DP switch in its ON position (1/16 inch).

TYPE DGT the high-profile indicator extends the same distance from the panel as the Type DL or DP switch in its OFF position (9/32 inch).

OUTLINE DIMENSIONS (inches)



METAL BEZELS (optional)

Gold-color—F1, Chrome—F2

MARKINGS

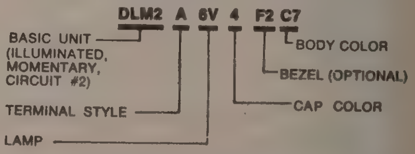
Letters, numbers, and symbols can be applied to lens-caps.

MOUNTING

Snap-in mounting in rectangular hole; fits any panel-thickness 1/32 to 3/16 inch.

ORDERING EXAMPLE

Develop catalog-number of unit by adding to the basic Type Number, shown above, the applicable code-letters or numbers in the sequence shown below.



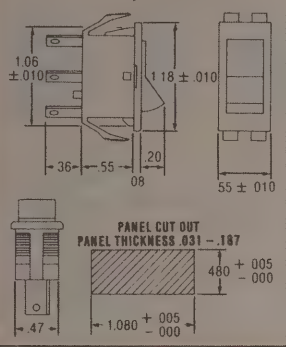
OSLO CONTROLS INC.

328 Industrial Avenue, Cheshire, Connecticut 06410
Tel.: (203) 272-2794 TWX 710 455 3774

OSLO • ROCKER SWITCHES

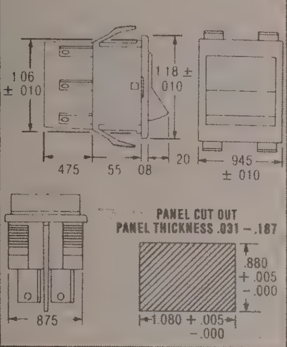
TYPE RSP

ALL DIMENSIONS IN INCHES



TYPE RTP

ALL DIMENSIONS IN INCHES



Electrical Features

Load Rating: 15 amperes 125/250 volts AC
Contacts: Fine silver for long life dependability
Dielectric strength: 1250 volts (live parts to ground)
Electrical Life: 25,000 operations at maximum rating.
Insulation Resistance: 5 megohms

Terminals

Style A – ¼ inch quick-connect

Lamps

6, 12, 28 volt incandescent, 125, 250 volt Neon

Mechanical Features

One-piece molded-nylon housing, available in choice of colors.
Integral spring-lock clip design speeds assembly.
Optional metal bezels available.
Rocker actuator available in choice of colors.
100,000 mechanical operations.

Markings

Letters, numbers, and symbols can be applied to rocker actuator or to integral nylon bezel.

Mounting

Snap-in mounting in rectangular hole; fits any panel thickness from .031 to .125 inch.

ORDERING PROCEDURE

To the basic catalog number listed, suffix letters and numbers are added in the sequence indicated below:

Example: RSL1A6V1C9F2 This specifies a SPST, lighted, maintained Off-On switch with ¼″ quick-connect terminals, transparent red actuator, black housing and optional chrome bezel.

LAMP VOLTAGE

6V=6 Volt Incandescent
12V=12 Volt Incandescent
28V=28 Volt Incandescent
125V=125 Volt Neon
250V=250 Volt Neon

LENS COLORS

1 = Red
2 = Clear
3 = Amber
*4 = Green
*5 = Blue
6 = White

*Blue or green actuators are not recommended for units with neon lamps

HOUSING COLORS

C7 = White
C8 = Grey (Non-Stock)
C9 = Black

METAL BEZEL (OPTIONAL)

F1=Gold Colored
F2=Chrome

RSL1A 6V 1 C9 F2

BASIC UNIT LIGHTED MAINTAINED ON-OFF SWITCH ¼″ QUICK TERM
LAMP
LENS COLOR
HOUSING COLOR
BEZEL (OPTIONAL)

NON-LIGHTED SWITCHES

CIRCUIT				BASIC CAT. NO.	
				Single Pole Body	Double Pole Body
SPST Maintained	2 1 OFF		2 1 ON	RSP1A	RTP1A
SPDT Maintained	2 1 3 ON		2 1 3 ON	RSP2A	RTP2A
SPDT Maintained Center Off	2 1 3 ON	2 1 3 OFF	2 1 3 ON	RSP3A	RTP3A
SPST (Momentary) Normally Open	2 1 OFF		2 1 (ON)	RSP4A	RTP4A
SPST (Momentary) Normally Closed	2 1 ON		2 1 (OFF)	RSP5A	RTP5A
SPDT (Momentary) Transfer	2 1 2 ON		2 1 3 (ON)	RSP6A	RTP6A
SPDT Maintained Center Off (Momentary)	2 1 3 ON	2 1 3 OFF	2 1 3 (ON)	RSP7A	RTP7A
SPDT (Momentary) Center Off (Momentary)	2 1 3 (ON)	2 1 3 OFF	2 1 3 (ON)	RSP8A	RTP8A

LIGHTED ROCKER SWITCHES

CIRCUIT			BASIC CAT. NO.	
			Single Pole Body	Double Pole Body
SPST Maintained	2 1 3 OFF	2 1 3 ON	RSL1A	RTL1A
SPDT (Momentary) Normally Open	2 1 3 OFF	2 1 3 (ON)	RSL4A	RTL4A

LIGHTED INDICATORS

BASIC CATALOG NO.
RSOA

Basic catalog number includes ¼ inch quick-connect terminals.
CODE: SPST = Single-Pole, Single Throw
SPDT = Single-Pole, Double Throw
( ) = Momentary Action

OSLO CONTROLS INC.

328 Industrial Avenue, Cheshire, Connecticut 06410
Tel.: (203) 272-2794 TWX 710 455 3774

OTTO CONTROLS

OTTO® SNAP-ACTION SWITCHES . . .

because the OTTO design features inherent rocking-action

BASIC SWITCHES sub-miniature
DOUBLE-BREAK B3 SERIES

MIL-S-8805/76
MIL-S-8805/101

CHARACTERISTICS
- Contact Resistance: .025Ω max.
- 10 million mechanical cycles.
- Operating Force: 5 $^{+3}_{-2}$ oz.
- Release Force: 1.5 oz. min.
- Overtravel: .006″ min.
- Move. Diff.: .018 ±.008″
- Rating: 7A Res., 115 VAC, 28 VDC.

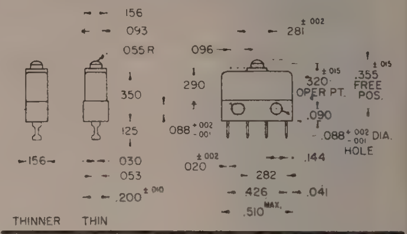
MIL-S-8805/76 THIN **B3-22141**

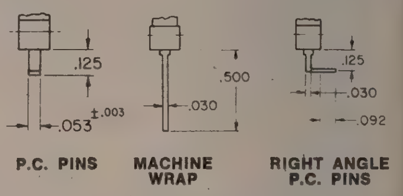
For your run-of-the-"MIL" projects, OTTO's B3-22141 Series is only .200″ thick. Contact resistance less than 25 milliohms, contact pressure higher than normal, minimal contact bounce. Gold flashed contacts, solder terminals in diallyl case. Rated 7A Res.

MIL-S-8805/101 THINNER **B3-12141**

OTTO inspired military spec. is only .156″ thin, yet all the rating, life, and reliability of the /76 version. Five B3-12141 Series in the space of four B3-22141. Choice of double-break from X, Y, Z and single break form C. B3-12141 turret terminals, B3-11141 p.c. pins. Also commercial versions.

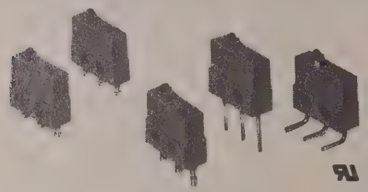
BASIC SWITCH, TURRET TERMINALS


.156
.093
.055R
.350
.125
.030
.053
.200 ±.010
.156
.096
.290
.088 +.002 -.001
.020 ±.002
.281 ±.002
.320 ±.015 OPER PT.
.355 ±.015 FREE POS.
.090
.088 +.002 -.001 DIA. HOLE
.144
.282
.426
.041
.510 MAX.
THINNER
THIN


.125
.053 ±.003
.500
.030
.125
.030
.092
P.C. PINS
MACHINE WRAP
RIGHT ANGLE P.C. PINS

All terminals are .020″ thick.

SINGLE-BREAK B2 SERIES



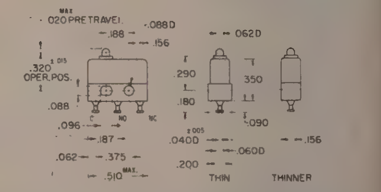
CHARACTERISTICS
- Contact Resistance: .025Ω max.
- 1 million mechanical cycles.
- Operating Force: 5 oz. max.
- Release Force: 1 oz. min.
- Overtravel: .004″ min.
- Move. Diff.: .005″ max.
- Rating: 7A res. @ 115 VAC, 28 VDC.

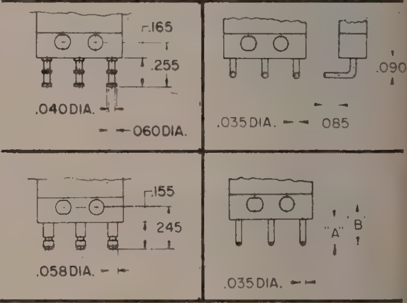
Now available in a choice of .200 and .156 inch wide models. While the OTTO B2 is qualified to MIL-S-8805/4, the same switch can be specified for commercial use at a cost savings. Whether it be military or commercial, low-level "dry circuit" or high ampacity, large or close differentials, you can specify the exact switch to meet your needs. Case is diallyl. Terminals are gold-flashed brass. Contacts are silver or gold.

APPROVALS TO MIL-S-8805/4

MS P/N	OTTO P/N
MS24547-1	B2-211351
MS24547-2	B2-211353
MS24547-4	B2-212351
MS24547-5	B2-212353

DIM. "A"	DIM. "B"	CAT. P/N CODE
.090	.180	6
.150	.240	4
.270	.360	5

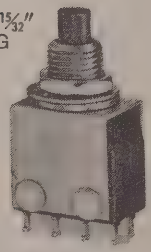

MAX. .020 PRETRAVEL
.188
.088D
.156
.062D
.320 ±.015 OPER.POS.
.088
.096
.187
.062
.375
.510 MAX.
.290
.180
.350
.090
.040D ±.005
.060D
.200
.156
THIN
THINNER


.165
.255
.040 DIA.
.060 DIA.
.090
.035 DIA.
.085
.155
.245
.058 DIA.
"A"
B
.035 DIA.

ACTUATORS FOR BASICS

PUSHBUTTONS

¼″ OR 15/32″ BUSHING



¼″ or 15/32″ bushings, red or black button, 1 to 4 poles. Feature B3 basics. Overtravel: .006″ min. Total travel: .036″ Typical.

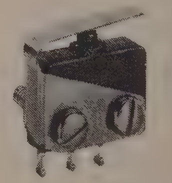
SEALED

Choice of 3 panel bezels styles, 1 or 2 poles. Feature B3 basics. Operating force: 4 lbs. max. Total travel: .050″ Typical.

TOGGLES

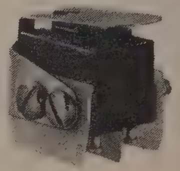
¼″ or 15/32″ bushings, 1 to 3 poles, B2 or B3 basics. Momentary and three position.

LEVERS



For B3 Basics

# Poles	Cat. No.
1	A3-101
2	A3-102



For B2 Basics

# Poles	Cat. No.
1	A2-101
2	A2-102

OTTO CONTROLS Division / OTTO Engineering Inc.

...MAKE AND BREAK EVERYTIME

...that breaks welds and wipes contacts clean

OTTO CONTROLS

PUSHBUTTONS miniature & moistureproof

P1-1

P1-2

P1-3

P1-5

P1-6

P1-7

P1-8

P3-3

P3-6

P3-7

P3-8

FEATURES

- 250,000 mechanical cycles.
- High Contact Pressure: 120 gr.
- Low Contact Resistance:
- Repeatable trip point within .001″.
- Rolling sleeve principle seals button.
- Sealed case and terminals.

TYPE P1 (MIL-S-8805/3)

Pushbutton is sealed by silicone rubber boot operating on a "rolling sleeve" principle to give long life and smooth operation. Case and terminals sealed against environment and solder flux. Load ratings: 10A res., 5A ind., 3A lamp. Contact forms: N.O., N.C., 2-circuit. Red or black button.

TYPE P3 Commercial Grade

Momentary or push-pull double-break action. Same specs as P1 military series. Choice of solder or screw terminals. Designed for use in panel boards, computers, business machines, instruments. Can be used as limit switch.

NEW

FEATURES:

- Mini size and sealed.
- .025 ohms max. contact resistance.
- Positive tactile feed back.
- 4 mounting styles.
- 6 circuit variations.

P7-3

P7-5

P7-6

P7-1

Sealed Subminiature Pushbutton

TYPE P7

Double-break action with sealed pushbutton meets environmental and electrical requirements of MIL-S-8805. Switches loads from 10 mA @ 30 mV to 5 amps @ 28 VDC. Choice of black or silver bezel and nine button colors. The P7-1 series features swage bushing, P7-3's have front panel bezel, P7-5's have ¼″ bushing while P7-6's have 15/32″ bushing. Seal is either moisture-proof/dust-tite or water-proof. Back-of-panel less than .500″. Front panel .437″ to .562″ diameter.

twostep™ for applications requiring 3 modes of operation

FEATURES

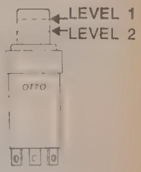
- Unique 2-position design.
- Sequential contact action.
- 12 contact arrangements.
- Make-before-break contact option.
- Moistureproof construction.
- 25,000 mechanical cycles.

P2-1

P2-3

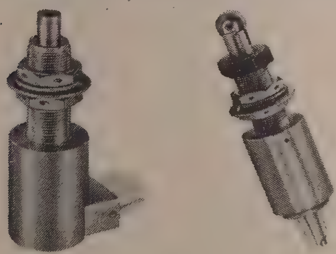
P2-6

Ideal for "off-high-low," "off-slow-fast," "Stop-fine-course" applications. Each level operates an independent set of SPDT circuits rated to 5A. Twelve contact arrangements are offered to satisfy just about any circuit requirement. Also available as DPDT single detent.



SPECIAL PURPOSE SWITCHES

ENVIRONMENT-FREE



One piece housing, sealed at plunger with ring seals and at base with hermetic header for immersion proof and against corrosive atmospheres. Case grounded for EMI reduction. P6 Series available with roller or in-line plunger.

CHARACTERISTICS

- Rating: 7A res. at 28 VDC.
- Actuating Force: 9 lbs. Typ.
- Reset Force: 5 lbs. min.

TOGGLE/ PUSHBUTTON

T2-0001

Combo toggle and pushbutton. It's a 2-position toggle and a pushbutton switch all in one. 30° toggle throw, .135″ total pushbutton travel with 4.5 lbs. operating force. Rated 10A res. and ind.

TOGGLE

T1-0001

Four position, 6-pole toggle featuring MIL-S-8805/4 basic switches. Positions #1 and #3 are 2PDT maintained action each, position #4 is 2PDT momentary, position #2 is center "off." Rated 7A. res. each pole.

T1-0004

Same except 3-position, 4-pole toggle. Position #1 is 2PDT momentary, position #2 is center "off," position #3 is 2PDT maintained action.

DEPT. EM, 2 EAST MAIN STREET / CARPENTERSVILLE, ILLINOIS 60110 / TEL: (312) 428-7171 / TELEX: 72-2426

Power Dynamics, Inc.

177 Valley Street, South Orange, New Jersey 07079 • (201) 762-6886 • TWX: 136567 (PDI)

Micro-Miniature Toggle Switches

FSC 60046 • PC • Ultra-Low Current • Low Cost

Developed especially for use with ultra-low currents. Gold-plated, plus extra heavy gold-plating on contact points. Unique contact design assures stronger and more stable contact resistance.

SPECIFICATIONS

Contacts and Terminals: Gold-plated

Rating: 5 VDC 100 mA
25 VDC 25 mA

Contact resistance: Less than 20m ohms (100 mV 1 mA)

Insulation resistance: More than 1000M ohms (500 VDC)

Current capacity: 0.1 micron A~0.1A

Dielectric strength: 100 VRMS at sea level

Life cycle: 50,000 contacts (standard type)

Mechanical life: 2 Pos.: 100,000 operations
3 Pos.: 50,000 operations

Electrical life: 2 Pos.: 50,000
3 Pos.: 25,000

Low Cost Commercial Versions: 2 Pos.: 40,000
3 Pos.: 20,000

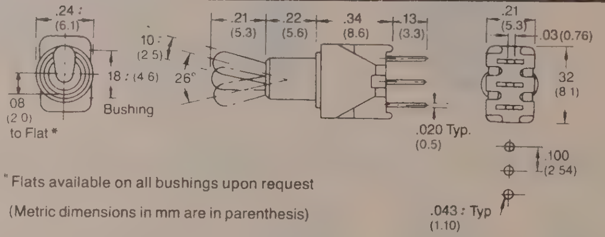
FEATURES

- ▲ Terminals utilize international printed circuit board standard spacing to match most PC boards.
- ▲ Pins and contacts are nickel, gold-plated. (3 microns of nickel-plating with a minimum of 1.3 microns of gold).
- ▲ Case is UL-standard approved 0-94V Valox. Resists the effects of chemicals, high impact shock and high temperatures.
- ▲ Cleaning is simple even after mounting because of the design of the standoffs.
- ▲ Single and double pole types have four standoffs to allow maximum mounting stability.
- ▲ Available:
  - Plain bushing, no threads
  - ¼ threaded bushings with hexagon nuts
  - Toothwasher (standard)
  - Locking washer
  - 10.4mm long lever
  - Low-Cost Commercial Version—0.5 Microns Aμ

CROSS REFERENCE ORDERING CHART

Power Dynamics Part #	Comparable Alcoswitch Part #
UTID-1	TT11DG-PC-1
UTID-2	TT11DG-RA-1
UTIE-1	TE11EG-PC-1
UTIE-2	TT11EG-RA-1
UT2N-1	TT21NG-PC-1
UT2N-2	TT21NG-RA-1
UT2P-1	TT21PG-PC-1
UT2P-2	TT21PG-RA-1

STANDARD (One Pole)


.24 ⌀
(6.1)
.10 ⌀
(2.5)
.18 ⌀ (4.6)
26°
Bushing
.08
(2.0)
to Flat *
.21
(5.3)
.22
(5.6)
.34
(8.6)
.13
(3.3)
.020 Typ.
(0.5)
.21
(5.3)
.03 (0.76)
.32
(8.1)
.100
(2.54)
.043 ⌀ Typ
(1.10)

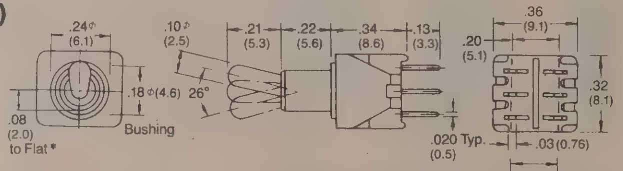
*Flats available on all bushings upon request

(Metric dimensions in mm are in parenthesis)

PDI MODEL	TYPE	↖	↑	↗
UT-1D-1	SPDT	On	None	On
UT-1E-1	SPDT	On	Off	On
UT-1F-1	SPDT	On	None	(On)
UT1G-1	SPDT	(On)	Off	(On)
UT1H-1	SPDT	On	Off	(On)

(On) Momentary

STANDARD (Two Poles)


.24 ⌀
(6.1)
.10 ⌀
(2.5)
.18 ⌀ (4.6)
26°
Bushing
.08
(2.0)
to Flat *
.21
(5.3)
.22
(5.6)
.34
(8.6)
.13
(3.3)
.020 Typ.
(0.5)
.36
(9.1)
.20
(5.1)
.32
(8.1)
.03 (0.76)
.100
(2.54)
.043 ⌀
(1.10)

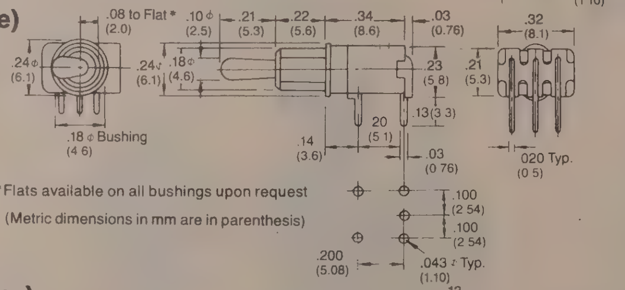
*Flats available on all bushings upon request

(Metric dimensions in mm are in parenthesis)

PDI MODEL	TYPE	↖	↑	↗
UT-2N-1	DPDT	On	None	On
UT-2P-1	DPDT	On	Off	On
UT-2R-1	DPDT	On	None	(On)
UT2S-1	DPDT	(On)	Off	(On)
UT2T-1	DPDT	On	Off	(On)

(On) Momentary

RIGHT ANGLE (One Pole)


.08 to Flat *
(2.0)
.10 ⌀
(2.5)
.21
(5.3)
.22
(5.6)
.34
(8.6)
.03
(0.76)
.24 ⌀
(6.1)
.24
(6.1)
.18 ⌀
(4.6)
.18 ⌀ Bushing
(4.6)
.23
(5.8)
.13 (3.3)
.20
(5.1)
.14
(3.6)
.03
(0.76)
.32
(8.1)
.21
(5.3)
.020 Typ.
(0.5)
.100
(2.54)
.100
(2.54)
.200
(5.08)
.043 ⌀ Typ.
(1.10)

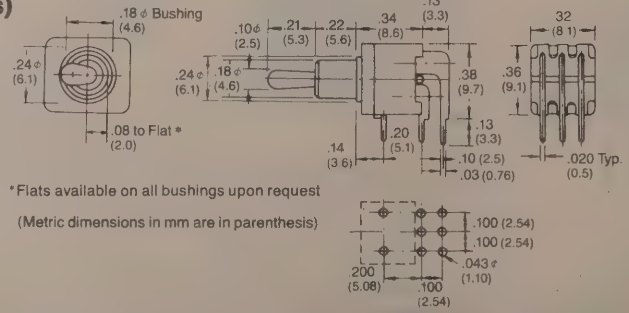
*Flats available on all bushings upon request

(Metric dimensions in mm are in parenthesis)

PDI MODEL	TYPE	↖	↑	↗
UT-1D-2	SPDT	On	None	On
UT-1E-2	SPDT	On	Off	On
UT-1F-2	SPDT	On	None	(On)
UT1G–2	SPDT	(On)	Off	(On)
UT1H-2	SPDT	On	Off	(On)

(On) Momentary

RIGHT ANGLE (Two Poles)


.18 ⌀ Bushing
(4.6)
.24 ⌀
(6.1)
.08 to Flat *
(2.0)
.10 ⌀
(2.5)
.21
(5.3)
.22
(5.6)
.34
(8.6)
.13
(3.3)
.24 ⌀
(6.1)
.18 ⌀
(4.6)
.38
(9.7)
.36
(9.1)
.32
(8.1)
.13
(3.3)
.14
(3.6)
.20
(5.1)
.10 (2.5)
.03 (0.76)
.020 Typ.
(0.5)
.100 (2.54)
.100 (2.54)
.043 ⌀
(1.10)
.200
(5.08)
.100
(2.54)

*Flats available on all bushings upon request

(Metric dimensions in mm are in parenthesis)

PDI MODEL	TYPE	↖	↑	↗
UT-2N-2	DPDT	On	None	On
UT-2P-2	DPDT	On	Off	On
UT-2R-2	DPDT	On	None	(On)
UT2S-2	DPDT	(On)	Off	(On)
UT2T-2	DPDT	On	Off	(On)

(On) Momentary

Ordering notes for all models:
- Add Suffix "E" to part number to indicate Silver Plating.
- Add Suffix "S" to part number to indicate Waterproof Sealing.
- Add Suffix "5" to part number to indicate Threaded Bushing.

PRES:AIR:TROL CORP

895 MAMARONECK AVE. MAMARONECK, N.Y. 10543
(914) 698-2026 **800-431-2625** Telex 646879
(Outside N.Y.)

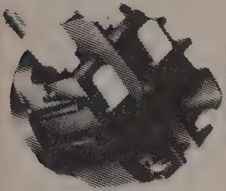
PRESSURE AND VACUUM SWITCHES

SAFE SWITCHING SYSTEMS

(Shock Proof • Water Proof • Explosion Proof)

Low Cost Pressure Switches

U.L. File Number E 80254



Low Pressure

SPDT	Range Inches Water	Electrical Rating
6731/03	1.5 — 7	3A @ 125 VAC
6731/06	5 — 45	10A @ 250 VAC
6731/10	20 — 55	15A

Approx. Overall Size
2¼" x 2⅛ O.D.

AIR INLET:
Pressure Connector 1/8" NPT brass thread or 1/8" O.D. spout

Microswitches accept Standard .250" slide on terminal.
Repeat accuracy ±2% at constant temperature
Field pressure adjustment is Phillips Head Screw.

Medium Pressure

SPDT	DPDT	P.S.I.	Electrical Rating
6741/20	6742/20	1.5 — 3.5	15A 125/250VAC
6741/30	6742/30	3.0 — 5.5	
6741/40	6742/40	5 — 10	
6741/50	6742/50	8 — 18	
6741/60	6742/60	16 — 30	
*6741/70	6742/70	25 — 50	
*6741/80	6742/80	45 — 70	
*6741/90	6742/90	55 — 80	

Approx. Overall Size
2¼" x 2" O.D.

Pressure Connector	1/8" NPT brass thread

*Consult Factory For Repeat Accuracy

See main catalog for differential pressure switch line.

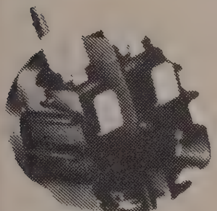
Air Operated Potentiometer

Part No.	Rating	Resistance Range In K ohms	Function	Tolerance
6832	0.75W	1,10,22,47,100,220,470	Linear	± 20%

Will operate over full range of resistance when used with our standard actuators.

Low Cost Vacuum Switches

U.L. File Number E 80254

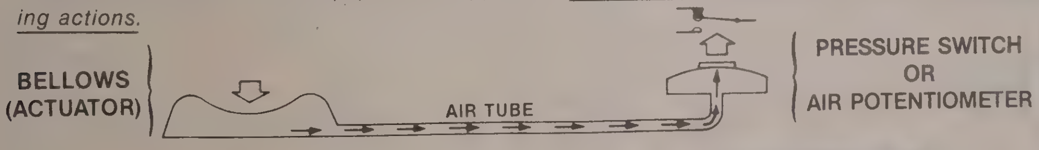


	6721/03	6721/06	6721/20	6721/30	6721/40
Inches of Water Vacuum (Adjustable)*	3" - 8"	7" - 15"	13" - 38"	28" - 80"	75" - 270"
Electrical Rating	SPDT 3A 125/250 VAC	SPDT 10A 125/250 VAC	SPDT 15A 125/250 VAC	SPDT 15A 125/250 VAC	SPDT 15A 125/250 VAC

All switches are available in SPDT and DPDT configurations with 1/8 O.D. spout or 1/8" NPT brass entry.

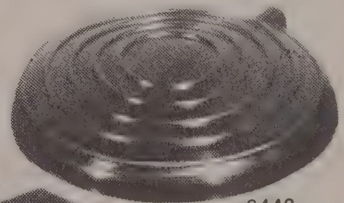
WATER, SHOCK AND EXPLOSION PROOF SWITCH SYSTEMS

Instead of a switch connected by cable to the equipment or appliance, an air bellows is joined by tubing to a pressure switch contained within the equipment or appliance. *Switches are available in momentary, alternate action, or sequencing actions.*



6470

The air bellows actuators in any of the various forms, are not affected by water, dirt, dust or flammable gases. Only a few of the many actuator available are shown here.



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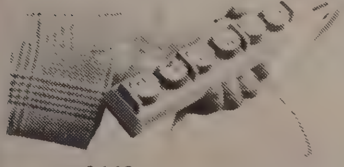

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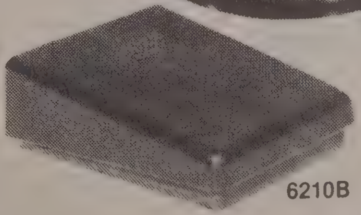
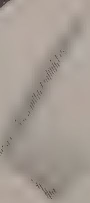
6446



6210B



6433

NCC National Controls Corporation
C&K
mec
Unimax Switch
DELTROL controls
Multi-Flex
Grayhill
Pollak
BRADY XYMOX
ALCOSWITCH
Taiko
Beau Products
SoLiCo
XENELL Corporation
Olympic
OSHINO
TELEDYNE ANSONIA
SIGMA INSTRUMENTS INC
CARLINGSWITCH

We're stocked and ready to roll.

We're the Switch Specialists. We *stock* the leading switch and electronic component lines. Call us. You'll get *what* you want, *when* you want it.

ALCOSWITCH: Switches, knobs, lights.

BEAU-VERNITRON: Plug and socket connectors, terminal blocks.

W.H. BRADY-XYMOX DIV.: Membrane switches.

C&K COMPONENTS: Sub-miniature, power, thumbwheel, dip switches.

C W INDUSTRIES: IDC connector systems.

CARLINGSWITCH: Switches and circuit breakers.

DELTROL: Relays, solenoids, timers.

GRAYHILL: Dip, pushbutton, keyboard, rotary switches.

LITTELFUSE: Fuses and fuseholders.

MULTIFLEX: Switch seals for toggle, pushbutton and rotary.

NATIONAL CONTROLS: Solid-state timers.

OLYMPIC WIRE & CABLE: Electronic wire and cable.

OMRON: Relays, thumbwheels, snap-action, lighted pushbutton switches.

OSHINO: Incandescent lamps.

OSLO: Lighted pushbutton and rocker switches.

POLLAK: Automotive and marine switch components.

SIGMA INSTRUMENTS: General purpose, reed, power, solid-state relays.

SOLICO: Indicator lights, LED's, lighted pushbutton switches.

SWITCHCRAFT: Switches, plugs, jacks, connectors.

TAIKO: Lighted pushbutton switches and relays.

TELEDYNE/ANSONIA: Solderless terminals and connectors.

UNIMAX: Snap-action, lighted pushbutton and proximity switches.

UNIMEC: Modular Switch and keycap switches.

XENELL: Neon indicator and control circuit lamps.

WGC

WES-GARDE COMPONENTS GROUP, INC.

Switch specialists coast to coast.

Wes-Garde Components Group distributors include: Atlantic Switch controls, Inc., Hartford, CT, Conectrix, Inc., Carol Stream, IL, Jerseyswitch, Inc., Mt. Laurel, NJ, Ohioswitch, Inc., Columbus, OH, Pacific Switch Controls, Inc., Van Nuys, CA, Switch Controls, Inc., Lakeland, FL, Texaswitch, Inc., Dallas, TX.

1B•1742

Rotary Switches
•Molded
•RF Power
•Subminiature

Radio Switch has a complete line of rotary switches to meet a wide variety of applications requiring exceptional reliability and quality.

With over 40 years experience in design and manufacturing, Radio Switch has the capability of providing a broad selection of standard switches as well as supplying switches to customers stringent specifications. Our staff will work closely with your engineering personnel to develop, test, and implement the rotary switch that is custom-designed for your application.

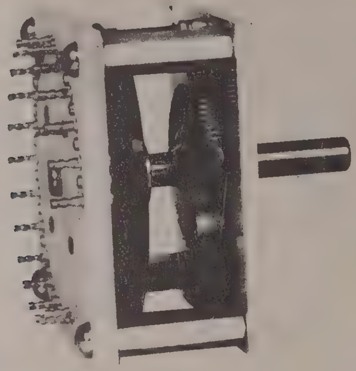
Our RF and power switches range from 2,000 volts peak flashover at 20 amperes to 24,000 volts peak flashover at 100 amperes. In the sub-miniature size, coin silver current carrying components can carry 5 amperes with initial contact resistance of only .010 ohms max. where low current switching applications are critical. Our molded type switches have the capability of switching 20 positions per circuit and are ideal for test equipment and industrial control systems.

For high performance, quality, and fast delivery, specify Radio Switch.

RSC RADIO SWITCH CORPORATION
ROUTE 79 • MARLBORO, NEW JERSEY 07746 • 201•462•6100

Shallco

ROTARY SWITCHES SERIES C, D, AND E



SPECIFICATIONS

GENERAL:

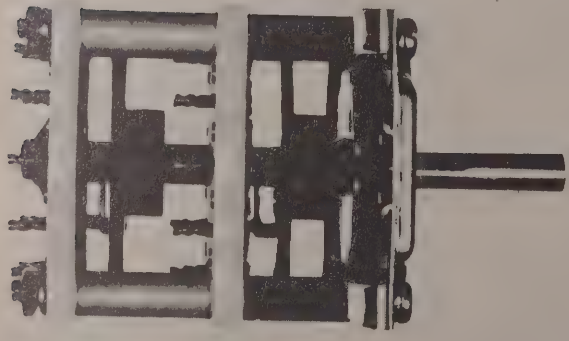
Meets or surpasses requirements of MIL-S-3786

ELECTRICAL:

Current carrying capacity—10 amps.
Current switching capacity—up to 2 amps.
Contact resistance—Initial—.005 ohms max.'
Contact resistance—After Life—.010 ohms max.
Insulation resistance—50,000 megohms
Dielectric withstanding voltage—1500V rms
Dielectric withstanding voltage after life—1000V rms

MECHANICAL:

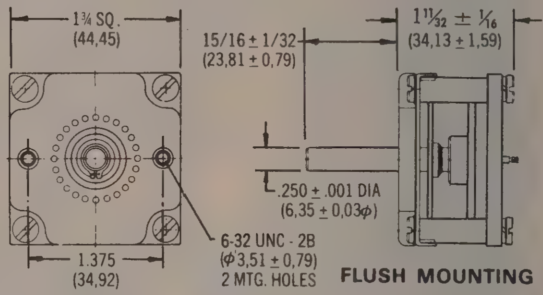
Rotational life—50,000 cycles* min.@.250 amps.@85° C
Stop torque—50 In. Lbs.
Type construction—Open frame
Stops—Factory set to desired position.
Optional features—⅜-32 UNEF-2A bushing mount with anti-rotation pin. Shaft and front panel "O" ring seals. Spring return feature.
Concentric shafts available
Progressive shorting available
*One cycle = one full cw plus one full ccw rotation.



FEATURES OF SHALLCO 1¾, 2¼, 2¾ SQUARE SERIES C, D, E SINGLE DECK SWITCH MULTI DECKS AVAILABLE

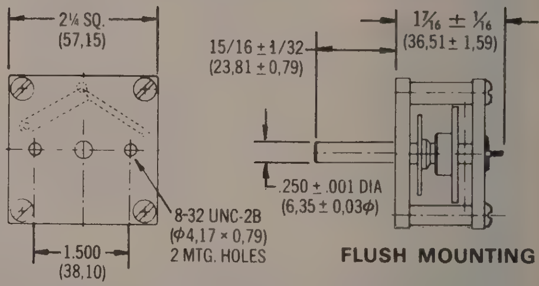
- Meets or surpasses requirements of MIL-S-3786
- Available in one pole 2-48 position through four pole 2-15 position. See ordering information
- High current carrying capacity
- Low contact resistance

SERIES C


1¾ SQ. (44,45)
15/16 ± 1/32 (23,81 ± 0,79)
1 11/32 ± 1/16 (34,13 ± 1,59)
.250 ± .001 DIA (6,35 ± 0,03φ)
6-32 UNC - 2B (φ3,51 ± 0,79) 2 MTG. HOLES
1.375 (34,92)
FLUSH MOUNTING

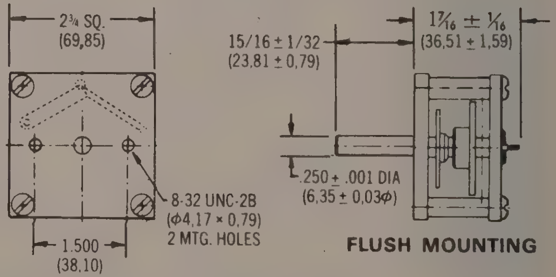
FOR ADDITIONAL DECKS ADD. 29/32 (23,02) PER DECK

SERIES D


2¼ SQ. (57,15)
15/16 ± 1/32 (23,81 ± 0,79)
1 7/16 ± 1/16 (36,51 ± 1,59)
.250 ± .001 DIA (6,35 ± 0,03φ)
8-32 UNC-2B (φ4,17 × 0,79) 2 MTG. HOLES
1.500 (38,10)
FLUSH MOUNTING

FOR ADDITIONAL DECKS ADD 1 1/16 (26,99) PER DECK

SERIES E


2¾ SQ. (69,85)
15/16 ± 1/32 (23,81 ± 0,79)
1 7/16 ± 1/16 (36,51 ± 1,59)
.250 ± .001 DIA (6,35 ± 0,03φ)
8-32 UNC-2B (φ4,17 × 0,79) 2 MTG. HOLES
1.500 (38,10)
FLUSH MOUNTING

FOR ADDITIONAL DECKS ADD 1 1/16 (26,99) PER DECK.

REQUEST CATALOG 10 FOR COMPLETE INFORMATION

NUMBERS IN ( ) ARE METRIC EQUIVALENT (MILLIMETERS)

USE ORDER FORM

SHALLCO INC. / SMITHFIELD IND. PARK / P.O. BOX 1089 / SMITHFIELD, N.C. 27577 / (919) 934-3135

SHALLCO ORDERING INFORMATION

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-CM	15°	24*	one	111-CB	30°	12**
112-CM	11¼°	32*		112-CB	22½°	16**
121-CM	15°	11	two	121-CB	30°	6
122-CM	11¼°	15		122-CB	22½°	8
131-CM	15°	5	three	131-CB	30°	3
132-CM	11¼°	7		132-CB	22½°	4
141-CM	15°	5	four	141-CB	30°	3
142-CM	11¼°	7		142-CB	22½°	4

*Maximum number of positions may be used with continuous rotation only.
**Normally supplied as continuous rotation; stops available on request.

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-DM	15°	24*	one	111-DB	30°	12*
112-DM	11¼°	32		112-DB	22½°	16*
113-DM	7½°	48		113-DB	15°	24*
121-DM	15°	24*	two	121-DB	30°	12*
122-DM	11¼°	32		122-DB	22½°	16*
123-DM	7½°	23		123-DB	15°	12
141-DM	15°	11	four	141-DB	30°	6
142-DM	11¼°	15		142-DB	22½°	8
143-DM	7½°	11		143-DB	15°	6

*Normally supplied as continuous rotation; stops available on request.

SHORTING				NON-SHORTING		
SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	SERIES	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
111-EM	15°	24*	one	111-EB	30°	12*
112-EM	11¼°	32		112-EB	22½°	16*
113-EM	7½°	48		113-EB	15°	24*
121-EM	15°	24*	two	121-EB	30°	12*
122-EM	11¼°	32		122-EB	22½°	16*
123-EM	7½°	48		123-EB	15°	24*
141-EM	15°	11	four	141-EB	30°	6
142-EM	11¼°	15		142-EB	22½°	8
143-EM	7½°	23		143-EB	15°	12
161-EM	15°	7	six	161-EB	30°	4
162-EM	11¼°	9		162-EB	22½°	5
163-EM	7½°	15		163-EB	15°	8
181-EM	15°	5	eight	181-EB	30°	3
182-EM	11¼°	7		182-EB	22½°	4
183-EM	7½°	11		183-EB	15°	6

*Normally supplied as continuous rotation; stops available on request.

(Order Form to order Series C, D, E)

Order by using a six-place "shorthand" description

Example: 211—EB—12

Rotary Selector Switch, two decks, 1 pole per deck, 30° of spacing between positions, E series, non-shorting, 12 positions.

2 1 1 - E B - 12

PLACE 1	PLACE 2	PLACE 3	PLACE 4	PLACE 5	PLACE 6
indicates number of decks:* 1 = One Deck 2 = Two Decks 3 = Three Decks, etc.	indicates number of poles per deck: 1 = One Pole 2 = Two Poles 3 = Three Poles 4 = Four Poles	indicates degrees of spacing between positions: Shorting 1 = 15° 2 = 11¼° 3 = 7½° Non-Shorting 1 = 30° 2 = 22½° 3 = 15°	indicates series of switch: C = C Series D = D Series E = E Series	indicates Shorting or Non-Shorting: M — Shorting (make before break) B — Non-Shorting (break before make)	indicates number of positions per pole: 2 – Two positions 3 – Three positions 4 – Four Positions, etc

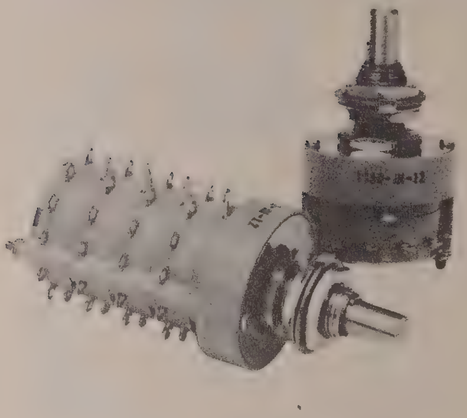
Request catalog 10 for more detailed information and additional switch types.

Shallco

SHALLCO, INC.
PRECISION ELECTRONIC COMPONENTS
SMITHFIELD INDUSTRIAL PARK • P.O. BOX 1089 • SMITHFIELD, N.C. 27577 • 919 934-3135

series J

ROTARY SELECTOR SWITCHES



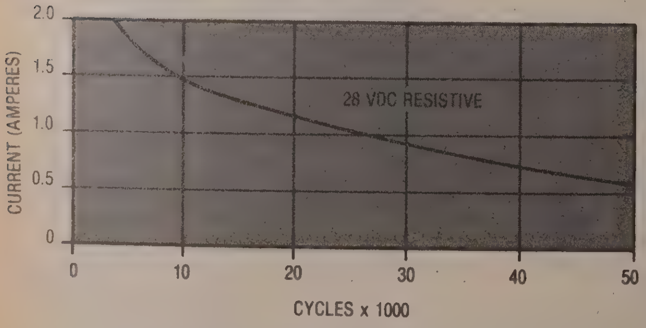
SPECIFICATIONS

GENERAL:
Designed to meet the requirements of MIL-S-3786/SR04

ELECTRICAL:
Current carrying capacity - 10 amperes
Current switching capacity - 1 ampere (28 VDC, Resistive)
Contact resistance - Initial - 5 milliohms maximum
Contact resistance - After Life - 20 milliohms maximum
Insulation resistance - 50,000 megohms
Voltage breakdown - 1000 VAC
Voltage breakdown - After Life - 500 VAC minimum

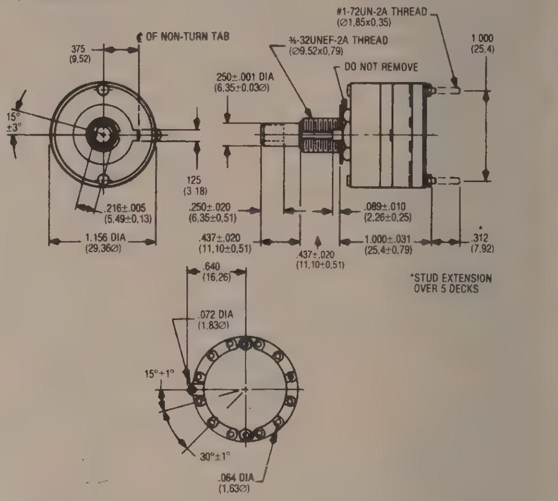
MECHANICAL:
Rotational life - 50,000 cycles
Stop torque - 15 pound-inches minimum
Construction - Enclosed
Stops - Factory set
Torque - 8 to 120 ounce-inches (dependent on decks, poles/deck)
Shaft flat - Opposite moving contact, see diagrams

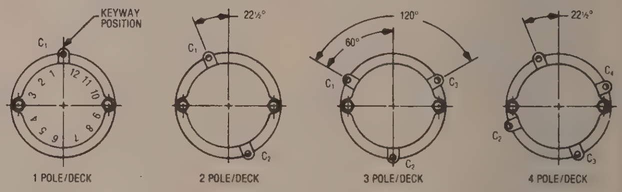
LOAD vs. LIFE



FEATURES OF SHALLCO ONE INCH SERIES J SINGLE OR MULTIDECK SWITCH

- Designed to meet requirements of MIL-S-3786
- Closed construction
- Smooth, positive detent
- Low, stable contact resistance


#1-72UN-2A THREAD (∅1,85x0,35)
℄ OF NON-TURN TAB
375 (9,52)
⅜-32UNEF-2A THREAD (∅9,52x0,79)
1.000 (25,4)
DO NOT REMOVE
250±.001 DIA (6,35±0,03∅)
15° ±3°
125 (3 18)
.216±.005 (5,49±0,13)
.250±.020 (6,35±0,51)
.089±.010 (2,26±0,25)
1.156 DIA (29,36∅)
.437±.020 (11,10±0,51)
.437±.020 (11,10±0,51)
1.000±.031 (25,4±0,79)
.312 (7,92)
*STUD EXTENSION OVER 5 DECKS
.640 (16,26)
.072 DIA (1,83∅)
15°+1°
30°±1°
.064 DIA (1,63∅)


KEYWAY POSITION
C₁
1 2 3 4 5 6 7 8 9 10 11 12
22½°
C₁
C₂
120°
60°
C₁
C₂
C₃
22½°
C₁
C₂
C₃
C₄
1 POLE/DECK
2 POLE/DECK
3 POLE/DECK
4 POLE/DECK

COMMON LOCATIONS

BACK-PANEL DEPTH

DECKS	INCHES	MM	DECKS	INCHES	MM
1	1.000	25.4	7	2.992	76
2	1.332	33.8	8	3.324	84.4
3	1.664	42.3	9	3.656	92.9
4	1.996	50.7	10	3.988	101.3
5	2.328	60.5	11	4.320	109.7
6	2.660	67.6	12	4.652	118.2

APPROXIMATE WEIGHT

Switch, 1 Deck/W Hardware	50 grams
Additional Deck	8 grams

MATERIALS AND FINISHES

Insulation	Diallyl Phthalate
Rotor/Stator Contacts	Silver Alloy
Shaft, Stampings, Hardware	Stainless Steel
Detent Spring	Tinned Music Wire
Terminals	Brass under Silver or Gold
Mounting Bushing	Brass, Zinc Plated - Chromate

NUMBERS IN ( ) ARE IN MILLIMETERS

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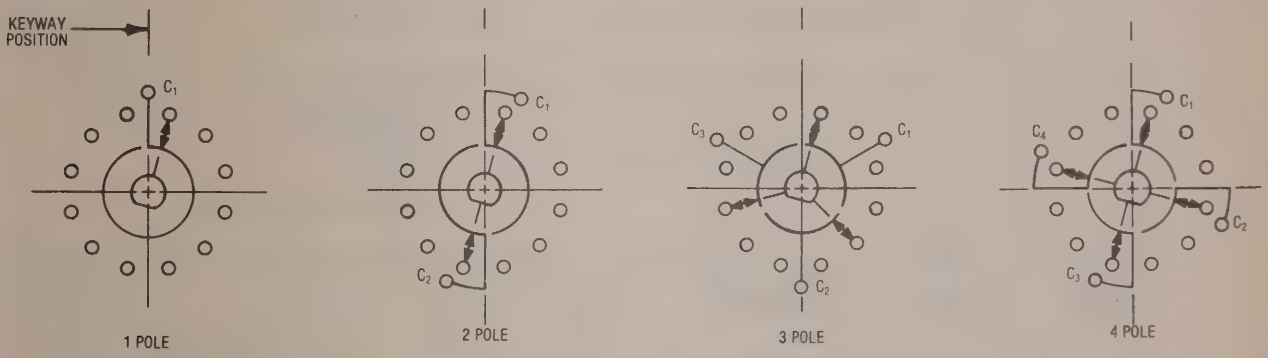
SHORTING CODE	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE	NUMBER OF POLES	NON-SHORTING CODE	SPACING BETWEEN POSITIONS	MAXIMUM POSITIONS PER POLE
1130-JM	30°	12	ONE	1130-JB	30°	12
1230-JM		6	TWO	1230-JB		6
1330-JM		4	THREE	1330-JB		4
1430-JM		3	FOUR	1430-JB		3

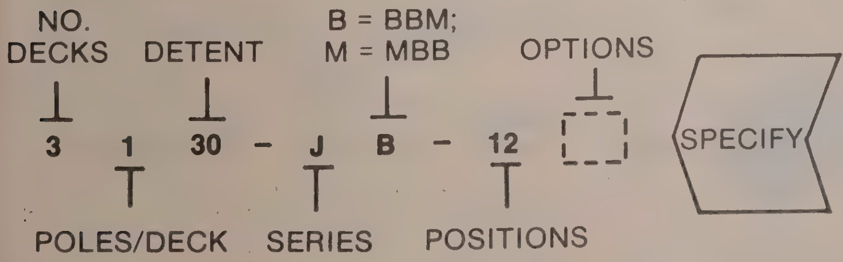
SINGLE DECK SHOWN. FOR MULTI-DECK, INCREASE FIRST DIGIT OF ABOVE CODES.

CIRCUIT DIAGRAMS


KEYWAY POSITION
C_1
1 POLE
C_1
C_2
2 POLE
C_3
C_1
C_2
3 POLE
C_4
C_1
C_2
C_3
4 POLE

(VIEWED FROM SHAFT END AND SHOWN IN POSITION 1, EXTREME CCW POS.)

ORDERING CODE


NO. DECKS
DETENT
B = BBM; M = MBB
OPTIONS
3
1
30
-
J
B
-
12
SPECIFY
POLES/DECK
SERIES
POSITIONS

G = GOLD PLATED
C = CONTINUOUS ROTATION
M = CUSTOMER MARKING
S = SEALED SHAFT

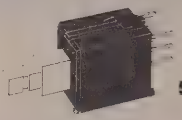
ADDITIONAL PRODUCTS

Audio Attenuators and Attenuation Networks Request Catalog A82 for complete product listing and Engineering Data.

SWITCHCRAFT

A Raytheon Company

IBS MINIATURE PUSHBUTTON SWITCHES



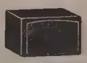
SERIES 98000

Series 98000 IBS switches provide low cost versatility for a wide range of electrical/electronic applications. .130 in. (3.30 mm) by .130 in. (3.30 mm) square plungers accept a full line of industry standard pushbuttons. Switches have .157 in. (4 mm) long PC terminals for mtg. single- or double-sided PC boards up to .094 in. (2.39 mm) thick on .394 in. (10 mm) centers in row or arrays. Ratings are .125 A resistive @ 125 V AC or 28 V DC. .144 in. (3.66 mm) plunger travel. Contactors: beryllium copper. Contacts & Terminals: silver or gold plated.

SERIES 98000

Part No.[1]	Description	Switching	Schematic
982A01	Momentary	SPST	1-A
982A03		SPDT	1-C
982A06		DPDT	2-C
987A01	Push-lock/ push-release	SPST	1-A
987A03		SPDT	1-C
987A06		DPDT	2-C

NOTE: [1] Order pushbuttons separately.



Type I

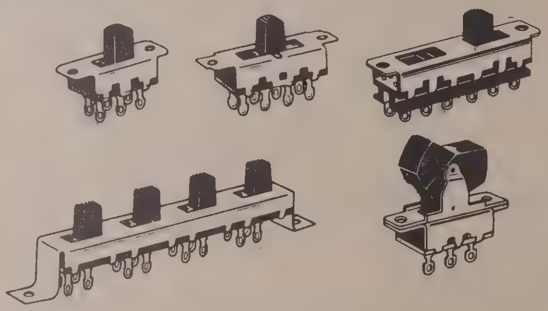
Type II

IBS PUSHBUTTONS

IBS pushbutton faces are concave for operator convenience with full legend capability. Can be mounted horizontally or vertically. Pushbutton dimensions: Type I — .388 in. (9.86 mm) W x .216 in. (5.49 mm) H x .425 in. (10.80 mm) D. Type II — .464 in. (11.79 mm) W x .288 in. (7.32 mm) H x .432 in. (10.97 mm) D. Pushbuttons must be ordered separately.

Type I	Type II	Color
P-2936	P-2951	White
P-2937	P-2952	Black
P-2938	P-2953	Red
P-2941	P-2956	Blue
P-2942	P-2957	Gray

SLIDE SWITCHES



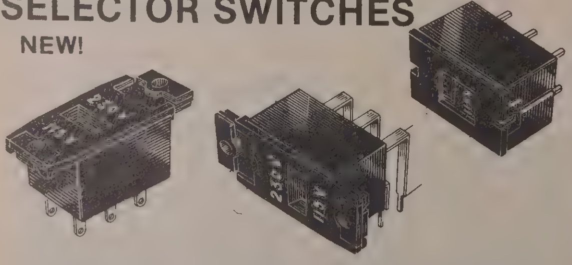
DW SLIDE SWITCHES

Instrument quality Switchcraft slide switches have low cost, precision "double-wipe" contacts with "U"-shaped bifurcated contacts rated at 0.5 A DC, 3 A AC, 125 V, non-inductive. Solder lugs have 5/64" dia. center holes and wrap-around notch. Many knob styles: crowned, rocker, flush. U.L. & C.S.A. listed types. Up to 4 poles of switching with locking or momentary action.

Series 46000E — General purpose slide switches
Series 47000E — Tandem switches
Series 51000E — Rocker switches
Series 58000 — Slide switches (6 amp)

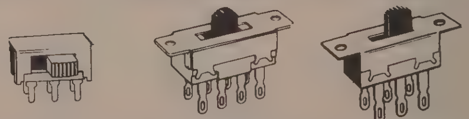
EUROPEAN LINE VOLTAGE SELECTOR SWITCHES

NEW!



Durable slide switches provide quick and easy programming/selection of 115 V or 230 V primary power in electrical/electronic equipment for international marketplace. UL, CSA and VDE (Verband Deutscher Elektrotechniker) approved. Mounting are flange or PC (straight or right angle), DPDT, locking. Ratings: UL & CSA: 2 A, 250 V AC & 4 A, 125 V AC. VDE: 2 A, 250 V AC. Switches also designed to comply with CEE and IEC requirements. Legends: 115 V-230 V.

"Tini-Slide" SWITCHES



Miniature "**Tini-Slide**" switches are precision locking switches with unique lift/wipe/slide action and silver contacts. Ratings: 0.5 A, 125 V AC or DC, non-inductive. 2- and 3-position types. U.L. listed. Solder lugs or PC terminals. Crowned knobs.

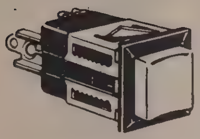
Series 56000 — DPDT & DPTT
Series C63000 — 4PDT
Series C62000 — Side Knobs

Switchcraft, Inc., 5555 N. Elston Ave., Chicago, IL 60630 Tel. (312) 792-2700 TWX 910-221-5199

SWITCHCRAFT®

A Raytheon Company

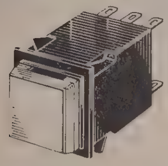
SERIES US & LUS — "Uniswitch" SWITCHES



Low cost, momentary pushbutton switches are only .688 in. (17.48 mm) square. SERIES US non-illuminated. SERIES LUS illuminated — use only 6 V, 0.5 W, T 1¾ bi-pin lamp Switchcraft Part No. P-2290 (not supplied with switch). Lamps replaced from front of panel. Both switch series incorporate "Adjusto-Clip" allowing simple "snap-lock" mounting. Solder lug terminals also accept #5-40 screw connections. PC terminals mount in single- or double-sided boards or multilayers. Solder/quick-connect terminals accept AMP Series 110 receptacles. Terminals: Solder lug, PC (PC suffix); quick-connect/solder (ST suffix). Contacts are bronze, silver plated, 250 mA, 30 W max., AC, non-inductive load, 1A circuitry. Switching is SPST (NO). Mounts in panels from .047 in. (1.19 mm) min. to .266 in. (6.76 mm) max. thick. Behind panel depth 1.313 in. (33.35 mm). Minimum square hole size .617 in. (15.67 mm). U.S. Pat. No. 3,446,467

SERIES	TERMINAL	PUSHBUTTON COLOR						
		RED	BLACK	GREEN	BLUE	WHITE	YELLOW	AMBER
LUS	SOLDER/SCREW	LUS-01-1	—	LUS-03-1	LUS-04-1	LUS-05-1	LUS-08-1	—
	PRINTED CIRCUIT	LUS-01-1PC	—	LUS-03-1PC	LUS-04-1PC	LUS-05-1PC	LUS-08-1PC	LUS-13-1PC
	SOLDER/ QUICK-CONNECT	LUS-01-1ST	—	LUS-03-1ST	LUS-04-1ST	LUS-05-1ST	LUS-08-1ST	LUS-13-1ST
US	SOLDER/SCREW	US-01-1	US-02-1	US-03-1	US-04-1	US-05-1	US-08-1	—
	PRINTED CIRCUIT	US-01-1PC	US-02-1PC	US-03-1PC	US-04-1PC	US-05-1PC	US-08-1PC	US-13-1PC
	SOLDER/ QUICK-CONNECT	US-01-1ST	US-02-1ST	US-03-1ST	US-04-1ST	US-05-1ST	US-08-1ST	US-13-1ST

SERIES BXL — "Box Switch" SWITCHES



Miniature momentary or locking pushbutton switches offer lighted or unlighted options in minimum panel space. Molded black plastic housing protects agains dust and dirt; prevents bending/disfiguring contacts caused by excessive handling. Bezel frames pushbutton, acting as built-in escutcheon. Mounted in rows or matrixes and completely compatible with Series BXR "Box-Switch" switches. Accepts standard incandescent T 1-3/4 wedge base lamps. Relamp from front of panel. Omit lamp for non-illuminated switch. Lamps not supplied. Order pushbuttons separately from chart.

Mounting hole: .625 in. (15.88 mm) square. Panel thickness: .031 in. (.79 mm) to .093 in. (2.36 mm). Behind panel depth: 1.219 in. (30.96 mm) max

SERIES BXL SWITCH PUSHBUTTONS

Part No.	Color	Part No.	Color	Part No.	Color
P-2827	Red	**P-2831**	Blue	**P-2832**	Orange
P-2830	Green	**P-2828**	White	**P-2829**	Yellow

Part No.	Action[1]	Switching	Ratings	Contacts	Schematic	Terminals
BXL-123S00	M	SPDT	0.25 A, 125 V AC Resistive	Copper Alloy, Silver Plated	1-C	Solder Lug
BXL-126S00		DPDT			2-C	
BXL-173S00	L	SPDT			1-C	
BXL-176S00		DPDT			2-C	
BXL-123P00	M	SPDT			1-C	PC
BXL-126P00		DPDT			2-C	
BXL-173P00	L	SPDT			1-C	
BXL-176P00		DPDT			2-C	

NOTE: [1] M = Momentary; L = Locking

SERIES 903, 913, 923, 933 — MOMENTARY Button Switch SWITCHES

Miniature pushbutton switches are enclosed in metal housing. Terinals: solder lug. Contacts: internal nickel silver, 250 mA, 30 W max., AC, non-inductive. **Series 903, 913:** behind panel mtg. **Series 923, 933:** front mount. All switches: bushing mount.

903 & 913

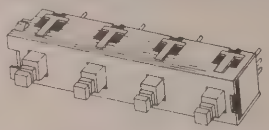
923 & 933

Part Nos.		Schematic	Mounting, In. (mm)		
Red Button	Black Button		Hole	Panel Thickness	Behind Panel Depth
903	913	1-C	469	171	734
903D	913D	1-D	(11.91)	(4.34)	(18.64) max.
923	933	1-C	.25	.140	890
923D	933D	1-D	(6.35)	(3.56) max.	(22.61) max.

SWITCHCRAFT®

A Raytheon Company

IBS Multi-Switch SWITCHES



Series 98000 IBS miniature pushbutton switches can be gang mounted on common frames, up to 12 stations long with center-to-center spacing of 10 mm, 15 mm or 20 mm. Available with interlock, non-lock, momentary or push-lock/push-release mechanical funcitons. .130 in. (3.30 mm) x .130 in. (3.30 mm) square plungers accept a full line of industry standard pushbuttons. Switches are stocked without pushbuttons due to wide variety that can be used. Order pushbuttons separately, Switches have .157 in. (4 mm) long PC terminals for mtg. single- or double-sided PC boards up to .094 in. (2.39 mm) thick. Close stacking (centers) permits high density within minimum front panel space. Plunger travel: .144 in. (3.66 mm).

Part Numbers/10mm Centers

Interlock	Non-Lock	Push-Lock/ Push-Release	No. of Stations[1]
IBS10B02106A	IBS10B02206A	IBS10B02706A	2
IBS10B04106A	IBS10B04206A	IBS10B04706A	4
IBS10B06106A	IBS10B06206A	IBS10B06706A	6
IBS10B08106A	IBS10B08206A	IBS10B08706A	8
IBS10B10106A	IBS10B10206A	IBS10B10706A	10
IBS10B12106A	IBS10B12206A	IBS10B12706A	12

Part Numbers/15mm Centers

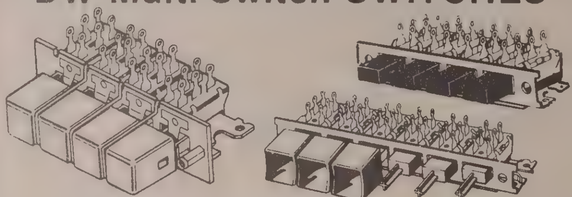
IBS15B02106A	IBS15B02206A	IBS15B02706A	2
IBS15B04106A	IBS15B04206A	IBS15B04706A	4
IBS15B06106A	IBS15B06206A	IBS15B06706A	6
IBS15B08106A	IBS15B08206A	IBS15B08706A	8
IBS15B10106A	IBS15B10206A	IBS15B10706A	10
IBS15B12106A	IBS15B12206A	IBS15B12706A	12

Part Numbers/20mm Centers

IBS20B02106A	IBS20B02206A	IBS20B02706A	2
IBS20B04106A	IBS20B04206A	IBS20B04706A	4
IBS20B06106A	IBS20B06206A	IBS20B06706A	6
IBS20B08106A	IBS20B08206A	IBS20B08706A	8
IBS20B10106A	IBS20B10206A	IBS20B10706A	10
IBS20B12106A	IBS20B12206A	IBS20B12706A	12

NOTE: [1] Odd numbers of stations (3, 5, 7, 9, 11) are available. Contact Switchcraft.

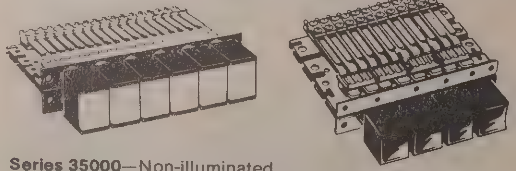
DW Multi-Switch SWITCHES



The DW (double-wipe) Multi-Switch switch is available up to 18 stations in a single row; or on special order, ganged assemblies with interaction between rows. Max. switching per station is 4-C (4PDT). Each station utilizes specially designed switching modules with U-shaped, high reliable bifurcated contactors rated at 3 amps, A.C.; 0.5 amp. D.C., 125 V, non-inductive load. DW Multi-Switch switches are available in 5 series: 65000, 66000, 67000, 70000, and 71000. All provide four standard functions: **Interlock**—actuating a pushbutton automatically restores to normal the pushbutton previously actuated. **Lock-Out**—prevents operation of more than one pushbutton at a time. This feature is included on all interlock switches. **Non-Lock**—each pushbutton has momentary action. **All-Lock**—all pushbuttons, except release, lock when depressed. All pushbuttons restored to normal by actuating (momentary) release pushbutton. **Push-Lock/Push-Release**—pushbuttons lock when depressed and release when again depressed. **All Series**—pushbuttons on ⅜" centers. DW Multi-Switch switches are available in single row assemblies with interlock and all-lock functions from one to twelve stations; with non-lock and push-lock/push-release functions up to eighteen stations.

Series 65000—Non-illuminated, integral pushbutton.
Series 66000—Non-illuminated version of Series 67000.
Series 67000—Illuminated pushbuttons.
Series 70000, 71000—Non-illuminated, cross-rib plungers, accept up to 12 different styles of pushbuttons.

littel Multi-Switch SWITCHES



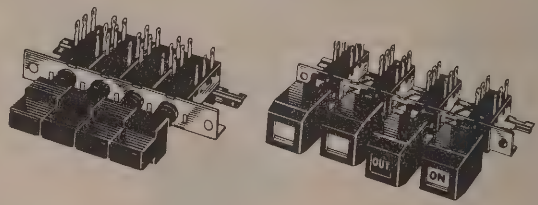
Series 35000—Non-illuminated.
Compact, rugged multiple-station switches feature up to 6PDT per station in .6 square inch space. Excellent selection of contacts for low or high current switching. Plungers accept nine different Switchcraft pushbuttons. Mechanical functions are: interlock, all-lock, non-lock and push-lock/push-release. One to 12 stations; many legends are possible.

Series 36000—Non-illuminated companion series to Series 37000. All other basic functions and features are same as Series 35000.

Series 37000—Single lamp illumination at each station. All other basic functions and features are same as Series 35000.

Series 38000—Twin lamp illumination using low power, low heat lamps. All other basic functions and features same as Series 35000.

Tini DW Multi-Switch SWITCHES

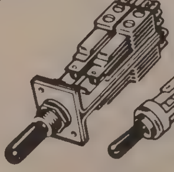
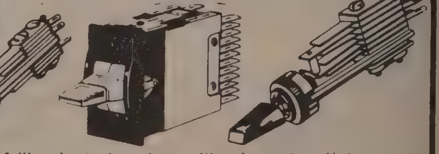


Dependable, low cost Series 90000 (10 mm centers) and 92000 (15 mm centers) switches offer a full range of versatile mechanical functions and the exclusive "Snap-Slide" switching technique.

And Tini DW Multi-Switch switches offer the bonus of up to 18 stations in a single row, each having up to 8-C (8PDT) switching. Mechanical functions include interlock, non-lock, all-lock and push-lock/push-release.

"Flip-Flop" Pushbuttons, Series TDW-F have unique internal "flip-flop" mechanism which permits button face to change colors without electrical energy, without lamps and without wiring. When pushbutton is operated, highly reflective panels inside housing change position and use ambient light to give a bright illuminated effect. ("Flip-Flop" pushbuttons designed for use on Series 92000 Tini DW Multi-Switch").

LEVER SWITCHES

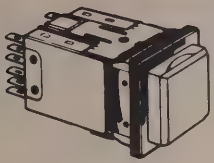
Large variety of illuminated and non-illuminated switches are rugged and compact and are ideal for all control panel applications. Non-illuminated types have up to 4PDT in locking or momentary actions. Ratings: up to 3 A, 300 W max., AC non-inductive load. Illuminated switches have up to 8 A, 125 V AC contacts with up to 8PDT switching. Lever lights a different color for each position. Terminals can be solder lug or quick-connect.

Switchcraft, Inc., 5555 N. Elston Ave., Chicago, IL 60630 Tel. (312) 792-2700 TWX 910-221-5199

SWITCHCRAFT®

A Raytheon Company

SERIES PL "Push-Lite" SWITCHES



Completely enclosed, lighted pushbutton switches feature long-life, highly-reliable, leaf-springs. Available with or without barriers, full or split-face display. Mounts with clamp-type bracket; no screws, washers or nuts needed. Can be mounted in vertical or horizontal rows and in matrixes. Accepts standard T-1¾ flange-base lamp (not furnished with switch) in either 6 V or 28 V rating. Specify 1 lamp for single lamp type or 2 lamps for twin-lamp type when redundant or split-face lighting is required. Barriers and colored filter snap-inserts optional (order separately). Palladium contacts rated at 2 A, 125 V max., non-inductive load. Silver contacts rated at 8 A, 125 V max., non-inductive load.

MOMENTARY

Part Numbers		Housing/ Button Color	Switching	Contacts	Schematic	Terminals
Single Lamp	Twin Lamp					
PL-1032-05	PL-2032-05	Black/White	SPDT	Palladium	1-C	Solder Lug
PL-1062-05	PL-2062-05		DPDT		2-C	
PL-1122-05	PL-2122-05		4PDT		4-C	
PL-1262-05	PL-2262-05		DPDT	Silver	2-C	
PL-4032-05	PL-5032-05	Gray/White	SPDT	Palladium	1-C	
PL-4062-05	PL-5062-05		DPDT		2-C	
PL-4122-05	PL-5122-05		4PDT		4-C	
—	PL-8032-05	Black/White	SPDT		1-C	PC
PL-7062-05	PL-8062-05		DPDT		2-C	
PL-7122-05	PL-8122-05		4PDT		4-C	

PUSH-LOCK/PUSH-RELEASE

Single Lamp	Twin Lamp	Housing/ Button Color	Switching	Contacts	Schematic	Terminals
PL-1037-05	PL-2037-05	Black/White	SPDT	Palladium	1-C	Solder Lug
PL-1067-05	PL-2067-05		DPDT		2-C	
PL-1127-05	PL-2127-05		4PDT		4-C	
PL-1237-05	—		SPDT	Silver	1-C	
PL-1267-05	PL-2267-05		DPDT		2-C	
PL-4037-05	—	Gray/White	SPDT	Palladium	1-C	
PL-4067-05	PL-5067-05		DPDT		2-C	
PL-4127-05	PL-5127-05		4PDT		4-C	
PL-7037-05	PL-8037-05	Black/White	SPDT		1-C	PC
PL-7067-05	PL-8067-05		DPDT		2-C	
PL-7127-05	PL-8127-05		4PDT		4-C	

U.L. LISTED, MOMENTARY & PUSH-LOCK/PUSH-RELEASE

Part Numbers		Housing/ Button Color	Action[1]	Switching	Contacts	Schematic	Terminals
Single Lamp	Twin Lamp						
26U-1003	26U-1005	Black/White	M	SPDT	Silver	1-C	Solder Lug
26U-1004	26U-1006		M	DPDT		2-C	
26U-1007	26U-1009		PL/PR	SPDT		1-C	
26U-1008	26U-1010		PL/PR	DPDT		2-C	

NOTE: [1]M = Momentary; PL/PR = Push-Lock/Push-Release

MINIATURE MOMENTARY KEY SWITCHES

Switchcraft miniature pushbutton switches offer long life for instrumentation, medical electronics, radio & TV and other applications where small size, and high reliability are important design factors. All switches are PC mount type, with precious metal contact surfaces. Some are available with LED illumination. Switches are designed for modern electronics equipment using semiconductors. Short stroke, long life, audible "click", positive tactile "feel" assure switch operation. Contacts are self-cleaning with low resistance throughout life.

No. P75120-002-22

No. P75120-008-02

No. P75120-050-02

No. P75120-102-02

No. P75120-100-22

No. P75120-057-12

No. P75120-108-01

Switching is SPST, .025 A, 30 V DC or AC.
Parallel contacts have silver surface.

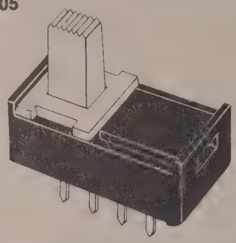
Part No.	LED Indicator	Snap-In Mount	Pushbutton Color
P75120-002-02	—	—	Black
P75120-002-22	—	—	Gray
P75120-008-02	—	—	Black
P75120-050-02	Red	—	Black
P75120-057-12	Red	Yes	Clear[1]
P75120-100-22	—	Yes	Gray
P75120-102-02	Red	Yes	Black
P75120-108-01	Red	Yes	Red[1]

NOTE: [1] Transparent pushbutton.

Switchcraft, Inc., 5555 N. Elston Ave., Chicago, IL 60630 Tel. (312) 792-2700 TWX 910-221-5199

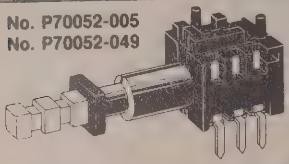
MINIATURE 4-POSITION SLIDE SWITCHES

No. P74650-013-05

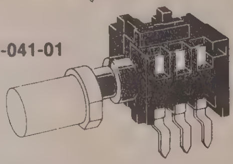


Part No.	Circuitry	Ratings	Mounting	Actuator Color
P74650-013-05	SP4T	100 mA, 30 V DC	PC	White

No. P70052-005
No. P70052-049



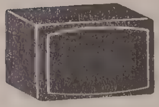
No. P70052-041-01



MINIATURE PUSH SWITCHES

Part No.	Function	Circuits	Rating	Mounting	Pushbutton Supplied	Pushbutton Color
P70052-005	PL/PR	DPDT	0.5 A, 12 V AC or DC	PC	No[1]	—
P70052-041-01	Mom	DPDT		PC	Yes	Red
P70052-049	Mom	DPDT	0.5 A, 250 V AC	PC	No[1]	—

NOTE: [1] See pushbutton chart below.



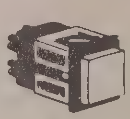
PUSHBUTTONS

Pushbuttons are available in various colors. Pushbutton faces are concave for operation convenience and can be mounted either horizontally or vertically. Pushbuttons must be ordered separately. May be factory installed, if desired, at nominal extra cost.

PART NUMBERS

Part No.	Color
P-2951	White
P-2952	Black
P-2953	Red
P-2956	Blue
P-2957	Gray

SERIES BXR — MOMENTARY "Box Switch" SWITCHES



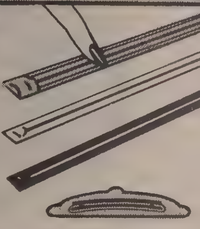
Miniature, non-illuminated momentary pushbutton switch offers broad switching capabilities in minimum panel space. Switch only .688 in. (17.48 mm) square. Molded plastic body protects against dust and dirt; prevents bending/disfiguring of contacts caused by excessive handling. Attractive bezel frames switch and acts as a built-in escutcheon plate. "Adjusto-Clip" mounting provides snap-in, front of panel mounting. Pushbuttons have .109 in. (2.77 mm) stroke. Mtg. hole: .620 in. (15.75 mm). Max. Panel Thickness: .047 in. (1.19 mm) to .281 in. (7.14 mm). Ratings: 250 mA, 30 W max. AC non-inductive load. Contacts: brass, silver plated. U.S. Patent Nos. 3,446,467 and 3,419,696.

Part No.	Button Color	Switching	Schematic	Terminals	Behind Panel Depth
BXR-01-1	Red	SPST (N.O.)	1-A	Solder Lug	1.219 (30.96) max. (minus panel thickness)
BXR-01-3		SPDT	1-C		
BXR-01-6		DPDT	2-C		
BXR-01-10		DPST (N.O.) + DPDT	2-A + 2-C		
BXR-02-1	Black	SPST (N.O.)	1-A		
BXR-02-3		SPDT	1-C		
BXR-02-6		DPDT	2-C		
BXR-02-10		DPST (N.O.) + DPDT	2-A + 2-C		
BXR-03-1	Green	SPST (N.O.)	1-A		
BXR-03-3		SPDT	1-C		
BXR-03-6		DPDT	2-C		
BXR-03-10		DPST (N.O.) + DPDT	2-A + 2-C		
BXR-05-1	White	SPST (N.O.)	1-A		
BXR-05-3		SPDT	1-C		
BXR-05-6		DPDT	2-C		
BXR-01-3PC	Red	SPDT	1-C	PC	1.125 (28.58) max. (minus panel thickness)
BXR-01-6PC		DPDT	2-C		
BXR-02-3PC	Black	SPDT	1-C		
BXR-02-6PC		DPDT	2-C		
BXR-05-3PC	White	SPDT	1-C		
BXR-05-6PC		DPDT	2-C		
BXR-05-10PC		DPST (N.O.) + DPDT	2-A + 2-C		

Tapeswitch

PRESS-AT-ANY-POINT

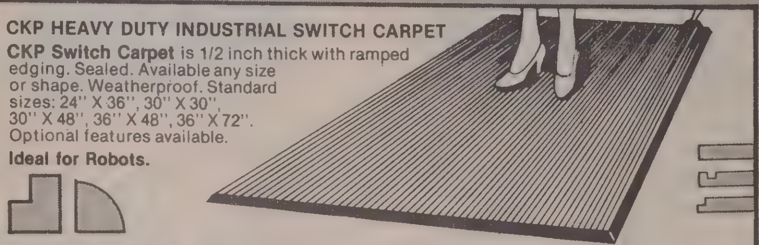
SENSING SWITCHES



RIBBON SWITCHES

Factory sealed units with 18 inch connecting leads at one end. Sensitivity: 8, 12, or 40 ounce finger pressure. Standard lengths: 1, 2, 5, 8, 10, 12, 15, 18, 20 ft. Double leads on order. See text at bottom.

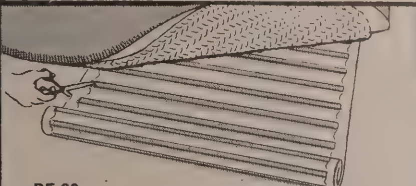
Now available with self adhesive.



CKP HEAVY DUTY INDUSTRIAL SWITCH CARPET

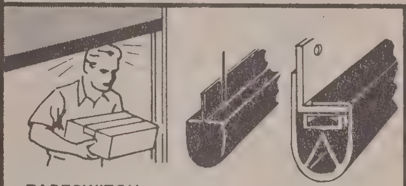
CKP Switch Carpet is 1/2 inch thick with ramped edging. Sealed. Available any size or shape. Weatherproof. Standard sizes: 24" X 36", 30" X 30", 30" X 48", 36" X 48", 36" X 72". Optional features available.

Ideal for Robots.



PE-30
UNDER CARPET SWITCHING RUNNER

30 inches wide X 3/32 inches thick 5ft., 25ft., 50ft. roll. Can be cut to any length from roll. For indoor use under carpeting. Excellent under plywood or tile. Parallel Tapeswitches between clear sheeting. Tinned wires for easy connections.

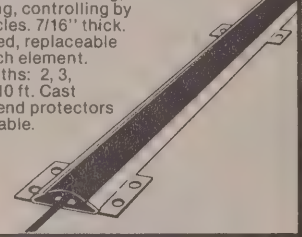


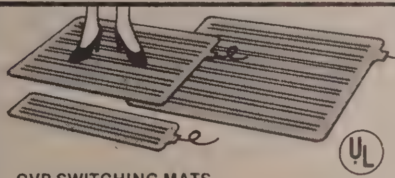
TAPESWITCH
CONTROFLEX® SAFETY EDGES

Serve as cushioned sensing switches for the leading edges of doors, gate arms, machinery, etc., to stop or reverse the action. Numerous styles available. Write or call for details.

RBMA ROAD SWITCH

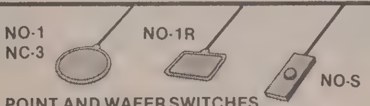
Successful, rugged roadway treadle for counting, timing, controlling by vehicles. 7/16" thick. Sealed, replaceable switch element. Lengths: 2, 3, 5, 8, 10 ft. Cast iron end protectors available.





CVP SWITCHING MATS

CVP style mats are durable flexible area switches for use exposed or under rubber mat or carpeting. UL listed for use in alarms. 3/32" thick. Available 6" X 23", 17" X 23", 23" X 35".

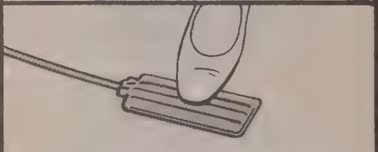


POINT AND WAFER SWITCHES

NO-1 and **NO-1R**—Rugged compact wafer switch. Normally Open. For under valuable objects or general purpose detection. 2 lb. nom. sensitivity.

NC-3—Normally Closed detector switch. Opens when weight is lifted off. 2 lb. nom. sensitivity.

NO-S—1 ounce sensitivity wiping action. Super sensitive.

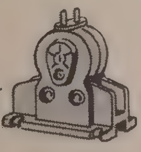


111 CONTROFLEX® FOOTSWITCH

Rugged, low-profile sealed vinyl footswitch. Rated at 100 watts. Employs Controflex® in flat pad. Non tiring. Stand or jump on it. 2" x 5" x ⅜" 6 ft. lead wire. SPST N.O.

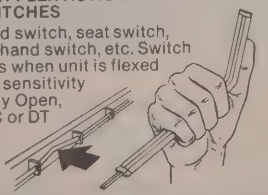
SENSITIVE AIRWAVE SWITCH MODEL AW

High quality diaphragm switch, adjustable sensitivity. Operates from tubing squeeze, air motion, light vacuum, breath pressure, etc. Silver contacts. Many adjustment features.



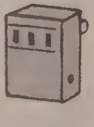
TAPESWITCH FLEX-ACTION RIBBON SWITCHES

Ideal for wand switch, seat switch, limit switch, hand switch, etc. Switch action occurs when unit is flexed 10°. Nominal sensitivity 4 oz. Normally Open, standard. NC or DT available.

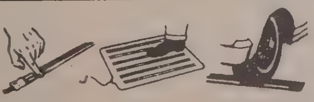


TAPESWITCH RELAY R-1

FOR AC CONTROL WITH ANY TAPESWITCH. This plug-in unit has AC outlet sockets giving Normally ON or Normally OFF 117 Volts AC at 5 Amperes. Built-in low voltage transformer. Simultaneous action.



Tapeswitch products are proven in all industries. Patented construction withstands tons of force yet can close on light finger pressure. TAPESWITCHES are unexcelled for—*safety*...*automation*...*antiburglar systems*...*counting*...*timing*...*door control*...*light switching*...*machine control*...*material handling*...*seat switching*...*computer and console switching*...plus many other applications. TAPESWITCH RIBBON SWITCHES can be bought in the size and length needed.



HAND.....FOOT.....VEHICLE

Features: Inherently sealed. Self bottoming. **Press-at-any-point operation** eliminates linkages. All styles except flex-action switches can be coiled without shorting. Millions of impacts at one point.

Rating: All Tapeswitches are rated at more than 1 ampere, 117 VAC. However, for floor switching a lower voltage is recommended.

TAPESWITCHES are designed in accord with the best principles of switch and cable design, with jacketing and insulation meeting the requirements of MIL-C-9154 and MIL-I-631C respectively.

Unique Fail-Safe circuitry is feasible with all Tapeswitches.

Call or write for complete information:

TAPESWITCH CORPORATION OF AMERICA
100 SCHMITT BOULEVARD, FARMINGDALE, NEW YORK 11735

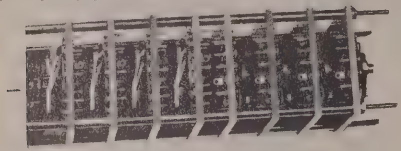
(516) 694-6312
Telex: 144611

Tech Labs
SINCE 1935

SWITCHES AND ATTENUATORS

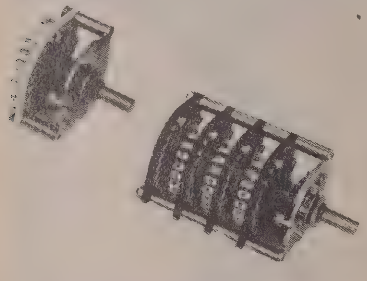
TECH LABORATORIES, INC.
DEPT. EM
BERGEN AND EDSALL BOULEVARDS
PALISADES PARK, N.J. 07650
TEL: (201) 944-2221

SQUARE ROTARY SWITCHES



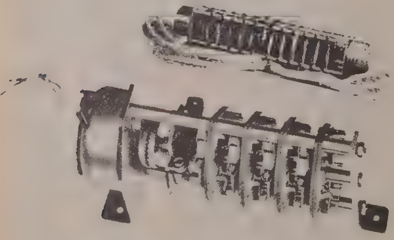
- 13 models available
- 1³⁄₁₆″ sq. to 8″ sq. x 15 decks (max.)
- 1 to 12 poles
- Up to 150 positions/pole
- Fixed stops or continuous rotation
- 3 amps at 120 VAC to 15 amps at 120 VAC
- Precious metal contacts
- Adjustable stops available

TYPE 2 ROTARY SWITCH



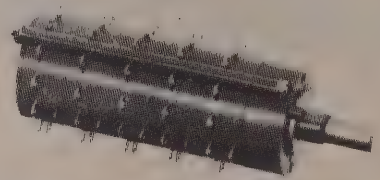
- Two insulation materials available
- 1 to 4 poles/deck
- Up to 24 positions/pole
- Adjustable stops
- 5 amps, 120 VAC max.
- Precious metal contacts

REMOTELY CONTROLLED ROTARY SWITCHES

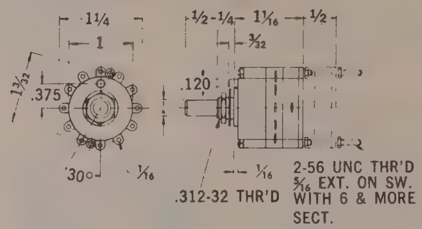


- All Tech Lab Switches can be supplied as stepping switches or continuous motor driven
- Solenoid drives
- Motor and Geneva drives
- Enercon AC incremental motor drive
- Available with interrupters or homing decks
- Completely pre-wired ready to install
- Hermetic sealing available
- May be remotely controlled by: Master-slave arrangement; Computer or other; External pulse
- Either AC or DC operation

TYPE 3 ROTARY SWITCH

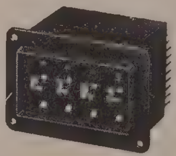


DIMENSIONS



- Enclosed molding in diallyl phthalate
- Molded in terminals
- 1 or 2 poles/deck
- Up to 12 positions/pole
- 1¼″ OD up to 8 decks (max.)
- Adjustable stops
- 12 amps, 28 VDC
- Precious metal contacts
- Mixed decks of shorting and non-shorting
- Mixed shorting and non-shorting contacts on each deck
- Choice of either ⅜-32 or ⁵⁄₁₆-32 mounting bushing
- External adjustable stops
- Offset wipers

THUMBWHEEL SWITCHES

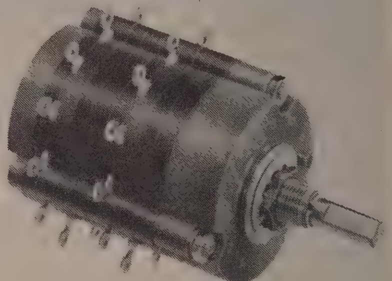


- Compact modular construction
- Positive detent, 8, 10, 11, 12 pos.
- Simple installation
- Two models available
- Wide range of codes
- Various terminations
- Illuminated
- Adjustable stops
- Decade transfer drive
- KV voltage dividers
- Precision Res. Dec.
- Capacitance decades
- Various colors

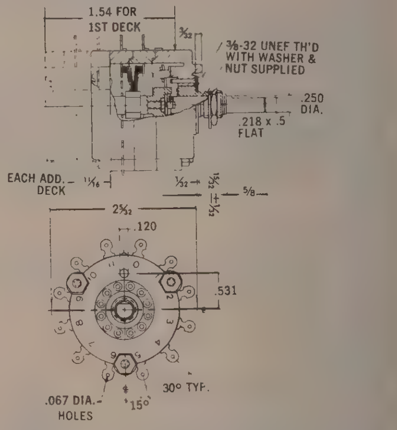
SPECIALS

Tech Labs can customize your Switch and Attenuator requirements, completely pre-wire your switches ready for installation. We can also undertake prototype design and manufacturing. Contact our factory for quotations.

ROTARY INSTRUMENT SWITCH SERIES 2000



- SP or DP/Deck
- Extremely low contact resistance — <1 milliohm
- Extremely high insulation resistance — more than one million megohms
- Totally enclosed -- dust tight
- Long life — > one million
- 12 position/1-6 pole/deck max.
- Silver alloy contacts
- External adjustable stops
- Shorting (MBB)



SPECIAL DESIGN VARIATIONS

SIX AND ELEVEN POSITION DETENTS

The six position detent is 60° throw, skipping every other contact. The eleven position detent is 30° throw with the eleventh position omitted so that the detent goes 60° from position ten to position zero.

OFFSET WIPERS

30° and 180° offset wipers are available for use in special circuits.

CAPACITANCE

Less than 1 micromicrofarad between contacts or to ground.

CURRENT CAPACITY

5 amps maximum continuous duty.

THERMAL EMF

Extremely low. Silver contacts & brushes.

VOLTAGE BREAKDOWN

Withstands 1500V RMS between contacts and to ground.

LOSSES

Low electrical losses at frequencies up to several megacycles.

Tech Labs
SINCE 1935

SWITCHES AND ATTENUATORS

TECH LABORATORIES, INC.
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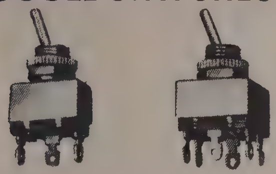
BERGEN AND EDSALL BOULEVARDS
PALISADES PARK, N.J. 07650
TEL: (201) 944-2221

TOGGLE SWITCHES



Tech Lab switches are available in many combinations of bushings, terminals, handles, housings and electrical styles.

OPERATING CHARACTERISTICS

- **Insulation Resistance**
  Greater than 100,000 megohms at 100 VDC and 70°F
- **Dielectric Strength**
  At sea level 1,000V rms at 60 cps for 1 min.
- **Contact Resistance**
  Initial — less than .010 ohms
- **Contact Rating**

DC Load	AC Load
Inductive	Inductive
28V	**125V**
5 amp	5 amp

- **Temperature Range**
  −55°C to 85°C
- **Vibration Endurance**
  10 to 2,000 cps per MIL-R-25018
- **Shock Endurance**
  75G
- **Contact Chatter**
  10 microseconds or less MIL-R-5757
- **Corrosion Resistance**
  of complete assembly 50 hrs per QQ-M-151
- **Mechanical Endurance**
  100,000 cycles switching 10 amp. 50 VDC resistive load

MATERIAL SPEC

- **Base**
  Rogers RX-600
  Phenolic Glass Fiber
- **Housing and Mounting Bushing**
- **Brass**
- **Contacts**
  Fine silver-gold plated

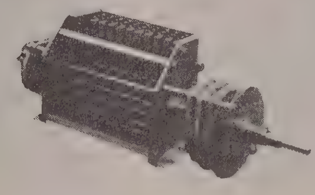
DIMENSIONS

- SP ¼" x ½" x 5/16"
- DP ½" x ½" x 5/16"
- ¼-40 TH'D Bushing
  ¼ or ⅜ long with Keyway
- Various type actuator levers
- Solder or PC Terminals

APPLICABLE MIL SPEC

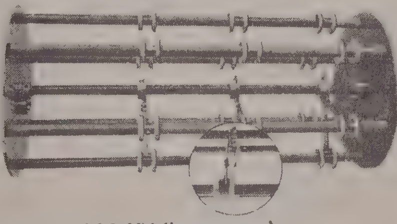
MIL-S-3950 MS-75028 MS-75029

PROGRAMMING SWITCH



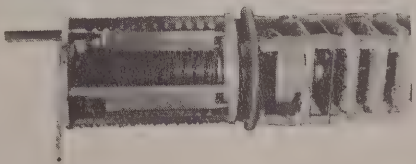
- Adjustable programming for process control, testing, sequencing, scanning, etc.
- SP or DP switches/section
- Up to 25 amp. contact rating
- Up to 48 pos./section/switch
- Remote control
- Computer interface opto-isolated

HIGH VOLTAGE SWITCHES



- Up to 100 KV (low power)
- Corona shields

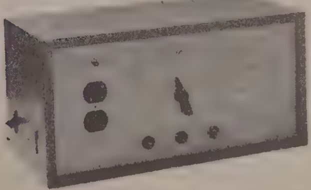
SLIP RING COMMUTATORS



- Integrated with remote controlled stepping switch
- Lift off brushes
- Multiplexing for temp. and strain gauge read out of rotating machinery

INSTRUMENTS

DC-AC INVERTERS
PREC. DECADE RESISTORS
KV-VOLTAGE DIVIDERS
MILLIOHM METER



ATTENUATORS

ROTARY/VARIABLE

- Five basic models — 1 7/16" to 3" dia.
- All circuit configurations
- Wide range of impedance
- Available with detents, tapers and cueing
- Aluminum anodized can
- Precious metal contacts
- Up to 45 steps
- Audio, video and RF

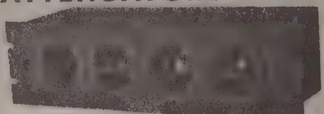
FIXED ATTENUATORS

- Two basic models
- Standard circuits "T" and Bridged "H" — others available
- Octal plug-in base available
- Up to 80 db loss
- Many impedance available

VERTICAL/VARIABLE

- Two basic models — 1" and 1½" wide
- Many circuit configurations available
- Wide range of impedance
- Available with detents, tapers and cueing
- Black anodized escutcheon plate
- Precious metal contacts
- Up to 30 steps

PRECISION ATTENUATORS



TYPE 11T AND 11H PRECISION ATTENUATORS — DC to 10 MHz*

- Circuit: "T" or Balanced "H"
- Impedance: 50 to 600 ohms, as specified
- Resistor Accuracy: ±0.1% or better
- Accuracy: ±0.1 db to 200 KHz (overall) ±0.6 db to 2 MHz
  Lower values of loss, essentially flat to 10 MHz

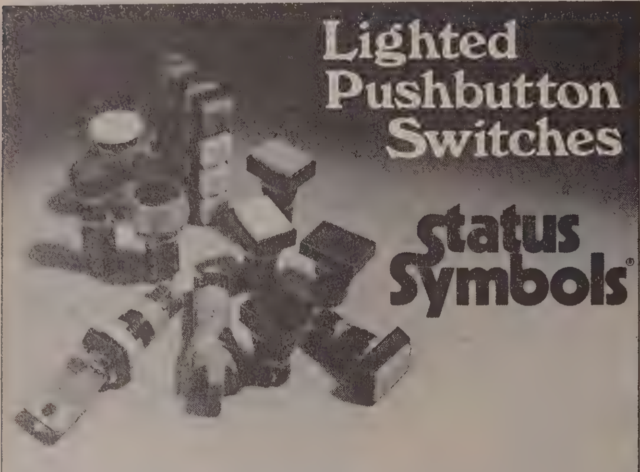
Type No.	Circuit	db Range	db/ Step	Dimensions
11-T	"T"	111	0.1	5¼"x19"x5"
11-H	Bal. "H"	111	0.1	5¼"x19"x10"

* On Low Impedance Units, Lower Losses Usable to 100 MHz.

TYPE 850T AND 850H FOR THE AUDIO RANGE

- Circuit: "T" or Balanced "H"
- Impedance: 600/600 ohms unless specified — Other values to order
- Range: 2 dial unit gives 93 db in 0.1 db steps: 3 dial unit gives 111 db in 0.1 db steps
- Terminals: Telephone type jacks for input and output — Solder terminals provided on rear for permanent connections: Insertion of plugs into jacks lifts rear connections
- Accuracy: Resistors adjusted to ±0.1% excepting low values of loss are ±.25%

UNIMAX:
BETTER SWITCHING SOLUTIONS



Lighted Pushbutton Switches

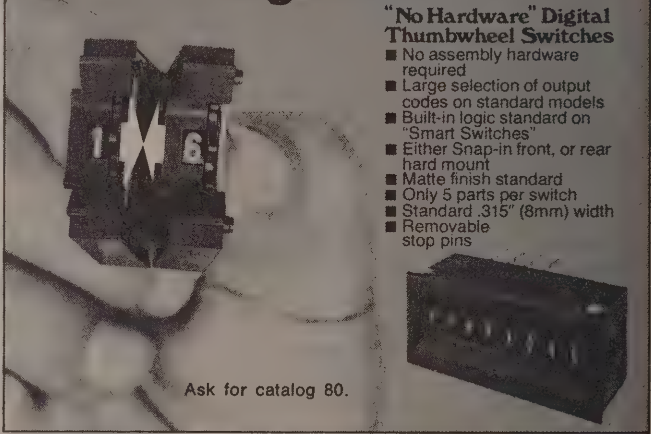
Status Symbols®

In a field full of appearance quality/performance switching variables, Unimax switches are the ones that show you care about quality, performance and price.

- *Single Lamp* —Round, square or rectangular, lighted and unlighted, momentary or alternate switching. 1-4 poles. Flat, concave and mushroom caps.
- *Four Lamp* — Multi-switch configurations. Approved to MIL-S-22885/9-12. Also meets high-shock requirements of MIL-S-910C.
- *Oil-Tight* — Key-operated, Interlock and Multi-position models also available.

Ask for Catalog TH

they SNAP together!



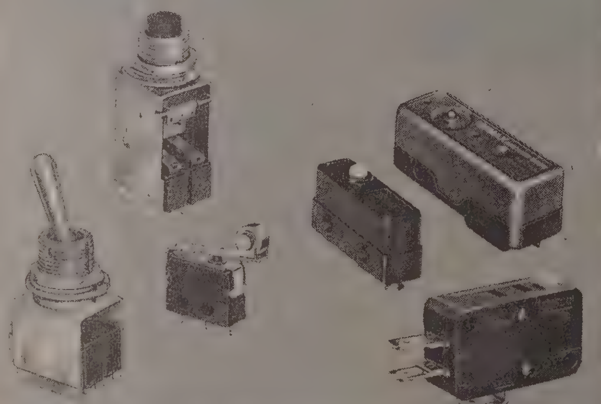
"No Hardware" Digital Thumbwheel Switches

- No assembly hardware required
- Large selection of output codes on standard models
- Built-in logic standard on "Smart Switches"
- Either Snap-in front, or rear hard mount
- Matte finish standard
- Only 5 parts per switch
- Standard .315" (8mm) width
- Removable stop pins

Ask for catalog 80.

The industry's widest selection of precision, general purpose, miniature and sub-miniature snap-action switches, as well as toggle and push-button switch assemblies. Ratings from low-level to 25A. All actuator styles available. Ask for catalog 60.

Snap-Action Switches



A full range of snap-acting switches enclosed in rugged die cast metal housings for protection against mechanical damage and, depending on the method of sealing, against destructive environmental conditions, Series KS (compact) is available with either through bolt or flange mounting. Series KL (heavy duty) is horsepower rated. Series KWL (splash proof) and KXL (explosion proof) are suitable for use in severe environments. All types are available with a variety of actuators. Ask for Catalog 30.

Unimax Switch

Metal Case Limit Switches

Unimax Switch®

A Subsidiary of The Unimax Corporation, Wallingford, CT. 06492 • (203) 269-8701
or your local distributor

In a World of Touch'n Go switch to VEETRONIX & find out why we think we're a Touch Above the Rest!

OUR REPUTATION WILL TELL YOU:
With a decade of experience in designing and building switches our objective is to produce a reliable switch that meets your specifications, your time table and at a competitive price. With an in-house tool and mold shop we can respond to your needs quickly. We also furnish several OEM's with special items produced on proprietary tooling.

OUR SWITCH DESIGN WILL TELL YOU:
We design panel switches and key board switches, long and short series with bi-level, alternate actions and switching forms. Both are hermetically sealed reed switches with optional illumination. The key board switches are for PCB mounting with several options. We also design and manufacture a variety of switch caps, space-bar and supporting mechanisms.

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and find out for yourself why we think we're a
TOUCH ABOVE THE REST!

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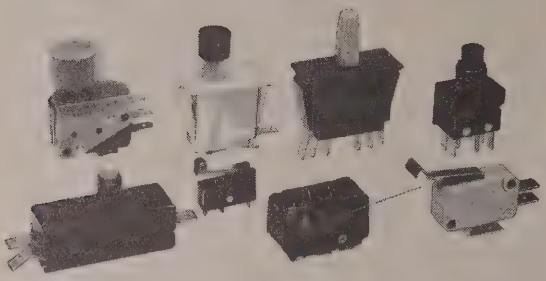
VEETRONIX™

VEETRONIX, INC.
P. O. Box 480 • Lexington, Nebraska 68850
308-324-4600

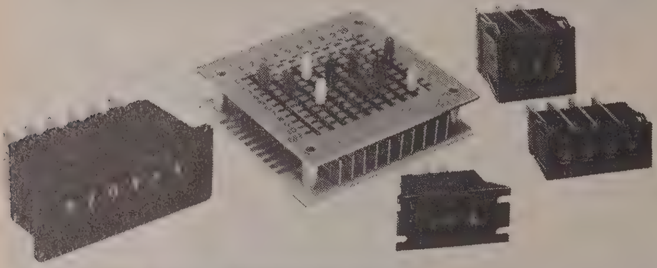
Take your pick from this CHERRY crop of fine products: CUSTOM PC BOARDS AND...



PRECISION SWITCHES

Whatever you make . . . you can make it better with a Cherry switch. Cherry snap-action switches are designed with a unique coil spring mechanism for longer mechanical life. Vast choice of sizes, operating forces, mountings, termination and actuators with electrical ratings from 1 through 25 amps. Gold crosspoint contact switches for low energy circuits, too.

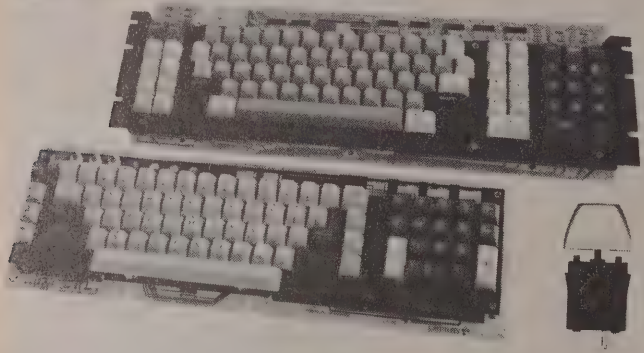
Phone: 312/587-3500



SELECTOR SWITCHES

When you need a switch to count . . . count on Cherry. For thumbwheel, leverwheel and pushwheel switches in a full range of alphanumeric readouts and output codes. Full range of sizes, too. And, for matrix selector switches with up to 2784 crosspoints . . . standard and stocked.

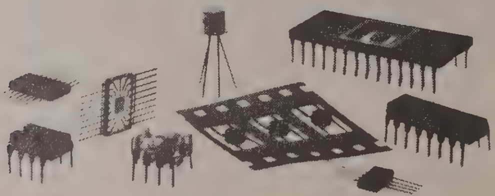
Phone: 312/587-3500



KEYBOARDS & KEYBOARD SWITCHES

Solid state . . . hard contact . . . or membrane? Cherry provides a broad range of custom designed keyboards in your choice of "any of the above" technologies. Plus, numerous standard keyboards available off-the-shelf . . . including the versatile, modifiable 67-key PRO. Many keycap colors, shapes, sizes and legends to choose from. Keyboard switches, too.

Phone: 312/587-3522



INTEGRATED CIRCUITS

Need a custom bipolar IC? Take your pick of linear or I^2L digital . . . or a combination of both on the same chip. Cherry designed tooling or your own. Semi-custom and standard ICs, too.

Phone: 401/885-3600

ALPHANUMERIC

DISPLAY PRODUCTS

A 16 character alphanumeric display system with microprocessor controlled circuitry for less than $90.00 in production quantities is only one of Cherry's cost-effective applications of gas discharge display technology. Also offered are numeric and alphanumeric display panels and systems for virtually any application.

Phone: 312/587-3538

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CHERRY®

CHERRY ELECTRICAL PRODUCTS CORP.
3600 Sunset Avenue, Waukegan, IL 60087 • TWX 910/235-1572

KEYBOARDS

Manufac-turer	Key Switches	Type					Features								Keypads
					Membrane										
		Mechanical (Hard Contact)	Capacitive	Hall Effect	Full Travel	Nonfull-Travel	Conductive Elastomers	Low Profile	Sealed Keyboard	Back Lighted	Illum. Switches	Modular	Custom Legends & Symbols	Custom Capabilities	
AMP Inc.		1B•1761						1B•1761	1B•1761	1B•1761			1B•1761	1B•1761	1B•1761
Bowmar		1B•1762*								1B•1762*	1B•1763*		1B•1762*	1B•1762*	1B•1762
Cherry Electrical	1B•1767	1B•1764	1B•1764			1B•1768		1B•1764			1B•1764		1B•1764		1B•1766
Flex-Key		1B•1770					1B•1771*	1B•1770	1B•1771	1B•1770	1B•1770		1B•1770	1B•1770	1B•1770
Grayhill	1B•1778	1B•1772				1B•1776		1B•1776	1B•1774	1B•1774		1B•1778	1B•1772	1B•1779	1B•1772
Industrial Electronic Engineers		1B•1781						1B•1781	1B•1781				1B•1781	1B•1781	
Mantex		1B•1783				1B•1783		1B•1783	1B•1783	1B•1783			1B•1783	1B•1783	
Mechanical Enterprises	1B•1784	1B•1784						1B•1785		1B•1785	1B•1785		1B•1785	1B•1785	1B•1785
Micro Switch		1B•1786	1B•1786	1B•1786		1B•1786		1B•1786	1B•1786						
Oak Switch	1B•1789	1B•1789			1B•1789			1B•1789	1B•1789						1B•1789
Orbit		1B•1790*						1B•1790	1B•1790	1B•1790			1B•1790	1B•1790	
George Risk Inds.	1B•1792	1B•1792											1B•1792	1B•1792	1B•1792

* Mil. Spec.

For manufacturers' sales offices, see yellow pages

NEED MORE INFORMATION?

USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
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QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?

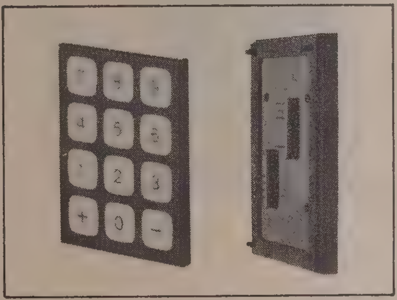
AMP keyboards—technology and experience to give your products a competitive edge.

Proven in more than 1,000 diverse applications . . .
■ Consumer products ■ Telecommunications ■ Data processing ■ Appliances ■ Instrumentation

Gives you more choice . . .
■ Standard or custom designs ■ Micromotion to full travel ■ Sublimated graphics that won't peel or wear ■ Static protection ■ EMI/RFI Shielding

And more choice . . .
■ Temperature range: −40°C to +65°C ■ Key travel: 0.005 to 0.125 inch ■ Profile thickness: 0.015 to 0.625 inch ■ Life: .5 to 10 million operations ■ Encoding: single pole, matrix, or custom ■ Operating force: 3 to 18 ounces ■ Termination: Printed or flex tail (range of center to center, 0.100 inch minimum) ■ Capacitance: ≤20 pf ■ Contact Bounce ≤6 ms ■ Contact Rating: 20 ma at 30 vdc

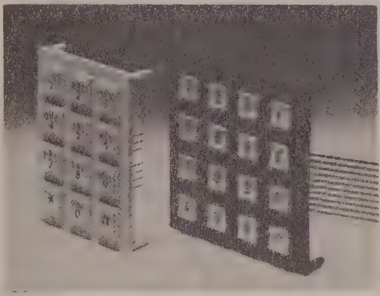
And high reliability
■ Designed and tested to meet the requirements of **MIL STD 810C**



Model EC Environmentally-Sealed Tactile Keyboards

■ Environmentally resistant design ■ "Snap action" feedback for positive data entry ■ Electrically and physically stable ■ Standard and custom legend formats available ■ Life — 1 million operations

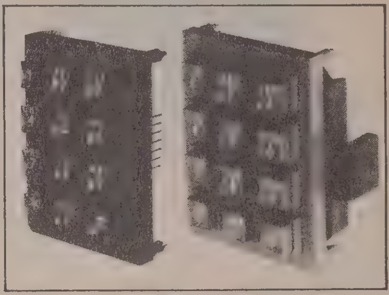
Request Catalog No. 81-637



Short-Stroke ET Keyboards

■ "Snap action" feel ■ 12 and 16 key models available ■ Long life — 10 million operations ■ Matrix encoding standard with other options available

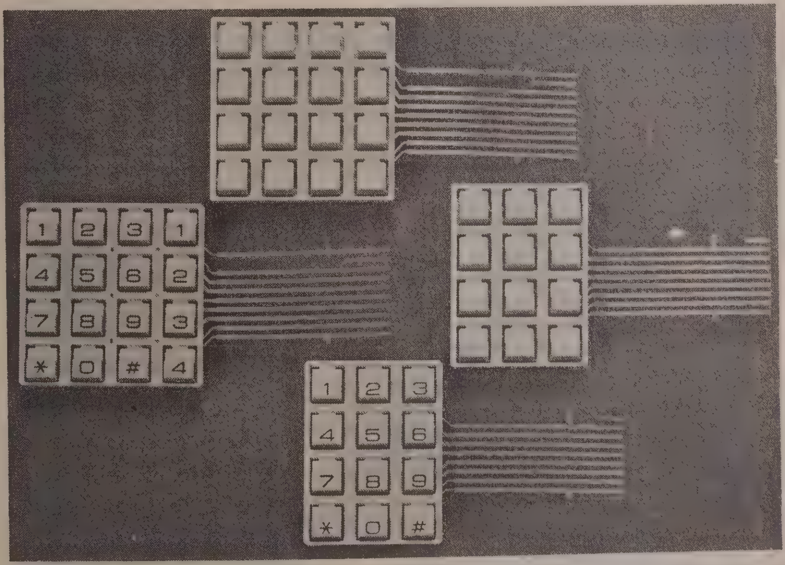
Request Catalog No. 81-639



Long-Stroke LT & BT Telephone Keyboards

■ Western Electric and GTE telephone keyboard "look-alike" ■ Simple mounting ■ Standard and optional encodings available ■ Low cost ■ .125 [3.18] key travel ■ Life — 10 million operations

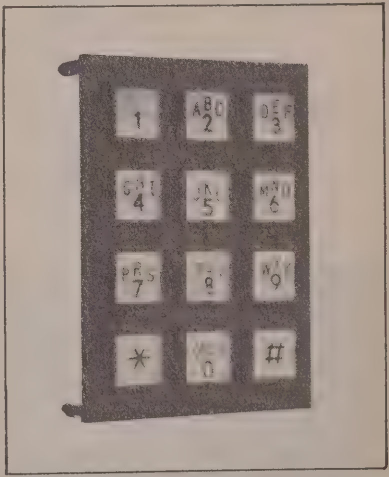
Request Catalog No. 81-641



Model EH Hinged-Key Keyboards

■ Several encodings available ■ Low profile tactile feedback ■ Stackable for large arrays ■ Life—½ million operations

Request Catalog No. 81-640



Model BL (Back Lightable) Tactile Keyboards

■ Translucent keytops ■ Proprietary key marking insures long wear ■ Snap-action tactile feel ■ Long life—1 million operations ■ Easy front panel mounting

Request Catalog No. 81-642

Need more details? Call AMP Customer Service at (717) 780-4400, or write AMP Incorporated, Harrisburg, PA 17105.

Specifications subject to change. Consult AMP Incorporated for latest design specifications.

AMP — Trademark of AMP Incorporated

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INCORPORATED

BOWMAR INSTRUMENT CORPORATION/Aerospace Division
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(219) 747-3121

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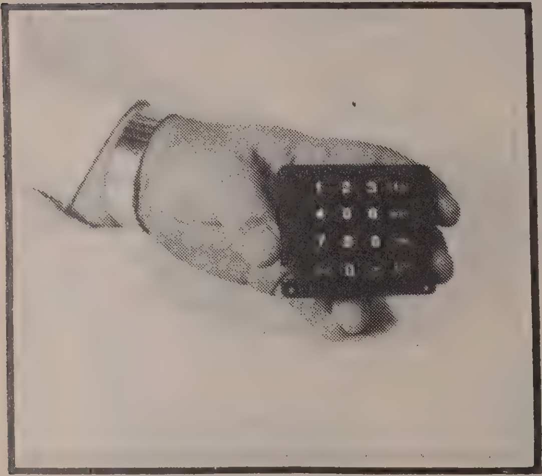
your worldwide source of aerospace keyboards, components, displays, and systems

OFF
INT
RET DEPR
CONT
GAIN
LVL
AUTO
DRIFT C/O
LIST
SEL RCL
NORM
WARN RESET

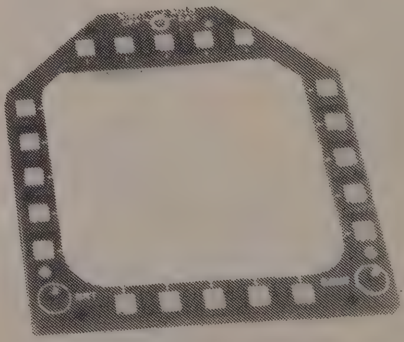
Submersible
to 3 ft. depth

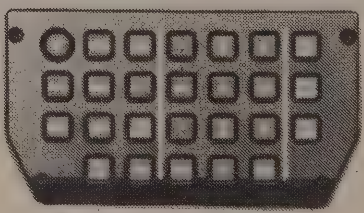


Pertinent Keyboard Specifications

- Actuation force: 25 oz ± 5 oz standard
  (other forces available)
- Travel: 0.015 in., 0.062 in. Standard
- Contact Resistance: Digital Logic Compatible (Gold on Gold)
- Contact Bounce: 1 ms typical
- Tactile Element: Various metallic materials plated gold
- Lighting: Incandescent, LED, and electroluminescent lamp sources
- Environmental standards are in accordance with typical airborne/ground military specifications for:
  - Temperature
  - Altitude
  - Rain
  - Humidity
  - Salt Spray
  - Vibration and Shock

Each design produced meets environmental requirements for the specific application.





Encoding Electronics
Included-LED Background

Sunlight Readable
Annuniciators

Bowmar

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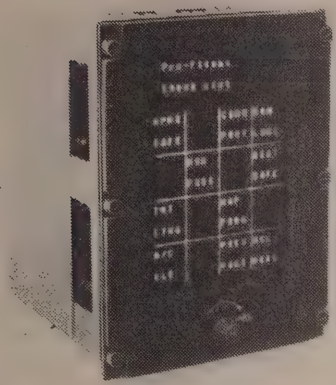
your worldwide source of aerospace keyboards, components, displays, and systems



16 Station Multifunction Keyboard Assembly

Standard Specifications

Interface: RS232C
Display Font: BIC version of standard ASC II, character set
Brightness Control: Front panel (manual)
Display: Red LED, 5x7 Dot Matrix
Overlay Markings: Window pane, white dividing line
25 Ounce Switch Actuation Force
Unit Color: Lusterless black
External Connector: 37 pin "D" type
RS232 BAUD Rate: 1200/2400
Power Supply: None (See options)
Mounting: MS25212 (5¾" standard rack mounting)

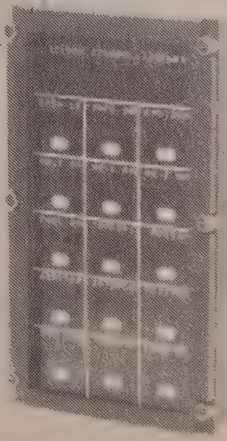
Options Available

Interface: 1553A/B, 8 BIT/16 BIT Parallel, RS422
Display Font: Customer Specified, On Line Programmable
Brightness Control: Automatic or Remote Dimming
Display: High Efficiency Red LED, Yellow or Green LED
Overlay Markings: Customer Specified, For Example: Raised Keystation Dividers
Unit Color: Customer Specified Color
External Connector: Customer Specified
RS232 BAUD Rate: Customer Specified
Power Supply: Logic Power Supply Available
Mounting: Customer Specified

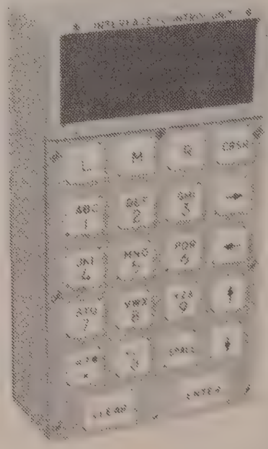
Custom Design Flexibility

- High Reliability — Trouble free and long lasting construction.
- Keyboards combined with electronic packages.
- Custom designs — stand alone keyboards.
- Keyboards combined with panels.
- Dedicated or programmable keystations or controllers.
- Lighted or unlighted configurations.
- Personalized service for solving your problem or design.
- Prompt turnaround and delivery.
- MIL-Q-9858A Quality System.

- 15 Keystations
- 16 Segment LED Legends (red)
- Low power
- Ideal for use where panel depth is limited (less than 2")
- Standard 5¾" wide mounting
- RS232C interface



All necessary electronics for interface, display driving and other related needs are found behind the display surface. These electronics may be remoted where space conflicts. DC power supply is needed for operation.



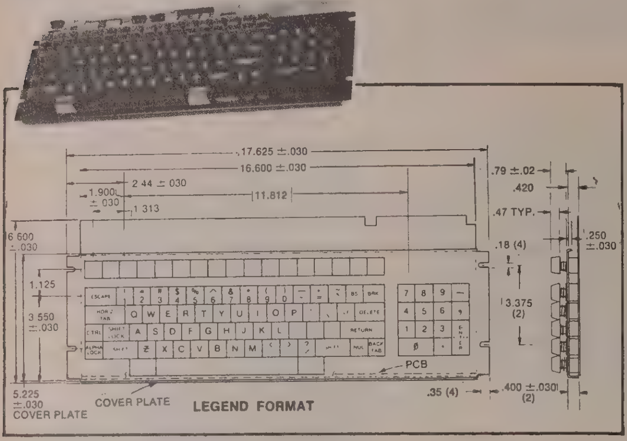
Display & Entry System

This computer Peripheral Display & Entry System provides complete interface capability with only four control lines and an 8-bit bi-directional data bus.

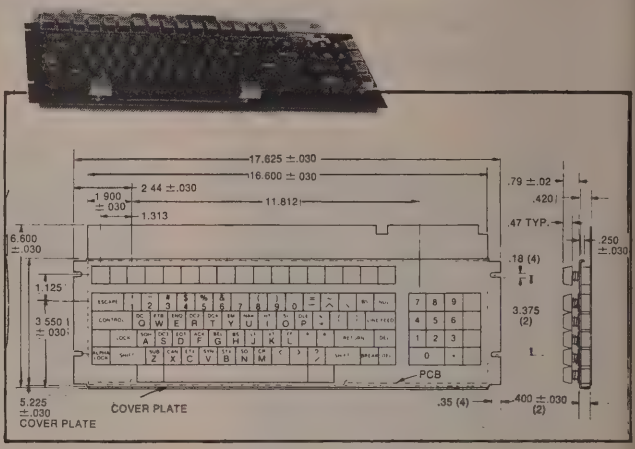
- Microprocessor controlled
- Full alpha-numeric display from a 6-bit ASCII data input
- 5x7 dot matrix character generation
- Blinking character cursor
- Two-key rollover on data entry
- Fully debounced and decoded keystroke data
- Designed to meet applicable MIL specifications
- Choice of keyboard options

CHERRY® Keyboards

B4VE-9501 SECRETARIAL


17.625 ±.030
16.600 ±.030
2 44 ±.030
1.900 ±.030
11.812
1.313
.79 ±.02
.420
.47 TYP.
.250 ±.030
.18 (4)
6.600 ±.030
1.125
3.550 ±.030
3.375 (2)
PCB
5.225 ±.030 COVER PLATE
COVER PLATE
LEGEND FORMAT
.35 (4)
.400 ±.030 (2)

B4VE-9601 COMMUNICATIONS


17.625 ±.030
16.600 ±.030
2 44 ±.030
1.900 ±.030
11.812
1.313
.79 ±.02
.420
.47 TYP.
.250 ±.030
.18 (4)
6.600 ±.030
1.125
3.550 ±.030
3.375 (2)
PCB
5.225 ±.030 COVER PLATE
COVER PLATE
.35 (4)
.400 ±.030 (2)

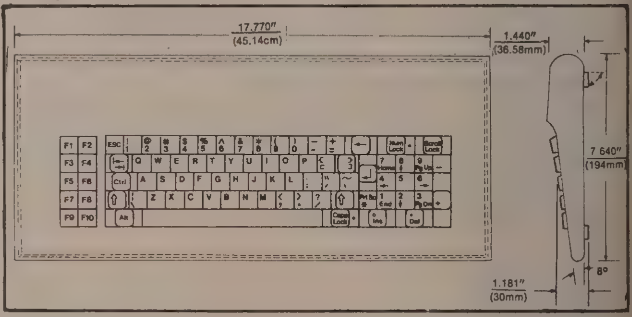
CHERRY SOLID STATE KEYBOARDS

The B4VE-9501 and B4VE-9601 keyboards are comprised of 95 and 96 capacitive encoded keys respectively. Both include the full ASCII alphanumeric typing array, a right hand pad, and a top row of 17 keys with re-legendable caps. Both have two user labeled keys on either side of the space bar. The B4VE-9501 has a 14 key auxiliary right hand numeric pad and the B4VE-9601 has a 15 key right hand numeric pad of which four are user labeled.

KFN3-8354

83 KEY IBM*PERSONAL COMPUTER COMPATIBLE KEYBOARD IN A 30mm DIN ENCLOSURE

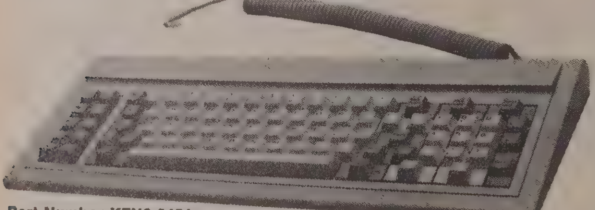
Part Number KFN3-8354
(Without housing specify **Part Number BFN3-8354**)


17.770" (45.14cm)
1.440" (36.58mm)
7.640" (194mm)
1.181" (30mm)
8°

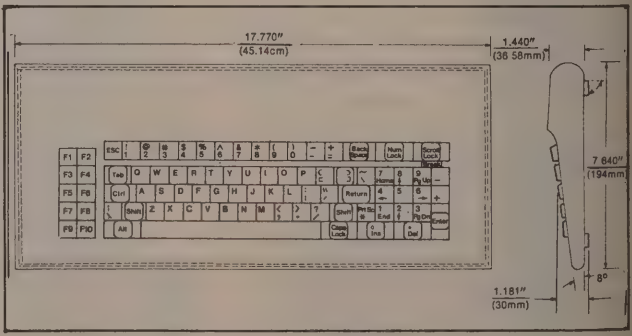
- Selectable output formats:
  1. IBM* compatible interface at 18K Baud serial output with UP/DOWN codes and special handshaking.
  2. ASCII jumpers allow conversion to serial with TTL differential output. (Baud rates 300, 1200 or 9600)
- 2-shot molded keycaps with matte finish
- Full N-key rollover
- Lighted "alpha lock" and "num lock" keys
- Chassis ground • External reset • Matching color, shielded coil cord with 5-pin circular DIN connector. • Auto-repeat
- Low profile — 30mm (1.181") from enclosure base to center point at home row keycap top
- Input Power: +5 VDC @ 250 mA typ., 360 mA max.

KFN3-8451

84 KEY IBM*PERSONAL COMPUTER COMPATIBLE KEYBOARD IN A 30mm DIN ENCLOSURE



Part Number KFN3-8451
(Wthout housing specify **Part Number BFN3-8451)**


17.770" (45.14cm)
1.440" (36.58mm)
7.640" (194mm)
1.181" (30mm)
8°

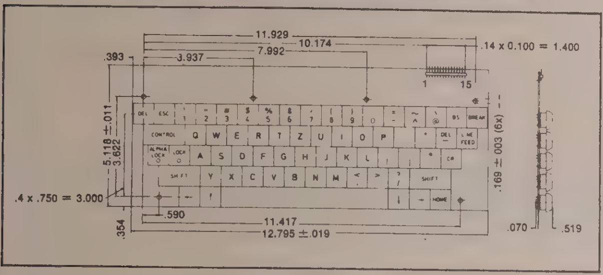
- Selectable output formats
  1. IBM* compatible interface at 18K Baud serial output with UP/DOWN codes and special handshaking. differential output. (Baud rates 300, 1200 or 9600)
  2. ASCII jumpers allow conversion to serial with TTL
- 2-shot molded keycaps with matte finish
- Full N-key rollover
- Lighted "alpha lock" and "num lock" keys
- Chassis ground • External reset • Matching color, shielded coil cord with 5-pin circular DIN connector • Auto-repeat
- Low profile — 30mm (1.181") from enclosure base to center point at home row keycap top
- Input Power: +5 VDC @ 250 mA typ., 360 mA max.

* IBM is the registered trademark of the International Business Machines Corp.

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Keyboards

G80-0316


11.929
10.174
7.992
3.937
.393
.14 x 0.100 = 1.400
1
15
5.118 ±.011
3.622
.169 ± .003 (6x)
.4 x .750 = 3.000
.590
11.417
12.795 ±.019
.354
.070
.519

- Serial ASCII Coded • 1200 Baud • Super Low Profile
- M8 Type Key Module
- DIN Compatible • Gold wire crossbar contacts
- 65 key array • 3 Modes
- Electronic Shift/Lock function and Alpha/Lock function with LED signal
- Automatic Power On/Reset function
- Power requirement: +5V/100 mA
- Negative logic Data output with open collectors or Tri-State (optional)
- Attractive brown keycaps with contrasting legends

MECHANICAL SPECIFICATIONS

Rest Height Uncovered (spherical) — .426″ ±.015″ (11.68 ±0.38 mm)

Total Travel — .100 Nom. (2.54 mm)

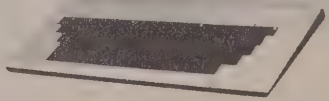
Operating Force — 2½ oz. typical (70 grams)

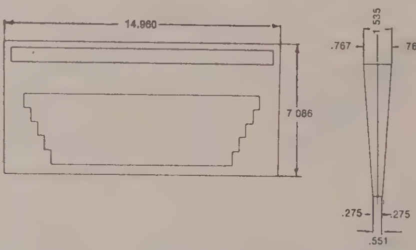
Life — 20 x 10^6

Feel — Linear — positive stop

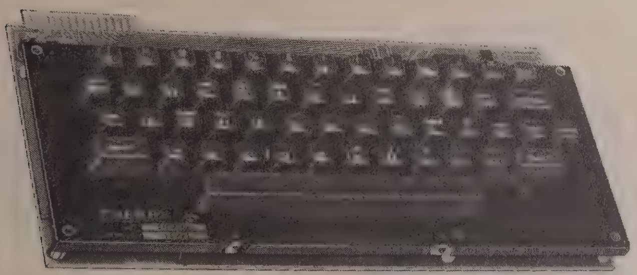
OPTIONAL G99-0056 HOUSING

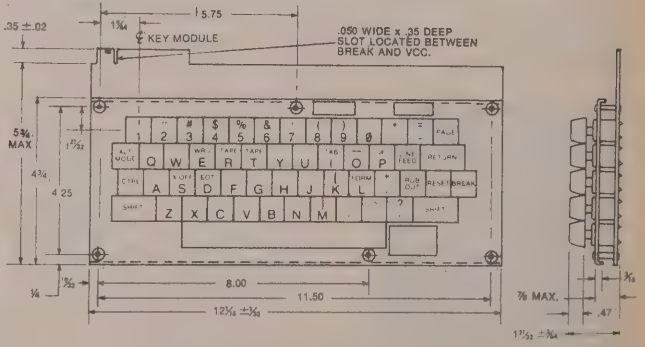
- Modern Design
- Compatible with DIN requirements
- Attractive brown/beige color




14.960
7.086
1.535
.767
.767
.275
.275
.551

B 70-4753 KEYBOARD FOR TELETYPEWRITERS

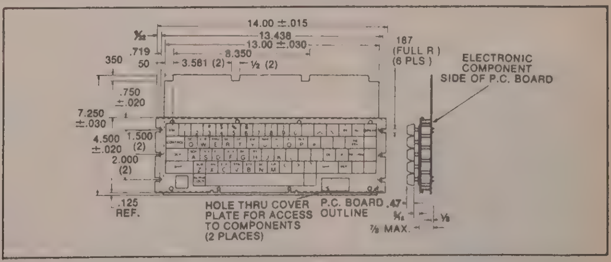



.35 ±.02
5.75
1¾
℄ KEY MODULE
.050 WIDE x .35 DEEP SLOT LOCATED BETWEEN BREAK AND VCC.
5¾ MAX
4¾
4 25
¼
8.00
11.50
12⅛ ±⅓₂
⅞ MAX.
.47

- 53 keymodules • Key Module Layout according to ASR 33
- 4 Modes (Alpha-Field only letters) • Code according to ASCII

B 70-05AB UNIVERSAL-KEYBOARD WITH ALPHA-LOCK

- Full 67 key array
- Five user-definable spare keys with keycaps that have "quick change" clear plastic tops. These keyswitches are not connected electrically, but can be conveniently hard-wired so as to output any code.
- TTL and DTL compatible output circuitry.


14.00 ±.015
13.438
13.00 ±.030
8.350
3.561 (2)
½ (2)
.187 (FULL R) (6 PLS)
ELECTRONIC COMPONENT SIDE OF P.C. BOARD
.350
.719
.50
.750 ±.020
7.250 ±.030
4.500 ±.020
1.500 (2)
2.000 (2)
.125 REF.
HOLE THRU COVER PLATE FOR ACCESS TO COMPONENTS (2 PLACES)
P.C. BOARD OUTLINE
.47
⅞ MAX.

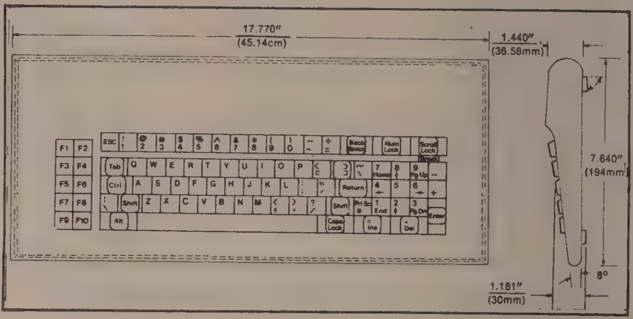
- Only one power supply voltage required: +5 volts at 325 ma. max.
- Positive logic with outputs resting low.
- Four mode keyboard offers (1) lower case mode, (2) upper case mode, (3) control case mode and (4) teletypewriter alpha lock configuration (alpha lock depressed).

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Keyboards

KXN3-8451 CHERRY IR WIRELESS KEYBOARD — 84 KEY, COMPATIBLE WITH IBM PC JR.*

Comes in DIN enclosure. This state-of-the art keyboard is equipped with CMOS electronic components and special power circuitry which requires power only when a key is depressed. This extends life of 4 AA alkaline batteries. May be used in a wireless, simplex mode at distances of 20 feet (line-of-site) with IBM PC jr. For use with IBM PC use the same Cherry IR Wireless Keyboard KXN3-8451 plus IR Receiver Part No. 0B99pl3AL which may be plugged into the keyboard jack on the IBM PC. This IR Receiver converts the PC jr code signals to IBM PC code. Also available with keyboard is optional cable (Part No. 37CO-C913) for wired use.


17.770″
(45.14cm)
1.440″
(36.58mm)
7.640″
(194mm)
1.181″
(30mm)
8°

- ASCII jumpers allow conversion to serial with TTL
- 2-shot molded keycap matté finish
- Full N Key rollover
- Lighted "alpha lock" and "num lock" keys
- Chassis ground. External reset. Matching color shielded coil cord with 5 pin circular DIP connector. Auto repeat
- Low profile-30mm (1.181″) from enclosure base to center point of home row key cap top

IBM Compatible interface at 18K Baud serial output with Up/Down codes and special handshaking, differential output. (Baud rates 300, 1200, 9000)

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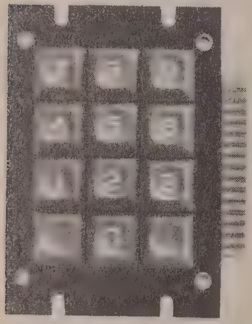
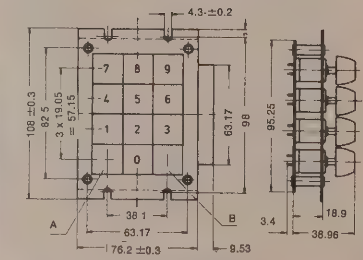
* IBM is the registered trademark of the International Business Machines Corp.

KEYPADS

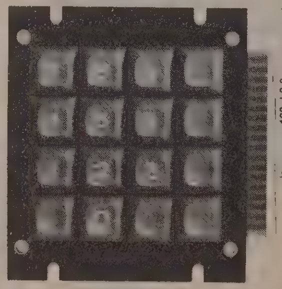
B65-1712 3 x 4

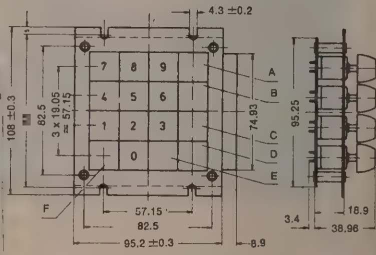



4.3-±0.2
7
8
9
4
5
6
1
2
3
0
108 ±0.3
82.5
3 x 19.05 = 57.15
63.17
98
95.25
A
B
38.1
63.17
76.2 ±0.3
9.53
3.4
18.9
38.96

B 65-1712 (M6 TYPE)
12 Keymodules
Standard keycap-color: grey
Non-encoded

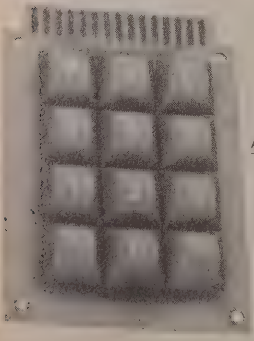
B65-1716 4 x 4

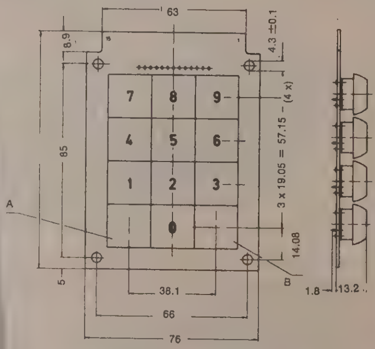



4.3 ±0.2
7
8
9
4
5
6
1
2
3
0
A
B
C
D
E
F
108 ±0.3
82.5
3 x 19.05 = 57.15
74.93
95.25
57.15
82.5
95.2 ±0.3
8.9
3.4
18.9
38.96

B65-1716 (M6 TYPE)
16 Keymodules
Non-encoded

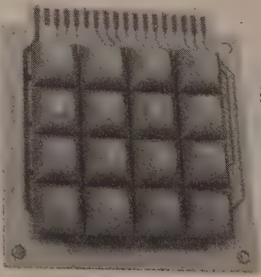
G80-0077 3 x 4

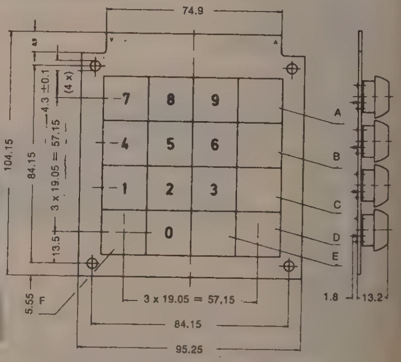



63
8.9
4.3 ±0.1
7
8
9
4
5
6
1
2
3
0
3 x 19.05 = 57.15 (4 x)
85
A
B
14.08
5
38.1
66
76
1.8
13.2

Super Low Profile M8 Type Keypad of 16 Keymodules
Non-encoded

G80-0084 4 x 4



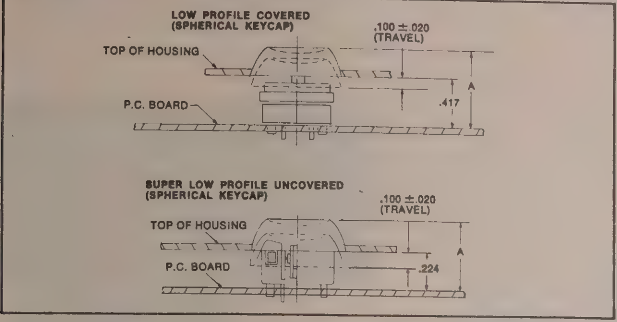

74.9
7
8
9
4
5
6
1
2
3
0
A
B
C
D
E
F
104.15
84.15
4.3 ±0.1
(4 x)
3 x 19.05 = 57.15
13.5
5.55
3 x 19.05 = 57.15
84.15
95.25
1.8
13.2

Super Low Profile M8 Type Keypad of 12 Keymodules
Non-encoded

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Keyboard Switches

M8 SERIES — SUPER LOW PROFILE DIN-COMPATIBLE GOLD CROSSPOINT CONTACT



Super low profile technology is available in individual keymodules or as complete keyboards. Keymodules are offered in covered or uncovered version with spherical caps and covered version with cylindrical sculptured caps.

- Super low profile from P.C. board to center point of home row keycap top—
  - .426″ uncovered spherical keycap
  - .619″ covered spherical keycap
- Linear feel with positive stop
- New ergonomic cylindrical button set
- Gold Crosspoint Contact switching

SUPER LOW PROFILE M8 MODULES

Part Number	Description
M81A-0100	Standard Force, Uncovered, Very Low Profile.
M81A-01R0	Standard Force, Uncovered, Very Low Profile, Red LED.
M81G-0100	Higher Force, Uncovered, Very Low Profile.
M81E-0500	Standard Force With Cover.
M81E-05R0	Standard Force With Cover With Red LED.
M81H-0500	Higher Force With Cover.

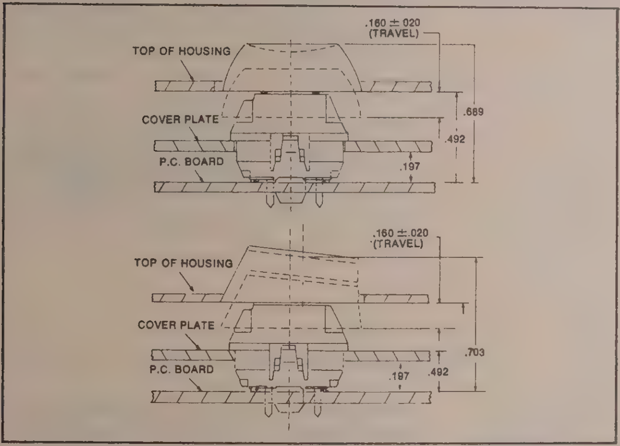
MECHANICAL SPECIFICATIONS

Rest Height (A)	.426″ ±.015″ (10.82 ±0.38mm) — Type I
Pretravel	.063″ ±.024″ (1.60 ±0.61mm)
Total Travel	.100 Nom. (2.54mm)
Operating Force	2½ oz. typical (70 grams)
Life	10 x 10⁶
Mounting	Printed Circuit Board (no coverplate)
Feel	Linear — positive stop

ELECTRICAL SPECIFICATIONS

Contact Rating:	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current switching	0.125A max.
Current carry	0.5 max.
Voltage	28V max.
Initial Contact Resistance — milliohms	200 max. (typically 25m)

MX SERIES — LOW PROFILE DIN-COMPATIBLE GOLD CROSSPOINT CONTACT



- Low profile — .689″ from PC board to the center point of home row keycap top with lo-pro spherical cylindrical sculptured keycaps.
- Linear or tactile feel — positve stop.
- Full Travel — .160″.

LOW PROFILE MX MODULES

Part Number	Description
MX1A-11NN	Standard Force, Linear, Face Plate Mount.
MX1A-21NN	Higher Force, Linear, Face Plate Mount.
MX1A-11NW	Standard Force, Linear, PCB Mount.
MX1A-21NW	Hgher Force, Linear, PCB Mount.
MX1A-A1NN	Standard Force, Tactile, Face Plate Mount.
MX1A-B1NN	Higher Force, Tactile, Face Plate Mount.
MX1A-A1NW	Standard Force, Tactile, PCB Mount.
MX1A-B1NW	Higher Force, Tactile, PCB Mount.
MX1A-31NN	Alternate Action, Face Plate Mount.
MX1A-31NW	Alternate Action, PCB Mount.

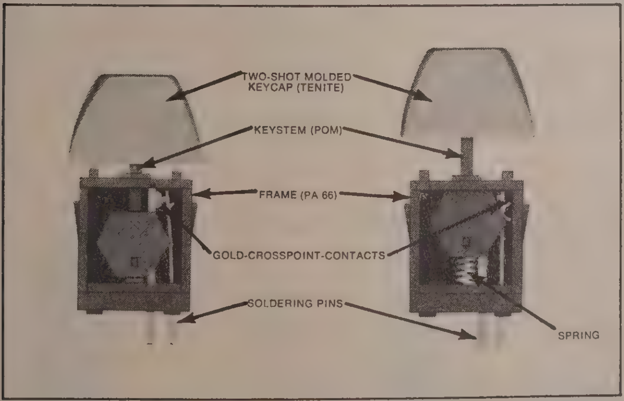
MECHANICAL SPECIFICATIONS

Rest Height ("A")	.689″ ±.015″ (17.5 ±0.38 mm)
Pretravel	.080″ ±.025″ (2.03 ±0.64 mm)
Total Travel	.160″ Nom. (4.06 mm)
Operating Force	2.5 oz. typical (70 grams)
Life	20 x 10⁶
Mounting	Cover Plate
Feel	Linear or tactile feel — positive stop

ELECTRICAL SPECIFICATIONS

Contact Ratng:	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current switching	0.125A max.
Current carry	0.5A max.
Voltage	28V max.
Initial Contact Resistance — milliohms	200 max. (typically 25m)

M4/M5/M6 SERIES — REGULAR PROFILE GOLD CROSSPOINT KEYBOARD SWITCHES



The proven design concept — crossed knife edge contact configuration — provides high force per unit of contact area and virtually eliminates contact closure interference by contaminates. Precious metal contact material (W/E Alloy #1) consists of 69% gold, 25% silver and 6% platinum. Contact interfaces are inert to chemical action with resultant low contact resistance (typically 25 milliohms).

REGULAR PROFILE KEYSWITCH

Part Number	Operating Force	Stem Angle	Action
M41-0100	6 oz.	0°	Momentary, Lighted, 1A Contact
M41-0103	2½ oz.	0°	Momentary, Lighted, 1A Contact
M51-0182	2½ oz.	10°	Momentary, 1A Contact
M51-0143	6 oz.	0°	Momentary, 1A Contact
M51-0229	4 oz.	0°	Momentary, 1A Contact
M61-0120*	2½ oz.	0°	Momentary, 1A Contact
M61-0800	2-4½ oz.	0°	Alternate Action, 1A Contact
M62-0100	2-4½ oz.	0°	Momentary, 2A Contact

* Replaces M61-0100

MECHANICAL SPECIFICATIONS

Operating Force	2½ oz. ±½ oz. Std. (Also available in forces from 2 oz. and higher)
Pretravel	.085 ±.030 Std. (Alternate action version pretravel .030″ to .065″)
Total Travel	.160 ±.020 Std.
Key Module Case Material:	Thermoplastic (Nylon)
Temperature	Operating — 0°/60°C Storage — −35°C/65°C

ELECTRICAL SPECIFICATIONS

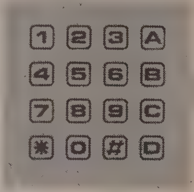
Contact Rating (Form A contacts)	
DC Resistive	3W max.
AC Resistive	3 VA max.
Current	0.125 amp. max. switching 0.5 amp. max. carry
Voltage	28V max.
Initial Contact Resistance	200 milliohms max. (typically 24 milliohms)

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Flat Panel Membranes

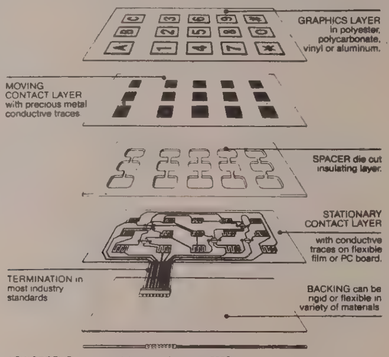
STANDARD MEMBRANES — FLAT PANELS

1
2
3
4
5
6
7
8
9
*
0
#

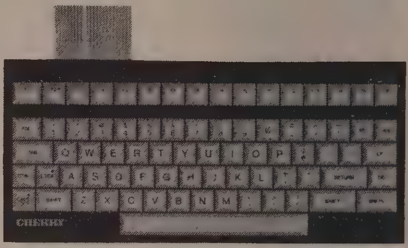

1
2
3
A
4
5
6
B
7
8
9
C
*
0
#
D

MEMBRANE STANDARDS

Part Number	Key Array	Constructon	Circuitry	Graphics	Termination
V1G1-0071	3 x 4	Flex-Circuit W/ADH Backer	Matrix	Gray/Black Velvet Text	Flex-Tail 2.62 in. Long
V2G1-0071	3 x 4	Flex-Circuit W/ADH Backer	Matrix	None	Flex-Tail 2.66 in. Long
V1G1-0075	4 x 4	Flex-Circuit W/ADH Backer	Matrix	Gray/Black Velvet Text	Flex-Tail 2.62 in. Long
V2G1-0075	4 x 4	Flex-Circuit W/ADH Backer	Matrix	None	Flex-Tail 2.66 in. Long
V1G1-0019	77 Key Alpha-Numeric	Flex-Circuit W/ADH Backer	Modified Matrix	Brown/Tan Embossed	Flex-Tail 4.46 in. Long
V1NV-0112	77 Key Alpha-Numeric	V1NV-0050 in Housing	ASCII Output Several Options	Brown/Tan Embossed	Parallel & Serial Headers


GRAPHICS LAYER in polyester, polycarbonate, vinyl or aluminum.
MOVING CONTACT LAYER with precious metal conductive traces
SPACER die cut insulating layer.
STATIONARY CONTACT LAYER with conductive traces on flexible film or PC board.
TERMINATION in most industry standards
BACKING can be rigid or flexible in variety of materials

LOW PROFILE means total thickness from just .030"



VINV-0112
Includes Cable

STANDARD 77-KEY KEYBOARD

Flexible adhesive backer, Part No. V1G1-0019; Contact factory for other versions, including full-logic rigid backer, and for available housing.

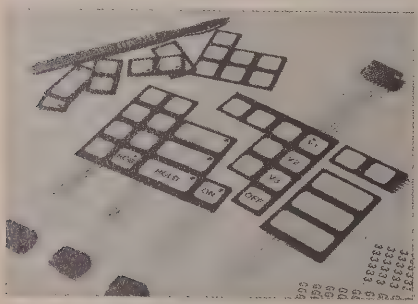
MEMBRANE ELECTRICAL SPECIFICATIONS

Maximum ratings: 100 ma @ 35 VDC 1.5 watts. Circuit resistance (closed): 100 ohms (max) for screened silver; 50 ohms (max) for etched copper; (open): 10 megohms (min). Circuit capacitance: 10 pf (typ). Contact bounce (at 100 ohms): 10 msec (typ). Life expectancy (operations): 5 x 10^6 (min).

STANDARD SWITCHES

The 4 x 3 panel has the numerals 0 to 9, with * and #, while the 4 x 4 panel provides four additional key positions with alpha characters A — D. Or, you can buy either without graphics for custom graphic capability.

PROTOPAD MEMBRANE PANELS

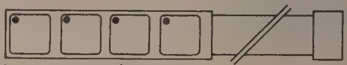


As a design aid to the Engineer considering a membrane panel application, Cherry provide a cost effective prototype answer with their 'Protopad' membrane development series.

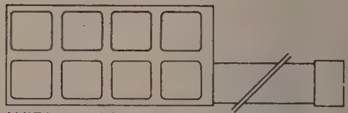
Features

- Key pad configurations of 1 x 4, 2 x 4 and 4 x 4 for economic grouping.
- Modular design provides layout matching in both the horizontal and vertical axis.
- Colour co-ordinated graphics, beige key pads on dark brown background, for balanced contrast.
- Self adhesive backing for ease of mounting.

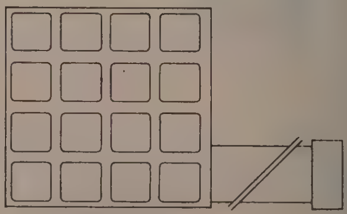
Protopad keys may be progressively cut away toward the flex tail without disturbing circuit continuity to the remaining keys.



AVIDI—0080A/0080B



AVIDI 0084A/0084B



AVIDI 0085A/0085B

PROTOPAD ORDERING CODE

	LED Window	Pad Embossed	With Connector	No. of Track Terminations 'N'	No. of Switch Pads	Dimensions in mm Pad Pitch 19mm Depth 0.8mm					
						A	B	C	D	E	F
AVID-I80A		•		5	4	79	19	79	15	15	15
AVID-I84A		•		6	8	79	38	79	15	15	18
AVID-I85A		•		8	16	79	76	79	15	15	23

FLEXIBLE TAIL CONNECTION MATRIX

Pad Locations	a_1	b_1	c_1	d_1	a_2	b_2	c_2	d_2	a_3	b_3	c_3	d_3	a_4	b_4	c_4	d_4
Connections for all 4 Pad Modules	1 5	2 5	3 5	4 5	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
Connections for all 8 Pad Modules	1 5	2 5	3 5	4 5	1 6	2 6	3 6	4 6	— —	— —	— —	— —	— —	— —	— —	— —
Connectons for all 16 Pad Modules	1 5	2 5	3 5	4 5	1 6	2 6	3 6	4 6	1 7	2 7	3 7	4 7	1 8	2 8	3 8	4 8

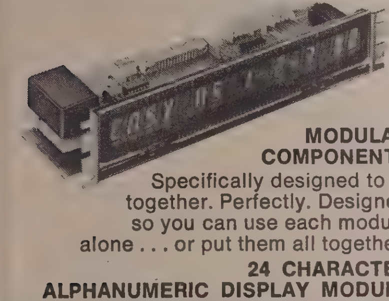
CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

CHERRY Displays

TECHNICAL INFORMATION

- 100,000 hour display life. • Wide viewing angle.
- Baud rates from 300 to 9600 selectable on back panel.
- RS232C, RS422, 20 ma loop, or TTL parallel interface operation.
- End of Line Modes — left entry with automatic carriage return; writeover carriage return, horizontal scroll.
- Self-test mode: ASCII character set scrolled across panel.
- Environmental Operating Range: 0-70°C, 5-95% relative humidity (non-condensing).
- Designed to meet NEMA Pub. ICS 2-230 standard for EMI noise immunity (showering arc transients).
- Metal enclosure wth sealed bezel compatible with NEMA 12 standards.
- 115/220 VAC • Full address capability

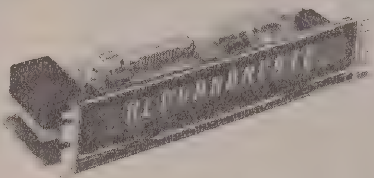
ALPHANUMERIC DISPLAY SYSTEMS



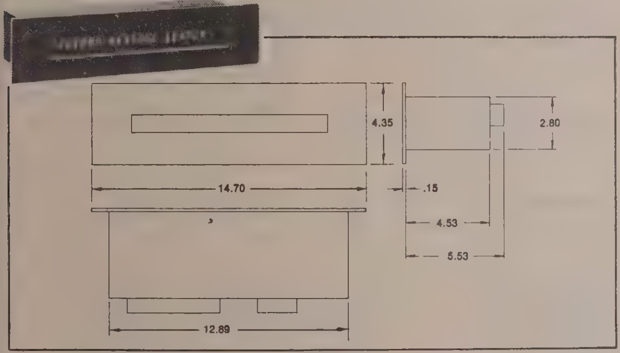
MODULAR COMPONENTS
Specifically designed to fit together. Perfectly. Designed so you can use each module alone . . . or put them all together.

24 CHARACTER ALPHANUMERIC DISPLAY MODULE
A totally self-contained system. Complete microprocessor controlled circuitry includes drivers, character generator, refresh memory and provides all standard functions.

Result	Characteristics
W424-1051 . . . requires 12 VDC only and accepts parallel or serial input — serial in either RS232 or 20 ma current loop. Selectable baud rates.	Receives only, in parallel or serial.
W424-1053 . . . requires 12 VDC only and accepts parallel or serial input (RS232 or 20 ma current loop.) Selectable baud rates. Fully interactive with half and full duplex operation capability.	Receives in parallel or serial. Sends in serial only.
W424-1058 . . . requires 12 VDC only and accepts binary input, 6 bits and strobe.	Will output a total of 64 messages, each being as long as 32 bytes. User can program his own message EPROM (2716). Requires no ASCII code or serial input.



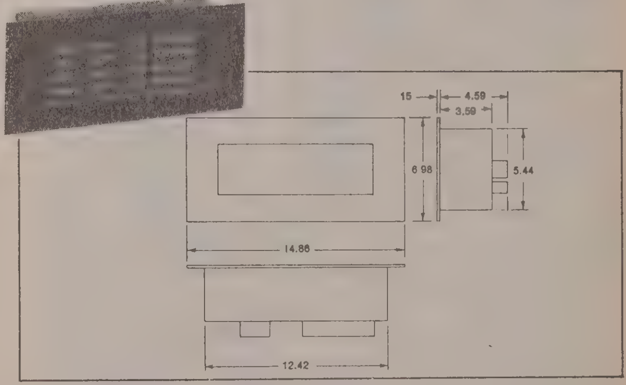
MESSAGE CENTER



4.35
2.80
14.70
.15
4.53
5.53
12.89

- 24 Characters • Alphanumeric
- Receives serial or parallel ASCII output.
- Microprocessor Controlled

W424-105B — It displays up to 24 character messages in large half-inch bright orange neon 14 segment characters.



15
4.59
3.59
6 98
5.44
14.86
12.42

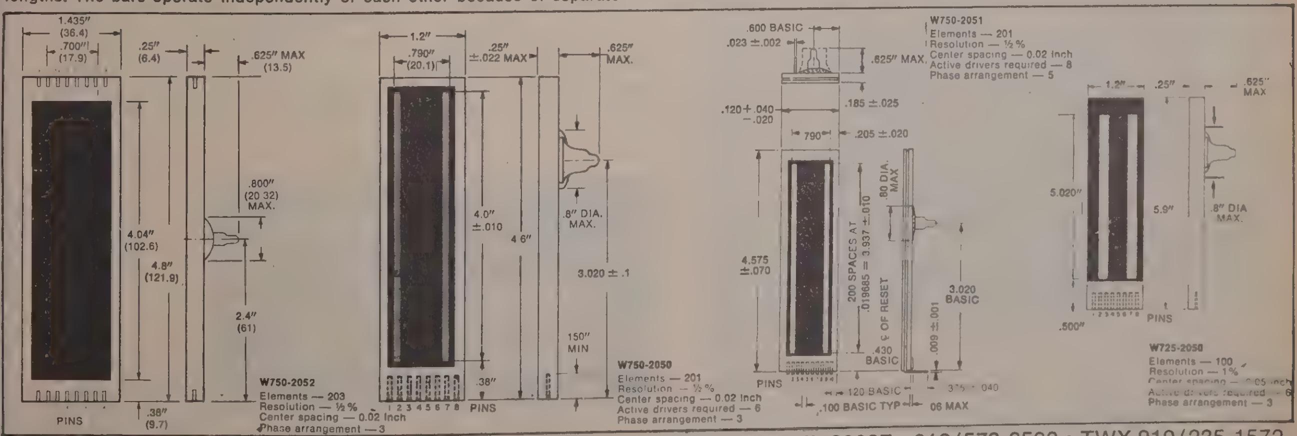
W424-105D — It can display up to 256 messages that have been stored in a nonvolatile, battery backed CMOS RAM.

W424-4040 — On a 4-line by 24 character display, the W424-4040 can show any of the 256 messages stored in the battery backed CMOS RAM memory. Each message may be up to 32 characters in length.

GAS DISCHARGE BAR GRAPH DISPLAY

The single wide bar graph is 10 inches long and is viewable at 50 feet. The elements are bussed together in a 5-phase arrangement for high brightness and provide for a flicker-free continuous appearing display.

Two separate graphs give continuous glow on precisely controlled bar lengths. The bars operate independently of each other because of separate connections. Each bar graph can be viewed from both directions at once, or from either direction. Two separate pieces of information can be viewed in each bar as long as the total elements do not exceed 201. Cathodes in each bar are bussed together in a 3-phase arrangement.



1.435″ (36.4)
.700″ (17.9)
.25″ (6.4)
.625″ MAX (13.5)
.800″ (20 32) MAX.
4.04″ (102.6)
4.8″ (121.9)
2.4″ (61)
PINS
.38″ (9.7)
1.2″
.790″ (20.1)
.25″ ±.022 MAX
.625″ MAX.
4.0″ ±.010
4 6″
.8″ DIA. MAX.
3.020 ± .1
150″ MIN
.38″
1 2 3 4 5 6 7 8 PINS
.600 BASIC
.023 ±.002
.625″ MAX.
.120 + .040 − .020
.185 ±.025
790
.205 ±.020
.80 DIA. MAX
4.575 ±.070
200 SPACES AT .019685 = 3.937 ±.010
℄ OF RESET
.009 ±.001
3.020 BASIC
.430 BASIC
PINS
.120 BASIC
.100 BASIC TYP
06 MAX
1.2″
.25″
.625″ MAX
5.020″
5.9″
.8″ DIA MAX.
PINS
.500″

W750-2052
Elements — 203
Resolution — ½%
Center spacing — 0.02 Inch
Phase arrangement — 3

W750-2050
Elements — 201
Resolution — ½%
Center spacing — 0.02 inch
Active drivers required — 6
Phase arrangement — 3

W750-2051
Elements — 201
Resolution — ½%
Center spacing — 0.02 inch
Active drivers required — 8
Phase arrangement — 5

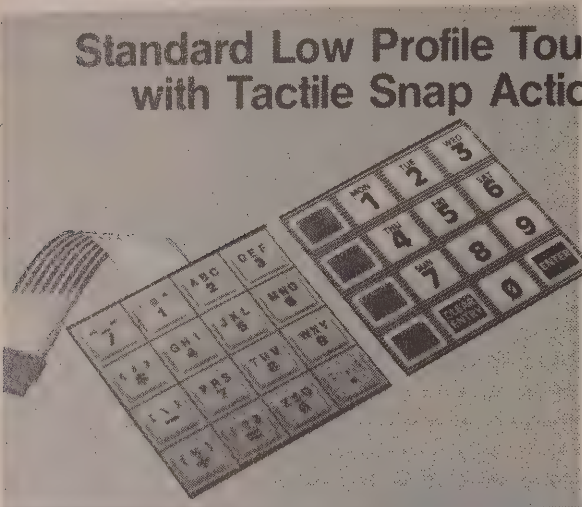
W725-2050
Elements — 100
Resolution — 1%
Center spacing — .05 inch
Active drivers required — 6
Phase arrangement — 3

CHERRY ELECTRICAL PRODUCTS CORP., 3600 Sunset Ave., Waukegan, IL 60087 • 312/578-3500 • TWX 910/235-1572

FLEX-KEY

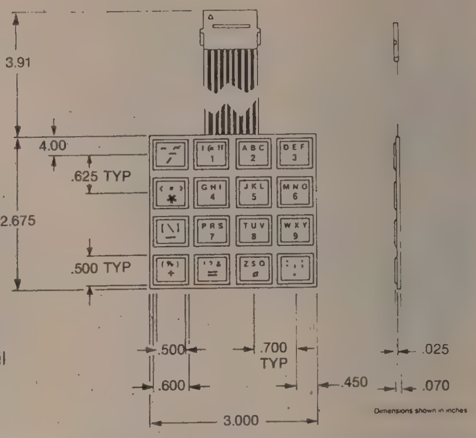
FLEX-KEY CORPORATION, 18 Sargent Street, Gloucester, Massachusetts 01930 (617) 281-2040

Standard Low Profile Touch Panels with Tactile Snap Action

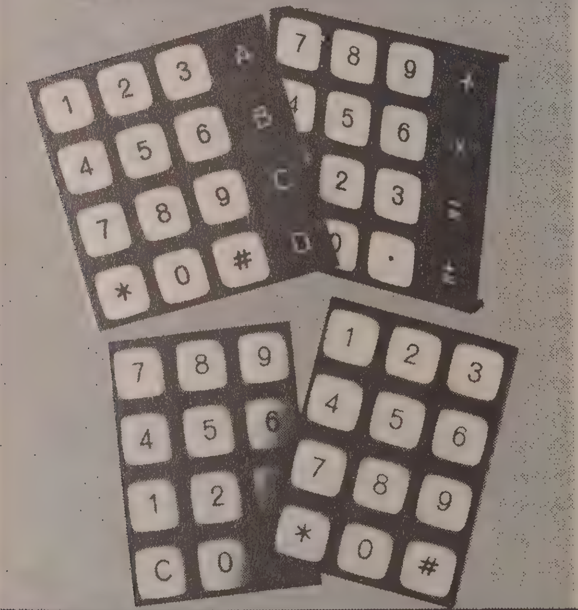


Customizing options include:

- special legends
- special circuits
- EMI/ RFI shielding
- static discharge protection.
- choice of colors
- choice of connectors
- interconnection tail length
- overlay size and shape



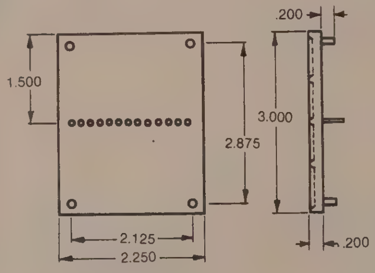
Standard Plastic Bezel Keyboards



Customizing options on Flex-Key's plastic bezel keyboards include:

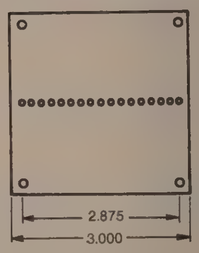
- key size, shape and arrangement
- legend and background colors
- terminal type and location
- switch matrices

12 KEY KEYBOARDS



12DK-1B 12DK-2B

16 KEY KEYBOARDS



16DK-1B 16DK-2B

12DK-1B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, 6, 3, 9, ., 8, 5, 2, 0, C, 7, 1, 4

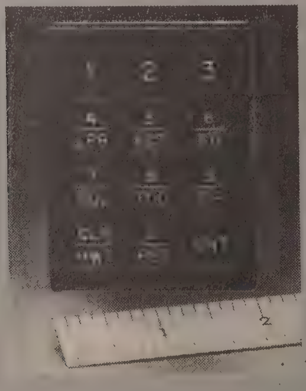
12DK-2B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, 6, 9, 3, #, 2, 5, 8, 0, *, 1, 7, 4

16DK-1B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, X, ≡, ÷, ±, 9, 6, 3, *, 8, 2, 5, 0, C, 7, 1, 4

16DK-2B: FORM A SWITCHES, TERMINAL SEQUENCE: Com, B, C, A, D, 3, 6, 9, #, 2, 8, 5, 0, *, 1, 7, 4

Custom Backlighted Keyboards for Hostile Environments

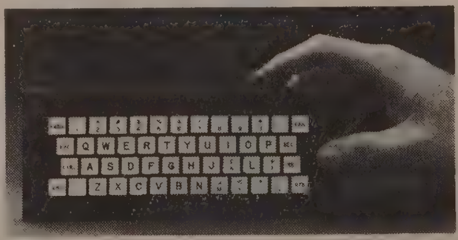
Flex-Key offers advanced electroluminescent (EL) backlighting in custom keyboard assemblies.



ILLUMINATED CHARACTERS

Low profile backlighted keyboards have custom options available including:

- special legends
- special circuits
- EMI/ RFI shielding
- static discharge protection.
- tempest protection
- encoding
- choice of colors

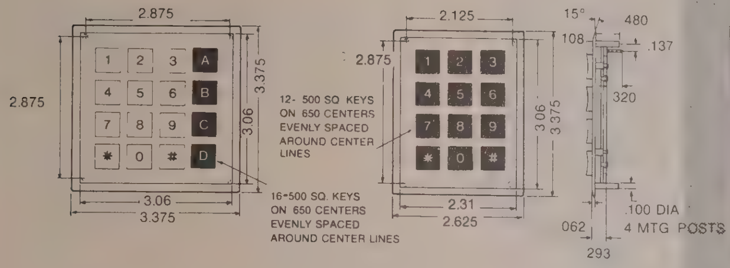


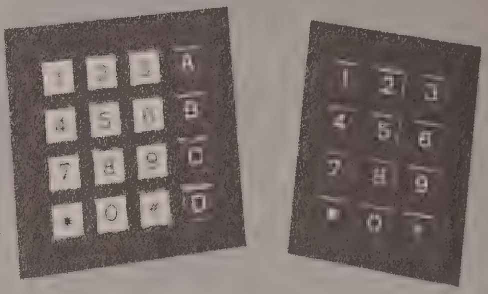
ILLUMINATED BACKGROUND

FLEX-KEY

A Subsidiary of Rogers Corp.

Standard Medium Travel Keyboards with Clear Key Caps


2.875
2.875
1 2 3 A
4 5 6 B
7 8 9 C
* 0 # D
3.375
3.06
3.06
3.375
16-500 SQ. KEYS ON 650 CENTERS EVENLY SPACED AROUND CENTER LINES
2.125
2.875
12- 500 SQ KEYS ON 650 CENTERS EVENLY SPACED AROUND CENTER LINES
1 2 3
4 5 6
7 8 9
* 0 #
3.06
3.375
2.31
2.625
15°
480
108
.137
320
.100 DIA
4 MTG POSTS
062
293



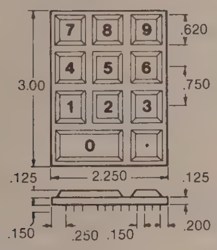
TERMINAL SEQUENCE:
12SK-72: 3, 6, 9, #, 0, 8, 5, 2, *, 7, 4, 1, Com.
16SK-62: A, B, C, D, #, 9, 3, 6, 0, 8, 5, 2, *, 7, 4, 1, Com.

Standard Rubber Covered Keyboards

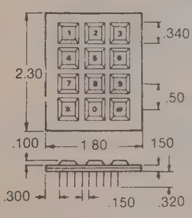
Customizing options include:

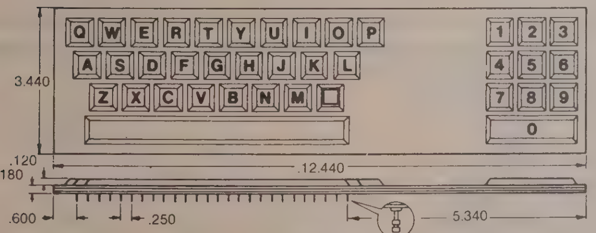
- number of keys
- key and key legend colors
- key spacing
- special matrix
- termination

DK-1M and DK-1MS

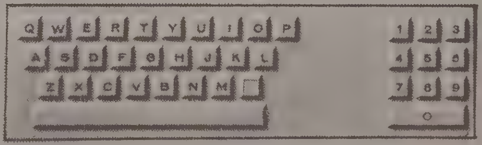

7 8 9
4 5 6
1 2 3
0 .
.620
.750
3.00
.125
2.250
.125
.150
.250
.150
.200

12DK-5M


.340
2.30
.50
.100
1 80
150
.300
.150
.320


Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
1 2 3
4 5 6
7 8 9
0
3.440
.120
.180
12.440
.600
.250
5.340

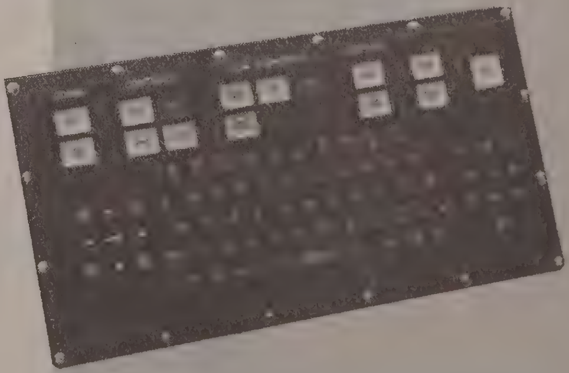
38DK-7MS



Militarized Full Travel Keyboards

These rugged custom units meet military requirements for vibration, shock, fungus, water, dust, salt spray, EMI/RFI, thermal, blast, EMP, high/low temperature, and key cycle life. Full tempest shielding is available.

Flex-Key engineers its militarized full-travel keyboards for optimum reliability and continuous operation while meeting all human factor requirements. These conductive elastomer keyboard assemblies provide command, control, communications, and data entry functions and have proven themselves in many demanding applications.



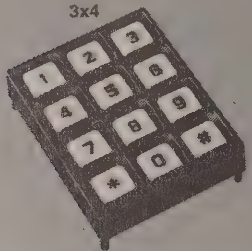
Grayhill

12, 16, and 20 Button Keyboards

Series 83

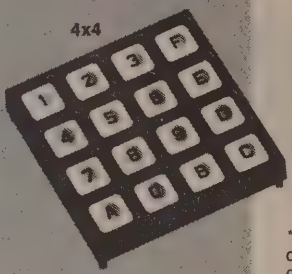
1/2" Button Centers—Post Mount

3x4



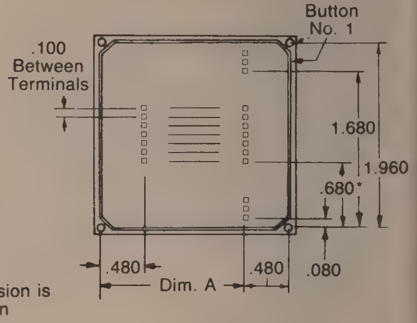
1.58" x 2.08"

4x4



2.08" sq.

Circuitry: 2 Out Of 7 (8); Matrix; or Single Pole/Common Bus *


Button No. 1
.100 Between Terminals
1.680
1.960
.680*
.480
.480
.080
Dim. A

*This dimension is dependent on circuitry code.

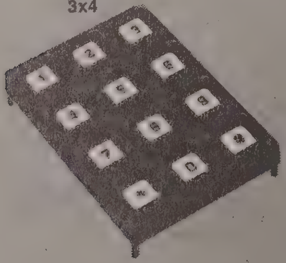
Height above board = .350"

Dim.	3x4	4x4
A	.980	1.480

Series 84

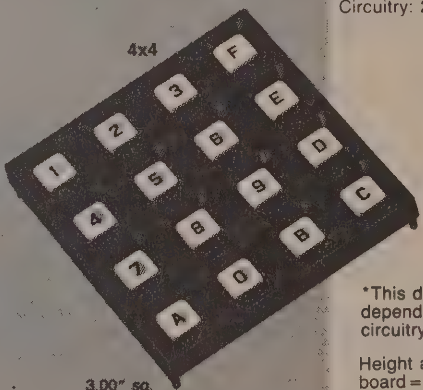
3/4" Button Centers—Post Mount

3x4



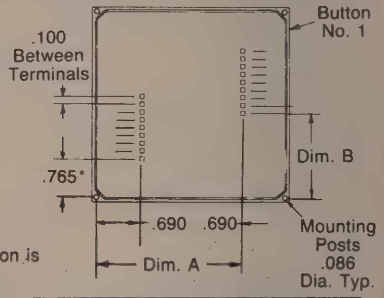
2.25" x 3.00"

4x4



3.00" sq.

Circuitry: 2 Out Of 7 (8); Matrix; or Single Pole/Common Bus *


.100 Between Terminals
Button No. 1
Dim. B
.765*
.690
.690
Mounting Posts .086 Dia. Typ.
Dim. A

*This dimension is dependent on circuitry code.

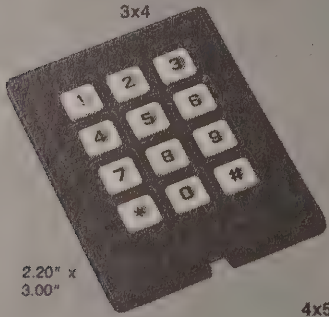
Height above board = .350"

Dim.	3x4	4x4
A	1.438	2.190
B	1.513	1.313

Series 86

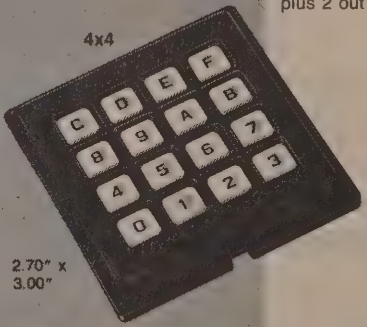
1/2" Button Centers—Flange Mount

3x4



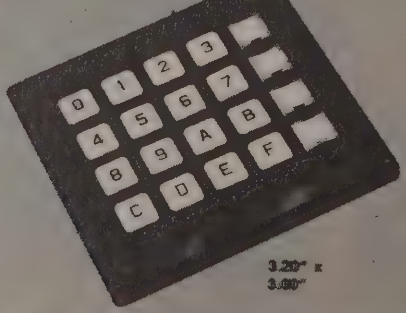
2.20" x 3.00"

4x4



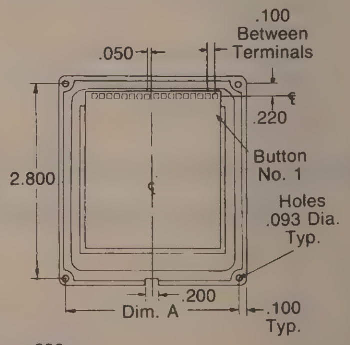
2.70" x 3.00"

4x5



3.20" x 3.00"

Circuitry: Matrix or Single Pole/Common Bus in all formats; plus 2 out of 7 (in 3x4), and 2 out of 8 (in 4x4) *


.100 Between Terminals
.050
.220
Button No. 1
2.800
Holes .093 Dia. Typ.
.200
Dim. A
.100 Typ.

For legend number -202, terminal pins are located along the "3, 7, B, F" edge

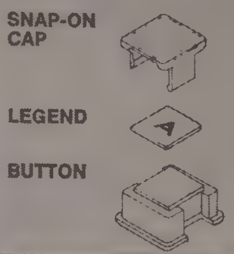
Height above board = .360"

Dim.	3x4	4x4	4x5
A	2.000	2.500	3.000

* Views show maximum terminals (SP/Common Bus) in the 4x4 format; for other circuitry, see GRAYHILL Catalog Number One.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Legends, Specifications, Prices



Standard Legends

All legended buttons shown here are two-shot molded. Blank areas are self-legend style buttons with snap-on caps as shown at right. The legend card with adhesive backed, printed inserts has additional blank inserts for dry transfer lettering. Inserts are 0.275" square. Snap-on cap projects 0.015" above keyboard.

Special—contact GRAYHILL.

—001

—002

0	1	2	3
4	5	6	7
8	[illegible]	A	B
C	D	E	F

—003

C	D	E	F
8	9	A	B
4	5	6	7
0	1	2	3

—004

1	2	3	C
4	5	6	D
7	8	9	E
A	0	B	F

—005

1	2	3	F
4	5	6	E
7	8	9	D
A	0	B	C

—006

1	ABC 2	DEF 3	A
GHI 4	JKL 5	MNO 6	B
PRS 7	TUV 8	WXY 9	C
*	OPER 0	#	D

—101

—102

1	2	3
4	5	6
7	8	9
*	0	#

—103

1	ABC 2	DEF 3
GHI 4	JKL 5	MNO 6
PRS 7	TUV 8	WXY 9
*	OPER 0	#

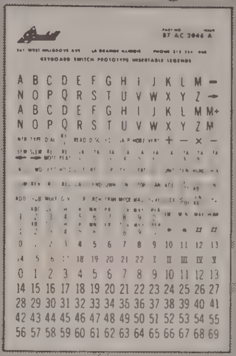
—201

—202

0	1	2	3
4	5	6	7
8	9	A	B
C	D	E	F

—203

0	1	2	3	
4	5	6	7	
8	9	A	B	
C	D	E	F	


87 AC 2046 A

A B C D E F G H I J K L M –
N O P Q R S T U V W X Y Z →
A B C D E F G H I J K L M M+
N O P Q R S T U V W X Y Z M
+ — × —
0 1 2 3 4 5 6 7 8 9 10 11 12 13
I II III IV V
0 1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35 36 37 38 39 40 41
42 43 44 45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66 67 68 69

PART NO. 87AC2046

Specifications

Rating Criteria

Rating At 24 VDC: 10 milliamps, resistive.

Contact Resistance: Compatible with MOS, TTL and DTL

Voltage Breakdown: 250 VAC between mutually insulated parts.

Life Expectancy: 3,000,000 operations per button.

Contact Bounce: Less than 4 milliseconds at make, 10 milliseconds at break.

Operating Temperature: -40° C to +80° C.

Materials and Finishes

Housing: ABS Plastic (Black).

Button: ABS Plastic (White with Molded-in Black Legend; White Self-Legend Style.

Snap-On-Cap: Clear Polycarbonate.

Terminals: Copper Alloy, CDA No. 725.

Operating Features

Button Travel: 0.015" nominal total travel.

Typical Operating Force: 350 grams.

Note:

The 2 out of 7 (8) "Telephone Code" was developed primarily for audio tone generation. To discuss critical data input applications, please contact Grayhill.

Ordering Information and Prices

83 A A 1-001

Series: 83, 84, or 86
See facing page.

Keyboard Format:
A = 3x4 (12 Button)
B = 4x4 (16 Buttons)
J = 4x5 (20 Buttons)

Circuitry Code:
A = 2 Out Of 7 (8)
B = Matrix
C = SP/Common Bus

Legend Number: See Above.
Must agree with format.

Termination:
1 = Series 83 and 84
2 = In-line, Series 86

Number of Buttons	Partial Part Number	Circuitry Code	Quantity 1-49	50-99	100-499
12	83AA1-	2 of 7	$10.60	$9.01	$7.95
	83AB1-	Matrix	9.54	8.11	7.16
	83AC1-	SP/Common	10.07	8.56	7.55
	84AA1-	2 of 7	11.66	9.91	8.75
	84AB1-	Matrix	10.60	9.01	7.95
	84AC1-	SP/Common	11.13	9.46	8.35
	86AA2-	2 of 7	10.60	9.01	7.95
	86AB2-	Matrix	9.54	8.11	7.16
	86AC2-	SP/Common	10.07	8.56	7.55
16	83BA1-	2 of 8	11.66	9.91	8.75
	83BB1-	Matrix	10.60	9.01	7.95
	83BC1-	SP/Common	11.13	9.46	8.35
	84BA1-	2 of 8	13.25	11.26	9.94
	84BB1-	Matrix	11.13	9.46	8.35
	84BC1-	SP/Common	12.19	10.36	9.14
	86BA2-	2 of 8	11.66	9.91	8.75
	86BB2-	Matrix	10.60	9.01	7.95
	86BC2-	SP/Common	11.13	9 46	8.35
20	86JB2-	Matrix	12.50	10.63	9.38
	86JC2-	SP/Common	13.25	11.26	9 94
Insertable Legend Card, Part No. 87AC2046			1.06	.90	.80
Dry Transfer—Small, Part No. 87-DT-2096-088			2.00	1.70	1.50
Dry Transfer—Medium, Part No. 87-DT-2096-125			2.00	1.70	1.50
Dry Transfer—Large, Part No. 87-DT-2096-187			2.00	1.70	1.50

Discount Schedule

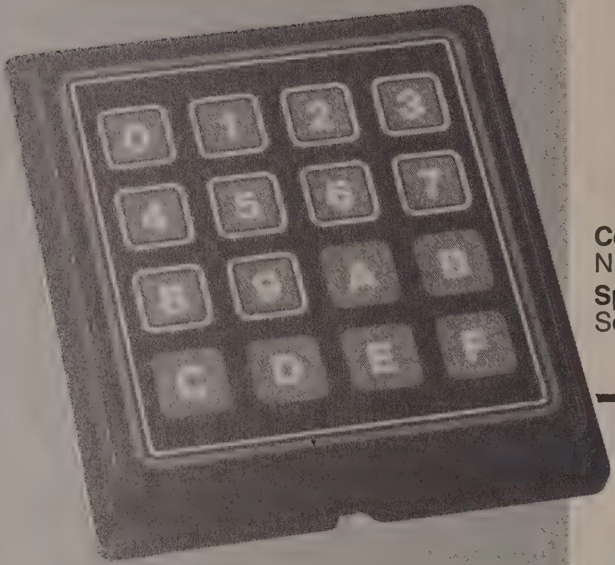
1-49	Unit Price	500-999	Less 36%
50-99	Less 15%	1000 UP	Contact your local Distributor or Grayhill
100-499	Less 25%		

Available Locally Through Your Grayhill Distributor

Grayhill INC.

Sealed And Lighted Keyboards

1/2 Inch Button Centers—Flange Mounted Keyboards 12, 16, Or 20 Buttons



Features

- Colorful
- Sealed Contacts
- Panel Seal Option
- Lighted
- Audible Contact
- Tactile Response

Code and Truth Tables—See GRAYHILL Catalog Number One.

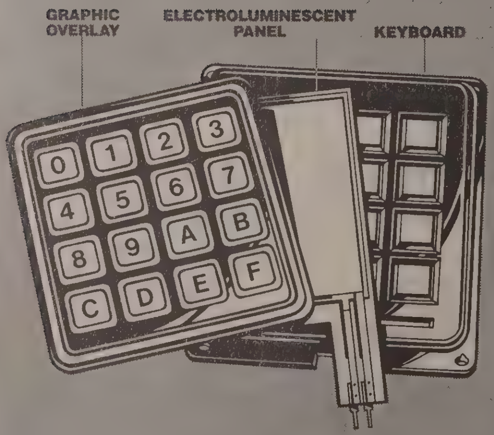
Specifications—See the Specifications listed for the Series 83, 84 and 86 Keyboards.

Dimensions

See also Series 86 on previous page.

No. Buttons \ Dim.	Outside	Thru Panel	Hole Centers
12	2.20 x 3.00	1.99 x 2.69	2.00 x 2.80
16	2.70 x 3.00	2.49 x 2.69	2.50 x 2.80
20	3.20 x 3.00	2.99 x 2.69	3.00 x 2.80
All	Ht. = .360*	Corner .150R	.093 Dia.

*Height above PC Board. Height above board for flange is .128″. Terminals are .025″ square, .280″ long, spaced on .100″ center, in line across top of keyboard, .220″ below center line of mounting holes.



Sealed Contact System

The snap-dome contact system is sealed by a polyester graphic overlay in the lighted, as well as unlighted, keyboards. The overlay is second surface printed and is colorful yet waterproof and washable with most cleaning solutions.

Panel Seal

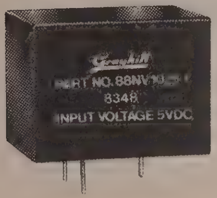
Lighted as well as unlighted keyboards can be sealed to the panel using an optional panel seal gasket. A gasket is available for either topside or sub-panel mounting. The first is .094″ thick and the second is .062″ thick. Both are made of cellulose fiber, foam, nitrile rubber.

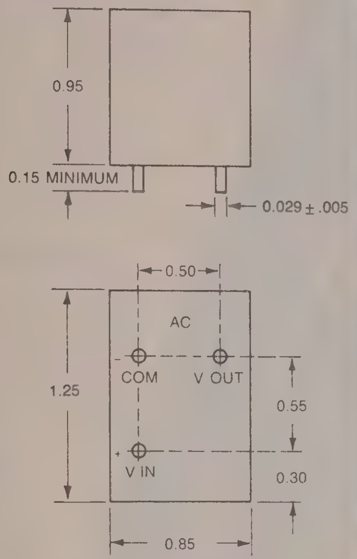
Light

Lighted keyboards contain a thin electroluminescent panel located beneath the graphic overlay. The panel is terminated in a 3 inch flexible tail with flat solder tab pins measuring .150″ x .025″ x .010″. The phosphor particles in the panel are excited by alternating current of sufficient voltage and frequency: approximately 130 Vac, 400-600 Hz.

Series 88 Keyboards

DC To AC Inverters For Lighted Keyboards





To achieve the 130 Vac, 400-600 Hz input for the electroluminescent panel using a DC source requires an inverter. It is a three terminal device: DC voltage input, AC voltage output, and common. For your convenience GRAYHILL carries small quantities of 3 inverters, designed for the 3 keyboard sizes using a 5 Vdc source. For input voltages of other than 5 Vdc or for inverter source recommendations, contact GRAYHILL.

Prices

Sealed Keyboards

To complete part number, add legend dash number.

Size	Partial Part No.	Circuitry or Description	Quantity		
			1-49	50-99	100-499
12	88AA2- 88AB2- 88AC2-	2 of 7 Matrix SP/Common	$10.60 10.07 10.60	$9.01 8.56 9.01	$7.95 7.55 7.95
16	88BA2- 88BB2- 88BC2-	2 of 8 Matrix SP/Common	11.93 11.66 12.46	10.14 9.91 10.59	8.95 8.75 9.35
20	88JB2- 88JC2-	Matrix SP/Common	15.25 16.00	12.96 13.60	11.44 12.00

Lighted Keyboards

To complete part number, add legend number. See margin note.

Size	Partial Part No.	Circuitry or Description	Quantity		
			1-49	50-99	100-499
12	88AA2-E01- 88AB2-E01- 88AC2-E01-	2 of 7 Matrix SP/Common	$24.00 23.50 24.50	$20.40 19.98 20.83	$18.00 17.63 18.38
16	88BA2-E01- 88BB2-E01- 88BC2-E01-	2 of 8 Matrix SP/Common	29.00 28.50 29.50	24.65 24.23 25.08	21.75 21.38 22.13
20	88JB2-E01- 88JC2-E01-	Matrix SP/Common	34.00 34.75	28.90 29.54	25.50 26.06

Inverters

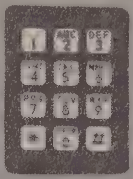
Description	Part No. (Complete)	Quantity		
		1-49	50-99	100-499
For 12 Button Keyboard	88NV1025-1	$21.00	$17.85	$15.75
For 16 Button Keyboard	88NV1025-2	21.00	17.85	15.75
For 20 Button Keyboard	88NV1025-3	21.00	17.85	15.75

Panel Seal Gaskets

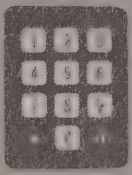
Size	Part No. (Complete)	Description	Quantity		
			1-49	50-99	100-499
12	88M2001-2 88M2012-1	Sub Panel Topside	$0.37	$0.31	$0.28
16	88M2009-2 88M2015-1	Sub Panel Topside	0.42 0.42	0.36 0.36	0.32 0.32
20	88M2019-1 88M2018-1	Sub Panel Topside	0.47	0.40	0.35

Prices and Discounts Subject to Change Without Notice.

STANDARD KEYBOARD LEGENDS

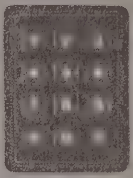


-143
White



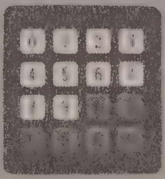
-152
Blue

-162
Orange



-172
Blue

-182
Orange

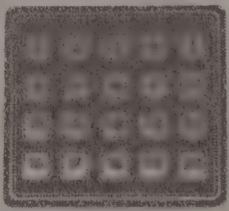


-052, (-053*)
Blue

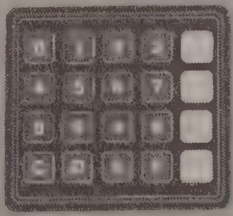
-062 (-063*)
Orange

-072
Blue

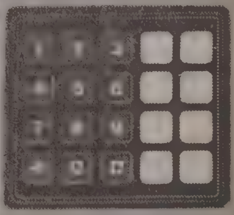
-082
Orange



-292, Silver (-293* White)



-252
Orange



-262
Blue

*For lighted keyboards substitute -053 for -052, -063 for -062, and -293 for -292.

Available Locally Through Your Grayhill Distributor

Grayhill INC.

Low Profile Keyboards

1
2
3
4
5
6
7
8
9
*
0
#
3x4
4x4
5x4

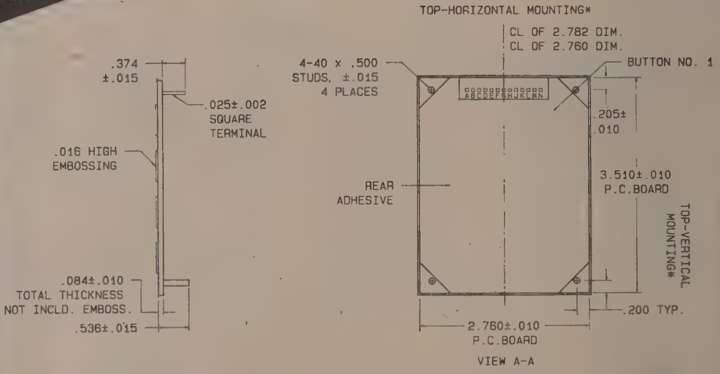
3/4 Inch Button Centers Stud Or Adhesive Mount with 12, 16, Or 20 Buttons

- Audible Snap-Dome Contact
- Colorful Graphic Legend
- Front Sealed Contacts
- 1/10 Inch In Height

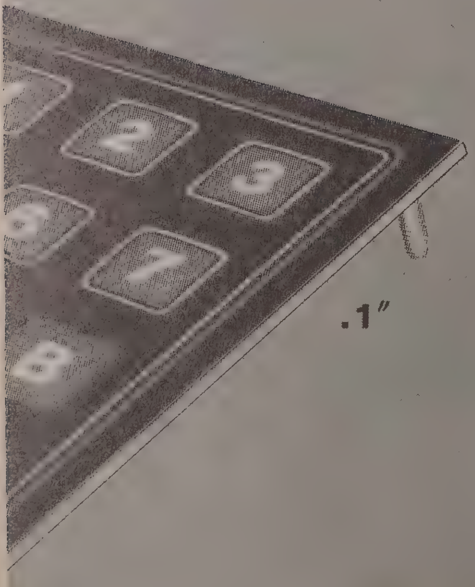
Dimensions

The measurements listed here are for the graphic overlay which extends slightly beyond the printed circuit board. Drawings indicate dimensions for a 12-button keyboard from which dimensions for other keyboards may be derived. Terminals are on .100 inch centers in line with mounting studs.

Keyboard Size	Inches Width	Inches Length
3x4 12 Button	2.782	3.532
4x4 16 Button	3.532	3.532
5x4 20 Button	4.282	3.532


TOP-HORIZONTAL MOUNTING*
CL OF 2.782 DIM.
CL OF 2.760 DIM.
BUTTON NO. 1
.374 ±.015
.025±.002 SQUARE TERMINAL
.016 HIGH EMBOSSING
.084±.010 TOTAL THICKNESS NOT INCLD. EMBOSS.
.536±.015
4-40 x .500 STUDS, ±.015 4 PLACES
ABCDEFGHJKLMN
.205± .010
REAR ADHESIVE
3.510±.010 P.C.BOARD
TOP-VERTICAL MOUNTING*
.200 TYP.
2.760±.010 P.C.BOARD
VIEW A-A

*When ordering custom legends, specify "Horizontal Mounting" or "Vertical Mounting" of legends with respect to the line of terminals.



Graphic Overlay Characteristics

The legend is printed on the second surface of a graphic overlay providing maximum legend protection. The graphic overlay is made of a polyester material which will withstand high humidity and which has excellent resistance to solvents. It is also resistant to scratching, marring, and dulling of the surface from contact by fingernails, wiping cloths, and cleaning materials.

Solvent Resistance: The graphic overlay is resistant to attack from water, petroleum oil, alcohols, and aliphatic hydrocarbons. In addition, it will not be attacked by any of the following common solutions: 5% acetic acid, 5% citric acid, 2% detergent solution, soapy water, 30% hydrogen peroxide, wine, beer, whiskey, coffee, cocoa, milk, tomato juice, lemon juice, and other materials of similar nature.

Although the overlay may not be affected by hydrocarbons, ketones, and freon, it is not recommended that keyboards be immersed or subjected to prolonged contact with these solvents. Depending on how the keyboard is mounted, extensive contact by these chemicals with the edges of the keyboard may affect the adhesive beneath the overlay.

Graphics: The graphic legend is applied by a printing process which makes custom legends of infinite design and color combinations an easy option.

Series 89

Mounting

The Series 89 low profile keyboards are provided with adhesive or studs or a combination of both. The adhesive mounting is a pressure sensitive material with a protective backing. To mount, peel off the back and set keyboard in place. The mounting studs are countersunk, non-turn studs which are not visible from the front of the keyboard. Mounting nuts are not provided.

Specifications

Rating Criteria

Rating At 24 VDC: 10 milliamps, resistive.

Contact Resistance: Compatible with MOS, TTL and DTL

Voltage Breakdown: 250 VAC between mutually insulated parts.

Life Expectancy: 3,000,000 operations per button.

Contact Bounce: Less than 4 milliseconds at make, 10 milliseconds at break.

Operating Temperature: -40°C to +80°C.

Materials and Finishes

Base (PC Board): FR-4 glass epoxy.

Graphic Overlay: Polyester.

Spacer (beneath overlay): Polyester.

Terminal Pins: Copper alloy, CDA No. 725.

Adhesive Mounting Sheet: 3 mil Polyester, coated on 2 sides with acrylic adhesive.

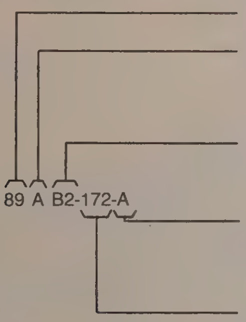
Mounting Studs: Phospher Bronze, Tin plated.

Operating Features

Button Travel: 0.015″ nominal total travel.

Typical Operating Force: 260 grams nominal.

Ordering Information



Low Profile Keyboards

Keyboard Format:
A = 3x4 (12 Button)
B = 4x4 (16 Button)
C = 5x4 (20 Button)

Circuitry Code:
B = Matrix
C = SP/Common Bus

Mounting Style
A = Adhesive
B = Studs
AB = Adhesive & Studs

Standard Legends
-172 or -182 for 3x4
-072 or -082 for 4x4
-252, -262, or -292 for 5x4

Sample part number orders a 12 button, low profile, adhesive mount keyboard with matrix circuitry, and blue buttons with white telephone legend.

Prices

To complete the part number, add appropriate legend dash number and the dash and character(s) for the mounting.

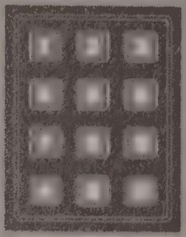
Number of Buttons	Type of Circuitry	Partial Part Number	Unit Price, Adhesive or Stud Mount**
12	Matrix SP/Common	89AB2- 89AC2-	$15.00 16.00
16	Matrix SP/Common	89BB2- 89BC2-	18.50 19.50
20	Matrix SP/Common	89JB2- 89JC2-	21.00 22.50

For the style which includes both adhesive and stud mounting as indicated by the suffix AB, add $1.25 to the price above and discount accordingly.

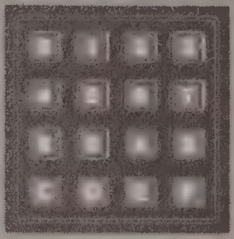
Discount Schedule

1-49 . . . . . Unit Price
50-99 . . . . . Less 15%
100-499 . . . . Less 25%
500-999 . . . . Less 36%
1000 UP Contact your local Distributor or Grayhill

STANDARD LEGENDS



-172 Blue
-182 Orange



-072 Blue
-082 Orange

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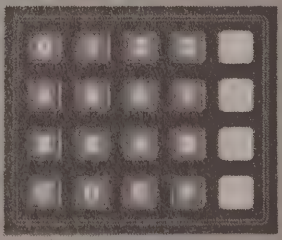
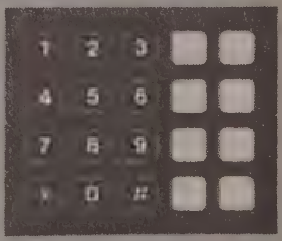
-292 Silver



-262 Blue

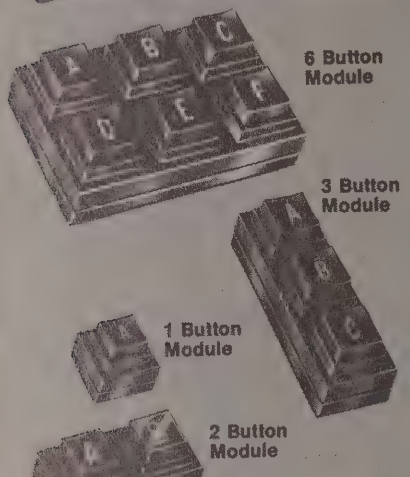


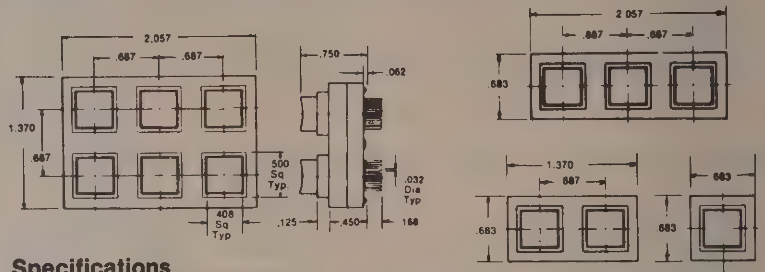
-252 Orange

Grayhill INC.

Modular Keyboards
Series 82—Long Stroke, PC Mountable

- **Create Your Own Keyboard Configuration**
- **Modules Retain 0.687 Centers When Placed Side By Side**
- **SPST To 4PST Under Each Button**





Specifications

OPERATING FEATURES:

Button Travel: 0.130" total travel.

Overtravel: 0.080" nominal.

Operating Force: 8 ± 3 ounces (dependent upon number of poles).

MOUNTING:

Modules are designed to plug into any printed circuit board from 1/16" to 1/8" thick.

Modules can be stacked horizontally or vertically for any combination of button array and still maintain 11/16" button centers.

RATING:

Rating at 5 VDC: 100 milliamps.

Contact Resistance: 25 milliohms or less on a new switch.

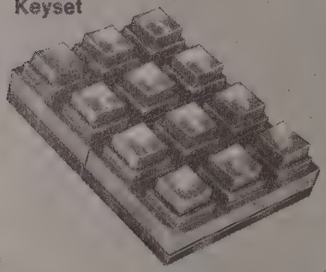
Voltage Breakdown: 250 VAC between mutually insulated parts.

Insulation Resistance: 1,000 megohms minimum.

Life Expectancy: 1,000,000 operations.

Contact Bounce: 10 milliseconds or less for the life of the switch.

Telephone Keyset



Telephone Keysets

- Permanent Molded-In Legends
- 2 Modules Create the Phone Set

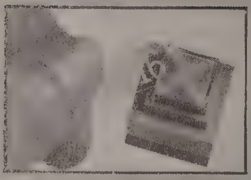
Legend Type	Circuitry Each Button	Part No.	Unit Price
Top Six Buttons Two-Shot Molded	SPST	82-601-85	$7.78
	2PST	82-601-86	8.70
	3PST	82-601-87	9.63
	4PST	82-601-88	10.56
Bottom Six Buttons Two-Shot Molded	SPST	82-601-89	$7.78
	2PST	82-601-90	8.70
	3PST	82-601-91	9.63
	4PST	82-601-92	10.56

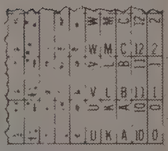
Discount Schedule

1-49	Unit Price
50-99	Less 15%
100-499	Less 25%
500-999	Less 36%
1000 UP	Contact your local Distributor or Grayhill

Prices and Discounts subject to change without notice

Self Insertable Legends





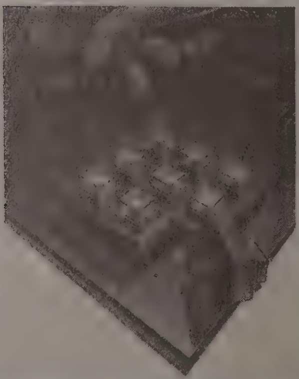
Portion Of Legend Sheet 82AC2017

Self Insertable Legend Modules

- Slotted Cap Permits Insertion Of A Clear Plastic Tab Imprinted With Legend
- Reduces Legending Problems For Prototype Or Small Production Quantities
- Available Legend Sheet Contains White Legends, 0-19, A-Z, Common Symbols

Part No.	No. Of Buttons	Circuitry Each Button	Unit Price
82-101-71	1	SPST	$2.11
82-101-74	1	4PST	2.58
82-201-41	2	SPST	3.40
82-201-44	2	4PST	4.33
82-301-61	3	SPST	4.69
82-301-64	3	4PST	6.08
82-601-81	6	SPST	8.55
82-601-84	6	4PST	11.33
82AC2017	Legend Sheet for Self Legend Modules		$1.29

Lightable Modules



Lightable Modules

- Bottom Holes Accomodate PC Mounted Incandescent Or LED Lamp
- Choice of Insertable Legend Or Non-Insertable Legend Modules
- Each Button will Accomodate a T-1 Size LED or Incandescent Lamp.*

Insertable Legend Modules

No. Of Buttons	Circuitry Each Button	Part No.	Unit Price
1	SPST	82-150-38	$2.47
1	2PST	82-150-16	2.58
3	SPST	82-350-12	5.46
3	2PST	82-350-9	5.77
6	SPST	82-650-19	9.89
6	2PST	82-650-9	10.51
Legend Sheet		82AC2050-1	$1.29

Unlegended Non-Insertable Modules

No. Of Buttons	Circuitry Each Button	Part No.	Unit Price
1	SPST	82-150-17	$2.27
1	2PST	82-150-15	2.37
3	SPST	82-350-10	4.84
3	2PST	82-350-8	5.15
6	SPST	82-650-10	8.65
6	2PST	82-650-8	9.27

Contact Grayhill to order printed legends.

*Lamps not available from GRAYHILL.

Grayhill, Inc. / 561 Hillgrove Ave. / P.O. Box 10373 / La Grange, IL 60525 / (312) 354-1040

Keyboard Modules The Stackable SYSTEM 87

- Low profile
- Long life — 3,000,000 operations
- Positive audible and tactile feedback

Select the modules you require to build your own keyboard design. The modules can be stacked side by side on your prototype PC board in any configuration that is required. ½-inch button centers will be maintained.

Circuitry is single pole/common bus in the single row switches and single pole/common bus or matrix code in the 3 x 4 and 4 x 4 keyboard pads.

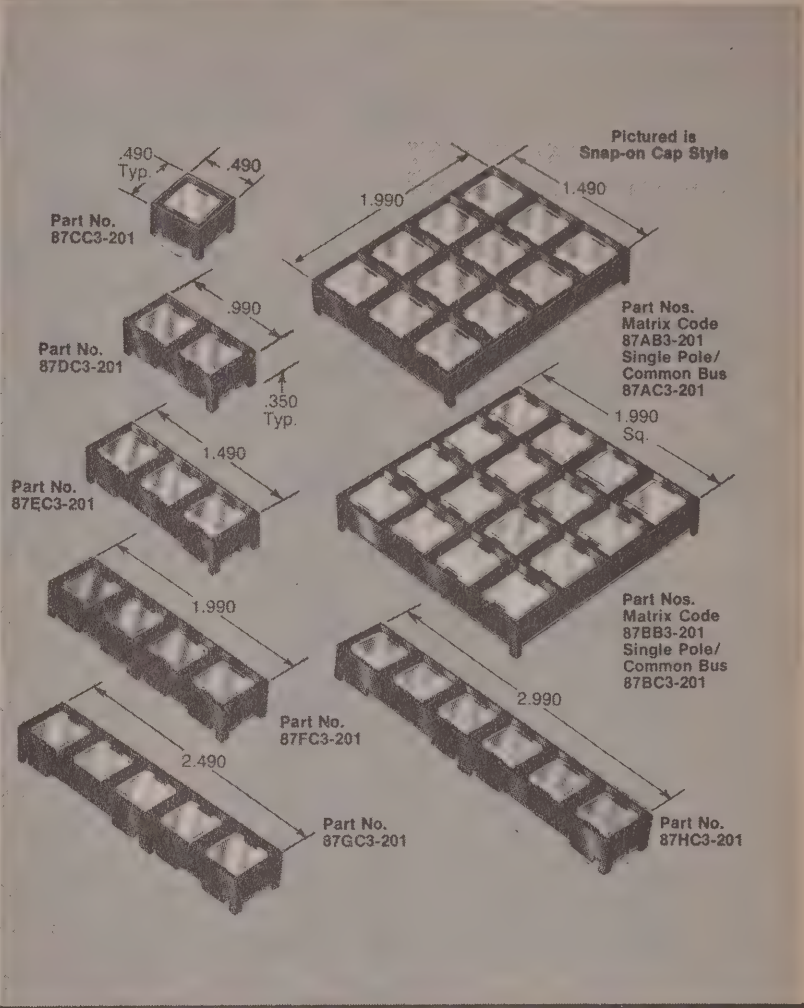
Prototype and Short Run Production

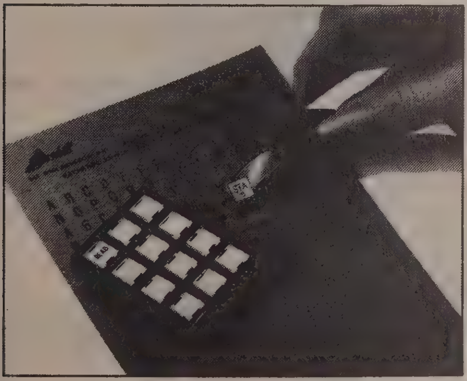
Arrange the modules in the required array on your PC board. Snap-on cap allows user to legend button with inserts from legend card and/or dry transfer lettering. For moderate quantities legends can be printed on the button by Grayhill. Printed legends will closely duplicate your prototype legend.

High Volume Production

Grayhill will provide a custom keyboard. The modules will be arranged and the board terminated to your specifications.

Legends — your choice of printed or molded-in legends; button color and legend color.


.490 Typ.
.490
Part No. 87CC3-201
Pictured is Snap-on Cap Style
1.990
1.490
.990
Part No. 87DC3-201
.350 Typ.
Part Nos. Matrix Code 87AB3-201 Single Pole/ Common Bus 87AC3-201
1.490
Part No. 87EC3-201
1.990 Sq.
1.990
Part Nos. Matrix Code 87BB3-201 Single Pole/ Common Bus 87BC3-201
2.990
Part No. 87FC3-201
2.490
Part No. 87GC3-201
Part No. 87HC3-201



Prototype Legends

GIVE THEM A PROFESSIONAL APPEARANCE

The System 87 modules described can be easily legended by you. The clear, protective, snap-on cap removes readily without special tools. To assist you, GRAYHILL has a legend card (Part No. 87AC2046) which includes all the popular legends and symbols on a clear insert, die-cut to fit the button. Type style is News Gothic Condensed.

Or, create your own legends. The GRAYHILL card contains blank inserts for your special needs. For this purpose, sheets of dry transfer lettering are also available in type style and sizes similar to the chart below. A sheet of small type is part number 87DT2096-088; medium is 87DT2096-125; and large is 87DT2096-187. You can also prepare and cut your own legend inserts. They should be cut to fit a 0.275" square surface.

ORDERING INFORMATION

All numbers describe self-legend style. Contact Grayhill for other legends.

Type of Module	Part Numbers	Unit Price
1 Button	87CC3-201	$1.54
2 Button	87DC3-201	2.23
3 Button	87EC3-201	2.86
4 Button	87FC3-201	3.82
5 Button	87GC3-201	4.77
6 Button	87HC3-201	5.30
12 Button Matrix Code	87AB3-201	9.01

Type of Module or Item	Part Number	Unit Price
12 Button—SP/Com Bus	87AC3-201	$9.54
16 Button—Matrix Code	87BB3-201	11.66
16 Button—SP/Com Bus	87BC3-201	12.19
Insertable Legend Card	87AC2046	1.06
Dry Transfer—Small	87DT2096-088	2.00
Dry Transfer—Medium	87DT2096-125	2.00
Dry Transfer—Large	87DT2096-187	2.00

Discount Schedule

1-49	Unit Price
50-99	Less 15%
100-499	Less 25%
500-999	Less 36%
1000 UP	Contact your local Distributor or Grayhill

Prices and Discounts subject to change without notice.

Available Locally Through Your Grayhill Distributor

MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms	**1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code	**3**•1103
Batteries, Product Selection Guide	**3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide	**2**•1003
Capacitors, Basic Formulas	**1A**•1093
Capacitors, Miniglossary	**1A**•1069
Capacitors, Product Selection Guide	**1A**•1003
Circuit Boards (Printed), Product Selection Guide	**2**•1089
Coils, Chokes, & Inductors, Product Selection Guide	**1A**•1219
Connectors, Miniglossary	**2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide	**2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide	**1A**•1309
Delay Lines, Product Selection Guide	**1A**•1445
Discrete Semiconductors, Product Selection Guide	**1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide	**1B**•1021
EBCDIC Code	**3**•1153
Encapsulation, Miniglossary	**2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide	**2**•1801
Filters, Product Selection Guide	**1A**•1577
Instruments, Graphic Recording, Product Selection Guide	**3**•1381
Instruments, Panel Meters, Product Selection Guide	**3**•1321
Instruments, Test & Measuring, Product Selection Guide	**3**•1182
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Keyboards & Keypads, Product Selection Guide	**1B**•1759
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Military Qualified Products Lists	**1B**•1003
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Opto Semiconductors, Miniglossary	**1B**•1218
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Relay Contact Forms	**1B**•1317
Relays, Electromechanical, Miniglossary	**1**•**B**1292
Relays, Product Selection Guide	**1B**•1289
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Transducers & Encoders, Product Selection Guide	**1B**•1827
Transformers, Product Selection Guide	**1A**•2115
Wire & Cable, Product Selection Guide	**2**•1935

IEE

Planar Products Division

For over fifteen years IEE has been the quality leader in keyboards for commercial, industrial and military applications. Today more than 100,000 are in use worldwide, performing reliably despite constant exposure to dust, dirt, corrosive atmospheres, submersion in water, extremes in altitude, wide temperatures and humidity ranges.

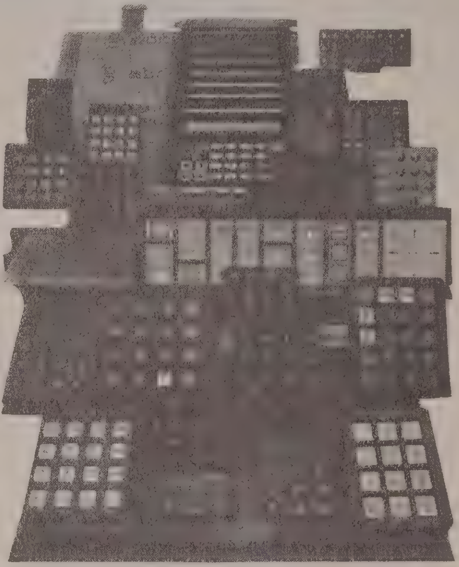
A continuing dedication to high quality is the reason for our success. This can be seen in features like high grade polyester, a special sealing process to keep out moisture, and etched circuitry instead of silkscreened ink for low contact resistance, better quality and longer life. The results are switch products with the highest reliability — with most exceeding many military test requirements. Keys to the maintenance of this reputation for quality are the talents of our engineering staff, the efficiencies of large scale manufacturing, and an exceptionally rigorous quality assurance program.

STANDARD KEYBOARDS

IEE's wide selection of standard keyboard models offers you an opportunity to save by consulting with our engineering staff and designing in our standard, keyboards in what you might have considered a custom application. Our standard keyboards include: Hi-Rel and Industrial PANELSWITCHES™, THINSWITCHES™, SEALEDSWITCHES™, TELSWITCHES™, THINPANEL™, and ASCII Keyboards.

CUSTOM KEYBOARDS

Custom configurations include: special coding/output, multiple color combinations; any number of custom arrangements; keyboards that are resistant to highly caustic solutions; stainless steel construction; EMI/RFI shielding; varying actuation force and key travel; movable legends and rigid backs, wide temperature range, high humidity. Incandescent, LED and electroluminescent backlighting is also available.



LOW COST
14 MESSAGES IN ONE DISPLAY

AUDI DASHBOARD

PROJECTION DISPLAYS/PROSWITCHES

TITAN™ Projection Displays and PROSWITCHes are the world's most extensively used family of graphic displays. The line offers many features not found in other display technologies

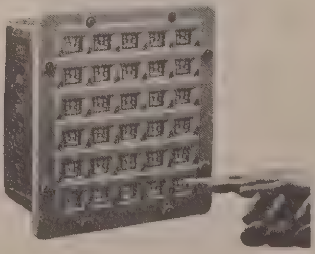
- The most cost effective system for displaying any image in any color
- Displays can be programmed to feature from 11 to 48 messages
- Over 15 models with display screens ranging from .076" to 3.375"

Recent advances include modular lamp assemblies and a new lens system for greater illumination. Our PROSWITCH™ series combines the features of projection displays with a tactile, membrane or opto switches. Projection displays and PROSWITCHes can save panel space, provide a significant reduction in hardware and wiring, and a noticable improvement in man/machine interface. Commercial and ruggedized configurations are available.

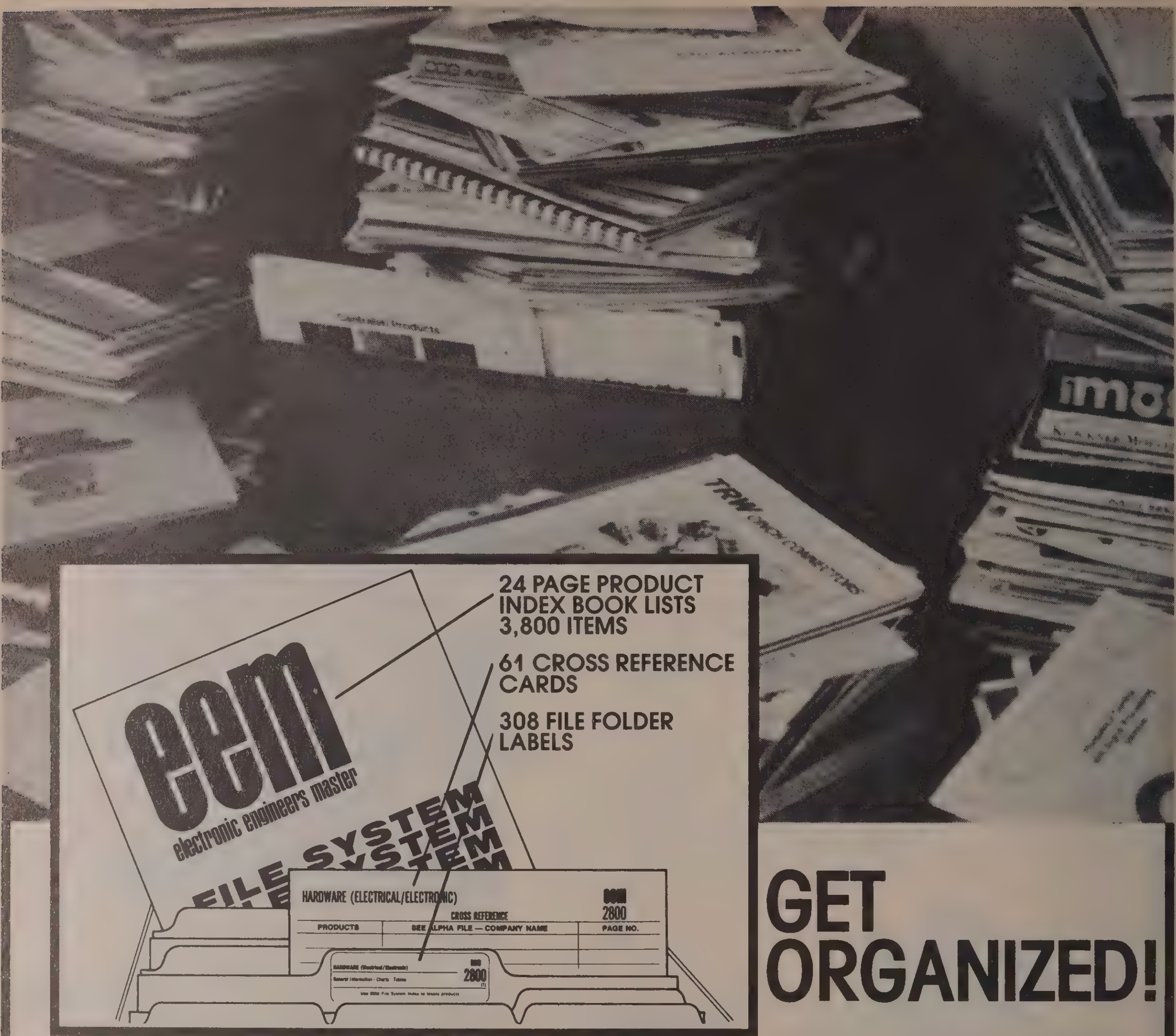
DISPLAY SUB-SYSTEMS

We have the capability to engineer the best man/machine interface solution using a wide spectrum of display technologies. Recent programs have involved meeting the custom requirements for a wide range of commercial, industrial and military applications.

Display accomplishments include a ruggedized 10" square interactive panel with over 1400 color and graphic messages, support electronics, and single interface connection. Another program involved a Touch Display militarized with a high MTBF, RFI shielding, and meeting exacting MIL vibration standards.



INDUSTRIAL ELECTRONIC ENGINEERS, INC. • 7740 Lemona Ave., Van Nuys, CA 91405 • Telephone (818) 787-0311 • TWX: 910-495-1707


24 PAGE PRODUCT INDEX BOOK LISTS 3,800 ITEMS
61 CROSS REFERENCE CARDS
308 FILE FOLDER LABELS
eem
electronic engineers master
FILE SYSTEM
HARDWARE (ELECTRICAL/ELECTRONIC)
CROSS REFERENCE
2800
PRODUCTS
SEE ALPHA FILE — COMPANY NAME
PAGE NO.
TRW
imo

GET ORGANIZED!

Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

The EEM File System was invented over twenty-five years ago to help people who specify, buy, or work with electronic products and equipment. It is upgraded on a constant basis to reflect the current state of the art. It's easy to use and easy to customize to your particular needs.

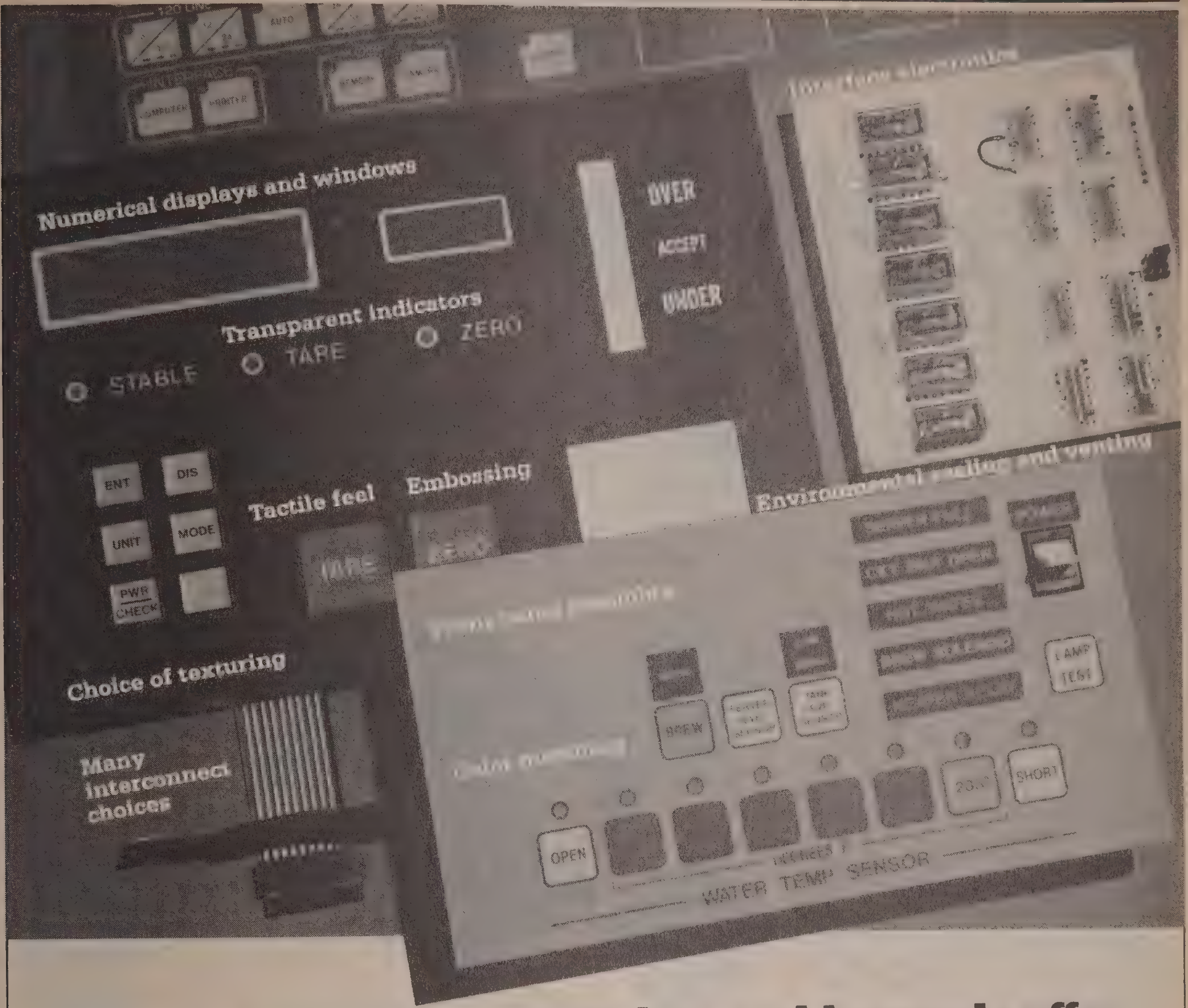
You say you want to file catalogs by type of product? That's easy to do with The System. But, what are you going to do when there are multiple products in one catalog? Take Mallory for example. There are all kinds of products in the Mallory Short Form Catalog. With the EEM File System all you do is file the catalog under "M" for Mallory and refer to it on all of the cross reference cards that apply.

There are thousands of EEM File Systems in everyday use in engineering and procurement offices all over the world. Shouldn't you be using this proven system?

The EEM File System is shipped in one neat package. The package contains everything you need to set up your very own filing system. Best of all, it's easy to get and very affordable. Send a check or money order for $25.00 and EEM will pay the postage and sales tax. If you must use a purchase order, please add $5.00 for postage and handling. An invoice will accompany your System.

Don't waste any more time. Get organized now!

EEM FILE SYSTEM,
645 stewart ave., garden city, ny 11530


Numerical displays and windows
OVER
ACCEPT
UNDER
Transparent indicators
STABLE
TARE
ZERO
ENT
DIS
UNIT
MODE
PWR CHECK
Tactile feel
Embossing
Choice of texturing
Many interconnect choices
Environmental sealing and venting
LAMP TEST
OPEN
SHORT
WATER TEMP SENSOR

Mantex membrane switches and keypads offer differences you can feel, hear and see.

Differences you can feel include touch variations, surface finishes and embossed outlines. Hear the keystroke with audible feedback. See the difference that top quality color matching, texturing, graphics and mar-resistant surfaces can make to your finished product. Mantex offers all these differences plus price, fast turnaround, reliability and quality advantages made possible by vertical integration.

Switch products

Tactile feel membrane
  Plastic bubble or stainless steel dome types
PC board membrane
Soft touch membrane
Fold-over or stacked membranes
Copper etched membranes
Electroluminescent backlit panels
Front panel assemblies
PC board assemblies
Peripheral plastic products or components
Microprocessor assemblies

In-house capabilities

Graphic/electronic design
Engineering • Layout
Photography • Screen making
Graphics • Material selection
Color matching • Ink blending
Screen printing • Laminating
Die cutting • Stamping
Embossing • Molding
UV cure top coatings
Hot stamping
Testing • Packaging
Interface electronics
  (hardware and software)
Assembly

mantex corporation

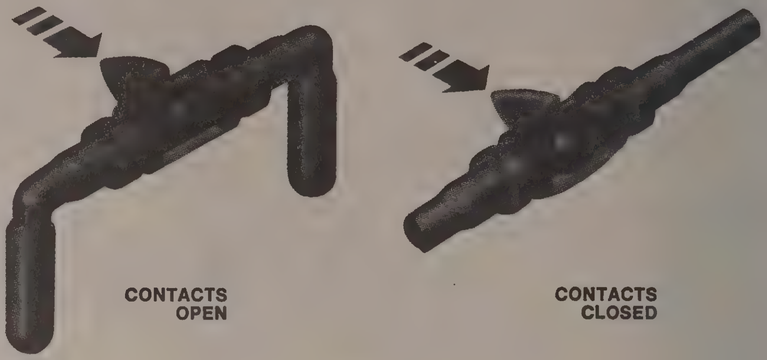
P.O. Box 15
1800 Metamora Rd.
Oxford, MI. 48051
(313) 628-9711

Call for the name of your nearest representative.

MEI DN & DNT SERIES KEYSWITCHES

SEALED CONTACTS

DN and DNT switches work in your product's environment because the contacts are sealed in a silicone rubber tube. And since they are sealed, the contacts can be silver with its lower cost and cleaner electrical characteristics. That's why DN reliably tests to over 15 million cycles, and DNT to over 50 million cycles.



DN SERIES

FOR DEMANDING INSTRUMENT PANEL APPLICATIONS

The DN series keyboard switches, because of their versatility of configuration, are the ideal choice for almost any front panel key array. Options include lighting, double pole, alternate action, sub-panel mounting, boot protection and numerous relegendable and double-shot keytops. The very low profile, sealed contact and full key travel features make the DN an excellent "operator friendly" alternative to touch panels.

DNT SERIES

HIGH QUALITY, LOW COST, FULL TRAVEL KEYBOARDS

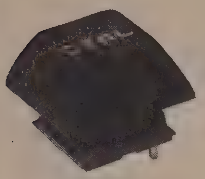
The DNT series because of its exceptional life and sealed contacts offers a low cost alternative to a solid state keyboard. The long travel and break-away touch are design features providing the maximum operator satisfaction. Profile height, while greater than the DN, is still low enough to allow construction of keyboards meeting the ergonometric standard of 30 mm height of home row keys. DNT switches may be used with or without a metal sub-panel.

MECHANICAL ENTERPRISES INC.

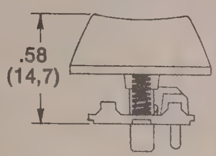
SALES - ENGINEERING
461 CARLISLE DRIVE
HERNDON, VA 22070
(703) 435-9496
TWX 710-832-0942

MANUFACTURING
1321 NW 65th PLACE
FT. LAUDERDALE, FL 33309
(305) 979-1333

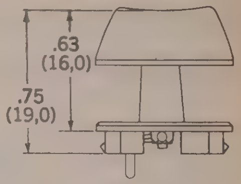
MEI DN & DNT KEYSWITCH STYLES



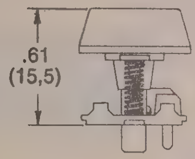
DN 500
with L Style Keytop



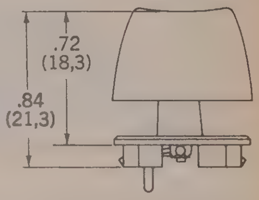
DNT
with Low Profile
Sculpted Keytop

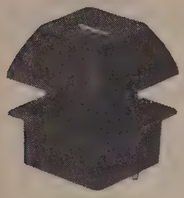

.63
(16,0)
.75
(19,0)

DN 500
with M Style Keytop

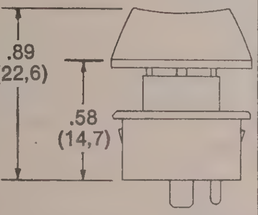


DNT
with High Profile
Sculpted Keytop

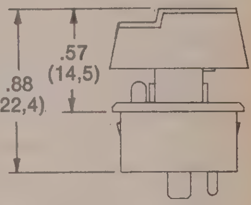

.72
(18,3)
.84
(21,3)

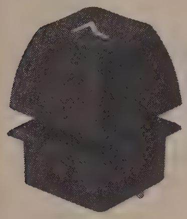


DN 500-005
with L Style Keytop
and 4.3mm Keytop
Coupling

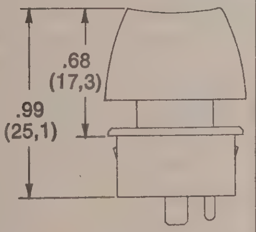

.89
(22,6)
.58
(14,7)

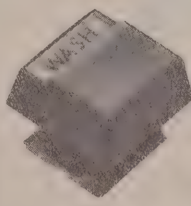
DN 500-005
with E Style
Relegendable Lens
Keytop Lighted
with 1 or 2 LED's.


.88
(22,4)
.57
(14,5)

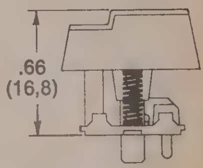


DN 500-005
with C Style Keytop
and 7.8mm Keytop
Coupling

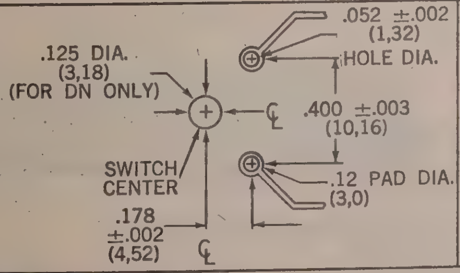

.68
(17,3)
.99
(25,1)



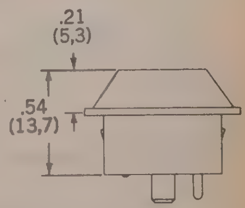
DN 500
with E Style
Relegendable Lens
Keytop Lighted with
LED



SWITCH
TERMINAL
LAYOUT
(DN & DNT)
NOTE: CHANGE
.052 TO .062
IF USING
SUB PANEL


.125 DIA.
(3,18)
(FOR DN ONLY)
SWITCH
CENTER
.178
±.002
(4,52)
℄
℄
.052 ±.002
(1,32)
HOLE DIA.
.400 ±.003
(10,16)
.12 PAD DIA.
(3,0)

DN 500-005
with Boot and
Legend Plate
Lighted with LED



FULL KEYBOARD WITH NUMERIC KEYPAD

SPECIAL ARRAYS

Both DN and DNT keyboard switches can be delivered configured in a custom array with properly legended keytops in a steel or aluminum sub-panel. Such arrays can simply be placed on the PCB with other components and wave soldered followed by a water wash.

**MECHANICAL
ENTERPRISES
INC.**

SALES - ENGINEERING
461 CARLISLE DRIVE
HERNDON, VA 22070
(703) 435-9496
TWX 710-832-0942

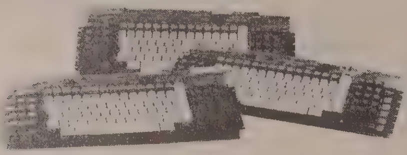
MANUFACTURING
1321 NW 65th PLACE
FT. LAUDERDALE, FL 33309
(305) 979-1333

MICRO SWITCH KEYBOARDS...

Quality and Reliability, each carries a 1% Acceptable Quality Level and a 2-year Warranty*

Until now getting a keyboard at the price you needed could have meant giving up the kind of performance you wanted. Not anymore. Now, in addition to our time-proven solid state Hall effect offerings, you can specify full travel capacitance or contact membrane keyboards in low profile (DIN standards) or touch panel membrane keyboards.

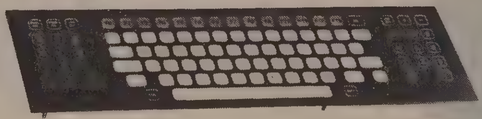
And you get them all — custom or off-the-shelf — backed with the experience and full application support that's been a MICRO SWITCH tradition.



SD Series Hall Effect Keyboard (104SD30)

FEATURES

- Solid state Hall effect keys with a single chip microcomputer
- 4-mode 8-bit USASCII code assignment . . . Key array in 4-language configurations
- Parallel data 8-bits and strobe . . . 50 microseconds nominal strobe pulse
- Serial output . . . 1-start, 8-data, even parity, 1-stop (TTL compatible) with choice of 4 baud rates
- Electronic shift lock with LED indicator
- Choice of 4-tones for audio feedback
- Manual/Auto repeat for designated keys . . . Repeat key controls repeat for other selected keys
- 1-function key . . . positive or negative logic
- 1-shift lock key, 2-shift keys, 1 control key, 1 alternate action caps lock key
- 121 possible coded keys, 6 mode keys, 1 function key
- 14 LED's in top row with current limit resistors
- 8-byte FIFO (first-in first-out) character storage
- N-key rollover
- Operates on a single 5 VDC supply
- MCBF . . . 20 billion operations

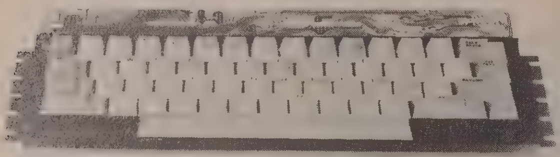


TC Series Touch Panel Keyboard (TC 454)

FEATURES

- Customized design. Graphics, colors, styles, and formats can be selected to achieve optimum clarity of operating functions
- Advanced construction and manufacturing processes. Reflects the MICRO SWITCH commitment to quality, reliability and performance
- Tactile feedback. Snap-disc provides positive feel of switching action; embossed touch surface enables positive finger positioning
- Micro-travel (.016 in. nominal)
- Environmentally sealed. Protects against contamination of switch contacts
- Provides both serial and parallel data outputs
- Pin-for-pin compatible EPROM capability
- Operates on a single 5 VDC supply
- Ultra-low profile membrane easily adapts to styling and package size requirements
- Channel venting. Prevents temperature/altitude changes from affecting operating characteristics

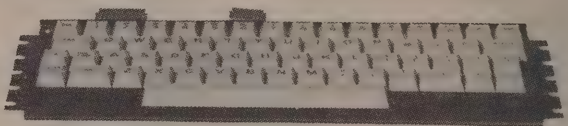
* One year warranty



Low Profile Capacitance-membrane Keyboard (58ST13-1)

FEATURES

- European ergonomic standards compliance
- Only 19,05 mm (.750″) nominal profile
- 3,2 mm (.125″) nominal key travel
- N-key rollover
- Parallel/serial data outputs
- Environmentally sealed membrane protects against liquid spills, airborne dust and moisture
- Internal venting protects from the effects of ambient temperature and pressure changes
- Operator preferred silent-tactile feel
- Electronic shielding reduces problems caused by electrical noise, cross coupling and stray capacitances
- Low power consumption



Contact-membrane Keyboard

FEATURES

- European ergonomic standards compliance
- Only 19,05 mm (.750″) nominal profile
- 3,2 mm (.125″) nominal key travel
- Environmentally sealed membrane protects the contacts from contamination
- Internal venting protects membrane from effects of ambient temperature/pressure changes
- Operator preferred silent-tactile feel
- Adherence to good human factor principles promotes maximum throughput

MICRO SWITCH, a Honeywell division

MICRO SWITCH

GENERAL SALES ORDER GUIDE

*Catalog Listings Hall Effect	Typical Applications	Power Requirements	Output Termination	Modes/Code Assignment	Keytops
12SD3-1	High Speed Numeric Entry	+5 VDC @ 50 mA	Solder Pad	Wired-only (Level)	Standard
16SD1-1	High Speed Numeric Entry	+5 VDC @ 132 mA	Card Edge	(1) BCD (Binary Coded Decimal)	Standard
16SD1-2	High Speed Numeric Entry	+5 VDC @ 132 mA	Card Edge	(1) BCD	Standard
16SD3-4	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	Standard
16SD3-5	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	Relengendable
16SD3-6	High Speed Numeric Entry	+5 VDC @ 130 mA	Solder Pad	Wired-only (Level)	Standard/LED
16SD3-7	High Speed Numeric Entry	+5 VDC @ 80 mA	Solder Pad	Wired-only (Level)	None
16SD3-12	High Speed Numeric Entry	+5 VDC @ 80 mA	40-Pin Header	Wired-only (Level)	Standard
16SD17-1	Adding Machine Format	+5 VDC @ 80 mA	Solder Pad	Wired-only (Scan)	Relegendable
16SD17-2	Telephone Format	+5 VDC @ 80 mA	Solder Pad	Wired-only (Scan)	None
26SD1-2	Point of Sale	+5 VDC @ 250 mA	Card Edge	(1) Six Bit Address	Standard/ Relegendable
51SD12-4	Typewriter Array	+5 VDC @ 200 mA −12 VDC @ 10 mA	Card Edge	(1) Six Bit Address	Sculptured
53SD5-2	Communications (Model 33 Array)	+5 VDC @ 250 mA −12 VDC @ 50 mA	Card Edge	(4) USASCII	Sloped
64SD30-1	Communications (Model 33 Array)	+5 VDC @ 156 mA	Rt. Angle Header	(4) USASCII	Stepped
66SD6-6	Interactive Visual Display (IBM 3790)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
66SD12-10	Interactive Visual Display (IBM 3790)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
66SD6-7	Interactive Visual Display (IBM 3270)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
78SD6-5	Interactive Visual Display (IBM 3270)	+5 VDC @ 0.5A −12 VDC @ 5 mA	Card Edge	(2) EBCDIC	Stepped
83SD30-2	Interactive Visual Display (DEC's VT 100)	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
87SD30-8	Interactive Visual Display (IBM 3278)	+5 VDC @ 300 mA	Rt. Angle Header	(1) USASCII	Front Stamped/ Standard
87SD30-9	Interactive Visual Display (IBM 3278)	+5 VDC @ 300 mA	Rt. Angle Header	(1) USASCII	Front Stamped/ Standard
63SD30-1	General Purpose Visual Display	+5 VDC @ 156 mA	Rt. Angle Header	(4) USASCII	Stepped
103SD24-2	Intelligent Terminals	+5 VDC @ 500 mA	Rt. Angle Header	(4) USASCII	Stepped
103SD30-2	Intelligent Terminals	+5 VDC @ 125 mA	Rt. Angle Header	(4) USASCII	Stepped
104SD30-Series	European Arrays	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Stepped
Capacitance-membrane (Low Profile DIN Standards)					
58ST13-1	Typewriter Array	+5 VDC @ 250 mA	Rt. Angle Header	(1) USASCII	Sculptured
63ST13-2	Interactive Display Terminal	+5 VDC @ 250 mA	Rt. Angle Header	(4) USASCII	Stepped
83ST13-5	Interactive Display Terminal (DEC's VT 100)	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
87ST13-1	Interactive Display Terminal (IBM 3278)	+8 VDC @ 250 mA	Telephone Type Header	(1) Eight Bit Address	Sculptured/ Front Stamped
103ST13-1	General Purpose	+5 VDC @ 350 mA	Rt. Angle Header	(4) USASCII	Sculptured
83ST13-1	Personal Comp. (IBM P.C.)	+5 VDC @ 350 mA	Telephone Type Header	Eight Bit Address	Sculptured
90ST13-1	General Purpose	+5 VDC @ 350 mA	Telephone Type Header	USASCII	Sculptured
105ST13-1	General Purpose	+5 VDC @ 350 mA	Telephone Type Header	USASCII	Sculptured
Contact-membrane (Low Profile DIN Standards)					
63ST22-5	Communications	–	Pigtail with Connector	Wired-only-X-Y matrix	Stepped
16ST22-1	Adding Machine Format		Pigtail with Connector	Wired-only X-Y matrix	Stepped
103ST22-1	General Purpose	–	Pigtail with Connector	Wired-only-X-Y matrix	Sculptured
Touch Panel					
TCA431-2 (12 Stations)	Numeric Entry	0.5 to 30 VAC/DC @ 10 µA to 100 mA	Pigtail	(1) Wired-only	Embossment
TCA431-4 (16 Stations)	Numeric Entry	0.5 to 30 VAC/DC @ 10 µA to 100 mA	Pigtail	(1) Wired-only	Embossment
TCM454-1 (103 Stations)	General Purpose	+5 VDC @ 500 mA	Rt. Angle Header	(4) USASCII	Embossment
TCA454-1 (103 Stations)	General Purpose	0.5 to 30 VAC/DC @ 10 µA to 100 mA	Pigtail	Wired-only	Embossment

WORLDWIDE SALES AND SERVICE

For technical literature on any of the general sale listings shown, application assistance, pricing and delivery scheduling; contact your nearest MICRO SWITCH Sales Office, write or call MICRO SWITCH, Freeport, IL 61032, Tel. 815/235-6600.

If your application calls for keyboards "sealed for hostile environments" NEMA 2, 3, 3R, 12 and 13, and military specifications MIL-STD-202 contact MICRO SWITCH, Freeport, IL 61032 for off-the-shelf listings.

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* First 2 digits indicate number of keys on keyboard.

MICRO SWITCH, a Honeywell division

eem

COMMONLY USED ELECTRICAL/ELECTRONIC ABBREVIATIONS AND ACRONYMS

A

AC	alternating current
A/D	analog to digital
ADC	analog to digital converter
ADP	automatic data processing
AF	audio frequency
AFC	automatic frequency control
ALGOL	algorithmic language
AM	amplitude modulation
AND	a logical operator
AQL	acceptable quality level
ASCII	American national standard code for information interchange
AWG	American wire guage

B

BALUN	balanced to unbalanced
BASIC	beginners' all-purpose symbolic instruction code
BCD	binary-coded decimal
BNC	baby "N" connector
BUS	basic utility system

C

CAD	computer aided design
CAM	computer aided manufacture
CATV	cable television or community antenna television
CERMET	ceramic metal element
Comm.	communications
CMOS	complementary metal-oxide semiconductor
CPS	characters per second
CPU	central processing unit

D

D/A	digital to analog
DAC	digital to analog converter
DC	direct curent
DIL	dual in-line
DIP	dual in-line package
DPM	digital panel meter
DTL	diode transistor logic

E

EDP	electronic data processing
EBCDIC	extended binary coded decimal interchange code
EEPROM	electrically erasable PROM
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPROM	electrically programmable ROM
ESR	equivalent series resistance

F

FEP	fluorinated ethylene propylene Copolymar, 200° Teflon
FET	field-effect transistor
FM	frequency modulation
FORTRAN	formula translator

G

GaAsFET	gallium arsenide field effect transistor
GPIB	general purpose interface bus

H

HF	high frequency (3 to 30 MHz)
HIPOT	test, measurement and diagnostic equipment
HLL	high level language
HV	high voltage
Hz	Hertz

I

IC	integrated circuit
IF	intermediate frequency
IO	input/output (devices)
IR	insulation resistance (or) infrared

J

JFET	junction field effect transistor
JMOS	junction metal oxide semiconductor

K

kHz	kilohertz (10^3 hertz)
KSR	keyboard send receive

L

LC	inductance capacitance
LCD	liquid crystal display
LED	light-emitting diode
LF	low frequency (30 to 300 kHz)
LSI	large scale integration
LVDT	linear velocity displacement transformer

M

MATV	master antenna television
μF	microforad
MHz	megahertz
MOS	metal oxide semiconductor
MOSFET	metal oxide semiconductor field effect transistor
MOV	metal oxide varistor
MPU	microprocessor unit
MSI	medium scale integration

N

NBS	National Bureau of Standards
NIM	nuclear instrumentation module
NOR	not OR

O

OEM	original equipment manufacturer
OR	a logical operator

P

pF	picofarad
PC	printed circuit
PCB	printed circuit board
PIN	positive-intrinsic-negative (transistor)
PLA	programmable logic array
PPI	plan position indicator
PROM	programmable read only memory
PUT	programmable unijunction transistor

Q

QAM	quadrature amplitude modulation
Q (meter)	quality-factor meter

R

RAM	random access memory
RC	resistance-capacitance
RFI	radio frequency interference
RMS	root mean square
ROM	read only memory
RF	radio frequency
RFC	radio-frequency choke
RFI	radio-frequency interference
RTD	resistance-temperature detector
RTL	resistor transistor logic
RTV	room temperature vulcanizing
RW	read/write

S

SAS	silicon asymmetrical switch
SBC	single board (micro) computer
SBS	silicon bilateral switch
SCR	silicon-controlled rectifier
SIP	single in-line package
SSI	small scale integration
SSR	solid state relay
STL	Schottky transistor logic

T

TC	temperature coefficient
TCXO	temperature compensated crystal oscillator
TFE	tetrafluoride ethylene propylene Copolymer, 250° Teflon
TTL	transistor-transistor logic
TTY	teletypewriter

U

UHF	ultra high frequency (300 MHz to 3 GHz)
UL	Underwriters Laboratory
UPS	uninterruptible power supply

V

VAC	volts (of) alternating current
VAR	volt-ampere reactive
VCR	video cassette recorder
VDC	volts (of) direct current
VHF	very high frequency
VHSIC	very high speed integrated circuit
VLF	very low frequency (3 to 30 kHz)
VLSI	very large scale integration
VRM	voice recognition module
VTVM	vacuum tube volt meter
VU	volume unit
VSWR	voltage standing wave ratio

W

WPS	word processing software

Y

YIG	yttrium iron garnet

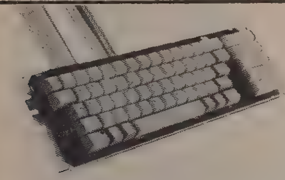
OAK KEYBOARDS, KEYPADS, KEYSWITCHES

OAK STANDARD 81 POSITION KEYBOARD

Oak's FTM full-travel membrane keyboard includes a 60-key typewriter layout, an 11-position numeric keypad and 10 function keys. Sculptured keycaps are available in beige or flat gray. Operating voltage: 1.0 to 30 V. Operating current: 50 microamps to 20 miliamps per single switch. Interconnection is row/column. Life rating exceeds 100 million per key. Pretravel: .080″ ± 0.020″ and total travel is 0.160″. Keyboards are environmentally top-sealed.

The encoded version features a choice of 2-key rollover of Oak's E^3 (entry-error-elimination) system, a multi-key rollover function with phantom key lockout for all data keys. The encoder debounces all keys and permits selection of auto repeat for all noncontrol keys. The board is 4-mode with ASCCI output codes and parallel transmission with a serial option.

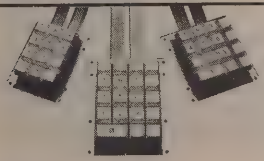
Contact your nearest Oak sales office for complete details and specifications.



LOW PROFILE FTM KEYBOARD

Measuring just 19.9 mm from the center of the home row keycap to the bottom of the aluminum baseplate, Oak's low profile FTM keyboard allows designers to place the FTM in an enclosure and still meet the international 30 mm DIN standards. One of the most notable features of the keyboard is a rocker mechanism which gives a distinct nonfatiguing feel for the keyboard operator. Other features include LED indicators for shift lock and function keys, variable operating force, RFI/EMI/ESD protection, single tail termination and custom encoding electronics.

Contact your nearest Oak sales office for complete details and specifications.



FULL TRAVEL MEMBRANE KEYPADS

The Oak FTM keypad incorporates human-engineered feel and touch and is useful in a wide range of data entry applications. With life expectancy rated at 100 million cycles per key, the keypad features full travel design (0.160″). The pretravel and overtravel features promote operator ease, input accuracy and low fatigue. The keypad is front sealed to protect against spilled liquids and other contaminants. EMI/RFI shielding is available on all standard keypads.

Contact your nearest Oak sales office for complete details and specifications.

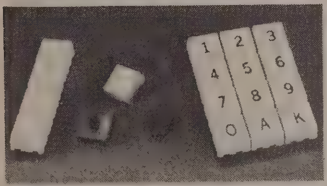
MEMBRANE SWITCHES

Oak TIP switches offer the ultimate in environmental resistance and flexibility. TIP switches are available in a variety of sizes, colors and designs. Tactile feel available.

The TIP switch product line consists of three designs. Type A and B products use rigid single-or double-printed circuit boards. Operating voltage: 1 to 50 (AC or DC). Operating current: 0.05 to 100 milliamps.

Type C products are completely film-based, using a non-rigid polymer substrate instead of a PC board. Termination is achieved via a "tail" which is compatible with standard commercial connectors. Operating voltage: 1 to 30 (AC or DC). Operating current 0.05 to 50 milliamps.

Contact your nearest Oak sales office for complete details and specifications.

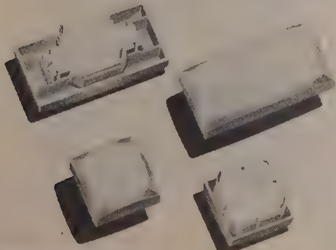


SERIES 225 LOW PROFILE PUSHBUTTON KEYBOARD SWITCH

Oak's series 225 switch is fully compatible with front panel styling and is available in five standard colors with a wide choice of legends. Switches with integrated LED's can be incorporated wherever positive visual confirmation of data entry is required. These unique microprocessor compatible switches are sealed to avoid contamination during wave soldering and immersion cleaning.

Series 225 is supplied in several styles with either .300″ or .225″ profile. Life rating exceeds 1 million cycles for operation over the range of −25° to +75°C. Max. loads are 5 V (AC or DC) @ 100 mA.

Contact your nearest Oak sales office for complete details and specifications.



SERIES 415 KEYBOARD SWITCH

Oak's series 415 switch is available in both single and double station styles. Standard sizes: .610″ square and .720″ square. Double station styles: .610″ x 1.235″ and .720″ x 1.470″.

This series mounts directly to a PC board. Keys are available in white, black, blue, red, and gray. Standard markings are numbers 0-9 or blank. Special markings and colors are available.

Minimum operating life is 10 million cycles under rated loads of 5 V (AC or DC) @ 100 mA.

Contact your nearest Oak sales office for complete details and specifications.

OAK SWITCH SYSTEMS INC.
P.O. Box 517, Crystal Lake, IL 60014
(815) 459-5000 • TWX 910-634-3353 • TLX 72-2447

RUGGEDIZED SWITCH PANEL DESIGNS

ORBIT INSTRUMENT CORP.

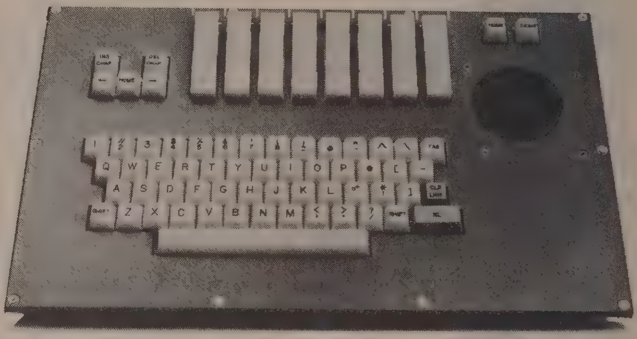
CORPORATE FACILITIES:
80 CABOT COURT, HAUPPAUGE, L.I., NY 11788, TELEPHONE: (516) 435-8300
6431 GLOBAL DRIVE, CYPRESS, CA 90630, TELEPHONE: (714) 527-0561

MILITARIZED KEYBOARD/ BALL TRACKER ASSEMBLIES

INSTALLED IN CONSOLES AS A REMOVABLE ASSEMBLY FOR EASY ACCESS

INCLUDES

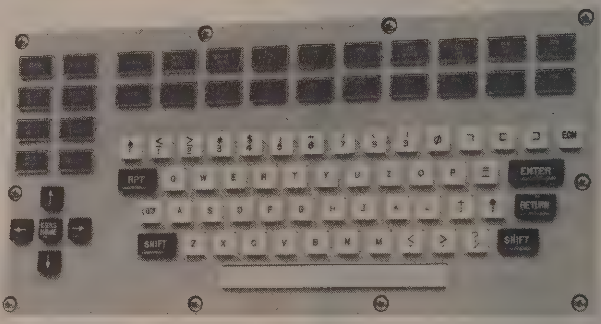
- 32 Function Switches For Fast Control Action
- Orbit Instrument 2″ Diameter Ball Tracker With 256 Output Pulses Per Revolution Of The Ball
- Bi-Directional Data Bus
- Qualified To MIL-STD-810 For Humidity, Salt Fog, Shock, Vibration, Dust And Fungus
- Ball Tracker Can Be Quickly Detached From The Keyboard



BACK LIGHTED KEYBOARDS

These Custom Keyboards Feature

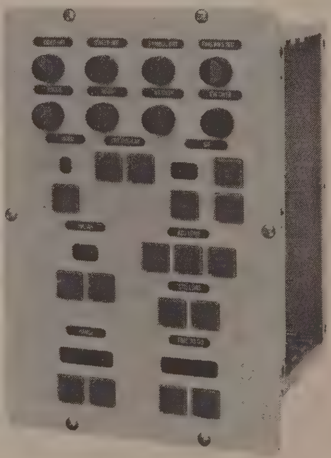
- Low Profile Design
- Sealed For Drip-proof Environments
- Relegendable Function Keys For Added Flexibility
- Any Key Can Be Backlit
- Custom Encoding
- Tactile Feel

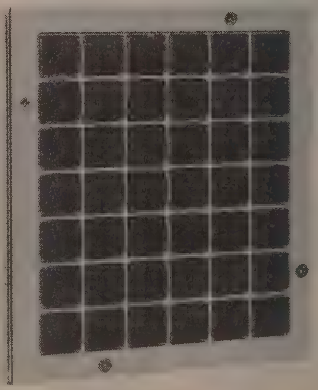


CUSTOM PANEL DESIGNS

USING

- Orbit Low Profile Snap Action Switch Technology
- Switches Can Be Split Legend Or TRI Split
- Rugged Design Construction
- Relegendable Keycaps





SEND US YOUR SPECIFICATIONS TELEPHONE (516) 435-8300 OR TWX (510) 221-2122

PROJECTION READOUT DISPLAYS
"The Link Between Man and Machine"

ORBIT INSTRUMENT CORP.

CORPORATE FACILITIES:
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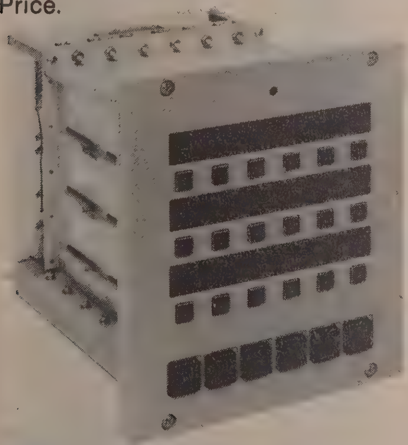
6431 GLOBAL DRIVE, CYPRESS, CA 90630, TELEPHONE: (714) 527-0561

SERIES 62000 REAR PROJECTION READOUTS

These Multi-Message Readouts Have Become World Renowned For Their Good Looks When Displaying Graphic Symbols As Well As Alpha-Numeric Data.

- The Series 62000 Is Capable Of Displaying 24 Or 48 Projected Images.
- Only 5 VDC Required.
- Time Tested To Withstand Humidity, Temperature, Shock And Vibration.
- A Distinct Advantage In Areas Of Limited Space.
- Switches Can Be Made An Integral Member Of Each Readout.

Features Like These Make It Difficult To Find Another Display That Offers So Much At a Comparable Price.



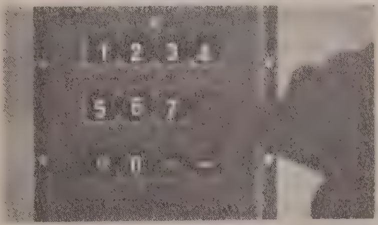
MULTI-LEGEND MATRIX DISPLAYS

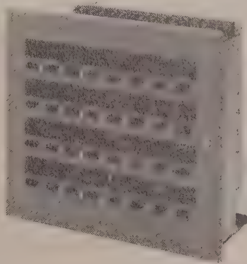
Data Subsystems incorporating the Series 62000 Readout can be arranged in a number of different matrices with the ability to present great amounts of pictorial or alpha numeric information.

Typically a 4 row by 8 column matrix can display over 1500 different legends.

SERIES 61000 DRIVER DECODERS

- Used In Conjunction With Orbit's Multi-Message Readouts.
- The Selection Of Any Desired Message Will Be Displayed When The Driver/Decoder Receives A (BCD) Binary Coded Decimal Signal From A C.P.U. Or External Logic Source.
- Orbit Driver/Decoders Assure Our Customers That Proper Voltage Levels Will Be Maintained Thus Extending The Life Of Orbit Rear Projection Readouts.

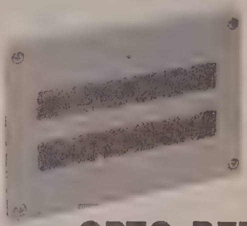




As a service oriented manufacturer, Orbit enjoys being able to see a product through development, manufacturing and test cycles. Careful process controls and quality assurance programs are the earmarks that set Orbit apart.

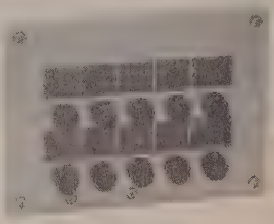
Each (MLM) Multi Legend Matrix is tailored specifically to satisfy the requirements of end users in the military, industrial and commercial environments.

Orbit Engineering Services have designed a variety of display subsystems integrating both hardware and software.



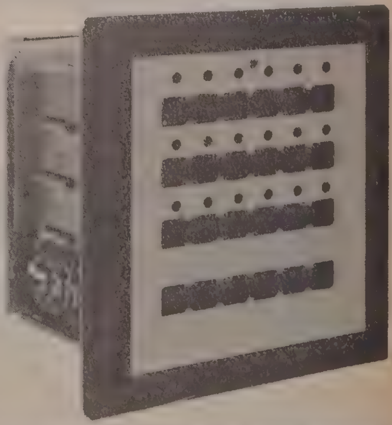
OPTO BEZELS

Data Entry Becomes A Simple Function Of Touching A Particular Message Area. Orbit's Infrared Switch Network Detects The Interruption Of Invisible Light And Actuates A Signal To Sensing Logic.



MECHANICAL SWITCH BEZEL

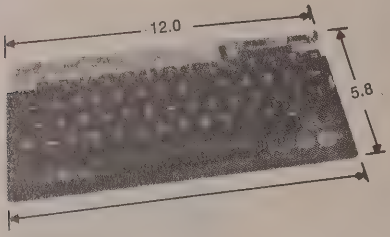
When tactile feel is the preferred means of data entry, we offer several different Bezel configurations to choose from. Whether it be push-button micro switch bezels with variable actuating forces or Orbit's own high reliability low profile, snap action technology, you can count on the quality!



GEORGE RISK INDUSTRIES, INC.

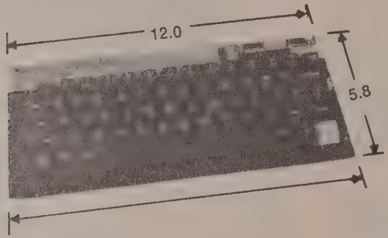
G.R.I. PLAZA / KIMBALL, NEBRASKA 69145 / TELEPHONE (308) 235-4645 / TWX 910-620-9040

KEYBOARDS



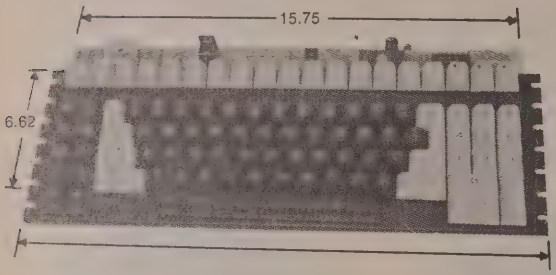
MODEL 7056

• 56 keys — full 128 character ASCII encoding • Two-key rollover • Buffered parallel output • TTL/CMOS compatible • Easy mounting provisions • Non-glare double-shot molded keycaps • Expandable for additional features.



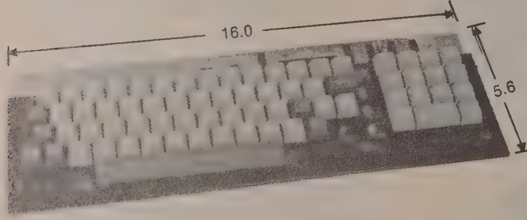
MODEL 7062

• 62 keys — same features as 7056 PLUS separate cursor control keys • User defined key with relegendable keycap or custom engraved • Auto-repeat on all keys • Four mode operating including CAPS LOCK.



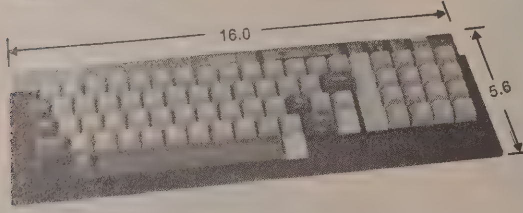
8000 SERIES

• State-of-the-art, microcomputer controlled keyboard, 95 keys, including 19 special function keys • High reliability performance • Four-wire serial interface, 300 or 1200 baud • Unique variable key rollover with phantom key lockout • High speed operation with NO input errors • Ergonomic design.



MODEL 7071

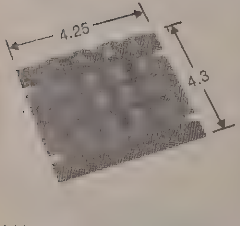
• 71 keys — full 128 character ASCII encoding • Integral 15 key numeric and cursor pad • Four mode operation including ALPHA LOCK • User selectable data and strobe signals • Buffered parallel output • Interface with APPLE II (with slight modifications) special instructions included.



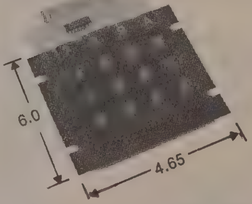
MODEL 7078

• 78 keys — identical to 7071 with the addition of 7 relegendable keycaps or custom engraved.

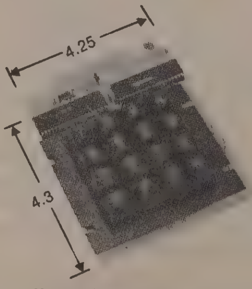
KEYPAD MODELS 10, 12 or 16 keys



• 4 bit hex encoded • Full CMOS design • Outputs compatible with LS and standard TTL logic.



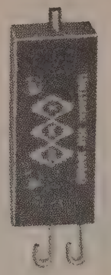
• Parallel or serial RS232 output
• Custom keyboard encoder
• Full 7-bit ASCII characters.



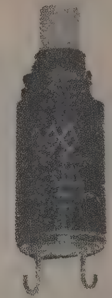
• Unencoded wiring, 1 of 16 or X-Y matrix • One side of each keyswitch is common • Design to be used with custom-supplied encoding.

PUSHBUTTON SWITCHES

DRY CIRCUIT & LOGIC SWITCHING



"B" SWITCH
1.125 H x .420 W



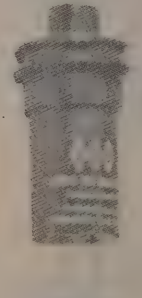
"G" SWITCH
1.745 H x .625 dia.

"W" SWITCH
2.525 H x .625 dia.

"KB" SERIES
1.550 H x .705 dia.

"D" SWITCH
1.470 H x .350 dia.

"R" SWITCH
.940 H x .375 dia.



"V" SWITCH
1.320 H x .590 case dia.
.675 bezel dia.

"KBLP" SERIES
1.125 x .750 sq.

SPST-NO, NC; DPST — NO, NC
Available in 4 form A or B
Illuminated and non-illuminated
Hi rel — 50 million
Mounting collars and buttons available
Mercury wetted reed switches available

Thermostats

Series 5003 – Low-Profile Thermostat

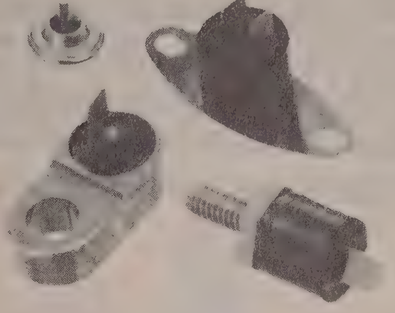
Extremely thin, lightweight, wafer-type thermal switch that provides fast, positive response, excellent repeat reliability, good shock and vibration resistance over a wide operating range.

Features:
- Overall depth is only .250".
- Operating temperature range from 15°F to 355°F.
- OPR or CLR contacts are available.
- 120Vac 5 amp, 240Vac 3 amp.
- Weight 2.3 grams.
- Variety of mountings and terminations available.
- Enviromental sealing available.
- Approval: ЯU SP

Series 5200 – Isolated Contact Thermostat

This hermetically sealed thermostat is perfect for applications requiring isolated contacts. The laser-welded construction withstands vibration and shock, and is designed to meet MIL-Spec requirements. Its size and reliability make it highly suitable for products such as business machines, hot glue-melt systems and other industrial-environment products.

Features:
- Hermetically sealed.
- Designed to meet military standards.
- Operating temperature range from 15°F to 500°F.
- ЯU Certified for regulating.



Series 5011 – Low-Cost, Grounded Thermostat

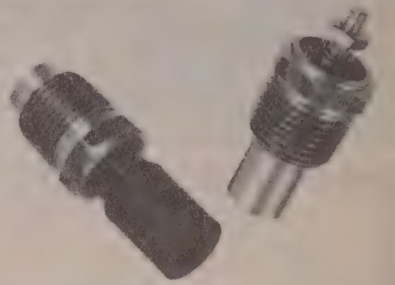
A very low-cost thermostat that will meet a number of exacting requirements for shock and vibration resistance. It is hermetically sealed and offers fast response. The only surface-sensing grounded device offered today. Plug, wire-lead, and isolated-base mountings are available. 1/4-20 boss-mounted and 3/8-16 UNC-2A sizes.

Features:
- Low-cost, grounded unit.
- Operating temperature range from 15°F to 550°F.
- Many mounting packages available: 120Vac, 32Vdc, 3 amp.
- Stud-mounted version available.

Series 5100 – Isolated Case Thermostat

This two-terminal, immersion-type hermetically sealed thermostat can be used on water-cooled engines, hydraulic systems, degreasers, industrial air compressors and tanks where liquids are heated. Its isolated contact is designed to switch 110Vac within your control circuitry. It offers rapid response to liquid or air temperature.

Features:
- Hermetically sealed.
- All stainless T.I.G. construction.
- Operating temperature range from 15°F to 550°F.
- 120Vac 3 amp and 240Vac 1.5 amp. models available.
- Approval: ЯU SP



Series 5021 – Sealed Immersion-Type Thermostats

A single throw, snap-action, sealed temperature control. Snap action disc located in the very tip of the probe. Ideally suited to protect engines from overheating damage by accurately sensing high water and oil temperatures.

Features:
- Solid one piece body construction.
- Operating temperature 15°F to 325°F.
- High vibration resistance.
- Conforms to MIL-12285/2.

Series 5020 – Hermetically Sealed Thermostat

This snap-action hermetically sealed temperature control is designed for use wherever a sealed unit and high vibration resistance are required. Protects engines from damage from overheating by sensing high water or oil temperatures. Snap-action disc located in the very tip of the probe assures rapid and true response to liquid temperature. The all-welded construction (and grounded case) of this sealed thermostat insures meeting Thermal Shock Specifications of MIL-STD-202, Method 107, Test Condition B. The tube will withstand a Pressure Exposure Limit of 1500 PSI. Insulation Resistance of 50 megohms minimum at 500 Vdc.

Features:
- Hermetically sealed.
- Grounded case.
- Operating temperature range from 15°F to 525°F.
- 32Vdc, 3 amp.
- 5020 – 13 Conforms to MIL-12285/1.

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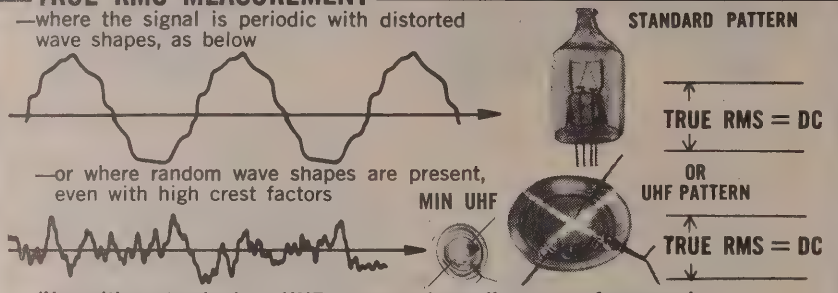
Guide to types, models and applications of
BEST vacuo-junction THERMOCOUPLES
as used by leading instrument manufacturers for:

TRUE RMS MEASUREMENT



—where the signal is periodic with distorted wave shapes, as below

—or where random wave shapes are present, even with high crest factors

(Use either standard or UHF pattern, depending upon frequency)

LINEAR TRUE RMS MEASUREMENT

MATCHED PAIRS

	UHF TYPES	STANDARD PATTERN TYPES	
	Model MPU 1	Model MP1S7	Model MP219
Tracking accuracy	0.5%	0.5%	0.2%
Time constant	1 sec	1 sec	200ms
Nominal current	5mA	5mA	6.67mA

Tracking accuracy applies over full 25°C temperature range.

Single standard patterns for 5mA and higher, useable to −65MHz; for less than 5mA, usable to 10MHz.
Single UHF types usable to 500MHz
Temperature coefficient of output available from −0.2% per °C down to 0.005% per °C on special order.

Reversal error, standard 0.2%. Most models available with R/E down to 0.02%, some models to 0.005%.
Optional special features: short time constants to 50 ms; double heater devices, ultra miniature sizes.

PHYSICAL DATA, STANDARD PATTERNS	
Height of envelope	0.900 inch
Diameter of envelope	0.437
Length of lead from envelope	2 ± ¼ inches
Length of sleeve from envelope	1¾ ± ¼ inches
Heater leads:	
Up to 400 milliamps	0.012 ± 0.002 inch diameter
500 milliamps and over	0.020 ± 0.002 inch diameter
Couple leads—all ranges	0.012 ± 0.002 inch diameter

PHYSICAL DATA, U.H.F.	MIN	REGULAR
Height of envelopes	.43	.75
Diameter of envelope	.47	.80
Width across heater leads	1.42	1.50
Diameter of heater and couple wires	.02	.02

Positive indicated by spot of red lacquer.

Specifications subject to change without notice.

Write on company letterhead for application notes and full line catalog

BEST ELECTRICS DIVISION
HARRY LEVINSON COMPANY
400 BOREN AVENUE N. • SEATTLE, WA 98109 • Tel. (206) 382-1300 • TWX 910-444-2154

Partial list of BEST STANDARD PATTERNS, INSULATED

*Preferred units, available from stock.

Following models have O/C E.M.F. of 7mV ±12%. Maximum permissible load, 250% of nominal.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
*S1	1.0	1750	13
S2	1.25	1600	13
S3	1.5	1000	13
*S4	2.0	800	12
*S5	2.5	400	8
S6	3.0	200	8
*S7	5.0	90	8
*S8	7.5	45	8
*S9	10.0	25	8
S10	15.0	20	4
S11	20.0	15	4
S12 thru S23	25.0 thru 1000.0	10.0 thru 0.15	4

Following have O/C E.M.F. of 20mV ±12%. Maximum permissible load, 200% of nominal.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
S45	2.0	2000	13
S46	2.5	1600	13
S47	3.0	800	13
*S48	5.0	250	8
S49	7.5	180	8
*S50	10.0	125	8
S51	15.0	50	4
S52	20.0	30	4
S53 thru S64	25.0 thru 1000.0	25.0 thru 0.25	4

Following models have O/C E.M.F. of 10mV ±12%. Maximum permissible load, 200% of nominal.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
S98	1.25	1600	13
S99	2.0	800	13
S100	2.5	400	8
S101	3.0	300	8
*S102	5.0	125	8
S103	7.5	70	8
*S104	10.0	40	8
S105	15.0	25	4
S106	20.0	20	4
S107 thru S118	25.0 thru 1000.0	15.0 thru 0.15	4

For Miniature UHF version add MIN as prefix to part number. Ex: MIN U.1

BEST U.H.F. UNITS, INSULATED

*Preferred units, available from stock.

Capacitance	0.3 mfd
Inductance, approx.	0.02 uH

Following models have O/C E.M.F. of 7 mv ±12%. Maximum permissible load, 250% of nominal.

Model No.	Range mA	Heater ohms Resistance ±10%	Couple ohms Resistance ±10%
*U1	5	90	8
*U2	10	25	8
U3	15	20	4
U4	20	15	4
U5	25	10	4
U6	50	3	4
U7	100	1.5	4
U8	150	1.0	4
U9	200	0.7	4
U10	250	0.6	4
U11	500	0.3	4
U12	1000	0.15	4
U27	2.5	200	8

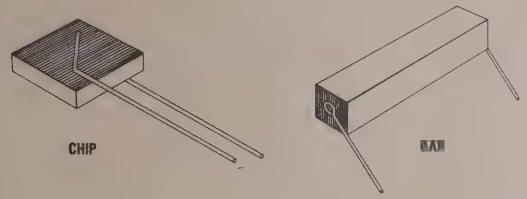
(Max. Perm. Load, Model U27, 150% of nominal)

CAL-R®, INC.

THERMISTORS

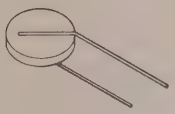
LEADED CHIP, BAR & CUBE

Cal-R Leaded chip and bar thermistors are produced from metal oxide ceramic materials utilizing a unique process which affords the highest degree of manufacturing control.



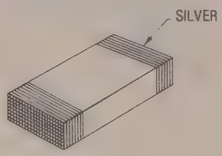
NTC DISCS

Maximum operating temperature 150°C (higher temperatures available).



HYBRID CHIP

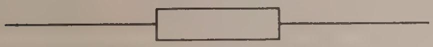
Cal-R Hybrid Chip Thermistors are produced by the same exacting manufacturing process as the Leaded Chip Thermistor and demonstrate the same electrical characteristics. Only the configuration is changed in order that they may be mounted in hybrid circuits utilizing the same equipment and techniques employed in the installation of other hybrid components. Cal-R hybrid chip thermistors are available with either silver or palladium-silver terminations to meet your process requirements.



LINEAR PTC DEVICES

Temperature Coefficient: +.45%/°C & ±.02%/°C (+0.6%°C available).

EPOXY COATED — RESISTANCE TOLERANCE ±1, 3, 5 & 10%



INTERCHANGEABLE THERMISTORS

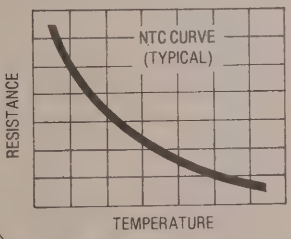
Thermistors designed for interchangeability over a temperature range of 0°C to 80°C without the necessity of recalibrating the system.

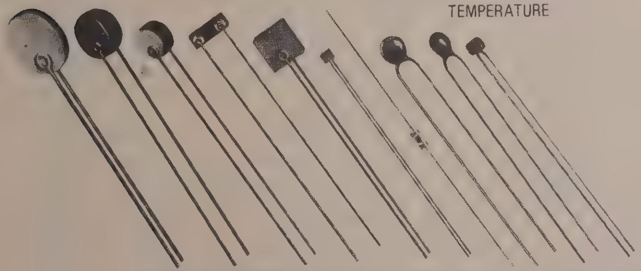
EPOXY COATED

NTC (Negative Temperature Coefficient)

Thermistors offer inexpensive solutions to:

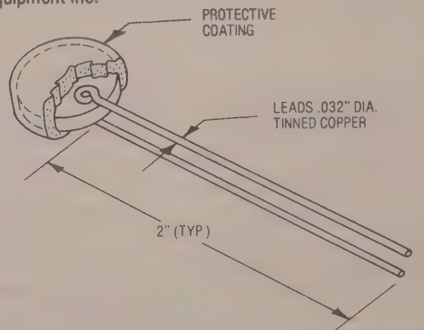
- Temperature Compensation
- Time Delay
- Soft Start
- Gas and Liquid Level Sensing
- Temperature Sensing and Control





SOFT START "INRUSH CURRENT" SUPPRESSING DEVICES

Cal-R Soft Start devices, made from rugged metal oxide ceramic materials, protect against high inrush currents in either AC or DC circuits. Soft Start affords protection for circuit components and assures longer equipment life.


PROTECTIVE COATING
LEADS .032" DIA. TINNED COPPER
2" (TYP)

TEMPERATURE SENSING PROBES

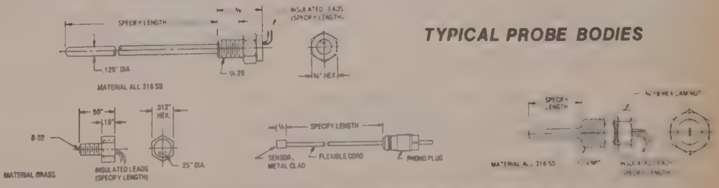
NTC, PTC & NETWORKS

(TEMPERATURE RANGE —60 TO +400°C)

Resistance (@ 25°C) range 50 ohm to 1 megohm — tolerance 10% to 0.5% or better.

CAL-R probes are designed for air, surface, and liquid temperature measurement and control applications. Special industrial probes can be produced to customer specifications.

TYPICAL PROBE BODIES


SPECIFY LENGTH
INSULATED LEADS (SPECIFY LENGTH)
.126" DIA
1/4 28
5/8" HEX
MATERIAL ALL 316 SS
.50"
.19"
.312" HEX.
8-32
MATERIAL BRASS
INSULATED LEADS (SPECIFY LENGTH)
.25" DIA
SPECIFY LENGTH
SENSOR, METAL CLAD
FLEXIBLE CORD
PHONO PLUG
SPECIFY LENGTH
MATERIAL ALL 316 SS

CAL-R engineers will design Temperature Sensing Probes for your special application. Outline your problem or specifications and send them to: CAL-R Applications Engineering Department.

CAL-R®, INC. 1601 Olympic Blvd., Santa Monica, California 90404 • (213) 450-1761 • TWX 910-343-6966
WIREWOUND RESISTORS • THICK FILM • THERMISTORS

CAL-R INC. THERMONETICS DIVISION

THERMISTORS — Negative Temperature Coefficient

THERMISTOR SPECIFICATIONS

R@ 25°C Ω ±10%	Part Number	NTC %/°C @ 25°C	Nominal D.C. *	Nominal T.C. **	Max. Dimensions A	Max. Dimensions B	Leads AWG#	Type
100,000	2J05	−4.4	3	10	.06	.26	30	Bar
75,000	2J06	−4.4	3	8	.06	.20	30	Bar
50,000	2J07	−4.4	3	7	.06	.15	30	Bar
30,000	2J08	−4.4	2	6	.06	.08	30	Bar
25,000	2J09	−4.4	2	5	.06	.07	30	Bar
20,000	2J10	−4.4	2	5	.06	.06	30	Chip
15,000	2J11	−4.4	2	4	.06	.05	30	Chip
10,000	2J12	−4.4	2	4	.06	.04	30	Chip
10,000	1J112	−4.4	2	4	.08	.05	30	Disc
10,000	1J13	−4.4	4	12	.11	.10	28	Disc
8,000	1J14	−4.4	4	10	.11	.08	28	Disc
7,000	1J145	−4.4	4	10	.11	.07	28	Disc
6,000	1J147	−4.4	3	9	.11	.06	28	Disc
5,000	1J15	−4.4	3	8	.11	.05	28	Disc
5,000	2J15	−4.4	3	8	.10	.04	28	Chip
4,000	1J154	−4.4	5	23	.16	.10	28	Disc
4,000	2J165	−4.4	3	8	.10	.04	28	Chip
3,000	2J16	−4.4	3	—	.12	.04	28	Chip
3,000	1J155	−4.4	6	20	.16	.08	28	Disc
2,500	1J158	−4.4	5	19	.16	.07	28	Disc
2,000	2J17	−4.4	3	5	.10	.03	28	Chip
2,000	1J20	−4.4	7	25	.22	.09	24	Disc
2,000	1D10	−3.9	2	3	.06	.04	30	Disc
2,000	2D10	−3.9	2	4	.06	.04	30	Chip
1,500	1D111	−3.9	2	3	.08	.06	30	Disc
1,000	2J21	−4.4	6	15	.18	.04	24	Chip
1,000	1J24	−4.4	9	48	.32	.09	24	Disc
1,000	1D112	−3.9	2	4	.08	.04	30	Disc
1,000	1D13	−3.9	4	10	.11	.08	28	Disc
1,000	2D13	−3.9	2	3	.08	.04	28	Chip
800	1D14	−3.9	3	8	.11	.06	28	Disc
700	1D145	−3.9	3	7	.11	.05	28	Disc
600	1D147	−3.9	3	7	.11	.04	28	Disc
500	1D15	−3.9	3	6	.11	.04	28	Disc
500	2D15	−3.9	2	4	.10	.04	28	Chip
500	1D153	−3.9	7	20	.16	.08	28	Disc
400	2D165	−3.9	2	4	.11	.04	28	Chip
300	2D16	−3.9	3	5	.10	.03	28	Chip
300	1D19	−3.9	7	25	.22	.09	24	Disc
200	2D20	−3.9	6	—	.15	.04	—	Chip
100	2D21	−3.9	6	—	.18	.04	24	Chip
100	2B13	−3.3	2	4	.07	.04	28	Chip
80	2B14	−3.3	2	4	.08	.04	28	Chip
80	2D211	−3.9	5	—	.20	.04	24	Chip
50	2D24	−3.9	6	—	.32	.04	24	Chip
50	2B15	−3.3	2	4	.10	.04	28	Chip
30	2D31	−3.9	7	—	.35	.04	24	Chip
30	2B16	−3.3	2	4	.10	.03	28	Chip
25	2D33	−3.9	7	—	.36	.04	24	Chip
20	2D34	−3.9	7	—	.36	.04	24	Chip
20	2B17	−3.3	3	4	.16	.04	28	Chip
10	2B21	−3.3	5	—	.18	.04	28	Chip
5	2B24	−3.3	6	—	.30	.04	24	Chip

"INTERCHANGEABLE (±0.2°C 0° To 80°C) THERMISTORS"***

EPOXY COATED

2,000	5J102	—4.4	3	10	.125	.125	30	Spherical
3,000	5J103	—4.4	3	10	.125	.125	30	Spherical
5,000	5J105	—4.4	2	8	.100	.100	30	Spherical
10,000	5J110	—4.4	2	8	.100	.100	30	Spherical
20,000	5J120	—4.4	2	8	.100	.100	30	Spherical

*****INTERCHANGEABLE THERMISTORS**

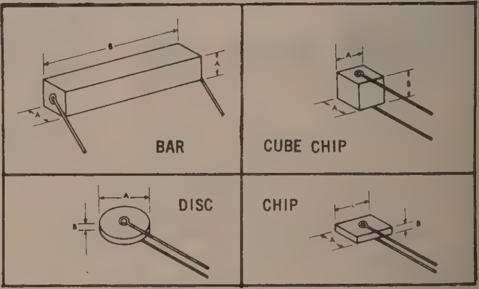
Thermistors designed for interchangability over narrower temperature ranges are available to your specifications at lower cost.

R/T CONVERSION TABLE

TEMPERATURE °C	TEMPERATURE °F	CURVE B R_t/R_{25}	CURVE D R_t/R_{25}	CURVE J R_t/R_{25}
—60	—76	43.0	73.04	140.5
—50	—58	24.3	38.95	67.0
—40	—40	14.4	21.51	33.7
—30	—22	8.93	12.33	17.7
—21.5	—6.7	6.09	—	10.6
—20	— 4	5.69	7.307	9.71
—10	+14	3.68	4.476	5.53
0	32	2.45	2.825	3.27
10	50	1.68	1.830	1.99
20	68	1.18	1.216	1.25
25	77	1.00	1.000	1.00
30	86	.854	.8267	.806
37.8	100	.671	—	.583
40	104	.628	.5742	.533
50	122	.464	.4067	.360
60	140	.350	.2937	.249
70	158	.267	.2160	.175
75	167	.236	—	.148
80	176	.208	.1615	.126
90	194	.163	.1229	.0916
100	212	.130	.0946	.0679
104.4	220	.118	—	.0598
110	230	.105	.0739	.0511
120	248	.0852	.0584	.0389
125	257	.0771	—	.0342
130	266	.0700	.0470	.0301
140	284	.0579	.0382	.0235
150	302	.0483	.0313	.0185

The alphabetical letter in the part number indicates the curve. To determine the approximate resistance of a thermistor at a specified temperature, multiply the thermistor resistance at 25°C by the ratio factor opposite that temperature on the R/T conversion table.

CURVE **B**	Ratio $\frac{R@\,25^\circ C}{R@\,125^\circ C} = 12.95 \pm 10\%$
CURVE **D**	Ratio $\frac{R@\,25^\circ C}{R@\,125^\circ C} = 19.8 \pm 10\%$
CURVE **J**	Ratio $\frac{R@\,25^\circ C}{R@\,125^\circ C} = 29.85 \pm 10\%$



***DISSIPATION CONSTANT**

Dissipation Constant, expressed in mw/°C, represents the amount of power required to raise the temperature of a thermistor 1°C.

****TIME CONSTANT**

Time Constant, expressed in seconds, is the time required for a thermistor dissipating zero power to change 63% of the difference between its initial temperature value and that of a new temperature environment.

CAL-R thermistors conform to AQL and confidence levels specified in MIL-T-23648, tables V and VI.

Coatings, marking, special leads, probes, resistor/thermistor networks, resistance values from 1 ohm to 150 KΩ, and other product variations are produced to meet your design requirements.

Resistance tolerances of ±1% through ±20% are available and may be specified at 25°C or any temperature within the operating range. Maximum operating temperature with leads 150°C.

CAL-R INC.
THERMISTORS • RESISTORS • MICROELECTRONICS
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 450-1761 • TWX 910-343-6966

CAL-R, INC.

THERMISTOR DIVISION

"SOFT-START"

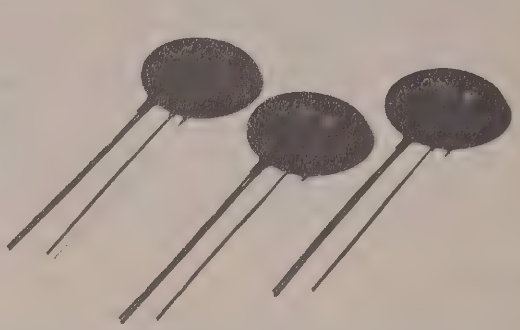
INRUSH CURRENT SUPPRESSING DEVICES

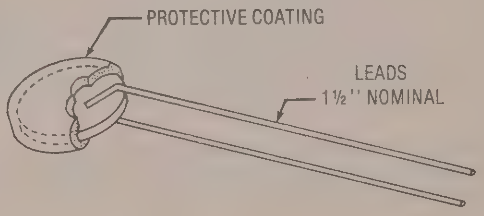
''Soft-Start'' devices display relatively high resistance to starting currents in a variety of electronic circuits. Having a negative temperature coefficient of resistance, these devices exhibit a large decrease in resistance when an AC or DC current is applied.

Unlike circuit breakers and fuses, ''Soft-Starts'' prevent dangerous, short-duration, peak inrush currents present at turn-on. Especially useful in power supplies where charging capacitors initially present extremely low impedance, ''Soft-Starts'' actually limit inrush currents thereby extending the life of other critical components.

Part Number	I Max. (Amperes)	R_o 25°C (Ohms)	R@I Max. (Ohms)	Maximum Diameter (Inches)	Maximum Thickness (Inches)	Lead Diameter (Inches)
25SS25	25	1	.01	1.10	.35	.040
20SS20	20	1	.015	.90	.30	.040
18SS36	18	2	.03	.90	.35	.040
15SS38	15	2.5	.03	.60	.30	.040
14SS56	14	4	.05	.90	.35	.040
12SS60	12	5	.06	.90	.50	.040
12SS30	12	2.5	.04	.90	.35	.040
10SS50	10	5	.06	.90	.35	.040
10SS25	10	2.5	.04	.90	.25	.040
9SS45	9	5	.06	.90	.25	.040
9SS23	9	2.5	.04	.60	.25	.032
8SS40	8	5	.05	.60	.25	.040
8SS32	8	4	.07	.60	.25	.040
7SS35	7	5	.07	.60	.25	.032
7SS18	7	2.5	.05	.60	.25	.032
6SS60	6	10	.15	.60	.35	.040
6SS42	6	7	.15	.60	.30	.040
6SS30	6	5	.07	.60	.25	.032
5SS50	5	10	.20	.60	.35	.040
5SS35	5	7	.15	.60	.30	.040
5SS20	5	4	.15	.60	.25	.032
4SS48	4	12	.22	.50	.35	.040
4SS28	4	7	.15	.60	.30	.040
4SS20	4	5	.15	.60	.25	.032
3SS30	3	10	.20	.50	.30	.032
3SS21	3	7	.14	.60	.25	.032
3SS15	3	5	.17	.60	.25	032
3SS08	3	2.5	.15	.60	.25	.032
2SS80	2	40	.60	.70	.25	.032
2SS40	2	20	.28	.60	.25	.032
2SS20	2	10	.20	.60	.25	.032
2SS10	2	5	.40	.60	.25	.032
1.5SS90	1.5	60	1.00	.60	.25	.032
1.5SS60	1.5	40	.80	.60	.25	032
1.5SS38	1.5	25	.60	.50	.30	.032
1.5SS15	1.5	10	.25	.50	.25	.032

- Standard R_o25°C tolerance is ±20%. Closer tolerances are available upon request.
- Protective silicone coating is standard and has a nominal thickness of .02 inches. Other coatings are available upon request.
- Standard lead material is tinned copper-clad steel. Nickel or copper leads are available upon request.
- Special marking is available upon request.





DEFINITIONS

I_{max}
Represents the maximum rated steady state DC or RMS current and is expressed in amperes.

R_o25°C
Represents the zero power resistance of the device at +25°C and is expressed in ohms.

R@I_{max}
Represents the approximate resistance at maximum steady state current conditions and is expressed in ohms.

Ambient Temp.
Full rated current may be applied in the ambient temperature range of +25°C to +65°C and must be derated in accordance with I_{max} derating curve.

I_{op}
Represents the actual operating current applied.

Cool-Down Time
Is the amount of time needed for a ''Soft-Start'' device to cool enough to cause the necessary amount of resistance to limit inrush current.

CARBORUNDUM THERMISTORS

APPLICATION DATA

Carborundum thermistors are temperature dependent resistors, offered in a wide variety of resistance-temperature characteristics. They are available with a wide range of negative temperature coefficients at 25°C ranging from −0.3%/°C to −5.4%/°C. These parts are made from ceramic materials, bonded in a high-temperature firing process into rod, disc, and chip configurations. They are available in a large range of sizes, thermal characteristics, resistance values, and temperature coefficients to suit the needs of many types of electrical and electronic circuits.

Carborundum offers long experience in the design of special resistance devices. This, together with expertise in the field of ceramic technology, assures a stable and uniform product to meet your thermistor requirements. All materials used in the manufacture of Carborundum thermistors are of the highest quality. Strict quality control is maintained over all stages of manufacture, and a minimum of two calibrations at the specified reference temperature is standard.

DEFINITIONS

Zero Power Resistance . . . is the resistance of a thermistor at the calibrating temperature, measured in such a manner that the measuring current does not appreciably heat the thermistor. Resistance, as used here, means zero power resistance unless otherwise stated.

Beta (β) . . . is the number that satisfies the equation:

$$R_1/R_2 = \epsilon^{\beta\,(1/T_1-1/T_2)}$$

Carborundum determines beta from measurements at 25°C and 73.2°C. Beta is proportional to the slope of the resistance-temperature characteristic, and it is also known as the material constant. It is not truly a constant, but it gives a good approximation of resistance over a substantial working range. In the equation, ϵ is 2.718 . . ., the base of natural logarithms, and β, T_1, and T_2 are in Kelvin (K).

Alpha (α) . . . or temperature coefficient of resistance (TCR) is proportional both to beta and to the square root of the temperature at which it is specified. Very nearly,

$$\alpha = -100\ \beta/T^2$$

In this equation, temperature is in Kelvin (K), and α is in percent per degree C (%/°C). It is evident that alpha becomes much higher as temperatures decrease.

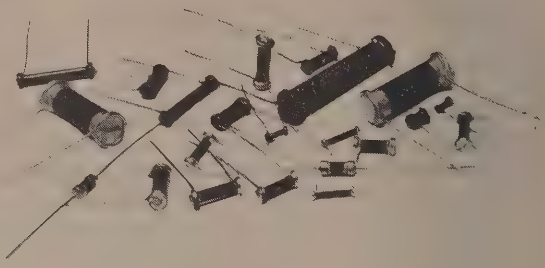
Dissipation Constant (δ) . . . is the ratio of power dissipated by the thermistor divided by the temperature rise above ambient due to self-heating. Here, it is 20 times the power required, in watts, to bring the thermistor to 75°C in an ambient of 25°C, and it is expressed in milliwatts.

Time Constant (τ) . . . is the time required for a thermistor which has attained equilibrium after being self-heated to 75°C to cool to 43.4°C in an ambient of 25°C. It is expressed in seconds.

Both δ and τ are necessarily approximate quantities, and they represent complicated concepts. They cannot be fully defined or used unless the conditions under which they are measured are fully defined.

In particular, note that the dissipation of a thermistor is the sum of dissipation due to conduction, convection, and radiation, which are related to temperature by linear, square-law, and fourth-power equations respectively. Only over narrow temperature ranges can dissipation constant be considered constant.

Also note that time constant is defined by a zero-power cooling curve. If the thermistor is attached to a heat sink the effective time constant is changed substantially. The time required for a thermistor to reach equilibrium due to heating from a current passing through it may be dramatically different from the time constant as defined above.



THERMISTOR SPECIFICATION

Thermistors are most often specified by a zero power resistance, suitably toleranced, at some specified temperature (most often 25°C or 37.8°C), and by a temperature coefficient, also suitably toleranced. This is all that is required as an electrical specification. Additional specifications may result in double dimensioning and be unduly restrictive (and therefore costly) or ambiguous.

The zero power resistance of a thermistor should be read in a temperature controlled, agitated oil bath. Not only does the oil bath provide a more controllable constant temperature, but it also speeds the settling of the reading.

ROD THERMISTORS

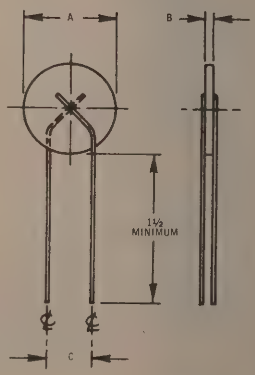
Rod thermistors are manufactured by extruding and firing a suitable ceramic mixture. For a given type of thermistor, low-, medium-, or high-sensitivity, a number of mixtures are available: in general, a mixture yielding a higher resistivity product also yields a higher beta or temperature sensitivity.

Standard rod thermistors are shown in the following table. They have a resistance tolerance of ±10% at 25°C, and they are neither coated nor marked. Special rod thermistors may be ordered with intermediate resistance values, other resistance tolerances, other calibration temperatures, coating, marking, special lead preparation, etc. Parts without wire leads are also available.

DISC THERMISTORS

Disc thermistors are manufactured by pressing and firing a suitable ceramic mixture. Carborundum offers six standard mixtures of various resistivity and beta.

Standard disc thermistors are shown in the following table. They have a resistance tolerance of ±10% at 25°C, and they are neither coated nor marked. Special disc thermistors may be ordered with intermediate resistance values, other resistance tolerances, other calibration temperatures, coating, marking, special lead preparation, etc. Parts without wire leads are also available.



CARBORUNDUM
The Carborundum Company
Electric Products Division, Post Office Box 339, Niagara Falls, N.Y. 14302
Tel: (716) 278-2521 • Telex: 91-555 (CARBO GLO NGF)

CARBORUNDUM THERMISTORS

Specifications	Type A	Type B	Type C	Types D & L	Type M
R @ 25°C / R @ 125°C	28.5	14.2	18.7	35.3	62.0
β (K) ±5% (25.0°C - 73.2°C)	3980	3070	3415	4200	4900
Temp. Coef. (α) %/°C @ 25°C	−4.4	−3.4	−3.8	−4.7	−5.4

ROD THERMISTORS

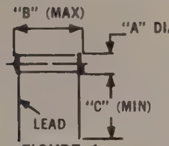


FIGURE 1

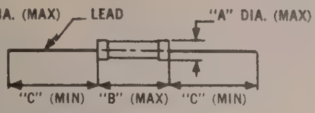


FIGURE 2

Style	Figure	Dimensions (inches) A	Dimensions (inches) B	Dimensions (inches) C	AWG	Dissipation Constant (mw/°C)	Time Constant (seconds)
0325F5- 0325H5-	1	0.12	0.30	1.00	24	6.0	10
0540F4-	2	0.20	0.50	1.25	20	9.5	22
0550H4-	2	0.20	0.63	1.25	20	11.0	25
0550F5- 0550H5-	1	0.22	0.63	1.38	20	11.0	25
1099F5-	1	0.38	1.13	1.38	20	24.0	90

		MEDIUM TEMPERATURE COEFFICIENT Type "F" Rods Beta ±10%			HIGH TEMPERATURE COEFFICIENT Type "H" Rods Beta ±5%	
Resistance Ohms ±10% @ 25°C	Dash Number	Style 0325F5	Styles 0540F4- 0550F5-	Style 1099F5-	Style 0325H5-	Styles 0550H4- 0550H5-
2.2	-402	—	—	1300	—	—
3.3	-403	—	—	1350	—	—
4.7	-404	—	1300	1400	—	—
6.8	-406	—	1350	1450	—	—
10.0	-410	1300	1400	1500	—	—
15.0	-411	1350	1450	1550	—	—
22.0	-412	1400	1500	1600	—	—
33.0	-413	1450	1550	1600	—	—
47.0	-414	1500	1600	1650	—	—
68.0	-416	1550	1600	1650	—	—
100	-420	1600	1650	1700	—	—
150	-421	1600	1650	1700	—	—
220	-422	1650	1700	1750	—	—
330	-423	1650	1700	1750	—	—
470	-424	1700	1750	1800	—	—
680	-426	1700	1750	1800	—	—
1,000	-430	1750	1800	1850	—	3000
1,500	-431	1750	1800	1850	—	3100
2,200	-432	1800	1850	1900	3000	3150
3,300	-433	1800	1850	1900	3100	3200
4,700	-434	1850	1900	1950	3150	3300
6,800	-436	1850	1900	1950	3200	3400
10,000	-440	1900	1950	2000	3300	3500
15,000	-441	1900	1950	2000	3400	3600
22,000	-442	1950	2000	2050	3500	3700
33,000	-443	1950	2000	2050	3600	3800
47,000	-444	2000	2050	2100	3700	3900
68,000	-446	2000	2050	2100	3800	4000
100,000	-450	2050	2100	2150	3900	4100
150,000	-451	2050	2100	2150	4000	4150
220,000	-452	2100	2150	2200	4100	4200
330,000	-453	2100	2150	2200	4150	4250
470,000	-454	2150	2200	2200	4200	4300
680,000	-456	2150	2200	—	4250	4350
1,000,000	-460	2200	2200	—	4300	4400
1,500,000	-461	2200	—	—	4350	—
2,200,000	-462	2200	—	—	4400	—

Order by the style number followed by the dash number. For example, part number 0540F4-404 is a thermistor of style 0540F4-, of 4.7 ±10% ohms resistance, and with a beta of 1300 ±10% K.

HIGH SENSITIVITY NTC DISCS

TYPICAL PARTS

Carborundum Part Number	Resistance at 25°C in Ohms	Dimensions A	Dimensions B	Dimensions C	Lead Wires AWG	Dissipation Constant mw/°C	Time Constant Seconds
TYPE "A" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
A3306J-16	50 ±20%	0.82	0.06	⅜	18	29.0	100
A2606J-16	75 ±20%	0.65	0.06	⅜	20	20.0	80
A2004J-16	100 ±10%	0.50	0.04	¼	20	15.0	60
A3311J-16	100 ±20%	0.82	0.11	⅜	18	29.0	150
A2207J-16	120 ±20%	0.55	0.07	¼	20	17.0	75
A3312J-16	120 ±20%	0.82	0.12	⅜	18	29.0	150
A1604J-16	150 ±10%	0.40	0.04	¼	20	9.0	38
A1203J-16	200 ±10%	0.30	0.03	¼	24	8.0	30
A2612J-16	200 ±20%	0.65	0.12	⅜	20	22.0	100
A1204J-16	300 ±10%	0.30	0.04	¼	24	8.0	30
A0803J-16	500 ±10%	0.20	0.03	⅛	24	7.0	20
A1612J-16	500 ±10%	0.40	0.12	¼	20	11.0	60
A0805J-16	750 ±10%	0.20	0.05	⅛	24	7.0	23
A0807J-16	1,000 ±10%	0.20	0.07	⅛	24	7.2	26
A1212J-16	1,000 ±10%	0.30	0.12	¼	24	9.0	40
A0809J-16	1,500 ±10%	0.20	0.09	⅛	24	7.5	30
A0810J-16	2,000 ±10%	0.20	0.10	⅛	24	7.5	30
TYPE "B" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
B3306J-16	2.0 ±20%	0.82	0.06	⅜	18	29.0	100
B2605J-16	3.0 ±20%	0.65	0.05	⅜	20	20.0	80
B1804J-16	3.8 ±20%	0.45	0.04	⅜	22	12.0	48
B2004J-16	5.0 ±10%	0.50	0.04	¼	20	15.0	60
B3312J-16	5.0 ±20%	0.82	0.12	⅜	18	29.0	150
B1604J-16	7.5 ±10%	0.40	0.04	¼	20	9.0	38
B1203J-16	10.0 ±10%	0.30	0.03	¼	24	8.0	30
B2612J-16	10.0 ±20%	0.65	0.12	⅜	20	22.0	100
B1205J-16	15.0 ±10%	0.30	0.05	¼	24	8.5	35
B1206J-16	20.0 ±10%	0.30	0.06	¼	24	8.5	35
B2012J-16	20.0 ±10%	0.50	0.12	¼	20	16.0	80
B0804J-16	30.0 ±10%	0.20	0.04	⅛	24	7.0	20
B0807J-16	50.0 ±10%	0.20	0.07	⅛	24	7.2	26
B1212J-16	50.0 ±10%	0.30	0.12	¼	24	9.0	40
B0809J-16	75.0 ±10%	0.20	0.09	⅛	24	7.5	30
B0810J-16	100.0 ±10%	0.20	0.10	⅛	24	7.5	30
TYPE "C" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
C2604J-16	10.0 ±10%	0.65	0.04	⅜	20	20.0	80
C2004J-16	15.0 ±10%	0.50	0.04	¼	20	15.0	60
C1603J-16	20.0 ±10%	0.40	0.03	¼	20	9.0	38
C3312J-16	20.0 ±20%	0.82	0.12	⅜	18	29.0	150
C1605J-16	30.0 ±10%	0.40	0.05	¼	20	9.0	38
C1205J-16	50.0 ±10%	0.30	0.05	¼	24	8.5	35
C2012J-16	50.0 ±10%	0.50	0.12	¼	20	16.0	80
C0803J-16	75.0 ±10%	0.20	0.03	⅛	24	7.0	20
C0804J-16	100.0 ±10%	0.20	0.04	⅛	24	7.0	20
C1612J-16	100.0 ±10%	0.40	0.12	¼	20	11.0	60
C0807J-16	150.0 ±10%	0.20	0.07	⅛	24	7.2	26
C0808J-16	200.0 ±10%	0.20	0.08	⅛	24	7.2	26
C1212J-16	200.0 ±10%	0.30	0.12	¼	24	9.0	40
C0810J-16	300.0 ±10%	0.20	0.10	⅛	24	7.5	30
TYPE "D" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
D2604J-16	100 ±20%	0.65	0.04	⅜	20	20.0	80
D2003J-16	150 ±10%	0.50	0.03	¼	20	15.0	60
D1804J-16	200 ±10%	0.45	0.04	¼	20	12.0	48
D3312J-16	200 ±20%	0.82	0.12	⅜	18	29.0	150
D1604J-16	300 ±10%	0.40	0.04	¼	20	9.0	38
D1204J-16	500 ±10%	0.30	0.04	¼	24	8.0	30
D2612J-16	500 ±20%	0.65	0.12	⅜	20	22.0	100
D1206J-16	750 ±10%	0.30	0.06	¼	24	8.5	35
D1207J-16	1,000 ±10%	0.30	0.07	¼	24	8.5	35
D1612J-16	1,000 ±10%	0.40	0.12	¼	20	11.0	60
D0806J-16	1,500 ±10%	0.20	0.06	⅛	24	7.0	23
D0807J-16	2,000 ±10%	0.20	0.07	⅛	24	7.2	26
D1212J-16	2,000 ±10%	0.30	0.12	¼	24	9.0	40
D0810J-16	3,000 ±10%	0.20	0.10	⅛	24	7.5	30
TYPE "L" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
L1205J-16	3,000 ±10%	0.30	0.05	¼	24	8.5	35
L1209J-16	5,000 ±10%	0.30	0.09	¼	24	9.0	40
L0805J-16	7,500 ±10%	0.20	0.05	⅛	24	7.0	23
L0807J-16	10,000 ±10%	0.20	0.07	⅛	24	7.2	26
L0810J-16	15,000 ±10%	0.20	0.10	⅛	24	7.5	30
TYPE "M" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS							
M1203J-16	7,500 ±10%	0.30	0.03	¼	24	8.0	30
M1204J-16	10,000 ±10%	0.30	0.04	¼	24	8.5	35
M2012J-16	10,000 ±10%	0.50	0.12	¼	20	16.0	80
M1207J-16	15,000 ±10%	0.30	0.07	¼	24	8.5	35
M0803J-16	20,000 ±10%	0.20	0.03	⅛	24	7.0	20
M1209J-16	20,000 ±10%	0.30	0.09	¼	24	9.0	40
M0805J-16	30,000 ±10%	0.20	0.05	⅛	24	7.0	23
M0809J-16	50,000 ±10%	0.20	0.09	⅛	24	7.5	30
M0810J-16	75,000 ±10%	0.20	0.10	⅛	24	7.5	30

DALE® THERMISTORS

Interchangeable and Custom Negative Temperature Coefficient (NTC)

NTC Thermistors are the most sensitive temperature sensors known to exist for temperature measurement and control between −50°C and +150°C. Dale Thermistors are rugged, reliable, predictable and are easily assembled in small housings to meet a multitude of temperature measurement and control requirements. The effects of "noise", which may be a factor with other sensors, and conductor resistance resulting from the installation of thermistors in remote locations, has minimal effect on system accuracy.

Interchangeable Thermistors provide greater temperature measurement and control accuracy over wider temperature ranges. In addition, they allow the use of multiple thermistor sensors with a single readout or control system and save money by eliminating costly calibration procedures. Dale Thermistors are backed by more than a decade's experience in manufacturing smaller, low-cost NTC styles which are used in a variety of temperature measurement and control equipment worldwide.

Resistance values and tolerances. The following charts list "standard" thermistor resistance values and tolerances. Contact us for additional information and assistance in developing custom thermistors and sensor assemblies to meet your application requirements.

SPECIFICATIONS

Point-Matched Tolerance: NTC Thermistors may be ordered with a temperature or a resistance tolerance at a temperature point. Parts listed are specified at 25°C:

Ω TOLERANCE	TEMPERATURE TOLERANCE
±10%—no suffix	±1.0°C— -A
± 5%— -5	±0.5°C— -B
± 3%— -3	±0.2°C— -C
± 1%— -1	

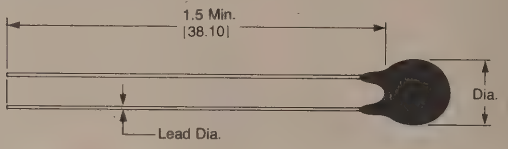
Interchangeable Tolerance: To simplify specification in ordering interchangeable Thermistors, they are specified to a temperature tolerance over a temperature range. The temperature tolerance corresponds to a resistance tolerance based on the temperature coefficient at each temperature point within the specified range (see definition of NTC).

INTERCHANGEABLE TOLERANCES AVAILABLE

TOLERANCE	0° to 70°C	SUFFIX
±1.0°C	—	A3
±0.5°C	—	B3
±0.2°C	—	C3

To specify, add the appropriate suffix to the part number selected from the "Most Specified NTC Thermistors" chart. *Example:* 1M1002-B3, Curve 1, 10KΩ @25°C, *interchangeable to* ±.5°C from 0° to 70°C. Asterisk (*) indicates ±0.2°C tolerance available for interchangeable thermistors.

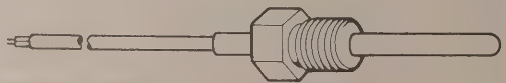
R25 Values ±10% listed are typical. 40Ω to 40 megohm @ 25°C available. Add -5 for ±5%, -2 for ±2%, etc. to part number for closer tolerance at temperature T.

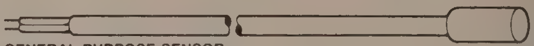


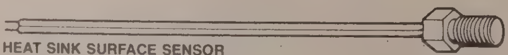
Leads: T series thermistors have Teflon insulated leads 3" [76.20] ± .25 [6.35]. All others are solid tinned copper 1.5 [38.10] ± .2 [5.08] long unless otherwise specified.

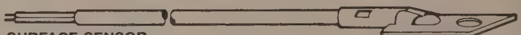
Coating: "Baked-on phenolic" for durability and improved long term stability. Other coatings are available.

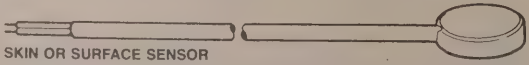
TYPICAL SENSOR ASSEMBLIES

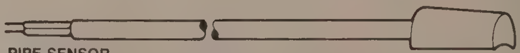

IMMERSION PROBE WITH THREADED HEX FITTING


GENERAL PURPOSE SENSOR


HEAT SINK SURFACE SENSOR


SURFACE SENSOR


SKIN OR SURFACE SENSOR


PIPE SENSOR

Sensor Assemblies are designed to enhance applicability, protect and appropriately locate thermistors for maximum efficiency, whether used in liquids, solids or gases. They may be designed to meet the stringent requirements of automotive, energy, industrial, computer, aerospace, consumer appliance, medical and ecology related industries. "Standard" sensor-assemblies are available; however, most are manufactured to customer specifications. Contact our engineers for design assistance and quotations.

For additional information and engineering assistance, contact
DALE ELECTRONICS, INC., Western Thermistor Division. 2300 Riverside Blvd., Norfolk. NE 68701 • Phone 402-371-0080

Most Specified NTC THERMISTORS

R_{25} Ω	P/N	CURVE	NOMINAL		MAX. DIA.	LEAD DIA.
			D.C.	T.C.		
100,000	7C1003	7	3	12	.095	.0125
50,000	7C5002	7	3	12	.095	.0125
30,000	4C3002	4	2.5	12	.095	.0125
20,000	4C2002	4	3	12	.095	.0125
10,000	1C1002*	1	3	12	.095	.0125
8,000	1C8001	1	3	12	.095	.0125
5,000	1C5001	1	3	12	.095	.0125
3,000	1C3001*	1	3	12	.095	.0125
2,000	1C2001	1	3.5	16	.095	.0125
1,000	2C1001	2	3	12	.095	.0125
500	2C5000	2	3	12	.100	.0125
200	2C2000	2	3.5	18	.150	.0125
100	2C1000	2	4	20	.195	.0125
30,000	9F3002*	9	.8	5	.072	.008
15,000	1F1502*	1	.8	5	.072	.008
10,000	1F1002*	1	.8	5	.072	.008
5,000	1F5001*	1	.8	7	.072	.008

R_{25} Ω	P/N	CURVE	NOMINAL		MAX. DIA.	LEAD DIA.
			D.C.	T.C.		
200,000	7M2003	7	2	12	.095	.010
100,000	4M1003*	4	2	12	.095	.010
50,000	4M5002*	4	2	10	.085	.010
30,000	4M3002*	4	2	10	.085	.010
20,000	9M2002*	9	2	10	.085	.010
10,000	9M1002*	9	2	12	.095	.010
10,000	1M1002*	1	2	10	.085	.010
6,000	1M6001	1	2	10	.085	.010
5,000	1M5001*	1	2	10	.085	.010
2,252	1M2251*	1	3	12	.095	.010
1,000	2M1001	2	3	12	.085	.010
30,000	4T3002*	4	2	12	.095	.010
20,000	9T2002*	9	2	12	.095	.010
10,000	9T1002*	9	2	14	.095	.010
10,000	1T1002*	1	2	12	.095	.010
5,000	1T5001*	1	2	12	.095	.010
2,252	1T2251*	1	2	14	.095	.010

.03937 in. = 1 mm.

*Indicates ±0.2°C tolerance available for interchangeable thermistors.

Contact factory for information on resistance values not listed.

RESISTANCE vs. TEMPERATURE CONVERSION TABLES (Ratio = $R_T \div R_{25}$)

TEMP. °C	CURVE 1			CURVE 2			CURVE 4			CURVE 7			CURVE 9		
	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC	Ratio	MT±%	NTC
−55	96.44	4.5	7.4	53.40	6.3					132.15	6.0				
−50	67.06	3.9	7.2	38.99	6.1	6.2				90.49	5.0	7.5	44.13	3.9	
−40	33.66	3.3	6.7	21.45	5.5	5.8	40.16	5.3		43.92	4.2	7.0	23.98	3.3	5.9
−30	17.70	2.6	6.2	12.27	4.8	5.4	20.64	4.3	6.5	22.26	2.9	6.7	13.52	2.6	5.6
−20	9.712	2.1	5.8	7.278	4.0	5.1	11.03	3.5	6.1	11.73	2.7	6.2	7.891	2.1	5.2
−10	5.534	1.5	5.5	4.459	3.2	4.7	6.119	2.6	5.7	6.418	2.1	5.9	4.754	1.5	4.9
0	3.266	1.1	5.1	2.815	2.3	4.5	3.510	1.8	5.4	3.632	1.4	5.5	2.949	1.1	4.6
10	1.990	0.6	4.8	1.826	1.4	4.2	2.078	1.0	5.1	2.121	0.9	5.2	1.879	0.6	4.4
20	1.249	0.1	4.5	1.215	0.5	4.0	1.267	0.2	4.8	1.276	0.2	5.0	1.226	0.1	4.2
25	1.000	0.0	4.4	1.000	0.0	3.8	1.000	0.0	4.7	1.000	0.0	4.8	1.000	0.0	4.0
30	.8058	0.2	4.3	.8276	0.5	3.7	.7942	0.4	4.6	.7889	0.4	4.7	.8194	0.2	3.9
37	.6016	0.6	4.1				.5814	1.0	4.4				.6258	0.6	3.8
40	.5326	0.7	4.0	.5758	1.4	3.5	.5105	1.1	4.3	.5003	0.9	4.4	.5592	0.7	3.7
50	.3602	1.1	3.8	.4086	2.3	3.3	.3359	1.8	4.1	.3249	1.5	4.2	.3893	1.1	3.5
60	.2488	1.3	3.6	.2954	3.1	3.2	.2259	2.4	3.9	.2147	1.9	4.1	.2760	1.3	3.4
70	.1751	1.8	3.4	.2172	4.1	3.0	.1550	2.9	3.7	.1447	2.4	3.8	.1990	1.8	3.2
80	.1256	2.1	3.3	.1622	5.1	2.8	.1084	3.4	3.5	.09941	2.7	3.7	.1458	2.1	3.1
90	.09164	2.3	3.1	.1229	5.5	2.7	.0771	3.9	3.3	.06949	3.2	3.5	.1084	2.3	2.9
100	.06792	2.6	2.9	.09446	6.7	2.6	.0557	4.4	3.2	.04938	3.6	3.3	.08168	2.6	2.8
110	.05108	2.7	2.8	.07350	7.4	2.4	.0408	4.9	3.0	.03564	4.0	3.2	.06235	2.7	2.6
120	.03894	3.2	2.7	.05788	8.5	2.3	.0303	5.3	2.9	.02610	4.4	3.0	.04818	3.2	2.5
125	.03416	3.3	2.6	.05158	8.7	2.3	.0263	5.5	2.9	.02246	4.5	3.0	.04253	3.3	
130	.03006	3.4	2.5	.04609	8.9	2.2	.0228	5.7	2.8	.01939	4.7	2.9	.03764	3.4	2.4
140	.02348	3.7	2.4	.03708	9.7	2.1	.0173	6.0	2.7	.01459	5.0	2.8	.02972	3.7	2.3
150	.01854			.03012			.0133			.01112			.02370		

DEFINITIONS

$R_T \div R_{25}$ ratio is Resistance at temperature T divided by resistance at 25°C. To determine the resistance of a NTC thermistor at temperatures other than 25°C, multiply the ratio selected from the appropriate curve column above by resistance at 25°C, e.g., Curve 1, 10KΩ @ 25°C, 1256Ω @ 80°C. Call us for 1°C ratio tables.

NTC (−%/°C) is negative temperature coefficient of resistance at temperature (T) expressed in % resistance change per °C. Since one NTC resistance change is approximately equivalent to a 1°C temperature change, NTC is useful in developing Interchangeable thermistor specifications, e.g., Curve 1, 10,000Ω ± 4.4% @ 25°C, 32,660Ω ± 5.1% @ 0°C, 1751Ω ± 3.4% @ 70°C results in a ±1°C Interchangeable Thermistor 0° to 70°C, .5 NTC = ±.5°C, etc.

Maximum Temperature for thermistors listed is 150°C; however, continuous operation or cycling above 125°C, or above specified temperature range for Interchangeable thermistors, may cause thermistors to exceed originally specified tolerances.

MT±% is manufacturing tolerance at temperature. Add to resistance tolerance specified at 25°C, e.g., Curve 1 10K ± 10% @ 25°C, 1256Ω ± 12.1% @ 80°C. Not applicable to Interchangeable Thermistors.

Dissipation Constant (D.C.) is the amount of power, in milliwatts, which will raise the thermistor 1°C above its environment while suspended by its leads in still air at 25°C.

Time Constant (T.C.) is the time, in seconds, required for the thermistor dissipating zero power to change 63% of the difference between its initial temperature value and that of a new temperature environment, while supported by its leads in still air.

Thermistor Resistance Measurements must be made at precisely controlled temperature while applying essentially zero power to assure measurement accuracy.

For additional information and engineering assistance, contact

DALE ELECTRONICS, INC., Western Thermistor Division, 2300 Riverside Blvd., Norfolk, NE 68701 • Phone 402-371-0080

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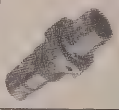
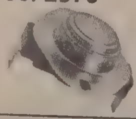
BI-METALLIC SNAP-ACTION THERMOSTATS

Description	Electrical Resistive Rating	Set Point Range Including Tol	Narrowest Tolerance Allowable	Narrowest Differential Available	Agency Listings	Typical Applications
3100/3106 Welded hermetic	**3100** 7A-30 VDC 3A-240 VAC	−20°F to 500°F	±3°F	6°F Max	UL	High-temp control for copy machines, computers, aircraft, electronic controls. 3106 for "Dry Circuit" applications.
	3106 .5A-50 VDC .1A-120 VAC	−28.89°C to 260°C	±1.7°C	3.3°C Max	CSA	
3150/3156 Similar to 3100 except low silhouette .301° max. design	**3150** 6A-120 VAC 1.5A-240 VAC	−20°F to 350°F	±3°F	6°F Max		Copy machines, computers, aircraft, electronic controls where space is critical. 3156 for "Dry Circuit" applications.
	3156 .5A-50 VDC .1-120 VAC	−28.89°C to 177°C	±1.7°C	3.3°C Max.	UL	
3800 Hermetically sealed, all welded construction. Long life.	125 VA-24 VAC 360 VA-600 VAC	20°F to 480°F −5°C to 250°C	±9°F ±5°C	18°F 10°C	UL CSA	Running overtemperature protection for AC & DC motors. On-winding mount.
3600 Hermetically sealed TO-5 case, with contacts for logic level.	1 Amp 28V AC/DC 5 MA 5 VDC	35°C to 105°C	±5°C	5°C Stand.		PC board mounted protection for power supply boards, logic boards, etc.
3000  Custom package housings	Consult Factory	0°F to 400°F −18°C to 204°C	±4°F ±2.2°C	10°F Max 5.6°C Max		Aircraft bleed air duct sensing, hydraulic oil temp control, liquid bath control, heater control.
3001/3004 Non-hermetic, phenolic and metal housing.	**3001** 6A-120 VAC 3A-240 VAC	0°F to 335°F	±40°F	8°F Max	UL, CSA BSI, VDE	Computer, copy machines, telecommunications equipment. 3004 meets European spacing requirements.
	3004 8A-120 VAC 4A-250 VAC	−17.8°C to 168.3°C	±2.2°C	4.4°C Max		
3450/3455R/3450RC **3455RC** Non-hermetic "C" models have high temperature base material	15 AMP-120 VAC 10 AMP-240 VAC 10 AMP-277 VAC	32°F to 500°F 0°C to 260°C	±5°F ±3°F	20°F 11°C	UL, CSA Int'l	Power supplies, communication, medical equipment, computers where high amp loads are present. 3455R/RC is used where increased spacing for Int'l req's are needed.
3455RM/CM Non-hermetic manual reset. Will not recycle automatically at room temperature. CM model for high temp.	15 AMP-120 VAC 10 AMP-240 VAC	125°F to 500°F 0°C to 260°C	±8°F ±5°C	Man. reset auto reset below 40°F 4.44°C	UL, CSA Int'l	Where manual reset is required. 3455RM/CM meet increased spacing for Int'l requirements.
TCO/MTP Non-eutectic, non-resettable thermal fuse which protects equipment from hazardous temp conditions	**TCO** 25A-240 VAC	162°F to 464°F 72°C to 240°C	+0°C	N/A	UL, CSA Int'l	Electric heaters, table-top appliances, small motors and transformers. Special configuration avail.
	MTP 5A-120 VAC	162°F to 306°F 72°C to 152°C	−3°C			

¾″ DISC THERMOSTATS

2500/2570  ¾″ Non-hermetic automatic reset device. 2570 series used for Defrost applications	**2500** 25A-240 VAC 13A-480 VAC	0°F to 350°F −18°C to 177°C	±5°F	10°F	UL, CSA	Electric heaters, clothes dryers, wood stoves. 2570 Series is designed for refrigerators, freezers, HVAC and food dispensing applications.
	2570 10A-120 VAC 5A-240 VAC	−20°F to 221°F −29°C to 105°C	±3°C	5°C		

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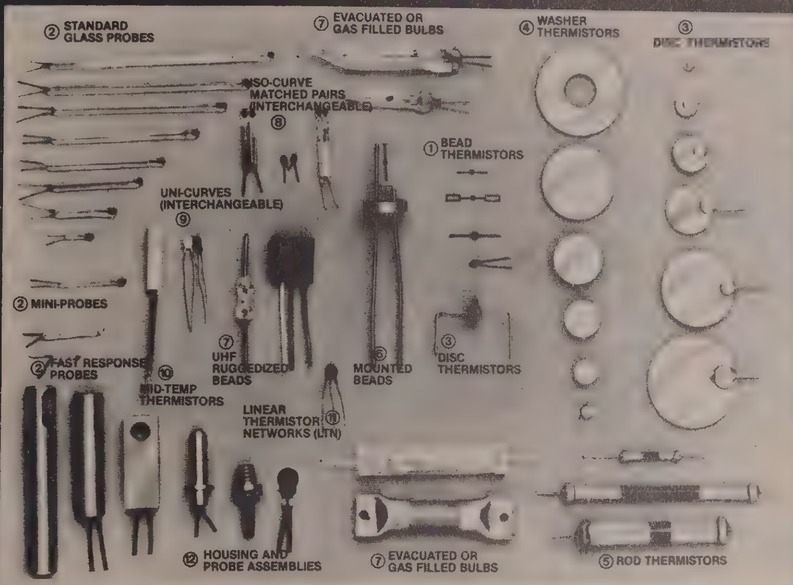

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1. **Glass Coated Beads** — used where small size, fast response, high precision, stability, and temperatures to 300°C are required.

2. **Glass Probes** — medium-small in size. Many of the advantages of beads but rugged, more easily mounted, useful in liquid media.

3. **Discs** — used where medium power dissipation is a requirement and space not a problem. Useful to 150°C.

4. **Washers** — used where high power dissipation is a prime requirement.

5. **Rods** — these units have power dissipation intermediate between discs and washers and are also used where their physical shape is an asset.

6. **Mounted Beads** — provide ease in using glass beads in such applications as gas chromatography, flow and vacuum measurement, etc.

7. **Vacuum and Gas Filled Assemblies** — high power sensitivity for specialized circuit applications.

INTERCHANGEABLE THERMISTORS

8. **Iso-Curve® Interchangeable Thermistors** — these units available in bead or glass probe configurations, follow standard L-2B curves over wide temperature range, and are completely interchangeable. Units match standard curves as close as ± ¼ % of resistance or as required. Bulletin L-2B.

9. **Uni-Curve® Interchangeable Thermistors** — completely interchangeable units having an accuracy of + 0.2%C over a temperature range of 0°C to 70°C and available on special order to other tolerances and ranges. Bulletin L-6B

MID-TEMP THERMISTORS

10. **Mid-Temp Thermistors** — Bead and probe thermistors designed for useage at the higher Mid-Temp range from 200°C to 600°C. Ask for bulletin L-10.

LINEAR THERMISTOR NETWORKS(LTN)

11. **Linear Thermistor Networks (LTNTM)** — precision resistors and thermistors which are designed to produce a resistance change or voltage output that varies linearly with temperature over the selected temperature range. Ask for Bulletin L-9A.

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12. **Probe Assemblies** — standard catalog types or built to specific military or commercial requirements. We are experienced in design of probe assemblies for all fields of application including industrial control and indication, aerospace — specializing in telemetry applications, and oceanographic — featuring fast response, very high pressure, and interchangeability using our Iso-Curve and Uni-Curve Thermistors. Ask for Catalog L-5A.

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THERMISTOR MANUAL

THERMISTOR MANUAL (EMC-6B) Most complete up-to-date listing of thermistors available. Theory, engineering data, complete specifications.

THERMISTOR HOUSING MANUAL (L-5A). Detailed information on how Fenwal Electronics can build thermistor sensor assemblies to fit your requirements.

THERMISTOR MANUAL

THERMISTOR APPLICATION AND TECHNICAL DATA NOTES: "Designing Linear Temperature Read-Out Circuits" AN-1A; "Using Thermistors to Compensate for Transistor Temperature Sensitivity" AN-2A; "Stability & Reliability Characteristics" TD-1A; "Considerations in Testing of Thermistors" TD-2A.

THERMISTOR

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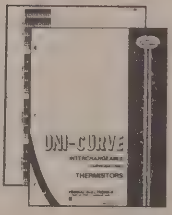
INTERCHANGEABLE THERMISTORS: ISO-CURVE manual (L-2B) and UNI-CURVE manual (L-6B) provide in-depth data pertaining to precision and low-cost RT, curve-matched interchangeable thermistors.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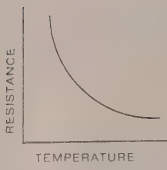
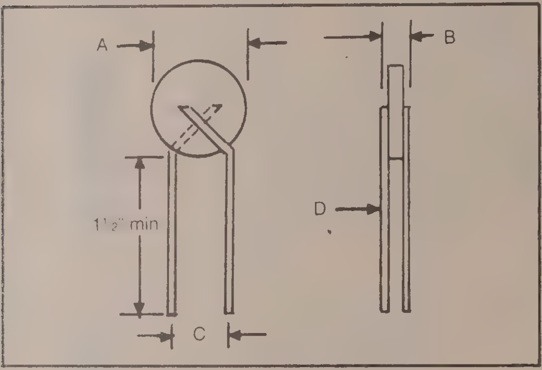


NTC (Negative Temperature Coefficient) thermistors decrease in resistance as temperature increases. Their maximum operating temperature is 125° C. Zero-power resistance values at 25° C range from 10 Ω to 250K Ω ; other values upon request. Disc thermistors are available with various coatings, lead styles, and resistance tolerances. Contact Keystone Thermistor Engineering or write for catalog T384.



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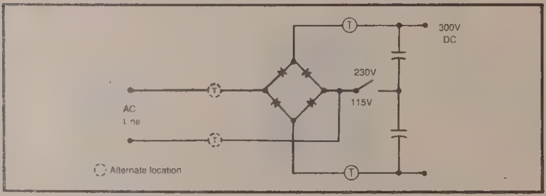
DISC TYPE THERMISTORS WITH CROSSED LEADS

KCC TYPE	R₀@ 25°C (Ω)	Tol. ±%	A (in.)	B (in.)	C (in.)	D (AWG)	Dissipation Constant (mW/°C)	Resist.† Ratio	Temp. Coef. @ 25°C (%/°C)
RL1004-65.6-59-D1	100	20	0.110	0.120	0.100	26	2.5	5.6	-3.42
RL1003-312-73-D1	500	10	0.110	0.110	0.100	26	2.5	6.9	-3.83
RL1007-624-73-D1	1,000	10	0.110	0.150	0.100	26	2.8	6.9	-3.83
RL1003-1157-95-D1	2,000	10	0.110	0.150	0.100	26	2.8	9.2	-4.43
RL1003-1746-97-D1	3,000	10	0.110	0.110	0.100	26	2.5	9.1	-4.40
RL1004-2910-97-D1	5,000	10	0.110	0.120	0.100	26	2.5	9.1	-4.40
RL1009-5820-97-D1	10,000	10	0.110	0.170	0.100	26	3.0	9.1	-4.40
RL1005-5744-103-D1	10,000	10	0.110	0.130	0.100	26	2.5	9.6	-4.49
RL1007-13.8K-120-D1	25,000	10	0.110	0.150	0.100	26	2.8	11.4	-4.84
RL1003-26.7K-140-D1	50,000	10	0.110	0.110	0.100	26	2.5	12.9	-5.08
RL1006-53.4K-140-D1	100,000	10	0.110	0.140	0.100	26	2.7	12.9	-5.08
RL1004-104.7K-155-D1	200,000	10	0.110	0.120	0.100	26	2.5	13.8	-5.23
RL1006-135.2K-138-D1	250,000	10	0.110	0.140	0.100	26	2.7	12.1	-4.96
RL2004-16.4-59-D1	25	20	0.220	0.130	0.156	24	6.5	5.6	-3.42
RL2007-32.8-59-D1	50	20	0.220	0.160	0.156	24	6.5	5.6	-3.42
RL2003-62.4-73-D1	100	10	0.220	0.120	0.156	24	6.5	6.9	-3.83
RL2006-125-73-D1	200	10	0.220	0.150	0.156	24	6.5	6.9	-3.83
RL2008-187-73-D1	300	10	0.220	0.170	0.156	24	6.5	6.9	-3.83
RL2003-289-95-D1	500	10	0.220	0.120	0.156	24	6.0	9.2	-4.43
RL2004-582-97-D1	1,000	10	0.220	0.130	0.156	24	6.5	9.1	-4.40
RL2007-1164-97-D1	2,000	10	0.220	0.160	0.156	24	6.5	9.1	-4.40
RL2006-1600-103-D1	2,786	10	0.220	0.150	0.156	24	6.5	9.6	-4.49
RL2005-2203-120-D1	4,000	10	0.220	0.140	0.156	24	6.5	11.4	-4.84
RL2006-2753-120-D1	5,000	10	0.220	0.150	0.156	24	6.5	11.4	-4.84
RL2012-5506-120-D1	10,000	10	0.220	0.210	0.156	24	7.2	11.4	-4.84
RL2006-13.3K-140-D1	25,000	10	0.220	0.150	0.156	24	6.5	12.9	-5.08
RL2005-27K-138-D1	50,000	10	0.220	0.140	0.156	24	6.5	12.1	-4.96
RL2008-52.3K-155-D1	100,000	10	0.220	0.170	0.156	24	6.5	13.8	-5.23
RL3004-6.56-59-D1	10	20	0.320	0.130	0.250	24	7.0	5.6	-3.42
RL3504-31.2-73-D1	50	10	0.370	0.130	0.250	24	7.0	6.9	-3.83
RL3006-59.4-85-D1	100	10	0.320	0.150	0.250	24	7.2	8.4	-4.23
RL3004-144-95-D1	250	10	0.320	0.130	0.250	24	7.0	9.2	-4.43
RL3004-291-97-D1	500	10	0.320	0.130	0.250	24	7.0	9.1	-4.40
RL3005-574-103-D1	1,000	10	0.320	0.130	0.250	24	7.0	9.6	-4.49

†Resistance Ratio: Ratio of zero-power resistance @ 0°C to zero-power resistance @ 50°C.

INRUSH CURRENT LIMITERS



The circuit diagram above displays a typical way to limit inrush current.

Protection against extremely high peak inrush current, especially in AC/DC switching power supplies, is now available with Keystone Inrush Current Limiters. These special NTC thermistors effectively control surge currents because the thermal time constant of the current limiter is longer than the electrical time constant (RC) of the thermistor and the capacitor.

All inrush current limiters are insulated with a protective coating. Caution must be taken when parts are cleaned in solvents.

Type	R₀ @ 25°C ± 25% (Ω)	Max.* Steady State Current (amps)	Nominal Resistance @ Imax (Ω)	A max. (in.)	B max. (in.)	C ref. (in.)	D (AWG)
CL-10	0.7	12	0.03	0.740	0.200	0.328	18
CL-20	1.3	8	0.04	0.525	0.150	0.328	18
CL-30	2.5	8	0.06	0.740	0.200	0.328	18
CL-40	5	6	0.11	0.740	0.200	0.328	18
CL-50	7	5	0.16	0.740	0.220	0.328	18
CL-60	10	5	0.18	0.740	0.200	0.328	18
CL-70	16	4	0.27	0.740	0.200	0.328	18
CL-80	47	3	0.49	0.740	0.200	0.328	18
CL-90	120	2	1 18	0.910	0.200	0.328	18
CL-100	0.5	16	0.02	0.910	0.200	0.328	18
CL-110	10	3.2	0.18	0.360	0.140	0.250	24
CL-120	10	1.7	0.34	0.360	0.140	0.250	24
CL-130	50	1.6	0.76	0.420	0.150	0.250	24
CL-140	50	1.1	0.89	0.420	0.150	0.250	24
CL-150	5	4.7	0.11	0.530	0.150	0.328	22
CL-160	5	2.8	0.20	0.530	0.150	0.328	22
CL-170	16	2.7	0.33	0.530	0.150	0.328	22
CL-180	16	1.7	0.49	0.530	0.150	0.328	22
CL-190	25	2.4	0.41	0.530	0.150	0.328	22
CL-200	25	1.7	0.49	0.530	0.150	0.328	22

*These values are *suggested* maximums based upon a 25° C ambient, no air flow environment with the thermistor mounted ½" from the circuit board. Contact Keystone Engineering to discuss Iss ratings with air flow.

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Thermistor Division • St. Marys, Pa. 15857
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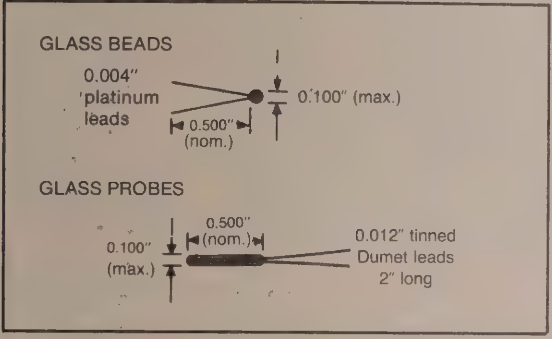
GLASS BEADS • GLASS PROBES

Glass bead thermistors are exceptionally stable because the glass seal protects the thermistor from hostile environments.



RESISTANCE/TEMPERATURE CHARACTERISTICS

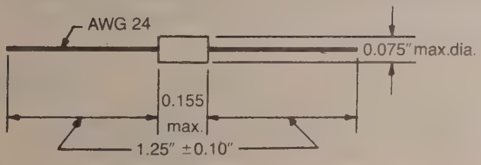
KCC TYPE	RESISTANCE (Ω)								Temp. Coef. @ 25°C (%/°C)
	-25°C	0°C	25°C	50°C	100°C	150°C	200°C	260°C	
RL0504-8783-95-G_*	189.3K	48.48K	15K	5484	1049	290 3	104.0	38.6	-4 33
RL0504-11.64K-97-G_	268 6K	65 76K	20K	7206	1364	370 4	130 3	47 4	-4.39
RL0504-16.92K-112-G_	462.6K	105.3K	30K	10 18K	1735	427 2	115.9	26.9	-4.64
RL0504-27.76K-120-G_	803.5K	182 2K	50K	16.5K	2658	642 5	204.7	67 2	-4.77
RL0504-55.53K-120-G_	1.61M	364 5K	100K	33K	5317	1285	409.4	134.4	-4 77
RL0504-111.3K-125-G_	3.38M	743 4K	200K	65.8K	10.22K	2416	762.2	249 2	-4.82
RL0504-272.6K-142-G_	9.31M	1.97M	500K	158.6K	22.2K	4700	1345	389	-5.00
RL0504-530.5K-148-G_	18.99M	3.94M	1 Meg	301 7K	41.74K	8780	2494	729	-5.11
RL0504-1.294M-176-G_	—	10 34M	2.5 Meg	716.7K	86 77K	15 96K	3955	982.5	-5.31
RL0504-2.588M-176-G_	—	20.68M	5 Meg	1.434M	173.6K	31.92K	7910	1965	-5.31

*Not presently available in Glass Probes.
Tolerance on resistance values ± 20% @ 25°C. Closer tolerances available.
Beads have a maximum operating temperature of 260°C.

—G1 for Glass Beads with platinum leads.
—G15 for Glass Probes.

GLASS ENCAPSULATED THERMISTORS

Keystone glass encapsulated NTC thermistors are tiny pellets of thermistor material hermetically sealed in glass bodies with a controlled amount of selected atmosphere. The hermetic seal makes these parts extremely stable in applications up to 204° C (400° F).



Temperature Range: −50°C to +204°C
Time Constant: 3 sec.
Dissipation Constant: 2.0 mW/°C
Tolerance: ±10% @ 25°C

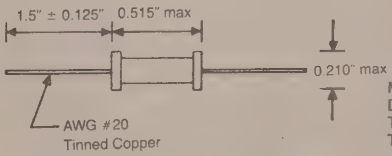
RESISTANCE/TEMPERATURE CHARACTERISTICS

KCC TYPE	RESISTANCE (Ω)								Temp. Coef. @ 25°C (%/°C)
	-25°C	0°C	25°C	50°C	75°C	100°C	150°C	204°C	
AL03006-624-73-G1	10.11K	2888	1K	403.9	185.6	94.4	31 0	12 1	-3 91
AL03006-1248-73-G1	20.22K	5776	2K	807.8	371.2	188.8	62.0	24.2	-3.91
AL03006-5818-97-G1	133 3K	32.96K	10K	3577	1469	671 2	182	59.9	-4.41
AL03006-11.7K-98-G1	253K	64.16K	20K	7234	2966	1356	361 2	115.9	-4.34
AL03006-29.1K-97-G1	625K	160K	50K	18.2K	7510	3431	918.5	293 2	-4.32
AL03006-58.2K-97-G1	1.25M	319.9K	100K	36.4K	15.02K	6862	1837	586 4	-4.32
AL03006-110K-130-G1	3.29M	729K	200K	64.2K	23.66K	9580	2184	595.8	-4.84
AL03006-269.8K-138-G1	8.91M	1.92M	500K	155.7K	55.85K	22.64K	4943	1329	-4.99
AL03006-535K-145-G1	18.72M	3.90M	1 Meg	305.3K	106 9K	42.47K	8946	2329	-5.07
AL03006-2.6M-164-G1	—	20.41M	5 Meg	1.45M	489.3K	185.9K	36.16K	8777	-5.26

ROD-TYPE THERMISTORS

HIGH-TEMPERATURE COEFFICIENT RODS

KCC TYPE	RESISTANCE @°C						Temp. Coef. @ 25°C (%/°C)
	0	25	50	75	100	125	
AL1545-6240-73-R1	28.2K	10K	4100	1890	956	520	-3.83
AL1545-11.6K-97-R1	67.2K	20K	7140	2920	1352	685	-4.46
AL1545-28.9K-97-R1	168K	50K	17.8K	7320	3381	1710	-4.46
AL1545-55K-120-R1	372K	100K	32.4K	12.2K	5270	2080	-4.86
AL1545-109K-125-R1	753K	200K	63.9K	23.9K	10.1K	4720	-4.91
AL1545-268K-137-R1	1.95M	500K	154K	55.6K	22.6K	10.4K	-5.03
AL1545-523K-155-R1	4.06M	1 Meg	294K	100K	39.3K	17.1K	-5.22



Maximum operating temperature: 125°C
Dissipation constant: 9mW/°C
Time constant: 45 sec.
Tolerance: ± 10% @ 25°C

LOW-TEMPERATURE COEFFICIENT RODS

KCC TYPE	RESISTANCE @°C						Temp. Coef. @ 25°C (%/°C)
	0	25	50	75	100	125	
AL1545-40.1-26-R1	80.6	50	32.9	22.6	16.2	11.9	-.1.78
AL1545-80.2-26-R1	161	100	65.8	45.3	32.4	23.8	-1 78
AL1545-160-26-R1	322	200	132	90 6	64.8	47 7	-1 78
AL1545-340-26-R1	685	425	280	192	137	101	-1 78
AL1545-391-29-R1	847	500	314	206	142	100	-1 98
AL1545-782-29-R1	1690	1K	628	413	284	201	1 98
AL1545-1560-30-R1	3430	2K	1240	808	548	387	-2 03
AL1545-3860-31-R1	8680	5K	3060	1980	1327	924	-2 07
AL1545-7730-31-R1	17.4K	10K	6130	3950	2654	1850	-2.07
AL1545-15.3K-33-R1	35.6K	20K	12K	7560	4976	3400	-2 17
AL1545-37.9K-34-R1	90K	50K	29.5K	18 5K	12K	8120	-2 22

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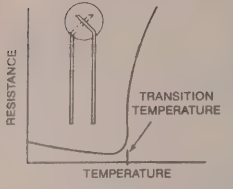
PTC — POSITIVE TEMPERATURE COEFFICIENT THERMISTORS



Positive Temperature Coefficient (PTC) thermistors are characterized by an extremely large resistance change in a small temperature span. The figure at left depicts a generalized resistance temperature plot for a PTC. The temperature at which the resistance begins to increase rapidly is referred to as the transition temperature. This point can be changed from below 0° C to above 160° C.

TYPICAL PTC APPLICATIONS

• Automatic Color TV Degaussing • Air Flow Measurement • Non-Destructive Fuse • Single Phase Motor Starting • Liquid Level Sensing • Combination Heater-Thermostat • Arc Suppression • Time Delay Fusing.

For detailed application notes, write for Bulletin P-780.

Operating Voltage V_{OP}	Type Number	R_o @ 25°C ±30% (Ω)	Transition Temperature T_{TR} (°C)	Reference Dimensions (In.)					Dissipation† Constant δ (mW/°C)	Time† Constant τ (Sec.)	Fig. No. *
				A	B	C	D	E			
12	RL5505-1-120-12-PTO	1	120	0.55	0.05	1.5	0.33	0.032	14.0	50	A
	RL5305-2-120-12-PTO	2	120	0.53	0.05	1.5	0.33	0.032	14.0	50	A
	RL3005-10-120-12-PTO	10	120	0.30	0.05	1.5	0.25	0.020	7.0	35	A
	RL3005-25-120-12-PTO	25	120	0.30	0.06	1.5	0.25	0.020	7.0	35	A
25	RL3006-50-30-25-PTO	50	30	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-40-25-PTO	50	40	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-50-25-PTO	50	50	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-60-25-PTO	50	60	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-70-25-PTO	50	70	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-80-25-PTO	50	80	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-90-25-PTO	50	90	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-100-25-PTO	50	100	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-110-25-PTO	50	110	0.30	0.06	1.5	0.25	0.020	7.0	35	A
	RL3006-50-120-25-PTO	50	120	0.30	0.06	1.5	0.25	0.020	7.0	35	A
50	RL5506-10-110-50-PTO	10	110	0.55	0.06	1.5	0.33	0.032	14.0	50	A
	RL5510-20-110-50-PTO	20	110	0.55	0.10	1.5	0.33	0.032	15.0	80	A
	RL4010-50-110-50-PTO	50	110	0.40	0.10	1.5	0.33	0.025	12.0	60	A
120	RL7510-10-120-120-PTO	10	120	0.75	0.10	1.5	0.33	0.020	20.0	90	A
	RL6010-20-120-120-PTO	20	120	0.60	0.10	1.5	0.33	0.032	18.0	90	A
	RL5510-25-65-120-PTO	25	65	0.55	0.10	0.5	0.33	0.025	15.0	90	B
	RL4510-50-120-120-PTO	50	120	0.45	0.10	1.5	0.33	0.025	12.0	70	A
240	RL5515-50-65-240-PTO	50	65	0.55	0.15	1.5	0.33	0.032	17.0	80	A
	RL6015-100-120-240-PTO	100	120	0.60	0.15	1.5	0.33	0.032	18.0	90	A
	RL3020-1500-100-240-PTO	1500	100	0.30	0.20	1.5	0.25	0.020	12.0	60	A

†The values for dissipation constant and time constant are for reference only. Actual values are a function of method of mounting, air flow, and other factors which affect the PTCs ability to dissipate heat. Contact Keystone Engineering for further information.
*Represents standard lead configurations. Other lead styles shown are available for custom made thermistors.

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TYPICAL CONFIGURATIONS

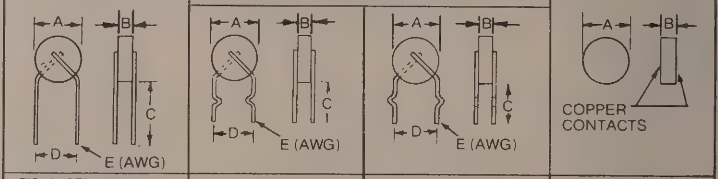


FIG. A (STRAIGHT LEAD) FIG. B (INSIDE KINK) FIG. C (OUTSIDE KINK) FIG. D (NO LEADS)

NOTE: 1. Operating Voltage: D.C. or 60Hz A.C. (for higher voltage req. — contact factory).
2. The specifications and configurations shown above are typical of standard items. Special characteristics, designs and alternate physical sizes are available upon request.

PTC RESETTABLE FUSES

Typical applications for PTC fuses:

- Telephone line fault protection
- Fuse for intermittent solenoids
- Over-current protection for transformers
- Locked rotor protection for FHP motors

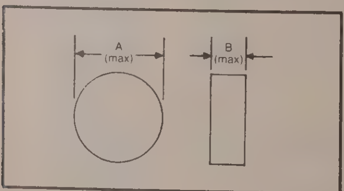
Minimum Limit Current — The minimum amount of current required by the PTC to guarantee switching at the minimum ambient temperature.

Maximum Limit Current — The maximum amount of current the PTC must be able to pass without switching at the maximum ambient temperature.

Operating Voltage V_{op}	No Load Resistance @ 25°C (±20%) (Ω)	Type Number	Minimum Limit† Current (amps)		Maximum Limit† Current (amps)		T_{TR} (Ref.) (°C)	Heat Capacity (Watt-Sec/°C)	Diss.† Const. (mW/°C)	Max. Dia. (In.)
			0°C	20°C	30°C	55°C				
12	1	RL5305-1-110-12-PTF	1.30	1.20	0.80	0.60	110	0.5	14.0	0.60
	5	RL4005-5-110-12-PTF	0.44	0.37	0.29	0.20	110	0.3	10.0	0.45
	10	RL3005-10-110-12-PTF	0.33	0.30	0.20	0.16	110	0.2	7.0	0.35
	25	RL2505-25-110-12-PTF	0.23	0.19	0.13	0.09	110	0.1	6.0	0.32
50	5	RL5506-5-110-50-PTF	0.55	0.50	0.30	0.25	110	0.7	14.0	0.60
	10	RL4006-10-110-50-PTF	0.30	0.27	0.18	0.16	110	0.4	10.0	0.45
	50	RL5310-50-110-50-PTF	0.23	0.20	0.11	0.10	110	1.1	15.0	0.60
	100	RL3810-100-110-50-PTF	0.10	0.09	0.06	0.05	110	0.5	12.0	0.42
120	10	RL7510-10-110-120-PTF	0.39	0.36	0.25	0.17	110	2.2	20.0	0.80
	50	RL4510-50-110-120-PTF	0.16	0.15	0.09	0.07	110	0.7	14.0	0.50
	100	RL3510-100-110-120-PTF	0.09	0.08	0.06	0.04	110	0.5	11.0	0.40

†The values for minimum and maximum limit current and dissipation constant are for reference only. Actual values are a function of method of mounting, air flow, and other factors which affect the PTCs ability to dissipate heat Contact Keystone engineering for further information

PTC HEATERS



Typical applications for PTC heaters:

- Contact lens cleaner kits
- Medical equipment
- In-line diesel fuel heaters
- Temperature stabilization of electronic components

Operating Voltage V_{OP}	Type Number	No Load Resistance @ 25°C (Ref.) (Ω)	Transition Temperature (Ref.) (°C)	A (In.)	B (In.)	Typical Operating Temperature Minimum Heat Sinking† C
24	6306-200-15-24-PTH	200	15	0.68	0.08	20††
	5506-20-120-24-PTH	20	120	0.60	0.08	160
	5506-20-140-24-PTH	20	140	0.60	0.08	180
	5506-40-110-24-PTH	40	110	0.60	0.08	130
120	5510-100-120-120-PTH	100	120	0.60	0.12	160
	5510-200-110-120-PTH	200	110	0.60	0.12	140
	5510-150-140-120-PTH	150	140	0.60	0.12	180
240	6315-250-120-240-PTH	250	120	0.68	0.18	160
	5520-250-140-240-PTH	250	140	0.60	0.23	180
	6315-500-110-240-PTH	500	110	0.68	0.18	140

†Measured at 25°C ambient, PTC mounted in small spring clip. ††Measured at −40°C ambient.

Keystone
CARBON COMPANY

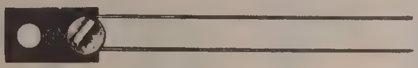
PTC SURFACE-MOUNT OVERTEMPERATURE PROTECTORS

Positive Temperature Coefficient (PTC) thermistors — act as solid-state switches. A typical application of these surface mount units is to prevent destruction of a power transistor.

PTCs are bonded to a tab which is mechanically mounted to the power transistor package. The PTC thermistor measures the surface temperature of the transistor. When the temperature of the transistor case reaches a critical point, the PTC switches and turns off the drive circuitry for the transistor. This action prevents its destruction. Then, as the transistor cools, so does the thermistor, automatically resetting itself to once again guard the power transistor.

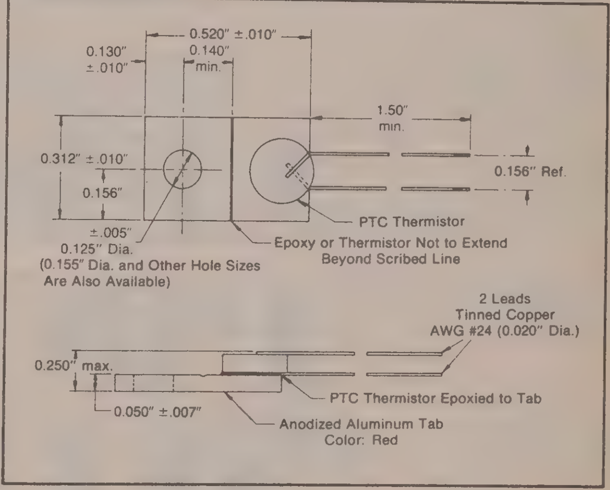
Specifications:

1. Resistance @ 25° C: 100Ω + 30% (70Ω - 130Ω).
2. Transition temperature per table is defined as the temperature at which the measured resistance is two times the minimum resistance.
3. Maximum voltage that can be applied to the device in DC or 60Hz sinusoidal wave form AC is 30 volts.
4. Maximum operating temperature 140° C.
5. Dielectric withstand between PTC element and aluminum tab is 50 VDC min.
6. Basic construction: .200″ dia. x .060″ thk. PTC disc with radial leads attached to an anodized aluminum tab.
7. Physical design — as shown.
8. Optional resistance values, switch temperatures and physical designs are available upon request.



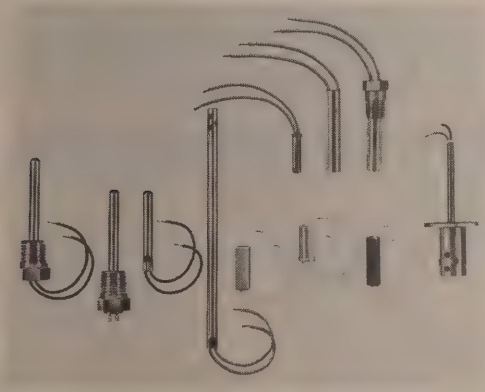
PTC SURFACE TEMPERATURE SENSORS

Type Number	Transition Temp. °C (Ref.)
RL2006-100-30-30-PT1	30
RL2006-100-40-30-PT1	40
RL2006-100-50-30-PT1	50
RL2006-100-60-30-PT1	60
RL2006-100-70-30-PT1	70
RL2006-100-80-30-PT1	80
RL2006-100-90-30-PT1	90
RL2006-100-100-30-PT1	100
RL2006-100-110-30-PT1	110
RL2006-100-120-30-PT1	120


0.520″ ±.010″
0.130″ ±.010″
0.140″ min.
1.50″ min.
0.312″ ±.010″
0.156″
0.156″ Ref.
PTC Thermistor
±.005″
0.125″ Dia.
(0.155″ Dia. and Other Hole Sizes Are Also Available)
Epoxy or Thermistor Not to Extend Beyond Scribed Line
2 Leads Tinned Copper AWG #24 (0.020″ Dia.)
0.250″ max.
PTC Thermistor Epoxied to Tab
0.050″ ±.007″
Anodized Aluminum Tab Color: Red

THERMISTOR PROBES

The probes illustrated below include stainless steel, aluminum, and chrome-plated materials in a variety of configurations. In addition, a variety of other designs are available. These probes are used in conjunction with solid state circuitry for liquid level measurement, and for use as sensors to measure the temperature of liquids or surface temperatures.



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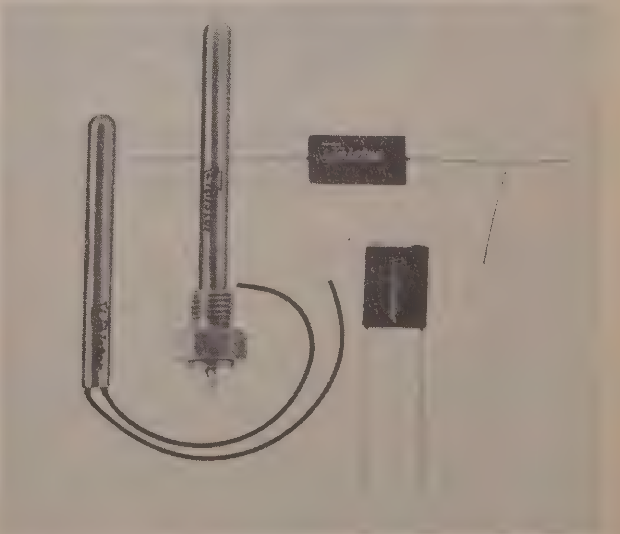
LINISTOR® ASSEMBLIES

Keystone developed Linistor assemblies to give an accurate resistance response over a temperature span of 0° to 100° C. Because Linistor assemblies have flattened out the thermistor resistance curve to a constant and predictable straight-line plot, they are valuable in a wide range of applications. Four standard encasements are available. Tolerance on resistance of Linistor is ±2% at 25° C.

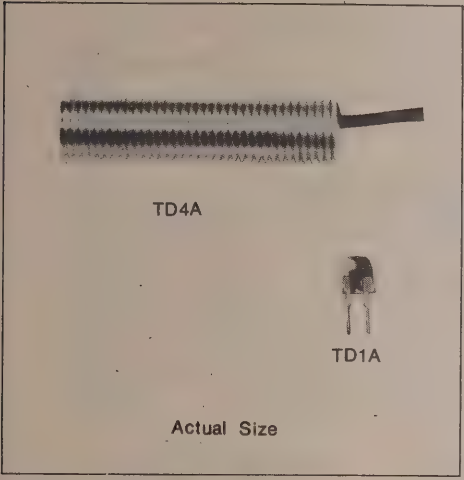


EEM PRODUCT SELECTION GUIDES

There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

MICRO SWITCH

TD Precision Interchangeable Temperature Sensors



INTERCHANGEABILITY

(with 1 mA Max. Current)

Temperature	Resistance (Ohms)
−40°C (−40°F)	1584 ±10 (1.5°C)
−30°C (−22°F)	1649 ±9 (1.3°C)
−20°C (−4°F)	1716 ±8 (1.2°C)
−10°C (14°F)	1784 ±7 (1.0°C)
0°C (32°F)	1855 ±6 (0.8°C)
+10°C (50°F)	1926 ±6 (0.8°C)
+20°C (68°F)	2000 ±5 (0.7°C)
+30°C (86°F)	2075 ±6 (0.8°C)
+40°C (104°F)	2153 ±7 (0.9°C)
+50°C (122°F)	2231 ±7 (0.9°C)
+60°C (140°F)	2312 ±9 (1.1°C)
+70°C (158°F)	2394 ±10 (1.2°C)
+80°C (176°F)	2478 ±12 (1.4°C)
+90°C (194°F)	2564 ±14 (1.6°C)
+100°C (212°F)	2651 ±16 (1.8°C)
+110°C (230°F)	2740 ±18 (2.0°C)
+120°C (248°F)	2831 ±20 (2.2°C)
+130°C (266°F)	2924 ±22 (2.3°C)
+140°C (284°F)	3018 ±24 (2.5°C)
+150°C (302°F)	3114 ±25 (2.5°C)

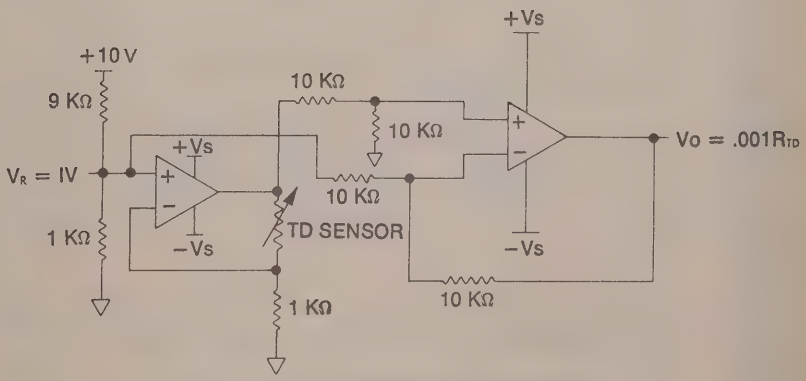
MICRO SWITCH TD Series are precision-interchangeable temperature sensors that operate on a change in resistance as a function of temperature. Each sensor includes a 0.040″ x 0.050″ silicon sensing chip. A thin film resistive network containing a sensing resistor and a laser trimmable resistor is patterned on each chip. Individual chips are laser trimmed to provide 2000 ohms nominal resistance at room temperature (20°C). Room temperature trim is accurate to ±0.70°C, and maximum error over the entire operating range of −40°C to +150°C (−40°F to +302°F) is ±2.5°C. This accurate trimming allows true sensor-to-sensor interchangeability without recalibration of the users circuit. During packaging the chip is covered with hard epoxy for environmental protection.

FEATURES

- *Interchangeability*
- *Very small thermal mass for fast response*
- *Air or liquid temperature sensing*
- *Linear temperature sensitivity*
- *Proven thin film processing reliability*
- *Low cost*
- *Long term stability*
- *2000 ohms nominal resistance at 20°C*

ELECTRICAL INTERFACING

The high nominal resistance, positive temperature coefficient and linear sensitivity characteristics of the TD Series temperature sensors simplifies the task of designing the electrical interface. Shown is an interface for applications requiring a voltage that varies linearly with temperature. In the example shown the current regulator can be affected by temperature, so only the temperature sensor should be exposed to thermal changes.



SIMPLE CURRENT REGULATOR INTERFACE

ABSOLUTE MAXIMUM RATINGS

Operating Range	−40°C (−40°F) to 150°C (302°F)
Storage Temperature	−55°C (−67°F) to 170°C (338°F)
Voltage	10 VDC Continuous (24 Hours)

ORDER GUIDE

Description	Catalog Listing
Fast response temperature sensor, 0.2 inch square ceramic package, 0.1 inch centers.	TD1A
Liquid temperature sensor, 1.50″ threaded (⅜-24 UNF-2A) anodized aluminum housing, 2 six-inch black teflon insulated leads.	TD4A

MICRO SWITCH, a Honeywell division

OTHER OPTIONS

MICRO SWITCH has the capability of packaging the TD Series temperature sensors in plastic, aluminum, brass, stainless steel or other materials depending on customer need and volume. By designing the sensing element of the TD Series on a silicon chip, a great deal of versatility is possible. Custom packaging could be for surface, liquid or gas temperature sensing, and signal conditioning electronics circuits are possible.

NTC THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

H-Series Hermetically Sealed Thermistors Manufactured by MIDWEST COMPONENTS INC. are small, rugged, and good for use up to 400ºC. The H-Series sensor is a preferred choice for all types of temperature sensing compensation or control circuits. Uniform dimensions make them desirable for automatic insertion in printed circuit boards. Dumet leads are weldable and/or solderable.

TYPICAL CHARACTERISTICS

CATALOG NUMBER

SPECIFICATIONS	TEST CONDITION	Fig. 2. 1H	Fig. 2. PIH	Fig. 1. APIH	Fig. 2. UH	Fig. 2. 2H	Fig. 2. 4H
Resistance @ 25°C (OHMS)	Zero Power	±10%	±2%	±2%	±.8%	±10%	±10%
Resistance Ratio $R_{25°C}$ / $R_{25°C}$		29.85	29.85	29.85	29.85	19.80	48.75
Maximum Withstand Temperature: °C		-55 -400	-55 to 400	-55 to 400	-55 to 400	-55 to 400	-55 to 400
Operating Temperature Range; °C		-55 -400	-55 to 400	-55 to 200	-55 to 200	-55 to 400	-55 -400
Interchangeability °C	0-100°C	N/A	1°C	1°C	.2°C	N/A	N/A
Stability (Change in Resistance)	1000 hrs. at 100°C		<.1%	< 1%	<. 1%		
Resistance Range		3K-100K	3K-100K	3K-100K	3K-100K	2K-5K	200K-1M

SPECIFICATIONS

Time Constant*

1H (3K-9 K) — 10 sec. max

1H (10K-100K) — 2H-4H — 8 sec. max

Dissipation Constant*

1H (3K-9.K) — 5mw/ºc

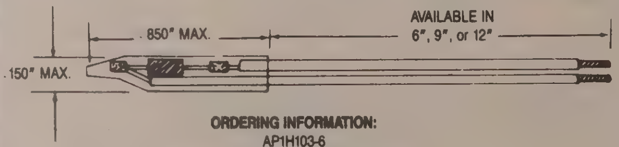
1H (10K-100K) 2H-4H — 2mw/ºc

STANDARD ZERO-POWER RESISTANCE VALUES (Ohms) at 25°C AMBIENT TEMPERATURE

							2000	2200	2400	2700	3000
3300	3600	3900	4300	4700	5100	5600	6200	6800	7500	8200	9100
10000	11000	12000	13000	15000	16000	18000	20000	22000	24000	27000	30000
96000	100000		200000	300000		400000		500000		600000	70000
800000	1M										

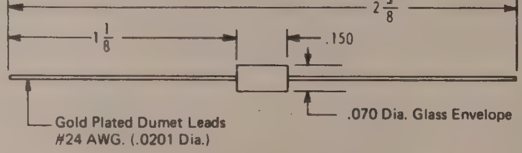
Temperature		Resistance Ratio Characteristics		
°C	°F	R_T/R_{25} MULTIPLIER 1H-	2H-	4H-
-55	-67	95	54	131
-40	-40	34	21.7	45.5
-21.5	-6.7	10.5	8.0	13.2
0	32	3.3	2.82	3.71
25	77	1.00	1.00	1.00
37.8	100	.58	.62	.543
50	122	.36	.41	.32
75	167	.148	.182	.114
104.4	220	.0595	.082	.0399
125	257	.0335	.505	.0205
150	302	.0180	.0300	.0101
200	392	.00670	.0116	.00285
250	482	.00280	.00555	.00110
300	572	.00140	.00291	.000454
350	662	.000800	.00178	.000113
400	752	.000450	.00104	.000113

To find the resistance of a particular H-Series Thermistor at any temperature in this table, multiply its 25°C resistance by the multiplier for that temperature.



ORDERING INFORMATION:
AP1H103-6
[BASIC CATALOG NUMBER] [LEAD LENGTH]

(Dimensions in Inches) OUTLINE DRAWING



GRADE	D	L	AWG
1H (3K-10K)	.095	.170	20
1H (10K-100K)	.070	.150	24
2H (2K-5K)	.070	.150	24
4H (200K-1M)	.070	.150	24

---

* The ratio, in a 25ºC still air ambient, of the power input to raise, the Thermistor temperature to 125ºC and its temperature rise (125ºC — 25ºC) above ambient.

** Time required for a Thermistor to change 63.2% of the temperature difference between its initial and final body temperature, when subjected to a step function change in temperature under zero-power conditions.

MIDWEST
COMPONENTS
INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

TUFF·SENSORS™

TEMPERATURE SENSORS INCAPSULATED IN THERMOPLASTIC

MANUFACTURED BY MIDWEST COMPONENTS, INC.

TUFF·SENSORS™, a family of thermoplastic molded probes, provide reliable protection against environmental extremes for our line of temperature sensors and switches. Use of high performance plastics creates a temperature probe that resists temperature variations, humidity, chemicals and rough handling.

Many standard sizes and shapes are available, with selection of type based on conditions of use.

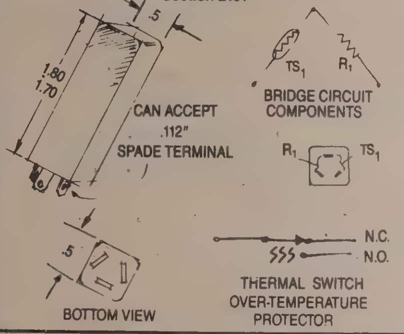
Custom designs available to your specifications.

PLASTICS AND THEIR PROPERTIES

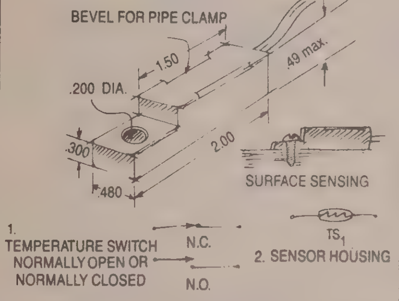
PROPERTIES	UNIT [illegible]	ASTM TEST STD	VALOX* 310SEO(GE)	NORYL* N225(GE)	RYTON† R10(PHILLIPS)	POLYPROPYLENE SHELL 5520
1 DIELECTRIC	V MIL	D149	560	630	324	600
2 MELT TEMP	°F	———	437	520	540	334
3 MOISTURE ABSORPTION @73°F	% 24H	D570	08	07	04	03
4 TENSILE STRENGTH	———	D638	8500	8000	12000	4800
5 COMPRESSIVE STRENGTH	PSI	D695	14500	6000	17500	———
6 FLEXURAL STRENGTH	PSI	D790	14700	1100	18000	1450
7 SHEAR STRENGTH	PSI	D732	7700	8500	11200	60
8 IMPACT RESISTANCE	FT# IN	D256	07	60	80	90
9 HARDNESS (ROCKWELL)	R	D785	120	116	———	84
10 THERMAL CONDUCTIVITY	BTU IN HR FT 2°F	———	12	135	43	H8
11 FLAMMABILITY UL RATING	UL94V	———	VO	VO	VO	———
12 ACCEPTABILITY FOR FOOD CONTACT	———	———	YES	———	———	YES

*Registered trademarks of the General Electric Co †Registered trademark of the Phillips Chemical Co

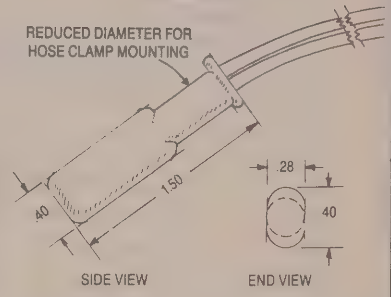
THERMAL SWITCH
Section 2101


.5
1.80
1.70
CAN ACCEPT
.112″
SPADE TERMINAL
TS1
R1
BRIDGE CIRCUIT
COMPONENTS
R1
TS1
.5
BOTTOM VIEW
N.C.
N.O.
THERMAL SWITCH
OVER-TEMPERATURE
PROTECTOR

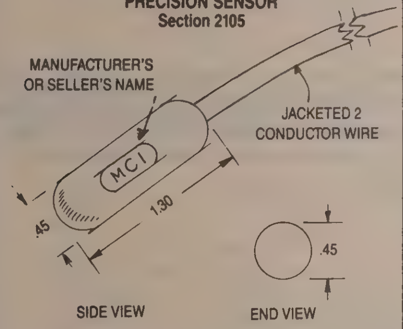
TEMPERATURE SWITCH
Section 2103


BEVEL FOR PIPE CLAMP
1.50
.49 max.
.200 DIA.
.300
2.00
.480
SURFACE SENSING
1.
TEMPERATURE SWITCH
NORMALLY OPEN OR
NORMALLY CLOSED
N.C.
N.O.
TS1
2. SENSOR HOUSING

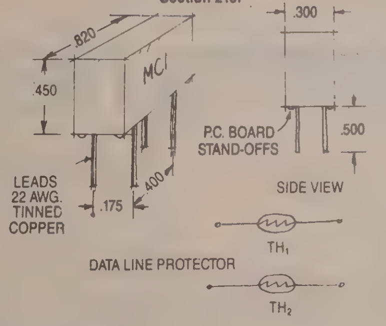
PRECISION SENSOR
Section 2104


REDUCED DIAMETER FOR
HOSE CLAMP MOUNTING
.40
1.50
.28
.40
SIDE VIEW
END VIEW

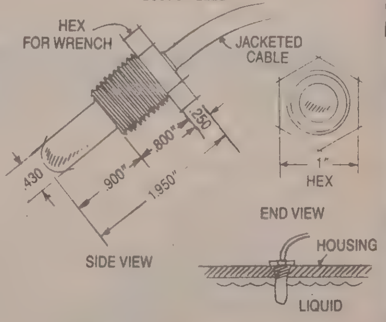
PRECISION SENSOR
Section 2105


MANUFACTURER'S
OR SELLER'S NAME
JACKETED 2
CONDUCTOR WIRE
MCI
.45
1.30
.45
SIDE VIEW
END VIEW

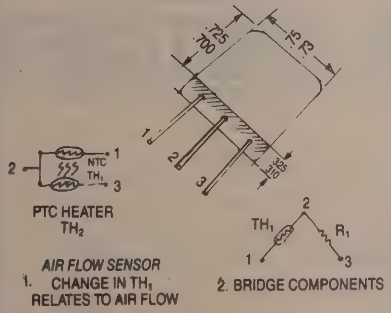
CURRENT LIMITER
Section 2107


.820
.300
MCI
.450
P.C. BOARD
STAND-OFFS
.500
LEADS
22 AWG.
TINNED
COPPER
.175
.400
SIDE VIEW
TH1
DATA LINE PROTECTOR
TH2

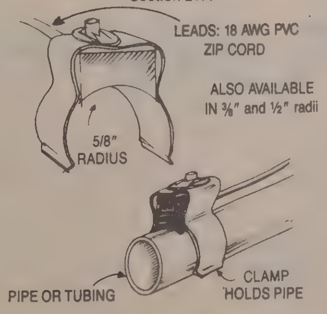
TEMPERATURE SWITCH OR PRECISION SENSOR
Section 2109


HEX
FOR WRENCH
JACKETED
CABLE
.250
.800″
.430
.900″
1.950″
1″
HEX
END VIEW
SIDE VIEW
HOUSING
LIQUID

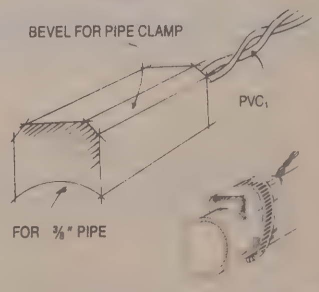
PTC OR NTC
Section 2110


.725
.700
.75
.72
.325
.310
1
2
3
2
NTC
TH1
1
3
PTC HEATER
TH2
TH1
R1
2
1
3
AIR FLOW SENSOR
1. CHANGE IN TH1
RELATES TO AIR FLOW
2. BRIDGE COMPONENTS

PRECISION SENSOR
Section 2114


LEADS: 18 AWG PVC
ZIP CORD
ALSO AVAILABLE
IN ⅜″ and ½″ radii
5/8″
RADIUS
PIPE OR TUBING
CLAMP
HOLDS PIPE

PRECISION SENSOR
Section 2115


BEVEL FOR PIPE CLAMP
PVC1
FOR ⅜″ PIPE

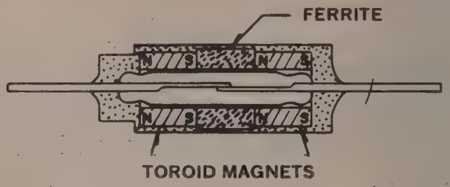
MIDWEST COMPONENTS INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

TEMPERATURE SENSING SWITCH

MANUFACTURED BY MIDWEST COMPONENTS, INC.

CONVENIENT AND RELIABLE TEMPERATURE CONTROL



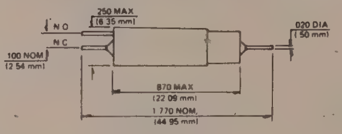
Miniature temperature switches use an electro-ceramic element instead of a bimetallic switch. The Reed Switch Temperature Sensor works on these two principles: a reed switch actuation occurs because of changes in strength of a magnetic field in the vicinity of the contact gap; and certain materials exhibit great changes in magnetic reluctance when the temperature is varied in the vicinity of the material's curie temperature.

The unit has good response time, and is operable in a variety of atmospheres and solutions. Variations in configurations suitable for installation in automotive engine crankcases and automatic transmissions, or mountings for use in computer cabinets are possible. Other applications include oven over-heat alarms, corrosive liquid temperature control, food freezer thaw warning and cooling fan stop indication. This switch replaces many thermally actuated devices now used where increased life is required or protection of the switching contacts from adverse environments is deemed desirable.

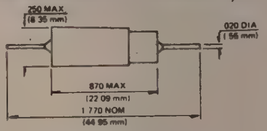
EPOXY PACKAGED SWITCHES

MANUFACTURED BY MIDWEST COMPONENTS, INC.

Switches feature small size for fast response. Eopxy package resists most chemicals and is good for use up to 125°C. Standard units from 0°C to 125°C are available in five degree nominal increments.



SPDT Form C



SPST Form B (NC)
SPST Form A (NO)

SPECIFICATIONS

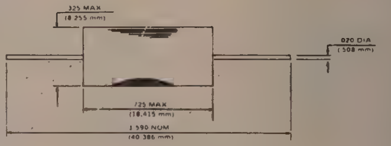
	SPST Form B (NC) SPST Form A (NO)	SPDT Form C
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V.A. maximum	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum	Carry — 1 amp maximum Break — 1 amp maximum Make — .500 amp maximum
OPEN TEMPERATURE — NOMINAL	5° increments starting at 0°C	5° increments starting at 0°C
TOLERANCE	±5°C	±5°C
RESET DIFFERENTIAL	10°C maximum	10°C maximum

FREEZE SENSORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

The Solar Freeze Sensor, Catalog Number TS-5B1, was developed to provide controller activation before freezing conditions damage collector. This activation will then provide recirculation or drain down to protect system. To meet the needs of high temperature exposure, the switch is packaged to withstand 400°C. Switch has also found application as road surface freeze indicator, refrigerated van warning sensor and is widely used as a frost sensor in the agricultural industry.

CONTACT ARRANGEMENT	SPST Form B (Normally Closed)
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V A maximum
VOLTAGE	Volts D C — 100 VDC maximum Volts A C — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum
ACTIVATION (TEMPERATURE FALL)	1-7°C
RESET (TEMPERATURE RISE)	10°C maximum
OVERALL LENGTH	1 590" nominal
DIAMETER	325" maximum
WEIGHT	1 6 grams

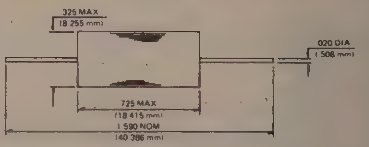


HIGH TEMP. SWITCHES

MANUFACTURED BY MIDWEST COMPONENTS, INC.

In addition to the three standard temperature switches, we now offer a high temperature Form B version. This new high temperature version is available from 0°C to 250°C. Typical applications include sensing temperature increases in temperature chambers, instrumentation, liquids, semi-solids or solids.

CONTACT ARRANGEMENT	SPST Form B (Normally Closed)
CONTACT RATING	Watts — 10W maximum Volt Amps — 12 V A maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A C — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — 5 amp maximum
TOLERANCE	±10°C
RESET DIFFERENTIAL	10°C maximum
OVERALL LENGTH	1 590" nominal
DIAMETER	325" maximum
WEIGHT	1 6 grams



MIDWEST
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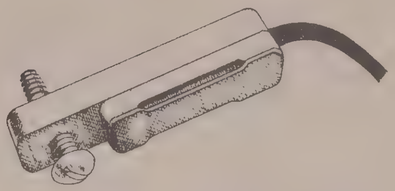
TEMPERATURE SENSING SWITCH

MANUFACTURED BY MIDWEST COMPONENTS, INC.

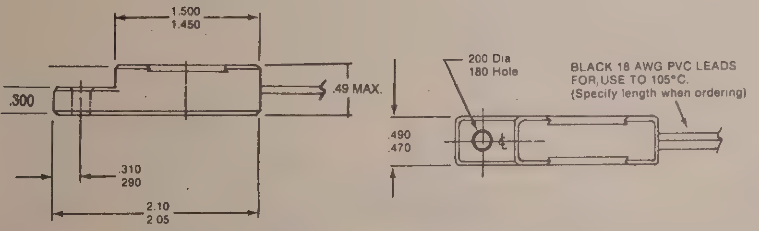
TEMPERATURE SENSING REED SWITCHES
PMS SERIES

Midwest Components, Inc. has now packaged the reliable temperature sensing reed switch in a convenient and easy to use housing. The molded plastic body offers the additional advantages of complete moisture and dust protection at an economical price.

This rugged switch can be quickly mounted with a screwdriver. An indentation on the housing also facilitates attachment by ordinary hose clamps or clip hardware supplied by the user. Type A (normally open) or Type B (normally closed) switches may be used in this new package.



CONTACT ARRANGEMENT	SPST Form B (NC)	SPST Form A (NO)
CONTACT RATING	Watts — 10W maximum Volt Amps. — 12 V.A. maximum	Watts — 10W maximum Volt Amps — 12 V.A. maximum
VOLTAGE	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum	Volts D.C. — 100 VDC maximum Volts A.C. — 120 VAC maximum
CURRENT	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp maximum	Carry — 1 amp maximum Break — 1 amp maximum Make — .5 amp. maximum
SWITCH TEMPERATURE — NOMINAL	5° increments starting at 0°C	5° increments starting at 0°C
TOLERANCE	±5°C	±5°C
RESET DIFFERENTIAL	10°C maximum	10°C maximum

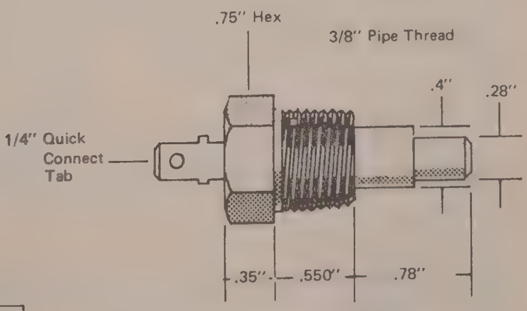


KEY TO ORDERING:

PMS	XXX	A or B	XX
Temp Switch	Temp In °C	Form	Lead Length in Inches

TEMPERATURE SENSING REED SWITCH PROBES

Now Available . . .
The ultra reliable temperature sensing reed switch in a convenient probe assembly. Probe is designed for liquid temperature sensing on auto, truck, compressor, or equipment cooling systems. Rugged brass body is hermetically sealed against harsh environments. Switching temperatures are available from - 10°C to 150°C. 3 million operations are possible at full rated load.



PHYSICAL DIMENSIONS

SPECIFICATIONS

CONTACT ARRANGEMENT	SPST Form B (Normally Closed)
CONTACT RATING	Watts – 10W maximum Volt Amps–12 V.A. maximum
VOLTAGE	Volts D.C. – 100 VDC maximum Volts A.C. – 120 VAC maximum
CURRENT	Carry – 1 amp maximum Break – 1 amp maximum Make – .5 amp maximum
TOLERANCE	±10°C
RESET DIFFERENTIAL	10°C maximum

KEY TO ORDERING:

TS	*XXX*	*B*	*P*
Temp. Switch	Activation Temp. (°C)	Form	Probe

EXAMPLE: TS100BP

MIDWEST
COMPONENTS
INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

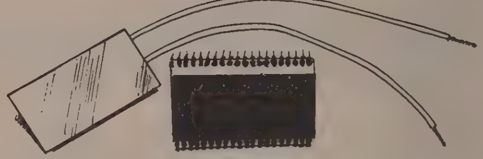
SPECIALTY CERAMICS

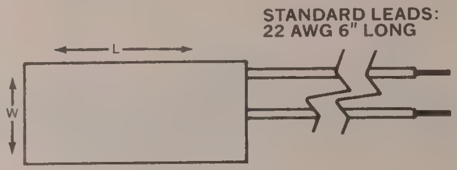
MANUFACTURED BY MIDWEST COMPONENTS, INC.

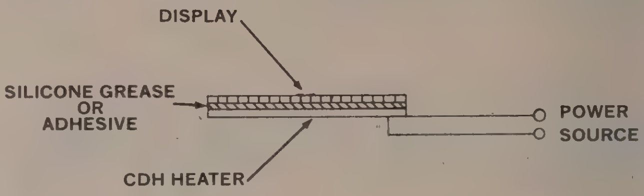
SELF REGULATING DISPLAY HEATER

The unique self-regulating heating effects of specially doped ceramics are utilized to create a new type heater for liquid crystal or other temperature sensitive displays. These devices produce heat at cold temperatures and curtail heating at normal or high temperatures. This feature allows its use in battery operated instruments due to low normal current drain. Use of this heater allows a broader application of displays by removing the adverse effects of temperature.

Heater is attached to reverse side of display with thermally conductive epoxies or silicone adhesives depending upon display's thermal coefficient of expansion or temperature to which it may be subjected. Actual performance of the display will depend upon manufacturers specifications.







ORDER NUMBER	SIZE* L X W	OPERATING VOLTAGE**	NOMINAL RESISTANCES R@ - 35°C	NOMINAL RESISTANCES R@ 50°C
CDH001	2.0" x .9"	12-28 AC or DC	5 OHMS	1500 OHMS MIN.
CDH002	3.1" x 1.1"	12-28 AC or DC	3 OHMS	1000 OHMS MIN.
CDH003	3.6" x 1.1"	12-28 AC or DC	2.5 OHMS	750 OHMS MIN.

*Other sizes available — consult factory.

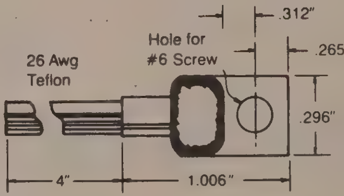
OVER TEMPERATURE PROTECTORS

MIDWEST COMPONENTS' Over Temperature Protector provides shutoff or regulation of expensive RF or AF Power Transistors. Protects against over heating that occurs from output stage component failure, antenna breakage, or short conditions.

Unlike fuses or bi-metal elements its action is recyclable and has no hysteresis effect.

Also available:

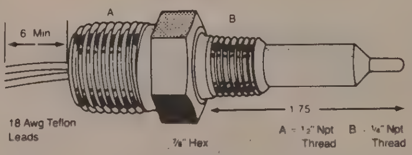
- Other switching temperature or resistances compatible with package constraints.
- Special lead types or end terminations.
- Body styles for protection of TRIAC or SCR Rectifiers.

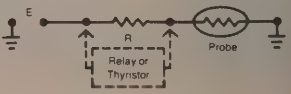


Order Number	Switching Temp. (Nom.)	Resistance at 25°C (Ohms)	Resistance at Switching Temperature	Max. Cont. Oper. Temp.
OTP60.11	60°C	100 ± 40%	250 OHMS (min.)	150°C
OTP70.11	70°C	100 ± 40%	250 OHMS (min.)	150°C
OTP80.11	80°C	100 ± 40%	250 OHMS (min.)	150°C
OTP100.11	100°C	100 ± 40%	250 OHMS (min.)	150°C
OTP120.11	120°C	100 ± 40%	250 OHMS (min.)	150°C
OTP125.11	125°C	100 ± 40%	250 OHMS (min.)	150°C

OVER TEMPERATURE PROBE 9RT1P—SERIES

This rugged Probe is designed for over temperature sensing on compressors, engines, or fluid transfer lines. When over temperature occurs its resistance increases by a factor of five or more. This large increase allows simple interface with relay or Thyristor controls. Probe functions on AC or DC without regard for polarity. Stainless steel is used to minimize corrosion.





Order Number	Resistance at 25°C (Ohms) ± 40%	Activation Temperature ± 5°C	Resistance at Activation Temperature
9RT1P106	2000	100°C	10,000
9RT1P101	2000	113°C	10,000
9RT1P107	2000	120°C	10,000
9RT1P108	2000	125°C	10,000

MIDWEST
COMPONENTS
INC.

MIDWEST COMPONENTS INC.
P.O. Box 787/1981 Port City Boulevard
Muskegon, MI 49443/(616) 777-2602/TWX: 510-394-4130

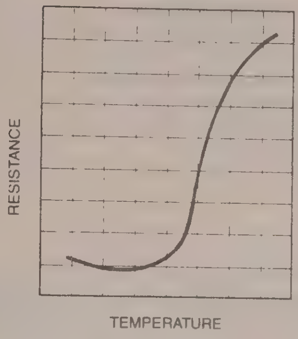
PTC SWITCHING THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

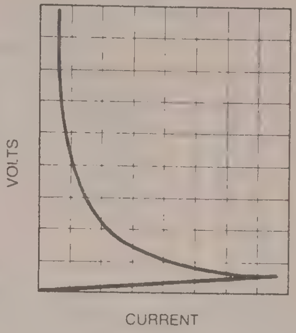
THE POSITIVE WAY TO SENSE, MEASURE, CONTROL, REGULATE AND PROTECT.

MIDWEST COMPONENTS INC. PTC switching thermistors are thermally sensitive resistors which exhibit large positive increases in resistance with temperature. At customer specified temperatures the resistance rises abruptly from a low value to a high value. This resistance shift is infinitely repeatable and has no hysteresis associated with its action.

TYPICAL PTC RESISTANCE VS TEMPERATURE CURVE



TYPICAL VOLTAGE CURVE VS CURRENT



• DISCRETE PTCS

Popular styles for current limiting or sensing Most types come standard with protective coatings

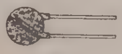


Fig. 1

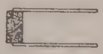


Fig. 2

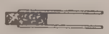


Fig 3

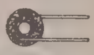


Fig. 4

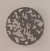


Fig 5

ORDER NUMBER	FIG	SWITCH TEMPERATURE	BASE RESISTANCE	TEST PARAMETERS	NOMINAL DIMENSIONS	Protective Coating (✓)
100D10112	1	0°C ± 5°C	100 ohms ± 40% @ −35°C	R@ 0°C ± 5°C 500 ohms ± 40%	42" Dia 05" Thk	
108D10001	5	8°C ± 10°C	10 ohms ± 40% @ −35°C	R @ 50°C = 3000 ohms min	65" Dia 05" Thk	
110Q20101	3	10°C ± 5°C	250 ohms ± 40% @ −35°C	R @ 10°C ± 5°C = 1250 ohms ± 40%	30" x 10" x 15"	
130D25000	5	30°C ± 5°C	25 ohms ± 20% @ −5°C	R @ 30°C ± 5°C = 5 x R 25°C ± 20%	78" Dia 08" Thk	
140D25001	1	40°C ± 5°C	25 ohms ± 50% @ 25°C	R @ 50°C = 125 ohms ± 50%	38" Dia 065" Thk	
150Q80112	2	50°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 50°C ± 5°C = 3,750 ohms ± 33%	30" x 10" x 15"	
160D10116	1	60°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 60°C ± 5°C = 5 x R 25°C Protective Current Level = 20 ma	3" Dia 20" Thk	✓
165D15001	5	65°C ± 5°C	15 ohms ± 33% @ 25°C	R @ 65°C ± 5°C = 75 ohms ± 33%	58" Dia 050" Thk	
165Q80113	2	65°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 65°C ± 5°C = 3,750 ohms ± 33%	30" x 10" x 15"	
170D10117	1	70°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 70°C ± 5°C = 5 x R 25°C Protective Current Level = 40 ma	3" Dia 20" Thk	✓
175Q15114	3	75°C ± 5°C	150 ohms ± 30% @ 25°C	R @ 75°C ± 5°C = 750 ohms ± 30%	30" x 10" x 15"	
180D10113	1	80°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 5 x R 25°C Protective Current Level = 60 ma	340" Dia 240" Thk	✓
180D15015	5	80°C ± 5°C	15 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 75 ohms ± 40%	48" Dia 15" Thk	

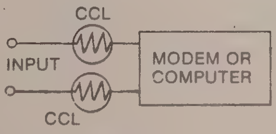
ORDER NUMBER	FIG	SWITCH TEMPERATURE	BASE RESISTANCE	TEST PARAMETERS	NOMINAL DIMENSIONS	Protective Coating (✓)
180Q20206	2	80°C ± 5°C	2000 ohms ± 40% @ 25°C	R @ 80°C ± 5°C = 10,000 ohms ± 40%	45" x 12" x 15"	
180W30115	4	80°C ± 5°C	300 ohms ± 50% @ 25°C	R @ 80°C ± 5°C = 1500 ohms ± 50%	6"O D 4"I D 17" Thk	
185D10102	1	85°C ± 5°C	100 ohms ± 20% @ 25°C	R @ 85°C ± 5°C = 500 ohms ± 20%	25" Dia 15" Thk	✓
195Q80115	2	95°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 95°C ± 5°C = 3,750 ohms ± 33%	30" x 10" x 15"	
200D40012	1	100°C ± 5°C	40 ohms ± 40% @ 25°C	R @ 100°C ± 5°C = 200 ohms ± 40%	30" Dia 20" Thk	✓
200D65011	1	100°C ± 5°C	65 ohms ± 38% @ 25°C	R @ 100°C ± 5°C = 5 x R 25°C Protective Current Level = 80 ma	4" Dia 275" Thk	✓
220Q32214	2	120°C ± 5°C	3200 ohms ± 25% @ 25°C	R @ 120°C ± 5°C = 16,000 ohms ± 25%	30" x 10" x 15"	✓
222W75101	4	122°C ± 5°C	750 ohms ± 33% @ 25°C	R @ 122°C ± 5°C = 3,750 ohms ± 33%	6"O D – 38"I D 17" Thk	
223D80011	1	123°C ± 5°C	8 ohms ± 40% @ 25°C	R @ 123°C ± 5°C = 40 ohms ± 40%	6" Dia 20" Thk	✓
225D10102	1	125°C ± 5°C	100 ohms ± 40% @ 25°C	R @ 125°C ± 5°C = 5 x R 25°C Protective Current Level = 100 ma	40" Dia 25" Thk	✓
225D28011	1	125°C ± 5°C	28 ohms ± 27% @ 25°C	R @ 125°C ± 5°C = 140 ohms ± 27%	28" Dia 23" Thk	
227D11212	1	127°C ± 5°C	1100 ohms ± 40% @ 25°C	R @ 127°C ± 5°C = 5500 ohms ± 40%	1" Dia 160" Thk	
227D60010	1	127°C ± 5°C	60 ohms ± 40% @ 25°C	R @ 127°C ± 5°C = 5 x R 25°C Protective Current Level = 125 ma	6" Dia 30" Thk	✓

ALL LEADS TINNED COPPER 1" MINIMUM

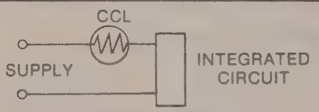
• CURRENT LIMITERS

The ceramic element protects circuits from destructive overcurrent conditions by switching to a high resistance which trims the current back to a safe level. The unit then recovers automatically when the overcurrent condition is corrected.

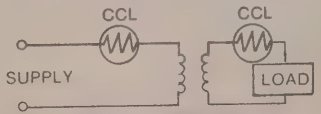
The ceramic current limiter is an inexpensive alternative to fuses and fixed resistors. It has obvious advantages over all of these since it has infinite life, is self resetting which eliminates field servicing and will not "flame out" eliminating the fire hazard of fixed resistors.



DATA COMMUNICATIONS LINE PROTECTOR



OVER-CURRENT PROTECTION



OVER-LOAD PROTECTION

ORDER NUMBER	MAXIMUM Ω @ 25°C	MAXIMUM VOLTS DC	NOMINAL CON-TINUOUS CURRENT	RESIDUAL CURRENT @ APPLIED VOLTAGE 50VDC	100VDC	150VDC	NOMINAL DIMENSIONS IN INCHES
CCL020.01	140 Ω	125	20 MA	8 MA	6 MA	N/A	.23 dia. x .1 thk.
CCL060.01	86 Ω	150	60 MA	16 MA	10 MA	8 MA	.4 dia. x .3 thk.
CCL100.01	40 Ω	150	100 MA	19 MA	13 MA	11 MA	.4 dia. x .3 thk.
CCL140.01	80 Ω	150	140 MA	23 MA	15 MA	13 MA	.56 dia. x .25 thk.
CCL150.01	23 Ω	150	150 MA	24 MA	16 MA	14 MA	.65 dia. x .32 thk.
CCL300.01	10 Ω	70	300 MA	31 MA	N/A	N/A	.55 dia. x .14 thk.
CCL450.01	12 Ω	100	450 MA	40 MA	30 MA	N/A	.6 dia. x .07 thk.

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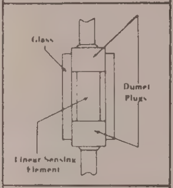
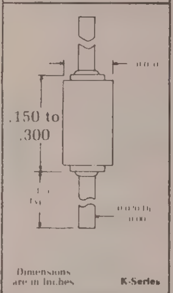
TEMPSISTOR

TEMPSISTOR© TEMPERATURE COMPENSATOR

MANUFACTURED BY MIDWEST COMPONENTS, INC.





The Tempsistor© manufactured by MIDWEST COMPONENTS INC. is a temperature compensator designed to offset the temperature drift of metallic and semi-conductors. Applications include pressure transducers, opto amplifiers, inductive motor controllers, and automatic gain controls. Small size can replace ⅛ watt or large resistors.

The Tempsistor© is available in resistances from 10 to 39,000 ohms at 25°C.

Resistance Ratio Temperature Characteristics

Temp.		R / R Multiplier			
		RESISTANCE VALUE (Ohms)			
°C	°F	10-56 Ω	68-820 Ω	1-2.7K Ω	3.3-39K Ω
−25	−13	.73	.65	.65	.61
0	32	.86	.82	.81	.83
25	77	1.00	1.00	1.00	1.00
50	122	1.15	1.21	1.19	1.19
75	167	1.32	1.44	1.39	1.37
100	212	1.49	1.68	1.58	1.52
125	257	1.68	1.94	1.75	
150	302	1.89	2.21		

TEMPSISTOR© SPECIFICATIONS

DISSIPATION CONSTANT -
Style 1K and 2K = 2.5 MW/°C
Style 3K = 5 MW/°C

TIME CONSTANT - *
Style 1K and 2K = 8 sec. in still air, 1 sec in rapidly stirred oil.
Style 3K = 19 sec. in still air, 2.2 sec. in rapidly stirred oil.

STANDARD ZERO-POWER RESISTANCE VALUES (Ohms) at 25°C AMBIENT TEMPERATURE

10	11	12	13	15	16	18	20	22	24	27	30
100	110	120	130	150	160	180	200	220	240	270	300
1000	1100	1200	1300	1500	1600	1800	2000	2200	2400	2700	3000
10000	11000	12000	13000	15000	16000	18000	20000	22000	24000	27000	30000
33	36	39	43	47	51	56	62	68	75	82	91
330	360	390	430	470	510	560	620	680	750	820	910
3300	3600	3900	4300	4700	5100	5600	6200	6800	7500	8200	9100
33000	36000	39000									

PART NUMBER DESIGNATION:
XX — XXX—X

SPECIFY ONE OF THREE CHOICES FOR FIRST 2 DIGITS
1K — Resistance range 10-820 .150" long body Max. Operate Temp. 150°C.
2K — Resistance range 1K-3.0K .150" long body Max. Operate Temp. 125°C.
3K — Resistance range 3.3K-39K .350" long body Max. Operate Temp. 100°C.
ALL STYLES WILL WITHSTAND 400°C. WITHOUT PHYSICAL OR ELECTRICAL DAMAGE.

NEXT 3 DIGITS DENOTE RESISTANCE VALUE AT 25°C.
1st digit denotes 1st significant figure
2nd digit denotes 2nd significant figure
3rd digit denotes multiplier by the power of 10

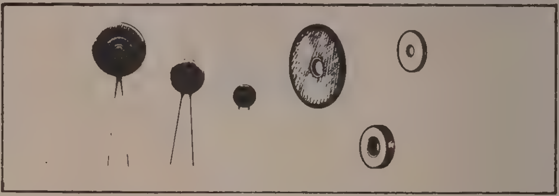
LAST DIGIT OF PART NUMBER DENOTES TOLERANCE AT 25°C.
L — ±20% K — ±10% (standard) J — ±5%

EXAMPLE OF PART NUMBER SPECIFICATION
2K — 272 — K
Part would be a .150" long body, 2.7 K ±10% @25°C.

VARISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

Varistor manufactured by MIDWEST COMPONENTES INC. offer inexpensive answers to problems of transient, surge, and lighting suppression. Energy handling capabilities are limitless depending upon size and construction of devices.



SMALL TYPE DISCS DESIGNED FOR PROTECTION OF CONTACTORS, RELAYS, AND SOLID STATE COMPONENTS

3" (76.2) AND 6" (152.4) DIAMETER DISCS FOR MEDIUM POWER APPLICATIONS ALLOW FOR CUSTOM ASSEMBLIES FOR POWER SUPPLY COMPONENTS

Catalog Number	Maximum Values						Specifications	
	Continuous Operating Voltage (Volts)		Continuous Power Rating (Watts)	Discharge Capacity (Watt-Seconds)	Peak Discharge -Voltage for Given DC Discharge Current		DC Test Voltage & Current	
	(DC)	(AC)			(Amps)	(Volts)	(Volts ±20)%	(Amps)
.5" (12.7) DIA.								
70D5010	150	135	25	30	10	400	175	001
68D5010	60	54	25	30	10	200	75	0025
67D5010	30	27	25	30	25	100	35	005
65D5010	15	13 5	25	20	25	60	15	010
.75" (19.05) DIA.								
71D7000	150	135	75	50	125	400	175	005
68D7000	60	54	75	50	25	185	70	0125
66D7000	30	27	75	50	25	185	70	0125
63D7000	15	13 5	75	50	50	100	35	025
1.0" (25.4) DIA.								
71D10000	300	270	1 5	275	25	1000	350	005
68D10000	150	135	1 5	275	50	575	175	010
66D10000	60	54	1 5	275	1 0	305	70	025
63D10000	30	27	1.5	275	1 5	175	35	050
3" (76.2) DIA.								
71W30100	1500	1350	3.5	9,250	10	7500	1800	0.0025
69W30100	300	270	3.0	5,100	1 5	1350	520	0 050
68W30100	150	135	3.0	5,100	2 5	800	230	0 050
67W30100	60	54	3.0	1,700	5 0	250	85	0 100
66W30100	30	27	3.0	1,700	5 0	150	36	0 100
63W30100	15	13 5	3.0	1,350	10	100	25	0 500
62W30100	7	6 3	3.0	1,100	10	40	9	0 500
6" (152.4) DIA.								
69W60100	275	250	10	22,500	10	1200	550	0 500
68W60200	200	180	10	22,500	12.5	990	400	0.500
68W60100	150	135	10	22,500	15	780	300	0 500

3" (76.2) AND 6" (152.4)
ASSEMBLIES FOR HIGH ENERGY USES. ALL UNITS HAVE STANDARD BRACKET MOUNTS AND SOLDERLESS TERMINALS FOR FAST CONNECTION

Type	Catalog Number	Continuous DC Operating Voltage Rating (Volts)	Continuous Power Loss in Operation (Watts)	Discharge Capacity (Watt-Seconds)
BRACKET	9RV3A12	150	3	5,100
	9RV3A14	300	3	5,100
	9RV3A15	600	6	10,200
	9RV6A4	150	40	90,000
	9RV6A5	300	20	45,000
	9RV6A6	275	10	22,500
	9RV6A7	275	20	45,000
	9RV6A8	275	30	67,500
	9RV6A9	275	40	90,000
	9RV6A10	550	20	45,000
BOX	9RV6A65	550	120	270,000
	9RV6A55	550	240	540,000

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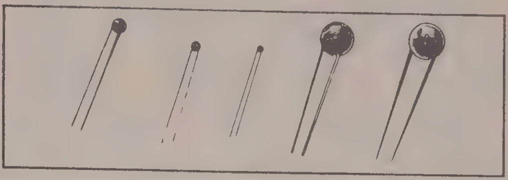
NTC THERMISTORS

MANUFACTURED BY MIDWEST COMPONENTS, INC.

• TEMPERATURE COMPENSATION AND SENSING

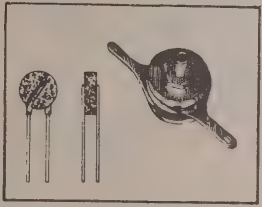
Type	Ohms @ 25°C	Res. Ratio 25°C/125°C	Diss. Const. MW/°C	Time Const.	Dia. In.
4D101	100K	48 78	4	12	1
4D103	50K	48.78	4	8	.1
1D051	20K	29 85	2	4 5	05
1D101	10K	29.85	4	12	.1
1D103	5K	29.85	4	8	.1
1D201	3K	29 85	8	34	.2
1D501	1K	29.85	19	140	5
2D054	1K	19.80	2	3	.05
2D102	1K	19.80	4	10	1
2D104	500	19 80	4	6	1
2D202	300	19.80	8	24	2
3D504	5	12.95	15 5	70	.5
4D051	200K	48.78	2	4 5	.05

Disc Series Thermistors are small rugged Thermistors with close electrical tolerances. Their small mass gives short thermal time constants, yet they are not so small that it is difficult to handle them. The tinned copper leads are easily soldered into electrical circuits.



SUPPRESSORS

INRUSH CURRENT SUPPRESSORS FOR SWITCHING POWER SUPPLIES.

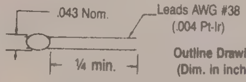


Switching power supplies present high initial currents due to filter capacitor impedance upon turn-on. The use of Midwest's NTC (Negative Temperature Coefficient) devices limits this current to a low valve. After current flow their resistance becomes negligible and offers little voltage drop.

MCI P/N	Description	FIG.	Size	Cold Resistance at 25°C	Maximum Applied Current	Hot Resistance At Specified Current
D204CS	Radial Leaded Disc	A	2" Dia	10 Ohms	1 Amp	75 Ohms
D304CS	Radial Leaded Disc		3" Dia	10 Ohms	2 Amps	50 Ohms
D504CS	Radial Leaded Disc		5" Dia	5 Ohms	3 Amps	24 Ohms
D752CS	Radial Leaded Disc		75" Dia	2 5 Ohms	4 Amps	18 Ohms
E752CS	Radial Leaded Disc		75" Dia	2 5 Ohms	5 Amps	12 Ohms
1A8CS	Assembly	B	75" Dia	3 15 Ohms	7 5 Amps	14 Ohms
1A9CS	Assembly		75" Dia	1 Ohm	10 Amps	055 Ohms
2A0CS	Assembly		75" Dia	1 Ohm	12 Amps	045 Ohms
3A9CS	Assembly		75" Dia	1 Ohm	15 Amps	032 Ohms

BEAD PROBES

Glass coated bead Thermistors feature SMALL SIZE, FAST RESPONSE, and improved HIGH-TEMPERATURE STABILITY. Leads are fired-in platinum-iridium. Bead probes, incorporating the bead in the tip of a glass probe, offer the additional advantages of more rugged construction in an easy to mount package which can be used in liquid media. Tinned Dumet leads are supplied on probes. The maximum operating temperature for beads and bead probes is 400°C.



Outline Drawings
(Dim. in inches)

FIGURE 1

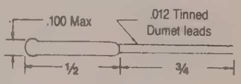


FIGURE 2
Bead probes also available in 2" lengths

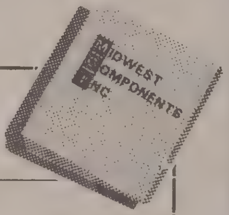
TYPE	Zero Power Resistance at 25°C ohms ± 20%	Catalog Number	Resistance Ratio R25°C/R125°C ± 5%	Dissipation Constant (δ) Milliwatts/ C	Thermal Time Constant (τ) Seconds	Figure Number
Bead Probe	2 000	81G 70250	19 8	1	25	2
	10 000	81G 10350	29 85			
	15 000	81G 15350	29 85			
	50 000	81G 50350	35 0			
	150 000	81G 15450	39 7			
	500 000	81G-50450	46 5			
	1,000 000	81G-10550	51 5			

At Midwest Components, Inc., we develop, design and manufacture the world's most complete line of temperature and voltage sensitive ceramics.

Our engineers and design staff are dedicated to supplying our customers with the highest possible standards of service and products.

Write for your FREE CATALOG or for immediate answers, call one of our application engineering specialists at **616-777-2602.**

Send for your FREE PRODUCT CATALOG.



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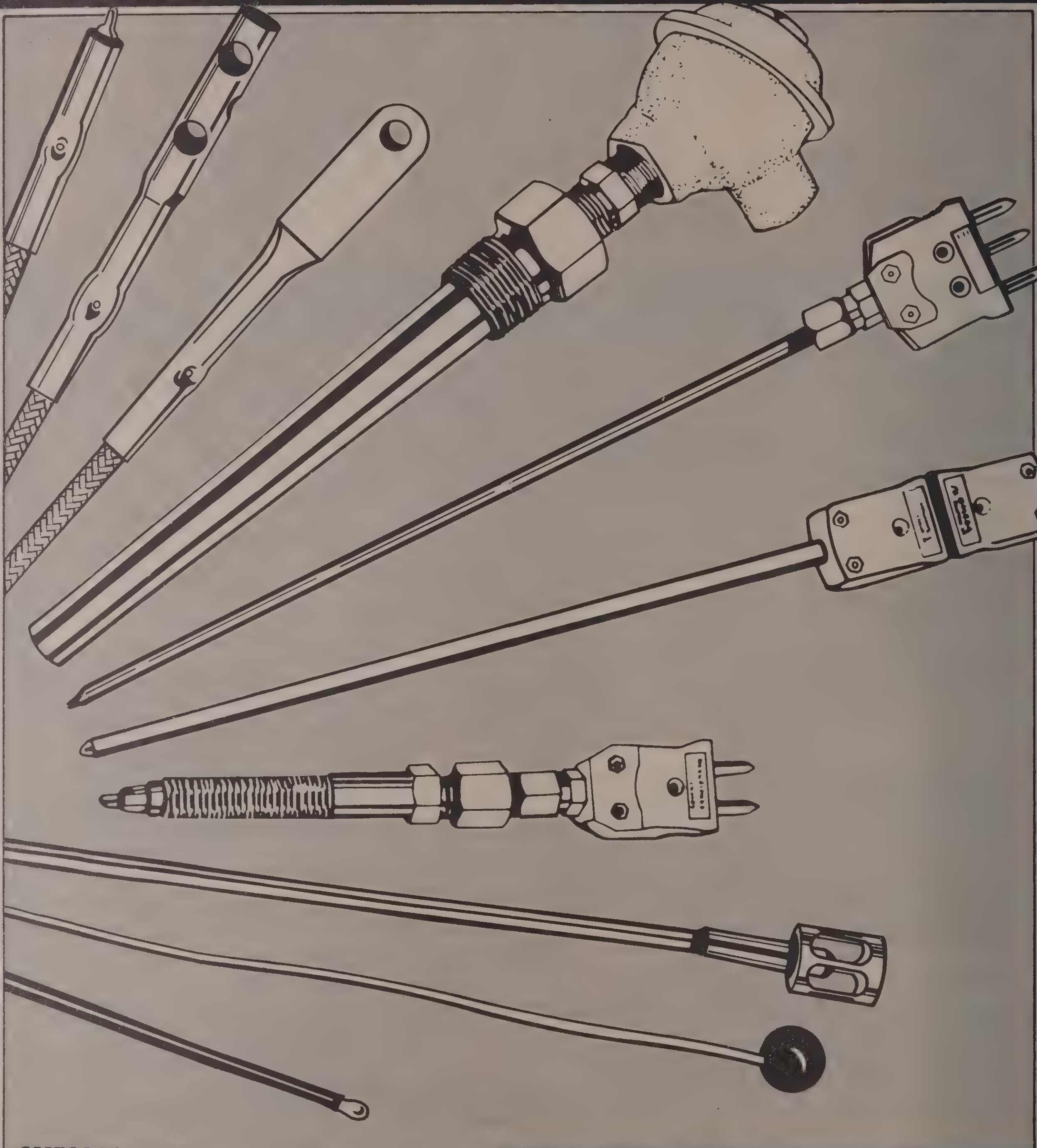
THERMOCOUPLE, RTD, THERMISTOR PROBES



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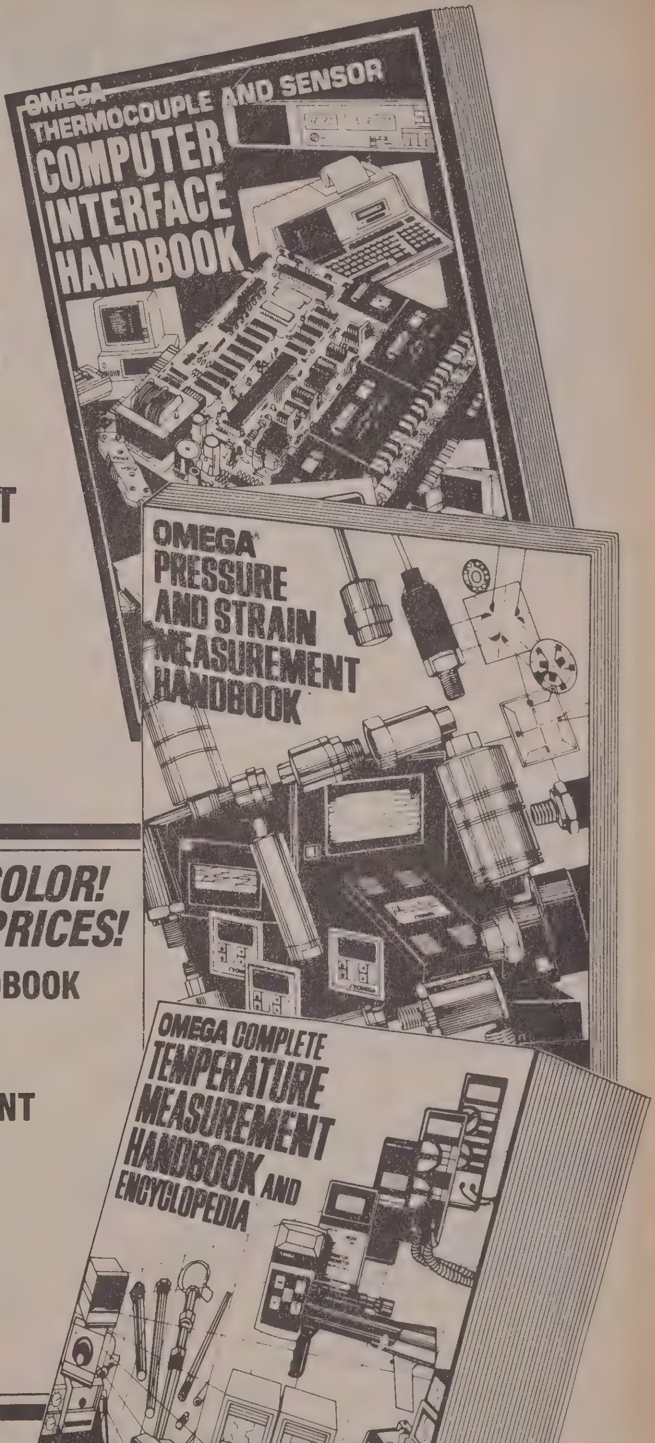
OMEGA
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PIEZO THERMISTORS

NTC WAFER THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Resistance Tolerance: ±10% std. Also supplied to within ±1%

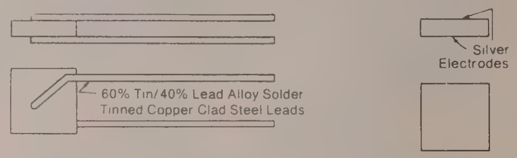
Resistance Range: 3 ohms to 10 megohms

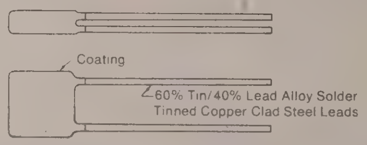
Temperature Coefficient: −3.4% to −6.1% per degree C

Thermal Time Constant: 3 to 23 seconds

Dissipation Constant: 1.0 to 7.9 mw per degree C

CONFIGURATIONS


Silver Electrodes
60% Tin/40% Lead Alloy Solder
Tinned Copper Clad Steel Leads


Coating
60% Tin/40% Lead Alloy Solder
Tinned Copper Clad Steel Leads

ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING

NTC PRECISION INTERCHANGEABLE WAFER THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Temperature Tolerance: ±0.2°C (0°C to +70°C)

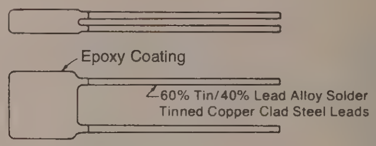
Resistance Range: 1000 ohms to 100K ohms

Temperature Coefficient: −4.4% & −4.7% per degree C

Thermal Time Constant: 3 to 9 seconds

Dissipation Constant: 1.3 to 3.0 mw per degree C

CONFIGURATIONS


Epoxy Coating
60% Tin/40% Lead Alloy Solder
Tinned Copper Clad Steel Leads

PIEZO ELECTRIC PRODUCTS, INC
800-922-0504

NTC BEAD-IN-GLASS THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +300°C

Resistance Tolerance: ±20% std. Also supplied to within ±1%

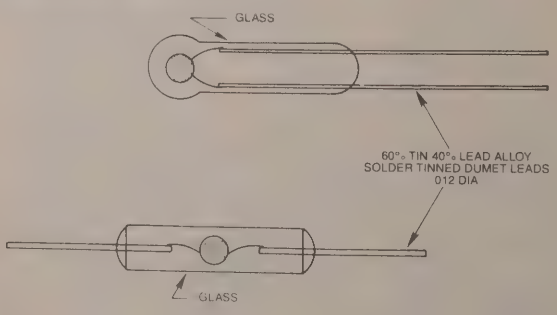
Resistance Range: 500 ohms to 500K ohms

Temperature Coefficient: −3.6% to −5.1% per degree C

Thermal Time Constant: 20 to 22 seconds

Dissipation Constant: .8 to 1.0 mw per degree C

CONFIGURATIONS


GLASS
60% TIN 40% LEAD ALLOY SOLDER TINNED DUMET LEADS 012 DIA
GLASS

NTC BEAD THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +300°C

Resistance Tolerance: ±20% std. Also supplied to within ±1%

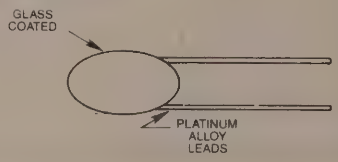
Resistance Range: 500 ohms to 5 megohms

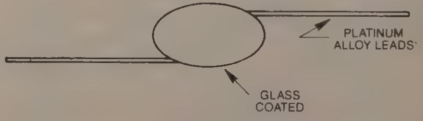
Temperature Coefficient: −3.4% to −5.6% per degree C

Thermal Time Constant: 1 to 2 seconds

Dissipation Constant: .1 to .7 mw per degree C

CONFIGURATIONS


GLASS COATED
PLATINUM ALLOY LEADS


PLATINUM ALLOY LEADS
GLASS COATED

Piezo also manufactures Microwave Probes, piezo elements, shapes, CATTS and fans. Our engineering department is prepared to analyze your PTC requirements. As one of the nation's largest manufacturers of thin-sheet piezo and thermistor hardware, we will provide you with the highest quality thermistor products at competitive prices.

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NTC THERMISTOR PROBE ASSEMBLIES

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Temperature Tolerance: Can be supplied to within ±0.2°C

Resistance Range: 1000 ohms to 100K ohms

Temperature Coefficient: −3.4% to −6.1% per degree C

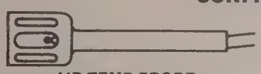
Thermal Time Constant: Housing dependent

Dissipation Constant: Housing dependent

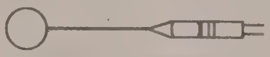
HOUSING MATERIALS

1. Stainless Steel
2. Aluminum
3. Copper
4. Plastic
5. Epoxy
6. Brass
7. Specials

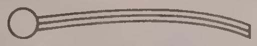
CONFIGURATIONS



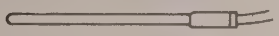
AIR TEMP PROBE



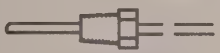
MEDICAL PROBE



SURFACE TEMP. PROBE



LIQUID TEMP. PROBE



STUD MOUNTED

NTC DISC THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Resistance Tolerance: ±10% std. Also supplied to within 1%

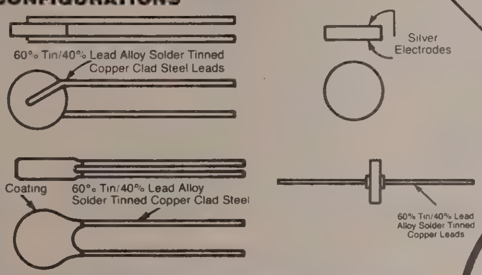
Resistance Range: 20 ohms to 10K ohms

Temperature Coefficient: −3.8% & −4.4% per degree C

Thermal Time Constant: 9 to 175 seconds

Dissipation Constant: 3 mw to 16 mw per degree C

CONFIGURATIONS


60% Tin/40% Lead Alloy Solder Tinned Copper Clad Steel Leads
Silver Electrodes
Coating
60% Tin/40% Lead Alloy Solder Tinned Copper Clad Steel
60% Tin/40% Lead Alloy Solder Tinned Copper Leads

ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING

NTC ROD THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Resistance Tolerance: ±10% std. Also supplied to within ±1%

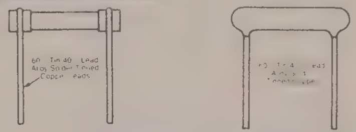
Resistance Range: 3K ohms to 150K ohms

Temperature Coefficient: −3.8% & 4.4% per degree C

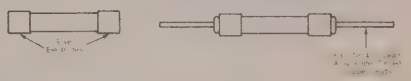
Thermal Time Constant: 20 to 95 seconds

Dissipation Constant: 3 to 6 mw per degree C

CONFIGURATIONS


60% Tin/40% Lead Alloy Solder Tinned Copper Leads

ALSO AVAILABLE: PHENOLIC + WAX COATING OR EPOXY COATING



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NTC GLASS ENCAPSULATED THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +204°C

Resistance Tolerance: ±10% std. Also supplied to within ±1%

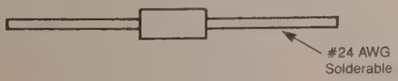
Resistance Range: 1000 ohms to 1 megohm

Temperature Coefficient: −3.8% to −4.7% per degree C

Thermal Time Constant: 8 seconds

Dissipation Constant: 2 mw per degree C

CONFIGURATION


#24 AWG Solderable

NTC CHIP THERMISTORS

CHARACTERISTICS

Operating and Storage Temperature Range: −55°C to +150°C

Resistance Tolerance: ±10% std. Also supplied to within ±1%

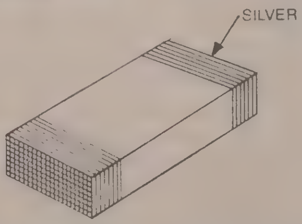
Resistance Range: 500 ohms to 2 megohms

Temperature Coefficient: −3.4% to −4.7% per degree C

Thermal Time Constant: 4 seconds

Dissipation Constant: 2 mw per degree C

CONFIGURATION



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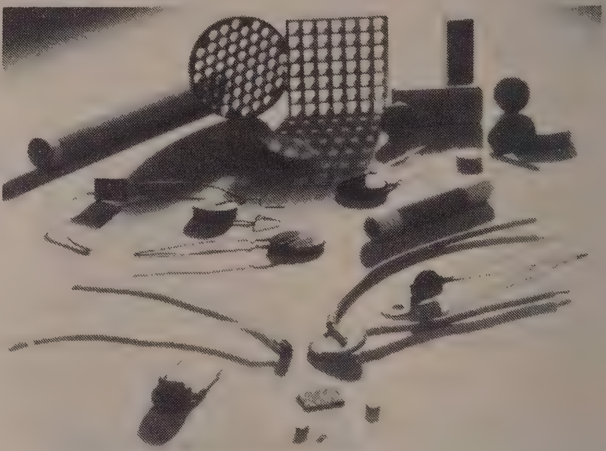


A versatile tool for design engineers

Whatever your product application, there will be problem areas where the unique characteristics of Thermaster™ PTC thermistors can provide a reliable and cost-effective solution. These versatile components can be used as self-regulating heaters, temperature sensors or control elements. Applications occur in all industries, including transportation, consumer products, office data processing equipment, industrial controls, instrumentation and communications. The advantages of Thermaster components include simplicity, solid-state reliability, versatility, stability, sensitivity and resolution. They are producible in a wide range of ratings and package styles. Isn't it time you looked into their capabilities? Ask for literature.

APPLICATIONS

HEATERS

Fluid

Cartridge

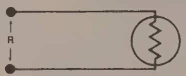
Surface

ADVANTAGES

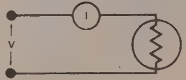
- No overtemperature protection required
- Fixed temperature operation, wide range of temperatures producible
- Stable characteristics over wide voltage range

Cost Effective—The ability of the PTC thermistor to auto-stabilize over wide variety of operating temperature precludes the need for temperature regulators and/or over temperature protectors in most heater applications.
Producible in a number of shapes and packages for heating liquids, solids or gases.

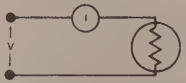
SENSORS



Temperature



Liquid Level



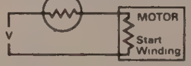
Air Flow

ADVANTAGES

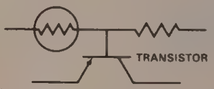
- Small size
- Low power levels required
- Broad resistance range producible

Versatile—PTC's are offered in a wide range of switching temperatures and resistances for maximum design flexibility.
Producible with attached leads for PC board mounting; as discs for surface mounting; as chips for hybrids; and in various other shapes.

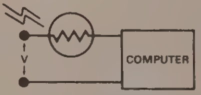
CONTROLLERS (Protectors)



Current Limiters



Overtemperature Protector



Surge Voltage & Line Fault Protectors

ADVANTAGES

- No moving parts
- Small size
- Wide range of packages
- High reliability

Control PTC thermistors provide a simple means to protect loads against fault conditions; i.e.; voltage surges such as line crosses; undesireable temperature rises; or to protect circuits from excessive current.
They have no moving parts, are rugged, and are available in a number of sizes and resistance ranges for almost any application.

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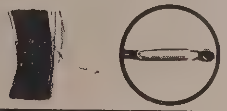
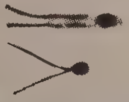
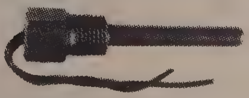
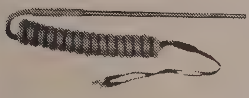
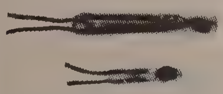
		DESCRIPTION	APPLICATION	BULLETIN
	BEADS	Glass coated beads from .005" dia. to .055" dia.	Temp. measurement & control. Gas analysis. Circuit compensation. Flow, microwave power, small size, fast response.	B1 B3 B5 B7 B9
	PROBES	Enclosed bead at tip of glass cylinder: .020" dia. to .100" dia.	Temp. measurement & control. Circuit compensation. Liquid level & flow. Rugged, easily mounted. Fast response.	C-1 C-3 C-7
	RODS	Ruggedized bead in glass rod: .060" to .100" dia.	General application where opposite lead ruggedized configuration is required.	C-5
	FLAKES	Thin Flakes: .020" x .020" x .001" to .120" x .120" x .004". Matched units on mounts.	IR measurement. Non-contact temp. meas. Intruder alarms. Microcircuit applications.	D-1 D-3 D-5
	ULTRA-FAST RESPONSE	Response times to 3 ms. Probes, insulated lead assemblies.	Where ultra-fast thermal response is required, in flow, temp. measurement. Catheter applications.	F-1
	HI-TEMP	.055" dia. beads & .060" to .100" dia. glass probes, using special matls. & processing.	Where operating temperatures of 450°C continuous are required.	E-1 E-3
	ASSEMBLIES	Large variety of special & standard housings.	Protected thermistor assemblies.	H-1 H-3 H-5
	TEMPERATURE STANDARDS	Precision temperature standards: 0°C to 60°C with calibrations every 0.01°C.	Laboratory & field temperature standards. OEM applications.	I-1 I-3
	ULTRA-STABLE THERMISTORS	Glass probes .060" to .100" dia. Interchangeable matched pairs. Guaranteed stability to 0.02% or 0.005°C/year.	Precision temp. measurement & control. Laboratory standards.	C-7
NEW!	THERMISTOR CHIPS	.050" x .050" to .100" x .100" sizes; bare and epoxy coated; broad tolerance or interchangeable.	General temperature measurement and control applications, low cost.	

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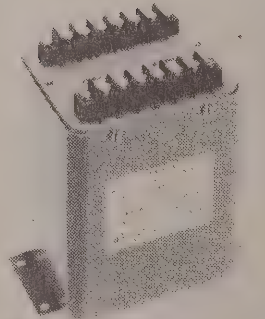
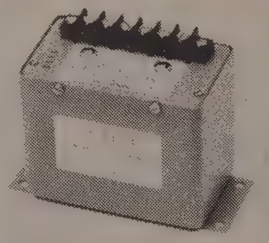
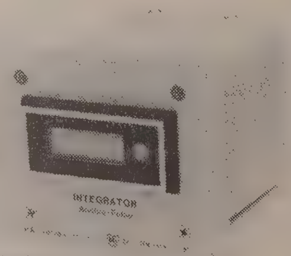


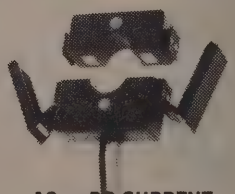
WATT & VAR TRANSDUCER



RMS VOLTAGE & CURRENT TRANSDUCER



PROCESS ACCUMULATOR



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SENSORS/TRANSDUCERS

Manufacturer	EEM Page no.	Current, DC Magnitude	Current, DC Level Sensing	Current, DC Bidirectional	Current, AC Ampl./RMS	Current, AC Level Sensing	Power True (W)	Power Apparent (VAR)	Power Factor	Phase Angle	Frequency	Voltage DC	Voltage AC	Other
American Aerospace	1B•1830													
	1B•1831	●	●	●	●	●	●	●					●	
Micro Switch	1B•1852	●	●		●	●								
Ohio Semitronics	1B•1854													
	1B•1855						●							
	1B•1856							●						
	1B•1857						●							
	1B•1858						●		●					
	1B•1859						●							Converter, Analog-to-Pulse (Integrator)
	1B•1861	●		●	●									
	1B•1862				●								●	
	1B•1863				●								●	
	1B•1864											●	●	
	1B•1865										●			
	1B•1866													Integrator, Analog Current
Scientific Columbus	1B•1876													
	1B•1877				●		●	●		●	●		●	

ENCODERS, SHAFT ANGLE

Manufacturer	EEM Page no.	Optical Abs	Optical Diff.	Contact Abs	Contact Diff.	Other
BEI Motion Systems	1B•1832	●	●		●	
Datametrics• Dresser Inds.	1B•1841	●	●			
Itek Meas. Sys.	1B•1845			●*	●*	
Litton Encoder	1B•1848	●	●	●*	●	Trackballs
Micro Mo Elctrns.	1B•1849	●	●			
Renco	1B•1874					
	1B•1875	●	●			
Transducers and Systems	1B•1880					Transformer, Rotary, Variable, Differential
US Digital	1B•1881		●			
Vernitech	1B•1882	●	●	●		

* Mil. Spec.

TRANSDUCERS

Manufacturer	EEM Page no.	Audio	Force/ Weight	Magnetic Field	Pressure	Temp.	Position		Position/ Velocity	Velocity	Other
							ABS	Displacement			
Aeroflex Labs.	1B•1829										Magnetic Pickups
Blatek	1B•1835	●									Transducers, Ultrasonic
Bruel & Kjaer	1B•1837										Microphones, Measuring
Celesco	1B•1838 1B•1839				●		●	●	●	●	
Data Instruments	1B•1840				●						Depth Sensors
Entran	1B•1842				●						
Hamlin	1B•1844										Proximity Sensors
Kavlico	1B•1846				●						
Kulite	1B•1847				●						
Micro Switch	1B•1850 1B•1851				●						
NTK Technical	1B•1853										Transducers, Ultrasonic
Ohio Semitronics	1B•1867			●							
Omega	1B•1868 1B•1869					●					
Paine	1B•1870				●						
Piezo Electric	1B•1871	●									Transducers, Piezoelectric
Renco	1B•1875						●				
Scientific Columbus	1B•1876 1B•1877					●					
Tedea USA	1B•1878		●								
Transducers and Systems	1B•1880		●					●		●	Transducer Measurement System, Universal; Inclinometers
Transducer Systems	1B•1879								●		Magnetic Pickups; Proximity Sensors
Vernitech	1B•1882 1B•1883				●						

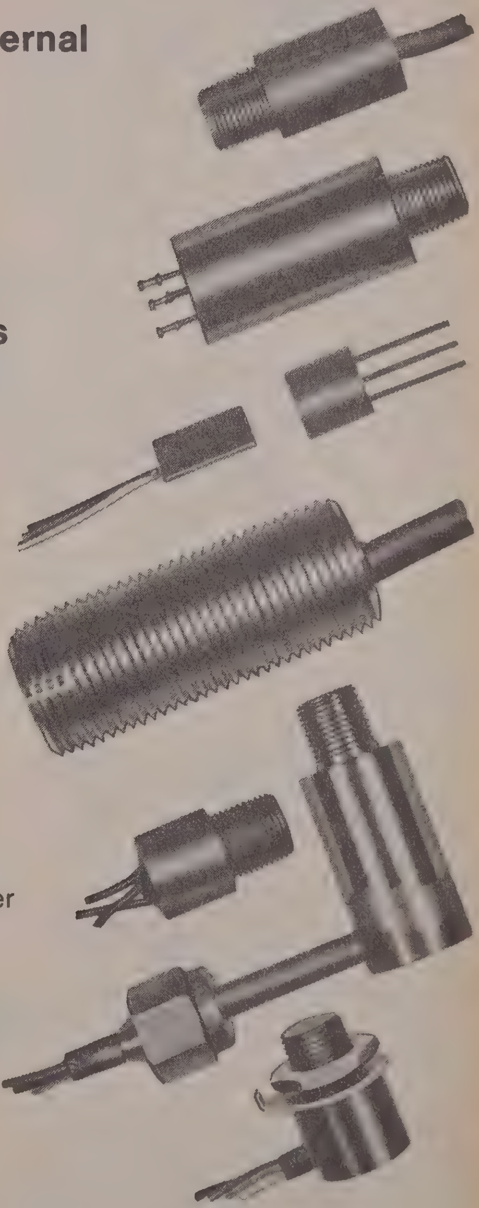
ACCELEROMETERS

Manufacturer	EEM Page no.	Acceleration	Vibration	Shock
Bruel & Kjaer	1B•1836		●	●
Entran	1B•1843	●	●	●
Vibro-Meter	1B•1885		●	
Wilcoxon	1B•1886		●	

Speed-Independent Magnetic Pick-ups

Their output voltage amplitudes are totally independent of the rate of change to the external magnetic field. They provide

- **True zero speed sensing**
- **Contactless limit switches**
- **Translational and rotational velocity, direction and position sensing**
- **Counting, indexing, and timing functions**



Benefits:

- Simplify designs
- Low power consumption
- Rugged enough for engine environments
- Aerospace reliability
- Operate from logic power bus
- Freedom from EMI (no choppers or oscillators)
- Freedom from actuator mechanisms
- Can replace optical systems

Applications:

Computer peripherals—sensing of indexing marks for drive mechanisms in card readers / magnetic tape memories / paper roll drive, and character selection in printers

Transportation—wheel speed sensing (skid-controlled braking) / ignition system timing / vehicle sensing (traffic control)

Industrial — speed, position and limit sensing

Aerospace — wide applications

Other Products:

Solid state Push Button and Toggle Switches / Solid state current sensors / as well as brushless DC Motors and Torquers.

For Technical "Hotline" Assistance,
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AAC

American Aerospace Controls Inc.

570 SMITH STREET, FARMINGDALE, NEW YORK 11735 ☐ (516) 694-5100

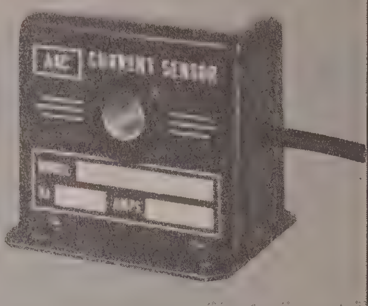

Figure 1 Size: 2 1/16″ x 2″ x 1¾″

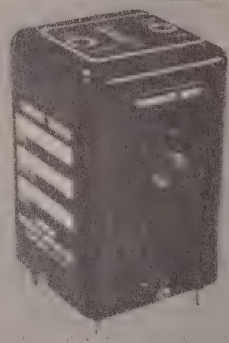

Figure 2 Size: 2 11/16″ x 1⅝″ x 1⅝″

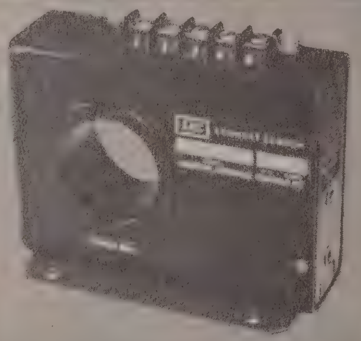

Figure 3 Size: 3½″ x 4¼″ x 2 3/16″

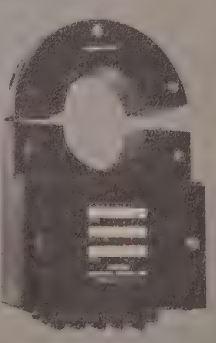

Figure 4 Size: 5″ x 3¼″ x 1 9/16″

AC CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
C	1, 2, 5, 10, 20A	+1mA DC	0.25%FS	400ms	6
1003AM1	2, 5, 10, 15, 20, 30, 50, 100A	+5VDC	1%FS	150ms	1
1004	2, 5, 10, 20, 50, 100A	+5VDC	1%FS	150ms	5
1002	5, 10, 25, 50, 100A	+5VDC	1%FS	50ms	—
1002M1	5, 10, 25, 50, 100, 150, 200, 250A	+5VDC	1%FS	50ms	5
1003AM2	30, 50, 75, 100, 150, 200, 250A	+5VDC	1%FS	150ms	—
1004M7	100, 150, 200, 250A	+5VDC	1%FS	150ms	5
1003AM3	150, 250, 500, 800, 1000, 1200, 1500A	+5VDC	1%FS	150ms	—
1001	150, 250, 500, 1000, 2000, 2500, 5000A	+5VDC	2%FS	150ms	4

DC CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
904B	.1, .2, .5, 1, 2, 5mA	+5VDC	1%FS	50ms	—
903B	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+5VDC	1%FS	50ms	5
903C	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+5VDC	2%FS	50ms	5
S209-903B	5, 10, 20, 50, 100, 200, 500mA & 1, 2, 5A	+1mA DC	1%FS	50ms	5
S218-903	100, 200, 500mA & 1, 2, 5A	+5VDC	1%FS	50ms	3
936	50 & 500mA	+5VDC	2%FS	100ms	—
937	10, 20, 30, 50, 100A	+5VDC	2%FS	200μs	—
913A	10, 20, 50, 100A	+5VDC	1%FS	1ms	2
913B	10, 20, 50, 100A	+5VDC	1%FS	1ms	5
913C	10, 20, 50, 100A	+5VDC	2%FS	1ms	5
S155-913B	10, 20, 35, 50, 75, 100A	+5VDC	1%FS	1ms	5
946	10, 15, 20, 25, 30, 50A	+5VDC	1%FS	30ms	—
950	10, 20, 30, 40, 50A	+5VDC	0.5%FS	10ms	5
951	10, 20, 30, 40, 50A	+5VDC	0.5%FS	30ms	5
952	100, 250, 400, 500, 1000, 1500, 2000A	+5VDC	0.5%FS	50μs	5
934	100, 200, 250, 300, 500, 750, 1000A	+5VDC	2%FS	200μs	5

BIDIRECTIONAL CURRENT SENSORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
905B	±50, 100, 200, 500mA & 1, 2, 5A	±5V	1%FS	50ms	5
905C	±50, 100, 200, 500mA & 1, 2, 5A	±5V	2%FS	50ms	5
925B	±10, 20, 50, 100A	±5V	1%FS	1ms	5
925C	±10, 20, 50, 100A	±5V	2%FS	1ms	5
907	±25, 50, 100, 150, 200, 250, 300A	±5V	2%FS	100μs	—
907A	±25, 50, 100, 150, 200, 250, 300A	±5V	2%FS	40μs	—
908	±25, 50, 100, 150, 200, 300A	±250mV	2.5%FS	5μs	—
910	±25, 50, 100, 150, 200, 250A	±250mV	2%FS	5μs	—
927B	±150, 200, 250, 300, 500, 750, 1000A	±5V	1%FS	100μs	5
927C	±50, 100, 150, 200, 250, 300, 500, 750, 1000A	±5V	2%FS	100μs	5
942A	±100, 200, 300, 500, 800, 1000, 2000A	±5V	1%FS	100μs	3
909	±150, 250, 500, 750, 1000, 1500, 2500, 5000A	±250mV	2.5%FS	200μs	4
909M4	±150, 250, 500, 750, 1000, 1500, 2000, 2500A	±5V	2.5%FS	200μs	4
921	±250, 500, 750, 1000, 2000A	±250mV	2%FS	20μs	5

CURRENT, VOLTAGE AND POWER INSTRUMENTATION

CALL 516-694-5100

AC & DC CURRENT LEVEL DETECTORS

SERIES	FULL SCALE (FS) INPUT CURRENT RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
850	1, 2, 5, 10, 15, 20, 50, 100, 200, 250A AC	RELAY	2%FS	500ms	—
S212-850	500mA AC (75A AC OVERLOAD)	RELAY	± 75mA	200ms	5
901B	20, 50, 100, 250, 500mA & 1, 2, 5A DC	+ 5V & SW	1%FS	50ms	—
S204-800	100mA DC (10A DC OVERLOAD)	RELAY	N/A	3ms	5
S58-800	200mA DC (10A DC OVERLOAD)	SWITCH	N/A	1ms	5
S201-800	1A DC (100A DC OVERLOAD)	RELAY	± 150mA	200ms	5

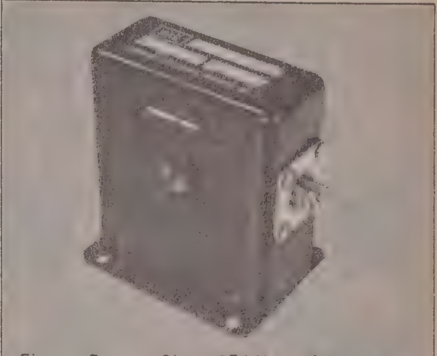

Figure 5 Size: 2⅞″ x 2$\frac{9}{16}$″ x 2″

AC VOLTAGE SENSORS

SERIES	FULL SCALE (FS) INPUT VOLTAGE RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
109	120, 125, 135, 240, 250, 270VAC	+ 1mA DC	0.5%V max	300ms	—
110	120, 125, 135, 240, 250, 270VAC	+ 1mA DC	0.5%V max	300ms	—
108	130, 150, 270, 500, 600VAC (0 to FS)	+ 5VDC	2%FS	200ms	—
S190-108	130, 150, 270, 300, 600VAC (0 to FS)	+ 10VDC	2%FS	200ms	—
V	150, 300, 500VAC (0 to FS)	+ 1mA DC	0.25%FS	400ms	6
101M3	150VAC @ 60Hz (SUPPRESSED ZERO)	+ 5VDC	2%V max	17ms	—
102M3	175VAC @ 400Hz (SUPPRESSED ZERO)	+ 5VDC	2%V max	3ms	—
105	465, 490, 505, 540VAC (SUPPRESSED ZERO)	+ 5VDC	2%V max	17ms	—

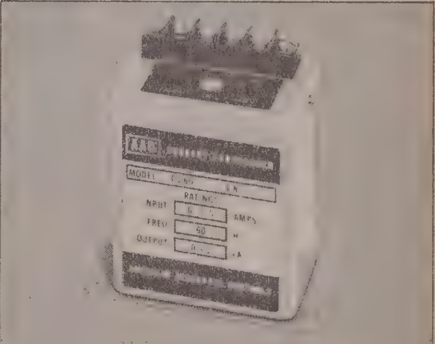

Figure 6 Size: 4″ x 4″ x 2″

WATT & VAR TRANSDUCERS

SERIES	FULL SCALE (FS) INPUT POWER RANGES	FS OUTPUT	ACCURACY	RESP.	FIG.
415A	1KW-100KW 120 or 220VAC 60Hz	+ 5VDC	2%FS	400ms	8
416A	4KW-200KW 440VAC 60Hz	+ 5VDC	2%FS	400ms	8
S217	2KW-80KW 220 & 440VAC 60Hz	+ 5VDC	2%FS	400ms	8
S73-413	1KW-50KW 120 or 220VAC 60Hz	+ 5VDC	2%FS	400ms	8
S206-415A	1KW-100KW 120 or 220VAC 400-1KHz	+ 5VDC	2%FS	150ms	8
W106	0.5KW-2KW (1 ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
W156	1KW-4KW (1½ ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
W206	1KW-4KW (2 ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
W256	1KW-4KW (2½ ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
W306	1KW-4KW (3 ele) 120, 220, or 440VAC	± 1mA DC	0.25%FS	400ms	7
Q106	0.5-2KVAR (1 ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
Q156	1-4KVAR (1½ ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
Q206	1-4KVAR (2 ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
Q256	1-4KVAR (2½ ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
Q306	1-4KVAR (3 ele) 120, 220 or 440VAC	± 1mA DC	0.25%FS	400ms	7
407	0.3-60KW DC 12-240VDC & 25-250A DC	250mV	2%FS	5µs	—
401	2.7-150KW DC 18-150VDC & 150-1000A DC	250mV	2.5%FS	200µs	4

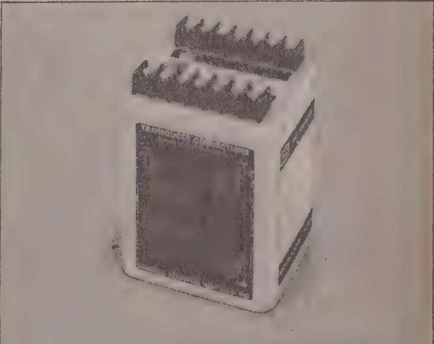

Figure 7 Size: 5$\frac{7}{16}$″ x 5⅛″ x 3⅜″

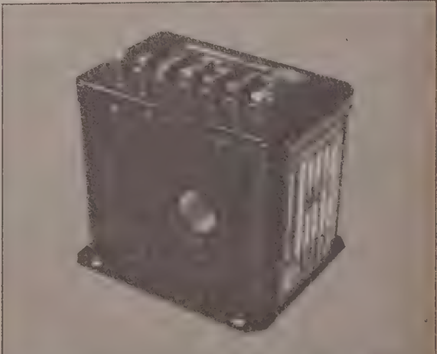

Figure 8 Size: 4″ x 4⅛″ x 3⅜″

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690
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New Series 143

Our DIGITAL PRODUCTS DIVISION offers a wide choice of high accuracy optical rotary, *absolute, incremental* and *tachometer* encoders. Standard resolutions to 1,048,576 bits-per-turn. Special resolutions to 16,777,216 (2^{24}) bits per turn.

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M-25 Two versions

Our POSITION CONTROLS DIVISION offers fast 30-day delivery on optical *absolute* encoders using the latest aerospace technologies in the range of 512 to 65,536 bits per turn in a convenient size 25 package.

Features include single light source, heavy duty shaft, housings and bearing assemblies, wide range of output driver options and mounting configurations.

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E-15
Self-contained, self-aligning

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Our modular M-15 can be customer installed in 60 seconds. Not a kit! Totally self contained. Needs no alignment. The E-15 is also self-contained, with shaft and bearings. Both models are 1.5″ diam. TTL outputs with resolutions up to 1024 CPT in quadrature with zero reference. Dual inch/metric outputs available.

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TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code **3**•1103
Batteries, Product Selection Guide **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide **2**•1003
Capacitors, Basic Formulas **1A**•1093
Capacitors, Miniglossary **1A**•1069
Capacitors, Product Selection Guide **1A**•1003
Circuit Boards (Printed), Product Selection Guide **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide **1A**•1219
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Connectors, Terminals, & Sockets, Product Selection Guide **2**•1097
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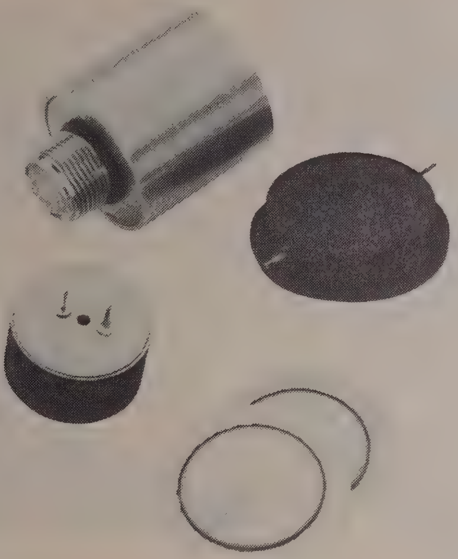
Solenoids, Product Selection Guide **1B**•1481
Switches, Product Selection Guide **1B**•1499
Thyristors/High Power Diodes, Miniglossary **1A**•1652
Transducers & Encoders, Product Selection Guide **1B**•1827
Transformers, Product Selection Guide **1A**•2115
Wire & Cable, Product Selection Guide **2**•1935



BLATEK ULTRASONIC TRANSDUCERS

Blatek Industries, Inc. offers ultrasonic transducers in several frequencies providing for a wide range of applications.

The 9000 series of transducers are high frequency, but low cost transducers designed for use in industrial controls and level sensing. Available in OEM quantities or custom designs.

The 9350 (pictured above, top center) is a 1Mhz unit designed for use in various liquid media including hydrocarbons. It is in a brass housing with a UHF connector. Minimum order is one piece.

The 8010 and 8020 model transducers, available in either 25 or 40KHz, are ideal for a variety of applications where a low to medium power ultrasonic transducer is required. Operating distance on these units is a minimum of six feet to a maximum of twenty feet.

Both have painted aluminum housings. The 8010 is available with either PC pins or a phono plug; the 8020 with either PC pins or wire lead attachments. Minimum order is five pieces. Available in OEM quantities.

BLATEK SPECIAL PRODUCTS

Blatek provides specific customer design assistance and/or assembles special products for companies that do not have in-house capability.

Some other special product lines include:

- — MEDICAL TRANSDUCERS AND SUBASSEMBLIES
- — SMALL MILITARY PARTS
- — PIEZO CERAMIC BIMORPHS
- — CUSTOM DESIGN AND SUB-ASSEMBLY WORK OF YOUR COMPANY'S PRODUCT OR SYSTEM

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Confidentiality of proprietary project guaranteed. Customer references furnished upon request.

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P.O. Box 574
Pine Street & Mill Road
Bellefonte, PA 16823

814-355-4910

BLATEK AUDIO TRANSDUCERS

Blatek piezo ceramic audio transducers are available in three standard sizes, with or without feedback tab. All units can be provided with soldered-on lead wires at additional charge. Units requiring a stud mount or other special treatment will be quoted upon request.

MODEL	O.D.	RES FREQ. (KHz)
6010 (6013)*	1.062"	4.8 ± 500
6020 (6023)	1.250"	3.5 ± 600
6030 (6033)	1.375"	3.0 ± 600

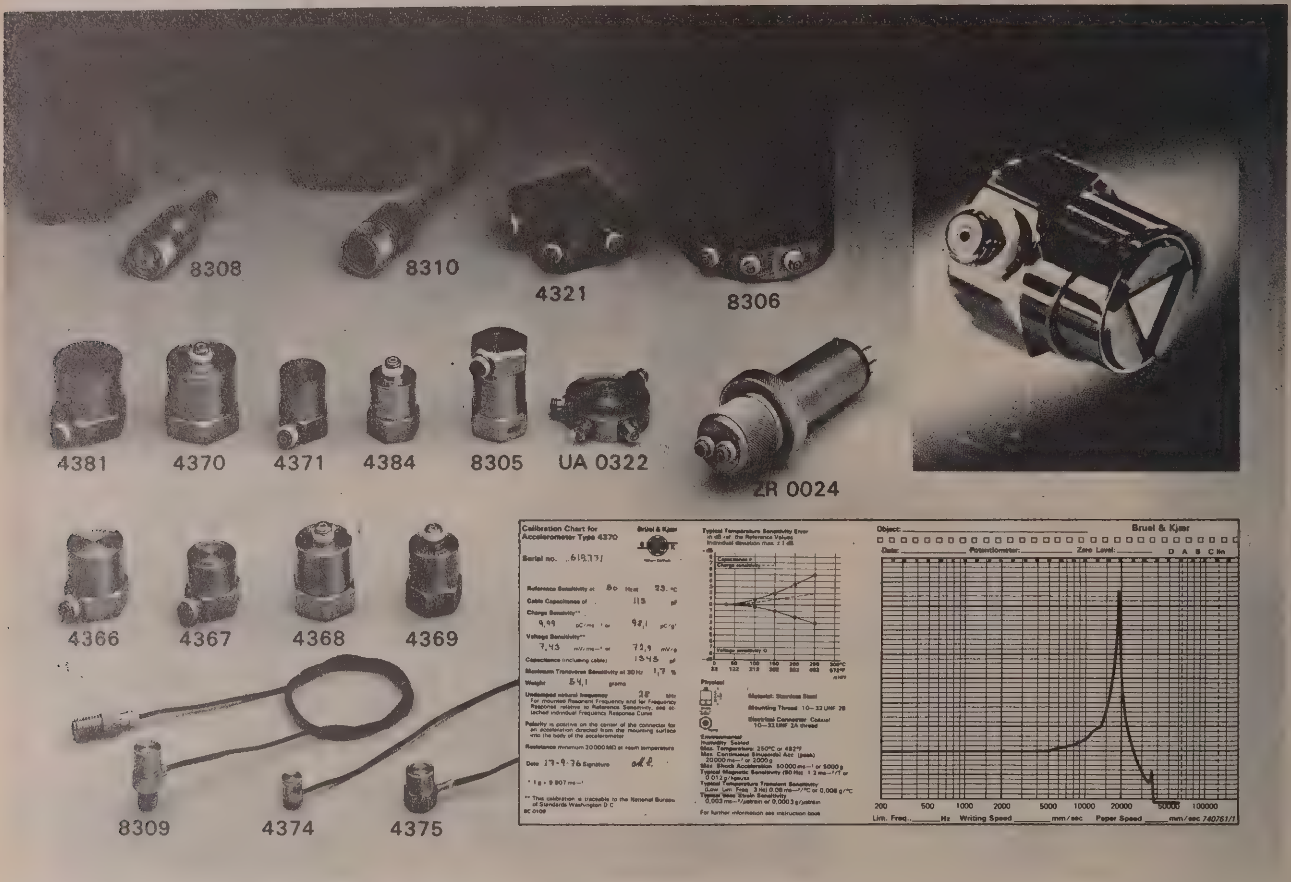
*Units in parenthesis designates feedback pattern. Special electrode patterns and frequency requirements quoted upon request. Small quantities from stock. Minimum order 30 pieces.

MODEL/FREQ.	*DIMENSIONS*	*BANDWIDTH*	*POWER RATING*	*IMPEDANCE*	*MAX. DRIVING VOLTAGE*
9350-1MHz	1.0"x1.250"	±10%	20 watts	300 ohms	200 (p-p)
8010-25KHz	1.0"x .562"	.4 KHz	.2 watts	325 ohms	35 (p-p)
8010-40KHz	1.0"x .562"	.4 KHz	.2 watts	750 ohms	60 (p-p)
8020-25KHz	1.5"x .375"	.8 KHz	2 watts	1150 ohms	100 (p-p)
8020-40KHz	1.5"x .375"	1.0 KHz	2 watts	525 ohms	100 (p-p)

REV C4-84

Bruel & Kjaer Accelerometers

The world's widest range of noise and vibration transducers, — all individually calibrated and documented.


8308
8310
4321
8306
4381
4370
4371
4384
8305
UA 0322
ZR 0024
4366
4367
4368
4369
8309
4374
4375
Typical Temperature Sensitivity Error in dB ref. the Reference Values. Individual deviation max. ± 1 dB
Capacitance
Charge sensitivity
Voltage sensitivity
0 50 100 150 200 250 300°C
32 122 212 302 392 482 572°F
Object:
Brüel & Kjær
Date:
Potentiometer:
Zero Level:
D A B C Lin
200 500 1000 2000 5000 10000 20000 50000 100000
Lim. Freq. ___ Hz Writing Speed ___ mm/sec Paper Speed ___ mm/sec 740761/1

Calibration Chart for Accelerometer Type 4370

Brüel & Kjær

Serial no. 619771

Reference Sensitivity at 50 Hz at 25 °C

Cable Capacitance of 115 pF

Charge Sensitivity** 9,99 pC/ms⁻² or 98,1 pC/g*

Voltage Sensitivity** 7,43 mV/ms⁻² or 72,9 mV/g

Capacitance (including cable) 1345 pF

Maximum Transverse Sensitivity at 30 Hz 1,7 %

Weight 54,1 grams

Undamped natural frequency 28 kHz

For mounted Resonant Frequency and for Frequency Response relative to Reference Sensitivity, see attached individual Frequency Response Curve

Polarity is positive on the center of the connector for an acceleration directed from the mounting surface into the body of the accelerometer

Resistance minimum 20000 MΩ at room temperature

Date 17-9-76 Signature

* 1 g = 9.807 ms⁻²

** This calibration is traceable to the National Bureau of Standards Washington D.C.

BC 0100

Physical

Material: Stainless Steel

Mounting Thread: 10–32 UNF 2B

Electrical Connector: Coaxial 10–32 UNF 2A thread

Environmental

Humidity: Sealed

Max. Temperature: 250°C or 482°F

Max. Continuous Sinusoidal Acc. (peak) 20000 ms⁻² or 2000 g

Max. Shock Acceleration 50000 ms⁻² or 5000 g

Typical Magnetic Sensitivity (50 Hz) 1.2 ms⁻²/T or 0.012 g/kgauss

Typical Temperature Transient Sensitivity (Low Lim. Freq. 3 Hz) 0.08 ms⁻²/°C or 0,008 g/°C

Typical Base Strain Sensitivity 0,003 ms⁻²/μstrain or 0,0003 g/μstrain

For further information see instruction book

B & K Type no.	Charge Sensitivity (pC/ms-2)*	Voltage Sensitivity (mV/ms-2)*	Freq. Range to - 10% limit (Hz) △	Mounted Resonance (kHz)	Weight (grammes)	Max. Working Temperature (°C)	Config-uration	Application Areas
4366	≈ 4.5	≈ 4	0.2 - 9000	27	28	250	Delta® Shear	General shock and vibration measurements. Vibration testing and control
4367	≈ 2	≈ 1.5	0.2 - 10,600	32	13	180		
4368	≈ 4.5	≈ 4	0.2 - 9000	27	30	250		
4369	≈ 2	≈ 1.5	0.2 - 10,600	32	14	180		
4371•	1 ±2%	≈ 1	0.2 - 12,000	35	11	250		As above. Easy calibration of measurement system
4384•	1 ±2%	≈ 1	0.2 - 12,000	35	11	250		
4370•	10 ±2%	≈ 10	0.2 - 6000	18	54	250		As above + low level measurement
4381•	10 ±2%	≈ 10	0.2 - 6000	18	40	250		
4374	≈ 0.1	≈ 0.2	1 - 27,000	90	0.65	250	Shear	High level, high frequency measurements. Delicate structures
4375	≈ 0.3	≈ 0.45	1 - 18,000	60	2	250	Delta Shear®	
8309	≈ 0.004	≈ 0.03	1 - 60,000	180	3 excl. cable	120	Compression	High level shock measurements
4321•	1 ±2%	≈ 0.8	1 - 12,000	40	55	250	Delta Shear®	Measurements in 3 directions
8305	≈ 0.12	—	0.2 - 4400 (2%)	30	40	200	Compression	Accelerometer calibration
8306•	1000 ±2%	1000 ±2%	0.2 - 1000	4.5	500	85		Ultra low level measurements
8308•	1 ±2%	≈ 1	1 - 10,000	30	100	400 (180)■		Permanent vibration monitoring — Measurements at high temp.
8310•	1 ±2%	≈ 1	1 - 10,000	30	100 excl. cable	400		

• Uni-Gain® types   * 1 ms⁻² ≥ 0.1g

△ Lower limiting frequency determined by preamplifier used and environmental conditions

■ The plug supplied with Type 8308 can tolerate temperatures up to 180°C

A descriptive data sheet is available for our accelerometers, and our catalog describes briefly more than 200 instruments to fulfil your measurement requirements. Give us a call and request your copies.

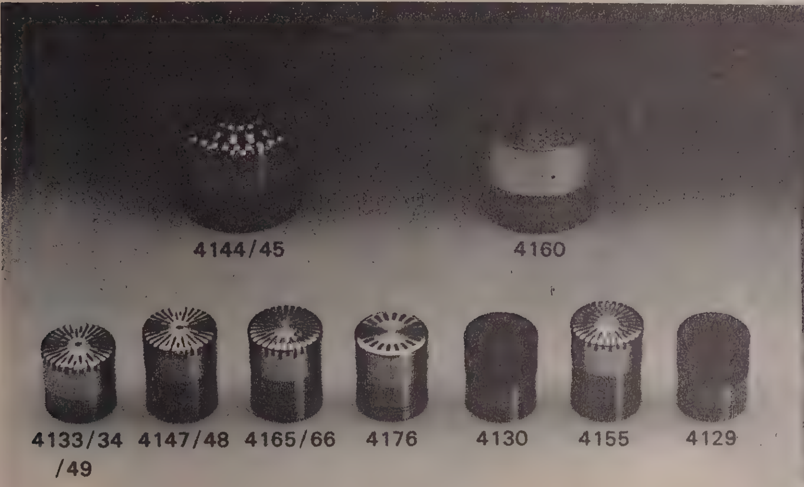
Bruel & Kjaer Instruments, Inc.

185 Forest Street, Marlborough,
Massachusetts 01752
(617) 481-7000 · TWX 710/347-1187

Regional offices: NJ-201-526-2284; MD-301-948-0494; GA-404-951-0115; MI-313-522-8600; IL-312-358-7582; TX-713-645-0167; CA-714-978-8066; CA-415-574-8100

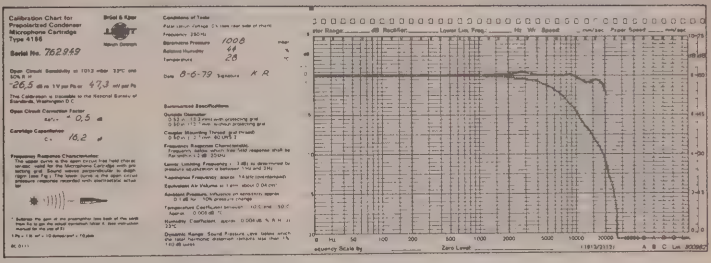
World Headquarters: Naerum, Denmark. Sales and service in principal US cities and 55 countries around the world.

Bruel & Kjaer Measuring Microphones



4135/36

4138


Calibration Chart for Prepolarized Condenser Microphone Cartridge Type 4166

Serial No. 762949

Conditions of Tests

Date 8-6-79

Cartridge Type no.	Associated Preamplifier (Type no.)	Sensitivity* (mV/Pa)	Polarization Voltage (V)	Frequency Range** (±2 dB)	Frequency Response	Dynamic Range*** (dB)	Diameter	Application Areas
4138	2633 + UA 0160 or 2619 + UA 0036	1	200	6.5 Hz - 140 kHz	Pressure and Random	2619: 55 - 168 2633: 58 - 168	1/8″	High level, high frequency measurements. Work in confined spaces
4135	2633 or 2619 + UA 0035	1		4 Hz - 100 kHz	Free Field and Random	2619: 42 - 164 2633: 37 - 164	1/4″	High level, high frequency measurements. Acoustic pulse and model work
4136		1.6		4 Hz - 70 kHz	Pressure	2619: 50 - 172 2633: 45 - 172		
4133 4149	2619	12.5		4 Hz - 40 kHz	Free Field	29 - 160	1/2″	General SPL measurements — Outdoor measurements (4149)
4134				4 Hz - 20 kHz	Pressure and Random			Coupler and medium SPL measurements
4147	2631 (with 2619 specs as 4134	3.7 - 18	None (10 MHz Carrier)	0.01 Hz - 18 kHz	Pressure and Random	64 - 150	1/2″	Very low frequency measurements. Used with Microphone Carrier System 2631
4148	2619 with Type 2804	12.5	28	4 Hz - 16 kHz	Free Field	28 - 140	1/2″	General SPL measurements — Requires only 28V polarization
4165	2619	50	200	2.6 Hz - 20 kHz	Free Field	18 - 146	1/2″	Low and general purpose SPL measurements
4166				2.6 Hz - 9 kHz	Pressure and Random			
4144	2619 or 2627	50		3 Hz - 8 kHz	Pressure	2619: 13 - 146 2627: 10 - 148	1″	Coupler-Audiometer calibration
4145				3 Hz - 18 kHz	Free Field			General SPL measurements
4160	2627	47	200	2.6 Hz - 8.5 kHz	Pressure	13 - 146	1″	Microphone calibration
4130	2642	10	28 (up to 120)	7 Hz - 8 kHz	Free Field and Random	26 - 146	1/2″	General SPL measurements — Requires only 28V polarization
4155	2619	50	0	4.0 Hz - 16 kHz	Free Field	19 - 146	1/2″	Low and general purpose SPL measurements without need of Polarization voltage
4129				7 Hz - 8 kHz		16 - 132		
4176				7 Hz - 12.5 kHz		14 - 142		

* 1 Pa = 1 N/m² = 10 μbar
** Free field normal incidence (0°). For 4138 90° incidence. Lower limiting frequency valid for microphone, the actual limit depends on preamp.
*** From A-weighted noise level to 3% dist. level re 0.00002 Pa

A descriptive data sheet is available for our measuring microphones, and our catalog describes briefly more than 200 instruments to fulfil your measurement requirements. Give us a call and request your copies.

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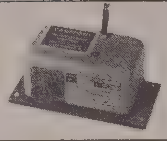
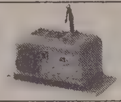
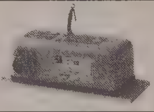
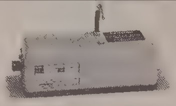
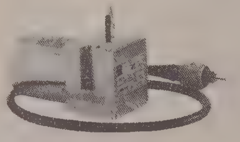
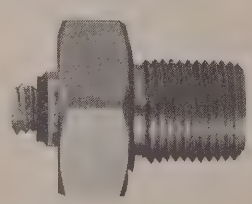
World Headquarters: Naerum, Denmark. Sales and service in principal US cities and 55 countries around the world.

celesco POSITION TRANSDUCERS

	Model	Ranges	Resolution	Accuracy	Thermal Effects (Zero)	Thermal Effects (Span)
	**PT101 Position/ Displacement Transducer:** Provides an electrical signal proportional to the linear extension of a stainless cable through the use of a precision potentiometer.	0-2 inches to 0-500 inches	essentially infinitesimal (most ranges)	±0.1% full scale (linearity and repeatability)	0.01%/°F full scale	0.01%/°F
	**VT201 Velocity Transducer:** Generates a DC signal proportional to the velocity of cable extension or retraction.	0-2 inches to 0-500 inches	essentially infinitesimal	±3%, linear to 0.1%	not applicable	0.01%/°F
	**DV301 Position/ Velocity Transducer:** Combines linear tachometer with potentiometer, offering both displacement and velocity outputs.	0-2 inches to 0-500 inches	position and velocity: essentially infinitesimal (most ranges)	position: ±0.1% full scale (linearity and repeatability) velocity: ±3% linear to 0.1%	position:0.01%/°F full scale velocity: not applicable	position: 0.01%/°F velocity: 0.01%/°F
	**PT420 Position Transmitter:** Combines a position transducer with two-wire 4-20 ma electronics. Operates from 12-45 VDC across input.	0-2 inches to 0-500 inches	essentially infinitesimal (most ranges)	±0.15% full scale (linearity and repeatability)	±0.015%/°F full scale	±0.015%/°F
	**Model PT801 Underwater Transducer:** A position/displacement transducer useful in underwater or extremely hostile environments. Available in stainless steel or anodized aluminum.	0-2 inches to 0-150 inches	essentially infinitesimal (most ranges)	±0.1% full scale (linearity and repeatability)	0.01%/°F full scale	0.01%/°F

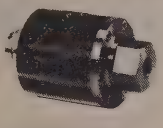
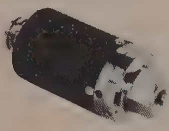
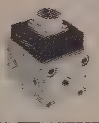
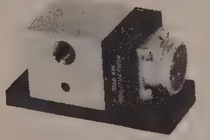
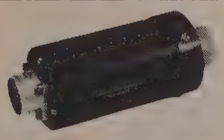
celesco PRESSURE TRANSDUCERS

Piezoelectric Pressure Transducers

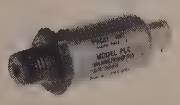
	Model	Sensitivity	Sensitivity	Charge Sensitivity	Capacitance	Maximum Pressure	Rise Time
	LC-33 Blast Pressure Transducer: High sensitivity; records a variety of dynamic pressure phenomena commonly found in free-field blast measurements, shock tunnel pressure-time profiles. Miniaturized LC-13 version available.	0.67V/psi	-101 db re $1V/\mu$ bar	3000 pc/psi	4500 pf	500 psi	10 μ sec
	**LD-25 Blast Pressure Transducer:** Flush-mounted economy model for various measurements of dynamic pressure, acoustic phenomena; useful for high-pressure transients, low-level acoustics.	0.15V/psi	-113 db re $1V/\mu$ bar	35 pc/psi	240 pf	3000 psi	1 μ sec
	LC-70 and LC-71 Pressure Transducers: Small, highly sensitive flush-mounted transducers for recording a variety of dynamic pressure and acoustic phenomena.	0.15V/psi	-113 db re $1V/\mu$ bar	120 pc/psi	800 pf	300 psi	4 μ sec

celesco PRESSURE TRANSDUCERS

Variable Reluctance Pressure Transducers

	Model	Ranges	Linearity	Maximum Line Pressure	Over-pressure	Working Fluids	Output
	**P1 Pressure Transducer:** Operates reliably under adverse environmental conditions; ideal for aircraft/missile flight, ground-test applications. Compatible with most carrier systems.	±0.1 to ±1000 psi gage, absolute or differential	0.5% full scale, best straight line	2000 psi	200% of range in either direction	liquids and gases, both sides	25mv/V nominal full scale at 3000 Hz
	**P2 Pressure Transducer:** Highly shock resistant; ideally suited for corrosive media and accidental pressure overloads in water and hydraulic systems. Can be disassembled for field cleaning.	0-200 to 0-10,000 psi, gage or absolute	±0.5% full scale, best straight line	not applicable	200% of range or 12,000 psi, whichever is less	liquids, gases and solid suspensions	25mv/V nominal full scale at 3000 Hz
	**P3D Differential Pressure Transducer:** For precise measurement of low differential pressure at high line pressures; insensitive to shock and vibration, and suitable for corrosive fluids.	±0.1 to ±5000 psi, gage or differential	±0.5% full scale, best straight line	5000 psi	200% of range of 7500 psi, whichever is less (either direction)	liquids and gases, both sides	25mv/V nominal full scale at 3000 Hz
	**P7D Differential Pressure Transducer:** Ideal for low- and medium-pressure measurements of laboratory accuracy. Commonly used in aircraft and missile flight and in ground test and control applications.	±0.1 to ±500 psi, gage or differential	±0.5% full scale, best straight line	1000 psi	200% of range in either direction	liquids and gases, both sides	25mv/V nominal full scale at 3000 Hz
	KP15 Pressure Transducer Kit: Perfect for general laboratory use. Kit includes case, wrenches spare seals, accessories and diaphragms for five different ranges.	±1, ±5, ±25, ±100 and ±500 psi, gage or differential	±0.5% full scale, best straight line	2000 psi	200% of range in either direction	liquids and gases, both sides	25mv/V nominal full scale at 3000 Hz
	P90D Differential Pressure Transducer: Measures very low pressure differences at line pressures to 1000 psi. Has low acceleration sensitivity and wide dynamic response.	±1 in. H_2O differential (.036 psi)	±0.5% full scale, best straight line	vacuum to 1000 psi	±15 psid, with less than 0.5% full scale shift	liquids and gases, both sides	25mv/V nominal full scale at 3000 Hz
	**CP51 Pressure Transducer—DC Output:** Combines a variable reluctance pressure transducer and carrier demodulator in a single package. Operates from 28 VDC or 115 VAC (optional).	±0.1 to ±1000 psi, gage, absolute or differential	±0.5% full scale, best straight line	2000 psi	200% of range in either direction	liquids and gases, both sides	0-5 VDC or ±5 VDC full scale
	LCVR Low Cost Differential Pressure Transducer: Designed to fill the need for a low-cost, ultra-low range, lightweight transducer for medical and industrial markets.	0-2 cm H_2O to 0-1000 cm H_2O gage or differential	±0.5% full scale, best straight line	30 psia	300% of range with less than 1% full scale zero shift	air, oxygen, CO_2 or any inert gas	25mv/V nominal at 4000 Hz

Strain Gage Pressure Transducers

	Model	Ranges	Accuracy	Resolution	Overpressure	Working Fluids	Output
	**PLC Pressure Transducer:** General purpose transducer. Low-cost, accurate, rugged, compact. Weather resistant and temperature-compensated.	0-15 to 0-10,000 psi gage or absolute	±0.5% full scale (linearity, hysteresis and repeatability)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH stainless steel	10mv/V ±1%, zero balance ±1% full scale
	P2805 Pressure Transmitter: Ideal for most fluids or gases, for hydraulic and pneumatic systems, automotive and aircraft instrumentation. 5 VDC output. 19-32 VDC input.	0-15 to 0-5000 psi gage or absolute	±0.5% full scale (linearity, hysteresis and repeatability)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH stainless steel and Viton O-ring	0-5 VDC (0-10 VDC optional)
	Model P4420 Pressure Transmitter: Similar to P2805 except offers 4-20 ma, two-wire output. Compatible with a wide range of electronic receiving, readout equipment. Transmitter requires 12-45 VDC input.	0-15 to 0-5000 psi gage or absolute	±0.75% full scale (linearity, hysteresis and repeatability)	infinitesimal	200% of range	liquids and gases compatible with 17-4 pH stainless steel and Viton O-ring	two-wire, 4-20 ma

Supporting electronics available for display and signal conditioning. Contact factory for engineering assistance.

celesco
Transducer Products, Inc.

7800 Deering Ave.; P.O. Box 1457
Canoga Park, CA 91304
Toll-Free: 800-423-5483 • In Calif: 818-884-6860
Telex: 67-3382 • TWX: 910-494-1951

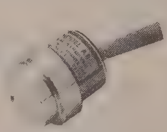
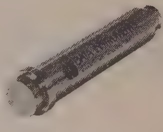
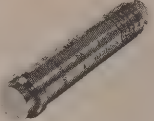
hcc

DATA INSTRUMENTS' PRESSURE TRANSDUCERS

Features
- Pressure ranges: 0–5 to 20,000 PSI
- Output: voltage, frequency, or current
- A unique design that puts stainless steel in contact with your pressure media
- 2x rated pressure without damage. 10x rated pressure without bursting
- Full calibration and temperature compensation
- Unit-to-unit interchangeability: ±1%
- Rated intrinsically safe

Options

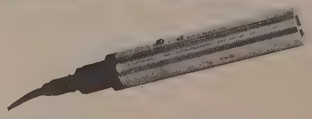
Optional features can be obtained at additional costs:
1. Absolute pressure version.
2. Improved zero and span temperature compensation to 1%/100°F (55°C) and improved accuracy (combined non-linearity, hysteresis and repeatability) from 1% to 0.5%.
3. Barbed fitting for attaching protective hose around cable.
4. Install longer cable by splicing to existing 3 ft. cable.
5. Install longer continuous cable.
7. Extended operating temperature range to 300°F (148.9°C) 6 and 15 PSI excluded. Includes Bendix PTIH-10-6P electrical connector with an extended case.

	Model AB PSIG, PSIA General Purpose	**Model AR** PSIG, PSIA  High Performance	**Model BF** PSIG, PSIA  Amplified Output	**Model BL** PSIG, PSIA  Two-Wire Transmitter	**Models EA and EAF** PSIG Rugged OEM Style	**Model SA** PSIA, PSIS Sealed/Absolute
Pressure Range	0–6, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 15,000, 20,000	0–5, 10, 20, 50, 100, 500, 1000, 5000	0–5, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 20,000	0–5, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 20,000	0–6, 15, 25, 50, 100, 200, 300, 500, 1000, 2000, 5000	0–15, 25, 50 PSIA; 0–100, 200, 500, 1000, 3000, 5000 PSIS
Accuracy	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.25% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis 0.25% available	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis 0.25% available	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis	Within 0.5% FSO best fit, including non-linearity, repeatability and hysteresis
Sensitivity	20 mV/V	20 mV/V				
Signal Output	0 to 100 mV	0 to 100 mV	0 to 5 Vdc	4 to 20 mA	1 to 6 Vdc 1 to 6 kHz	1 to 6 Vdc
Excitation Voltage	5 Vdc or ac; 6 V maximum	5 Vdc or ac; 10 V maximum	12 to 20 Vdc or 20 to 32 Vdc	14 to 50 Vdc	8 to 20 Vdc 10 to 20 Vdc	9 to 20 Vdc
Operating Temperature Range	−65°F to 200°F	−65°F to 200°F	−50°F to 200°F	0°F to 200°F	−67°F to 257°F −40°F to 185°F	−67°F to 257°F
Compensated Temperature Range	30°F to 130°F	30°F to 130°F	30°F to 130°F	30°F to 130°F	32°F to 185°F	32°F to 185°F
Thermal Effect on Zero	<1% of full scale over compensated range	< ±2% of full scale over compensated range	<1% of full scale over compensated range	<1% of full scale over compensated range	< ±0.02% FSO/°C maximum over compensated range	< ±0.02% FSO/°C maximum over compensated range
Thermal Effect on Sensitivity	<1% of reading over compensated range	< ±2% of reading over compensated range	<1% of reading over compensated range	<1% of reading over compensated range	< ±0.02% RDG/°C maximum over compensated range	< ±0.02% RDG/°C maximum over compensated range
Options	1, 2, 3, 4, 5, 7	1, 3, 4, 5,	1, 2	1, 2		

Series E Explosion-Proof Housing

Series E may contain Models AB, BF, or BL. Consult above chart for specifications.

Model DS Depth Sensor



- Two-wire • 4–20 mA output
- Watertight connector
- Waterproof housing withstands 10,000 PSI

Transducer Instrumentation

Signal Conditioners/Controllers, Data Acquisition Systems, Meter Indicators, and Power Supplies are available.

Features
- Digital readout • Multi-channel operation
- Bridge excitation for transducers • Zero and span controls • Dual set points for controls and alarms • Auxiliary output signal

Talk to us about your special needs in the areas of:
- gaging • specifications • material • mounting

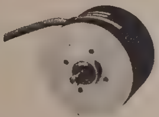
Let us help you find the answers to your pressure measurement problem.

CALL: (617)861-7450

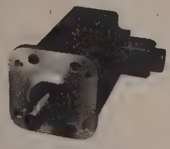
DATA INSTRUMENTS
4 Hartwell Place, Lexington, MA 02173 USA
Telex: 200081

OPTICAL SHAFT ENCODERS

INCREMENTAL ENCODERS

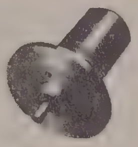
	Pulses Per Revolution	Input Voltage (VDC)	Output Formats	Frequency Range (KHz)	Shaft Diameter (Inches)	Outline Dimension (Inches)
K15 Modular	50 to 1000	5 or 12	Square Wave	0 to 50	N/A	1½ Dia. x ¾ L
	Ultra low cost, very small modular encoder for easy installation on servo or stepper motor. Hybrid circuitry minimizes solder connections and improves reliability.					
K3 Modular	50 to 1200	5	Square Wave, Sine Wave	0 to 50	N/A	2 Dia. x ¾ L
	Low cost modular encoder designed to be integrally mounted on servo or stepper motor having shaft diameter of up to ½ inch. Square wave or amplified sine wave output.					
LC-15 Instrument Grade	50 to 1000	5 or 12	Square Wave	0 to 50	¼	1½ Dia. x 1½ L
	Very low cost shaft encoder for applications where space is at a premium. Unit features a single LED light source, a monolithic sensor array and hybrid circuitry for maximum reliability.					
LC-23 Instrument Grade 	30 to 2500	5 or 12	Square Wave, Sine Wave, Line Driver	0 to 50	¼	2¼ dia. x 1⅞L
	Low cost shaft encoder which offers many of the optional features of far more expensive units. Face or servo mount, choice of output formats, cable or terminal connections.					
Tru-Mite Heavy Duty	100 to 5000	5 to 15	Square Wave, Sine Wave, Line Driver	0 to 100	⅜	2½ Dia. x 2½ L
	High performance, industrial duty encoder with ⅜" diameter shaft and sealed bearings. Cast aluminum housing with flange or servo mount. LED light source 100 KHz frequency range and up to 5000 PPR resolution.					
Tru-Tac Heavy Duty	10 to 1200	5 to 24	Square Wave, Sine Wave, Line Driver	0 to 30	⅜	3L x 3¼ W x 3⅛ H
	Very rugged encoder with double-ended ⅜" diameter shaft and sealed bearings. Cast aluminum housing with foot or face mounting. Built-in voltage regulator permits use over a wide supply voltage range.					

OPTIONAL ENCLOSURES



L Series

The L Series consists of a heavy duty sealed, NEMA 4 enclosure within which an encoder is mounted. A flexible coupling connects the encoder shaft to the enclosure's shaft, thus isolating the encoder's bearings from shaft loading effects. Two Datametrics encoder models can be mounted in the L Series — LC-23 and Tru-Mite.



EX Series

The EX Series consists of an explosion-proof enclosure which is FACTORY MUTUAL LISTED for Class I, Divisions 1 and 2, Groups C and D; and Class II, Division 1, Groups E, F and G indoor and outdoor (NEMA 4) hazardous locations. Two Datametrics encoder models can be mounted in the EX Series — LC-23 and Tru-Mite.

ABSOLUTE ENCODERS

	Resolution (Counts)	Input Voltage (VDC)	Output Codes	Output Format	Frequency Range (KHz)	Shaft Diameter (Inches)	Outline Dimensions (Inches)
LR Absolute	360 or 512	5 to 24	BCD, Gray Natural Binary, Gray	Square Wave	0 to 50	⅜ or ⅝	5 L x 3½ W x 3⅝ H
	Industrial duty, absolute encoder with BCD, natural binary or Gray code output. 360 or 512 counts per revolutions, 5 to 24 VDC input voltage range, open collector or passive pull-up output.						

DATAMETRICS • DRESSER INDUSTRIES, INC.
340 Fordham Road, Wilmington, MA 01887
Tel: (617) 658-5410 TWX: 710-347-7672

DATAMETRICS®

1-800-243-8160

The advantages of being tiny.

At Entran, we've solved most of the problems you might encounter with pressure transducers by making them tiny. And nowadays, tiny is the state-of-the-art.

Being tiny means you don't interfere with the integrity of the system being measured.

Being tiny means less measuring surface to bear loads, and a more compact solid state density with no moving parts.

Being tiny means being insensitive to acceleration, vibration and shock, so you get flat pressure readings, both static and dynamic.

And, being tiny means greater handling ease in hard-to-get-at places. Which adds up to more applications flexibility.

Entran pressure tranducers can usually be interfaced directly with scopes, recorders and milliammeters.

Our transducers come complete and ready to use. All you need supply is the excitation voltage on two leads and read output on the other two leads.

All units give you direct linear output in millivolts/psi and read both static and dynamic pressures. There's no need for charge or voltage amplifiers. Calibrations are traceable to The National Bureau of Standards.

Write Entran Devices, Inc., 10 Washington Ave., Fairfield, N.J. 07006 (201) 227-1002, Telex 130-361.

$360.00

Must not be used in water or corrosive medium.

Only 0.080 in diameter (that's tiny), EPI-080.

This solid-state pressure transducer is 0.080" in diameter, 0.25" in length and occupies a volume of only 0.0013 cubic inches. Yet it gives accurate static and dynamic pressure readings like the big ones do. Its atomically bonded, diffused diaphragm with leads attached to the non-active area make this device virtually insensitive to acceleration, vibration and shock.

Typical ranges	25 psi	50 psi	100 psi	250 psi	500 psi
Sensitivity nom.	3 mV/psi	1.8 mV/psi	1.0 mV/psi	0.4 mV/psi	0.2 mV/psi
Useful frequency nom.	25 KHz	30 KHz	40 KHz	60 KHz	80 KHz

Excitation. 5V. Output impedance: 750 Ω nom. Repeatability: 0.5%.
Non-linear and hyst: ± ¾%. Resolution: infinite.

$385.00

Tiny but easy to handle, EPX-10

This easy to install pressure transducer is built with standard 10-32 UNF thread and is available in an optional M5 metric version. it gives flat pressure readings static and dynamic, in 5 to 5,000 psi ranges to as high as 90KHz. Has infinite resolution and is also insensitive to acceleration, vibration and shock. Made of stainless steel, and with its built-in "O" ring seal can be screwed in just about anywhere. However, for corrosive or water usage, order our "welded" version.

Typical ranges	5 psi	50 psi	100 psi	250 psi	1000 psi
Sensitivity nom.	3 mV/psi	1.5mV/psi	1.2 mV/psi	0.5 mV/psi	0.12 mV/psi
Useful frequency nom.	9 KHz	15 KHz	15 KHz	20 KHz	40 KHz

Combined non-linear and hyst: ± 1% below 100psi, ½% above 100 psi.
Excitation: 10V. Output impedance: 350 Ω nom.
Repeatability: 0.25%. Thread length: 7/16".

Entran® Pressure Transducers.

(Today, miniature makes sense.)

Call (201) 227-1002

The advantages of being tiny.

At Entran we build a line of accelerometers that can best be described as tiny.

Being tiny means you don't interfere with the integrity of the system being measured.

Being tiny gives you greater handling ease in hard-to-get-at places, which adds up to more applications flexibility. And, being tiny means less mass to distort your test scale, more room for other instruments. All at no sacrifice in test data.

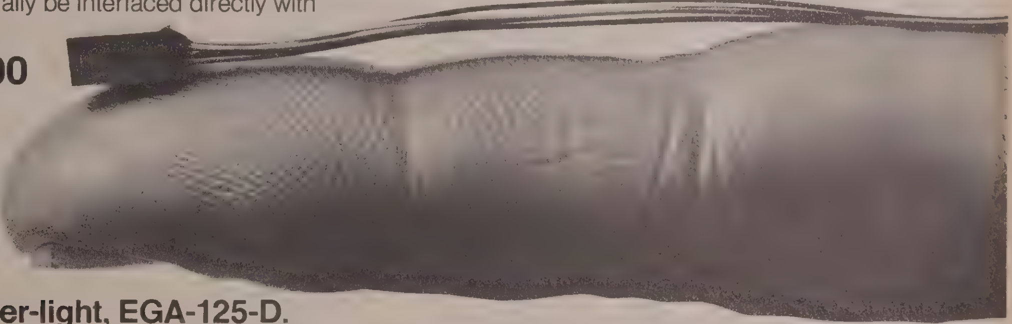
Entran accelerometers give you high output, low impedance readings, both static and dynamic. As a result they can usually be interfaced directly with scopes, recorders and milliammeters.

Entran accelerometers come complete and ready to use. All you supply is the excitation voltage on two leads and read output in millivolts on the other two leads.

All units give you direct linear output in millivolts/g and read both static and dynamic acceleration. There's no need for charge or voltage amplifiers. Calibrations are traceable to The National Bureau of Standards.

Write Entran Devices, Inc., 10 Washington Ave., Fairfield, NJ 07006 Phone 201/227-1002, Telex 130-361.

$329.00



Tiny and feather-light, EGA-125-D.

This accelerometer weighs only one half a gram. Is less than 0.006 cu. inches in volume. Yet gives you static & dynamic readings of acceleration, vibration and shock. And comes with .7 critical damping to eliminate resonance. ("D" is for "damped.")

Typical ranges	± 5g	± 10g	± 50g	± 100g	± 500g
Sensitivity nom.	15 mV/g	12 mV/g	4 mV/g	2.5 mV/g	0.5 mV/g
Useful frequency nom.	150 Hz	200 Hz	500 Hz	600 Hz	1200 Hz

Excitation: 15V, Weight: ½ gram without leads, Linearity: ± 1%,
5 other mounting styles available at no extra charge

$389.00

Tiny but tough, EGC-500DS.

Guaranteed overrange of 1000%. And only a half inch cube to boot.

Static & dynamic measurements of acceleration, vibration and shock in ranges from 5 to 1,000 g. Fully damped to eliminate resonance and fitted with mechanical stops to impede overload response.

Typical ranges	± 5g	± 10g	± 50g	± 100g	± 500g
Sensitivity nom.	25 mV/g	20 mV/g	4 mV/g	2 mV/g	0.5 mV/g
Useful frequency	150 Hz	200 Hz	600 Hz	1000 Hz	1500 Hz

Excitation: 15V, Damping: 0.7 cr. nom., Linearity ± 1%
Output impedance. 450 Ω nom., Input impedance 1000 nom
Size: 0.5" x 0.5" 0.6" width, 10-32UNF tapped hole

Entran Accelerometers.

(Today, miniature makes sense.)

Call (201) 227-1002

HAMLIN INC

LAKE and GROVE STREETS · LAKE MILLS, WISCONSIN 53551
PHONE: SALES 414/648-2361 · TWX 910-260-3740

REED SWITCHES • SENSORS • REED, HG & MOS RELAYS • LIQUID CRYSTAL DISPLAYS

MAGNETIC ACTUATED REED PROXIMITY SENSORS

Offer the long life and high reliability of reed switches. Include all the advantages of magnetic reed switches but come packaged ready for mounting. Expoxy package resists most solvents, acids and salts. Safe for use in hazardous environments. Shock and vibration characteristics comparable with the basic reed switch.

Stock No	Fig. No	Type	Form	Contact Rating Watts	Max DC/AC Voltage	Max Amps	Min Breakdown Voltage	Notes	Price
33F-1208	1	5801	A	10W	200/DC 240/AC	.500	400	1,5	4.36
33F-1210	1	5901	A	360VA	120-240/AC	1.500	400	4,5,8	6.08
33F-1209	2	5802	C	3W	28/DC 120/AC	.250	200	1,2,5	5.48
33F-1073	3	5804	A	10W	100/DC 120/AC	.500	200	1	1.52
	5	5807	A	10W	100/DC 120/AC	.500	200	6	2.20
	5	5808	A	50W	500/DC 240/AC	2.000	1000	3,7	3.56
	5	5809	C	3W	28/DC 120/AC	.250	200	6	3.04
	5	5811	A	50W	100/DC 120/AC	1.000	225	7	2.64
	4	5806	A	10W	100/DC 120/AC	.500	200	6	2.28
	4	5812	A	10W	200/DC 200/AC	.500	400	6	2.27

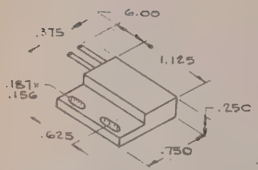


FIG 1

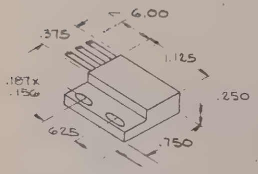


FIG 2

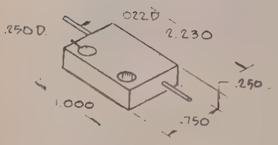


FIG 3

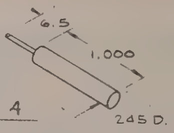


FIG 4

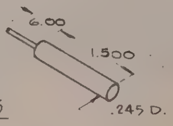


FIG 5

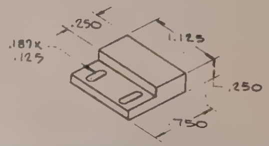


FIG 6

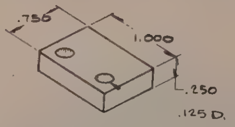


FIG 7

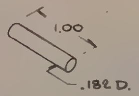
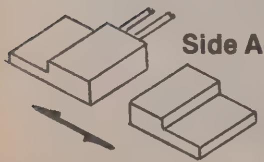


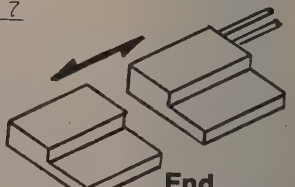
FIG 8

NOTES:

1. Underwriters Laboratories recognized component; File E61760.
2. Dwell may occur between point common leaves one contact and makes with the other contact.
3. Mercury wetted contacts operation restricted to ± 30° from vertical. ARC suppression suggested above 12 volts.
4. Rating at 25°C.
5. Lead wires 20 AWG 19/32, Teflon, 200°C, 200V UL Type 1180.
6. Lead wires 24 AWG 7/32, PVC, 105°C, 600V, MILW 16878D Type B.
7. Lead wires 25 AWG 7/32, PVC, 105°C, 600V, MILW 16878D Type B.
8. Reed/Triac Combination.



Side Actuation



End Actuation

MAGNETIC ACTUATORS AND ACTUATING DISTANCES (IN)

Stock No	Actuator	Fig. No	Sensor Operate Mode	5801 ON	5801 OFF	5802 ON	5802 OFF	5804 ON	5804 OFF	5806 ON	5806 OFF	5807 ON	5807 OFF	5808 ON	5808 OFF	5809 ON	5809 OFF	5811 ON	5811 OFF	5901 ON	5901 OFF
33F-1211	5701	6	SIDE	.400	1.00	.250	1.00			.400	1.000	.450	1.100	.150	.750	.250	.900	.250	.750	.400	1.00
			END							.200	.750	.200	.750	.100	.500	.150	.750				
33F-1076	5805	7	SIDE					.400	1.00	.350	1.000	.350	1.100	.050	.750	.150	.900				
			END							.200	.750	.200	.750	.050	.500	.100	.750				
	5810	8	SIDE							.350	1.000	.400	1.100	.100	.750	.200	.900	.250	.750		
			END							.150	.750	.150	.750	.050	.500	.100	.750				

SECURITY TYPE PROXIMITY SENSORS

Type	Form	Contact Rating Watts	Mac DC/AC Voltage	Max. Amps	Min. Breakdown Voltage	Price
301	A	10W	200/DC 140/AC	.500	250	2.45
302	A	10W	200/DC 140/AC	.500	250	2.22
303	C	3W	28/DC 120/AC	.250	200	3.14

NOTES:

1. Wire: 15" long, PVC white, contact wires have stripped ends.
2. Operating Distance: 301 and 302 (Form A) .470 Max. 303 (Form C) .240 Max.
3. Case color white: Note: Aluminum color case also available. Specify 400 series 401, 402, 402. All other parameters same as 300 series.
4. Ratings at 25°C.

ITEK ENCODERS ON TARGET: HIGH PERFORMANCE IN A SMALL PACKAGE

Individual data sheets of any Itek Absolute and Incremental encoder or display are immediately available on request. Modifications to your specific encoder requirements can be accommodated.

MicroSeries® Ultra-Small Absolute Encoders For Military Fire Control

MODEL	SIZE (Inches) O.D.	SHAFT DIAM.	RESOLUTION (QUANTA/REV.) BINARY (2^{xx})					BCD
μS_/16	1.6	.25	12	13	14	15	—	6.4K
μS_/23	2.3	.25	13	14	15	16	17	

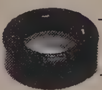
Features: Small Size • High Accuracy • Direct Digital Transducer • Absolute Whole Word Output • MIL Environments—Gun, Ship, Aircraft, Spacecraft (Vibration 20g, Shock 1000g, 0.8ms) • LED Illuminators • High Reliability.

Digisec® Encoders—RA series / RI series

Rotary Absolute Encoders

Rotary Incremental Encoders

	SIZE (Inches)		Resolution (Quanta/Rev.)										Resolution (Quanta/Rev.)																			
Model	O.D.	Shaft Diam.	Binary (2^{xx})								BCD		Binary (2^{xx})							Decimal													
SOLID SHAFT																																	
15	1.5	.187											C 8	C 9	C 10	C 11	C 12	C 13		C 0.5K	C 1.0K	C 1.8K	C 2.0K	C 3.6K	C 4.0K	C 5.0K	C 6.4K	C 8.0K					
23	2.3	.25	C 11	C 12	C 13	T 16	T 17	T 18	T 19	T 20																							
35	3.5	.375	C 12	C 13	C, S 14	C, S 15	C, S 16	C, S 17	S 18		S 3.6K	S 36K	C 13	C 14	C 15	C 16	C 17	C 18	C 19	C 20K	C 32K	C 36K	C 40K	C 50K	C 64K	C 72K	C 100K	C 128K	C 180K	C 200K	C 320K	C 360K	C 640K
THRU-HOLE	O.D.	I.D.																															
55	5.5	.75	S 16	S 17	S 18	S 19	S 20						C 16	C 17	C 18	C 19	S 20																
60	6.0	2.25	S 16	S 17	S 18	S 19	S 20																										
100	10.0	2.75	S 16	S 17	S 18	S 19	S 20	S 21			S 36K	S 360K	C 17	C 18	C 19	C 20	S 21			C 360K													
106	10.0	6.0	S 16	S 17	S 18	S 19	S 20	S 21			S 36K	S 360K	C 17	C 18	C 19	C 20	S 21			C 360K													
117	11.0	7.0	S 19	S 20	S 21																												
158	15.0	8.0	S 20	S 21	S 22								C 20	C 21	S 22																		



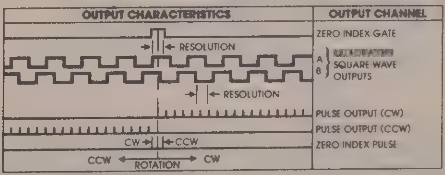
OD—Outside Diameter **ID**—Inside Diameter **C**—Self-contained Electronics **S**—Separate electronic enclosure **T**—2 speed geared paired configurations

Features: • Parallel whole word unambiguous output • T TL/DTL compatible • Resolution to 0.31 arc-seconds (22 bits) • Highest accuracies available anywhere • Operating temperature –40° to +71°C • Military Specification rated • Instant on-the-fly readout • LED light sources • Separate Electronics—no electronics in optical unit (thru-hole systems)

Available Options: • Serial readout • Line driver output • Redundancy • Chrome slit and disc (standard on size 23 and size 158) • Binary lamp display • Subtractor card for electronic zeroing

Features: • Quadrature square wave or pulse output, zero index • T TL/DTL compatible • Resolution to 0.31 arc-seconds (22 bits) • Self-contained electronics • Operating temperature –40° to +71°C • Military Specification rated • LED light sources

Available Options: • Line driver output • Pigtail cable • Square wave or pulse output



Environmental Ratings. All DIGISEC® encoders are designed to meet rigid military specifications. The following environmental specifications are typical.
Temperature, –40° to +71°C Vibration, 10-20g Humidity, 0 to 98%
Shock, 50g, 11 milliseconds (higher on solid shaft models)

Spacecraft Encoders: Absolute & Incremental

Model	Type	Diam. (Inches)	Resolution (Quanta/Rev.)	Accuracy	Weight (lbs.)	Power (watts)	Features
RA21/1510	Absolute	15.0	2^{21}	2.6 sec	20.0	3.0	10 inch Thru-hole Electrical Redundancy
RA18/60	Absolute	6.0	2^{18}	10.0 sec	8.5	3.0	Elect. & Mech. Redundancy
RI13/35	Incremental	3.5	2^{13}	2.6 min	3.0	2.0	Commutator Outputs
RI20/63	Incremental	6.3	2^{20}	1.5 sec	1.7	0.5	Unhoused. Commutator Outputs.
RI36K/40	Incremental	4.0	36,000	2.5 sec	3.0	0.3	Electrical Redundancy
RI14.4K/23	Incremental	2.3	14,000	1.5 min	.75	0.4	Commutator Outputs

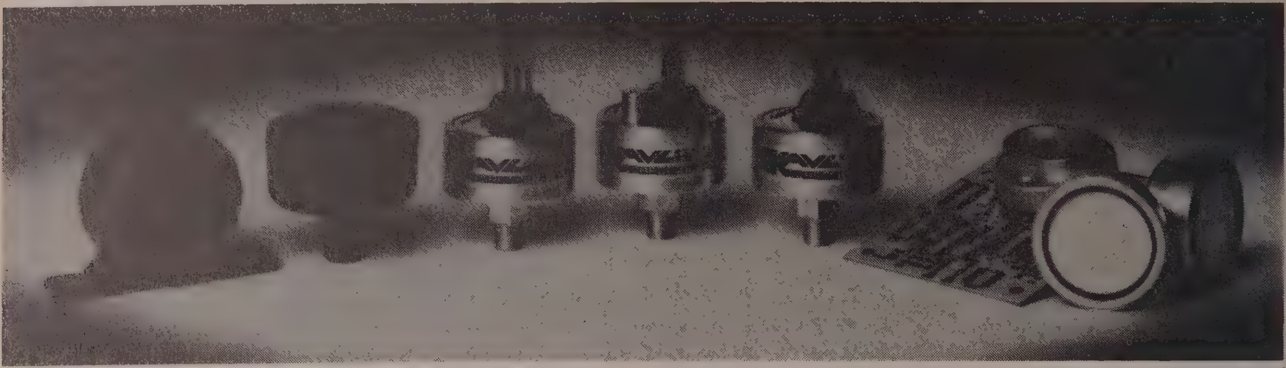
Features: LED Illuminators • Resolution to 0.31 Arc Seconds (22 Bits) • Highest Accuracy Available Anywhere. Available with bearings (housed) or without (unhoused).

Specifications subject to change without notice.

Litton
ITEK MEASUREMENT SYSTEMS
27 Christina Street, Newton, Massachusetts 02161
Telephone: 617-969-7300 TWX: 710-335-6783

Write or call Dept. E

NEW P600 SERIES PRESSURE TRANSDUCERS



Providing excellent performance at minimum cost, the P600 Series is intended for custom, OEM pressure measurement applications. This series features exceptional repeatability, low hysteresis, accurate operation over a broad temperature range, and the ability to perform without zero shift when subjected to high overpressures. These characteristics, combined with long term stability, make the series ideal for microprocessor-based applications.

Key to the uniform performance and low cost features of this series is Kavlico's patented ceramic sensing element with its integral signal conditioning that employs a reliable solid state, custom hybrid circuit. Temperature compensation and calibration is provided through use of computer-controlled laser trimming of hybrid circuit components. As a result, uniformity from unit-to-unit is assured and there is no need for adjustment or recalibration by the user. In addition, the P600 Series maintains repeatable performances even after extraordinary overpressure, which has been demonstrated in over five years of automotive service.

The P600 Series provides a high level output voltage, permitting it to interface easily with a variety of circuits, indicators, or alarms. In addition, its ratiometric output is ideal for digital monitoring. By using the supply voltage as the reference for the conversion circuit, measurement accuracy is maintained regardless of supply voltage variations.

The P600 series provides a choice of rugged die cast aluminum or high dielectric strength Valox housings. Seal materials are available to meet a variety of applications.

In electrically noisy environments, reliability and performance are assured with protection against electromagnetic interference (EMI) and line voltage transients as a standard feature on most models.

DIE CAST ALUMINUM

⅛ NPT, ¼ NPT, and tube fitting available

SPECIFICATIONS AT 25°C (77°F)

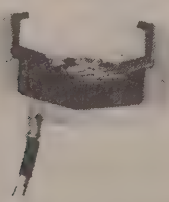
@ Standard V_3 = 9 VDC	P655			P656, P657			P657			
	0-5 thru 0-500 psi			±10"H_2O thru ±15 psid			0-.5, 0-1 psig			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output	5.92	5.96-6.04	6.08	5.9	5.95-6.05	6.1	5.9	5.95-6.05	6.1	VDC
Null Offset	1.92	1.96-2.04	2.08	3.9	3.95-4.05	4.1	1.9	1.95-2.05	2.1	VDC
Span*	3.84	3.96-4.04	4.16	1.8	1.9-2.1	2.2	3.8	3.9-4.1	4.2	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5							%SPAN
Null -10° to +80°C Span -10° to +80°C					±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_3)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA
EMI-Standard all models Change in output due to refield of 200V/M 10KHz to 1GHz		±0.2	±1.0		±0.2	±1.0		±0.2	±1.0	VDC

VALOX

SPECIFICATIONS AT 25°C (77°F)

@ Standard V_3 = 9 VDC	P650 — P652			P651 — P652			P651			
	0-5 thru 0-150 psi			±10"H_2O thru ±15 psid			0-5 thru 0-15 psid			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output	5.9	5.94-6.06	6.1	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	VDC
Null Offset	1.9	1.94-2.06	2.1	3.9	3.92-4.00	4.1	2.35	2.4-2.5	2.7	VDC
Span*	3.8	3.94-4.06	4.2	1.8	1.84-2.16	2.2	3.3	3.32-3.68	3.75	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	%SPAN
Null -10° to +60°C Span -10° to +60°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5				
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_3)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA

OEM MODULE



¼ NPT and tube fitting available

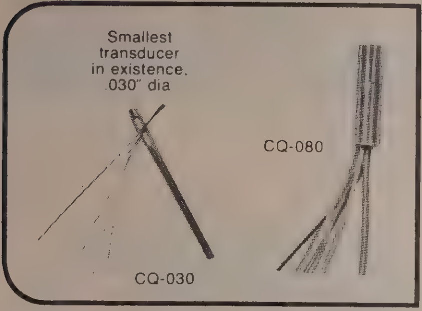
SPECIFICATIONS AT 25°C (77°F)

@ Standard V_3 = 9 VDC	±1, ±5 psid			0-1, 0-5, 0-15 psid			0-1 psig, 0-5, 0-15			
PARAMETER	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Full Scale Output (Pos. Press)	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	5.9	5.92-6.08	6.1	VDC
Null Offset	3.9	3.92-4.08	4.1	2.35	2.4-2.6	2.7	1.9	1.92-2.08	2.1	VDC
Span*	1.8	1.84-2.16	2.2	3.2	3.32-3.68	3.75	3.8	3.84-4.16	4.2	VDC
Linearity (Best fit)		±0.3	±0.5		±0.3	±0.5		±0.3	±0.5	%SPAN
Hysteresis		±0.003	±0.01		±0.003	±0.01		±0.003	±0.01	%SPAN
Repeatability		±0.005	±0.05		±0.005	±0.05		±0.005	±0.05	%SPAN
Temperature Error Null -30° to +100°C Span -30° to +100°C		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5		±1.6 ±1.0	±3.0 ±1.5	%SPAN
Stability (1 year)		±1.0			±1.0			±1.0		%SPAN
Supply Voltage (V_3)**	7.5		15	7.5		15	7.5		15	VDC
Supply Current (Quiescent) 10K Load		8	15		8	15		8	15	MA

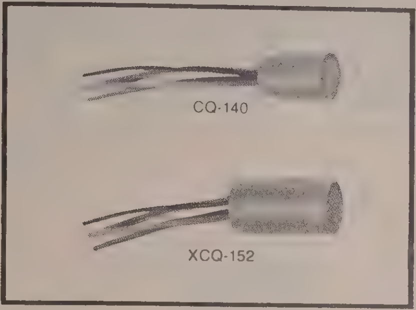
KAVLICO CORPORATION

20869 PLUMMER STREET, CHATSWORTH, CA 91311
TELEPHONE (818) 882-2400 • TELEX 65-1481

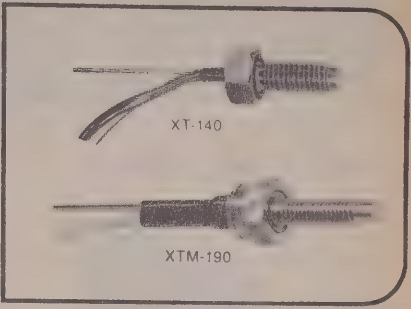
Miniature Pressure Transducers



CQ-030 XCQ-080 Series Smallest available pressure transducers. Diaphragm diameters from .030" to .080" (.76mm to 2mm). High frequency. Bulletin: KU-1000B



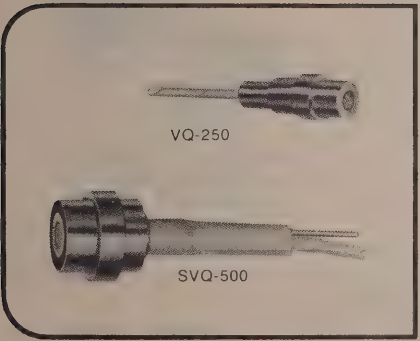
CQ-140 XCQ-152 Series Diaphragm diameter .140" to .155" (3.1mm to 3.5mm). Excellent dynamic and solid-state characteristics. Bulletin: KU-1000B



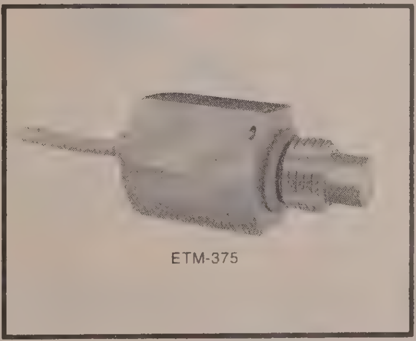
XT XTM Series Thread mount pressure transducers may be supplied with either silicon or metal diaphragms, allow user ease of mounting while retaining high performance of CQ Series. Bulletin: KM-1000C & KS-1000B

MODEL NO.	RANGE PSI (A), (G), (D)	INPUT VDC	OUTPUT FS (NOM) (mV)	NON-LINEARITY AND HYSTERESIS %	EXCITATION	OPERATING TEMPERATURE RANGE (°F)	NATURAL FREQUENCY (APPROX) KHz	UNIT PRICE*
CQ-030 XCQ-062	100-500 G, D 25-500 G, D	5	40 65-75	±1	5VDC/AC	0 to 250	1500 500-1400	$875 $640
XCQ-080	25-500 G, D	5	65-100	±0.25-±0.75	5VDC/AC	−65 to 250	230-940	$495
CQ-140 XCQ-152	5-2000 G, D	10, 20	50-100	±0.5	5VDC/AC	0 to 250	70-650	$430 $425
XT-140	25-500 A, G, D	5	75-100	±0.5	5VDC/AC	0 to 250	125-420	$465
XT-190 XTM-190	5-2000 A, G, D 25-5000 A, G, D	10-20	50-100 75	±0.3 ±0.5	5VDC/AC 10 VDC/AC(XTE)	0 to 250 XTE to 525	70-650 30-400	$395 $425

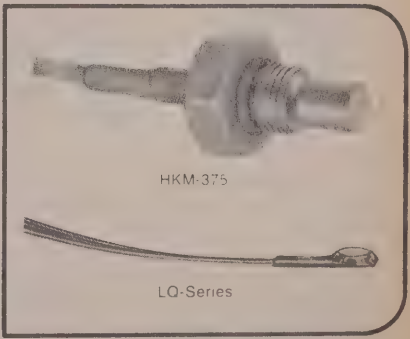
*Quantity discounts available.



VQ SVQ Series Scanivalve compatible pressure transducers for use where steady state accuracy is of prime importance. Bulletin: KPS-VQ-3C



ET ETM Series Smallest available pressure transducer with built-in amplifier and signal conditioning. Flight qualified for use on aircraft and missiles. Available in 3- and 4-wire versions. Bulletin: KM-1000C & KS-1000B



HKM HEM Series High pressure transducers with metal diaphragm compatible with most pressure medias — high temperature operation +500°F (+260°C) Bulletin: KM-1000C

LQ Series Thin-line pressure transducer for use on turbine blade and airfoil applications. Bulletin: LQ-3C

MODEL NO.	RANGE PSI (A), (G), (D)	INPUT VDC	OUTPUT FS (NOM) (mV)	NON-LINEARITY AND HYSTERESIS %	EXCITATION	OPERATING TEMPERATURE RANGE (°F)	NATURAL FREQUENCY (APPROX) KHz	UNIT PRICE*
VQ-250 SVQ-500	5-2000 A, G, D	10, 20	50-100	±0.3	10VDC to 20VDC	0 to 250 VEM to 525	70-200	$450 $410
HKM-375 HEM-375	25-30,000 A, G	10	75	±1	10VDC/AC	0 to 250 -65 to 500	50-395	$425 $595
ET-375 ETM-375	5-200 A, G 25-20,000 A, G	28 ± 4	5,000	±1	28VDC ± 4VDC	−65 to 250	70-200 50-395	$750 $750
LQ-080	25-200 G	5	65-100	±0.5	5VDC/AC	0 to 250	230-590	$440
LQ-125 LE-125	5-500 G 25-500 G	10, 20 10, 15	55-100	±0.5 ±1	5VDC/AC	0 to 250 −65 to 525	70-350 100-350	$395 $700

*Quantity discounts available

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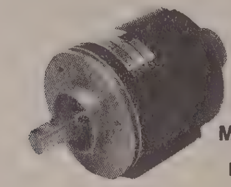
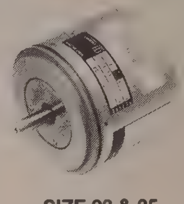
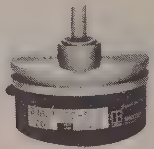
INCREMENTAL

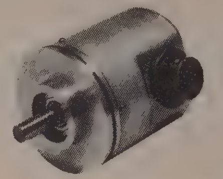

MODEL 70
Optical
Industrial
2.5″ dia.

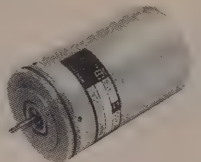

SIZE 23 & 35
Optical
Commercial &
Military

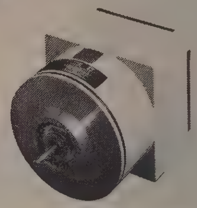
MODEL 81
Low Cost
1.5″ dia.


MODEL 82
Low Cost
2.2″ dia.

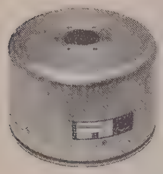
ABSOLUTE

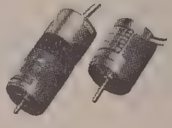

MODEL 76
Low Cost Optical
2.5″ dia.


SIZE 23 & 35
Optical
Commercial &
Military


Multi-Turn
Heavy Duty
4.3″ dia.

ABSOLUTE / INCREMENTAL


SIZE 60
6″ dia.


SIZE 11
Pin Contact

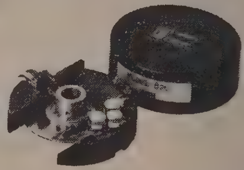
MODULAR

Absolute
Optical
2″ dia.

MODEL 715
Incremental
Optical
1.5″ dia.

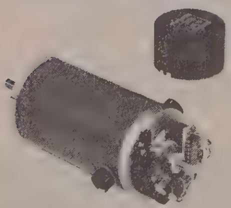
MODEL 720
Incremental
Optical
2″ dia.

New!


MODEL 820
Incremental
Digital
2.1″ dia.

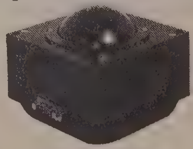
MODEL 920
Incremental
Analog
2.1″ dia.

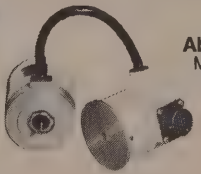
MOTOR/ ENCODER PACKAGE



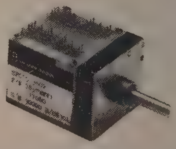
SPECIALS / CUSTOM DESIGN

Aerospace


TRACKBALL
Commercial &
Military
4″ sq.


Absolute
Military

New Low Cost
TRACKBALL
Commercial
3″ sq.
RS232 Interface
Option


PIN CONTACT
DETENTED
SWITCH

The Litton Encoder team leads the way with encoders and special products that help you build more reliable, higher quality, cost-effective products with the precision you need.

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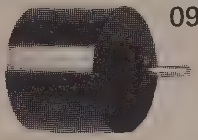
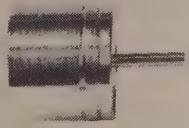
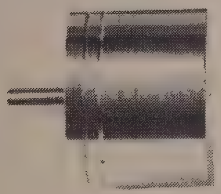
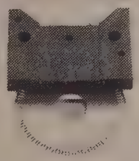
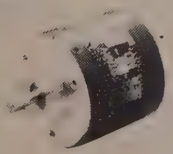
Litton
ENCODER DIVISION

The Marketing Department
Litton Encoder Division
20745 Nordhoff Street
Chatsworth, California 91311-5979
Telephone (818) 341-6161 TWX 910-494-1229

OPTICAL SHAFT ENCODERS

	Diameter (mm)	Resolutions (Cycles/Rev.)	Output Channels	FEATURES
01A	22	15	Dual	**01A** High Precision. LED Operating Current: 5-20mA. Phototransistor Maximum Power Dissipation: 50 mW. Maximum Frequency approx.: 10 KHz (40,000 RPM). Signal Phase Shift: 120°. Output Wave Shape: Incremental Quasi-Sinusoidal. Available fitted to our Faulhaber Motors.
09A or 10A 	22	100 180	Single Dual	**09A or 10A** Quasi-Sinusoidal Output Signals can be interfaced through a standardized 6-pin connector. Signal Phase Shift: 90°. LED Operating Current: 50 mA. Phototransistor Maximum Power Dissipation: 100 mW. Available fitted to our Faulhaber Motors.
012H 	12	50 90 125	Dual	**012H** Our smallest, custom and thru-shaft versions available. Factory equipped leads and double-shielded dual ball bearing construction standard. Compact P.C. Board mountable, weighs 0.26 oz. Optional Squaring Circuit available. Speeds up to 8,000 RPM. Signal Phase Shift: 90°. Standard Output Wave Shape: Incremental Quasi-Sinusoidal. LED Operating Current: 40 mA. Max. Phototransistor Maximum Power Dissipation: 75 mW.
018H 	18	100 200 300 360	Dual with Indexing	**018H** Rugged construction. Custom and thru-shaft versions available. Same as our 012H. Optional Built-in Squaring Circuit TTL compatible. Speeds up to 8,000 RPM. Signal Phase Shift: 90°. Output Wave Shape: Incremental Quasi-Sinusoidal. LED Operating Current: 40 mA. Max. Phototransistor Maximum Power Dissipation: 75 mW.
E-3030	30	100 200	Dual with Indexing	**E-3030** Encoder with Standard Square-Wave Output. Amplifier built-in, with Standard 7½" flexible cable. Power Supply Voltage: 5VDC ± 5% at 80 mA. Max. Supply Current. Signal Phase Shift: 90°. Maximum Operating Frequency: 20 kHz.
KRE-01 	NA	100	Dual with Indexing	**KRE-01** Easy installation. Modular Unit consists of Encoded Disk and separate Sensor Module. Output Wave Shape: Quasi-Sinusoidal. Signal Phase Shift: 90°. Operating Frequency: 20 kHz. Power Dissipation: 60 mA. Max.
SZS-1 **SZS-3** **SZS-4** 	20 50 70	100 to 4000	Dual with Indexing	**SZS-1-3-4** General purpose high resolution. Signal Phase Shift: 90°. Operating Current to 100 mA. Max. Speeds up to 5,000 RPM. TTL, Square Wave Output. Channel Output Options: a/Clockwise, B/CCW or A, B, C/Direction.

☐ New Item - Rotary Hall Effect Encoders Available.

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742-2nd Avenue South / St. Petersburg, Florida 33701 / Phone: 813/822-2529 / Telex: 807-982

MICRO SWITCH

PRESSURE SENSORS

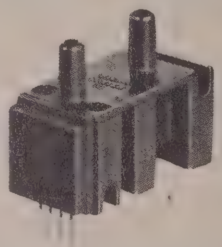
MICRO SWITCH solid state pressure sensors are ideally suited to applications that require exact measurement of pressure. They provide the important benefits of repeatability, low hysteresis, and long term stability.

The sensing element in each sensor is a square silicon chip with integral sensing diaphragm and ion implanted piezoresistors. Pressure applied on the diaphragm causes it to flex, changing the resistance, which results in an output proportional to pressure.

NON-SIGNAL CONDITIONED SENSORS

There are four series of non-signal conditioned sensors. They provide a low level output (typically 40 to 250 mV). Each series includes the basic sensor version, and a version with laser trimmed resistors (for close tolerances on null and sensitivity) and a thermistor for limited temperature compensation.

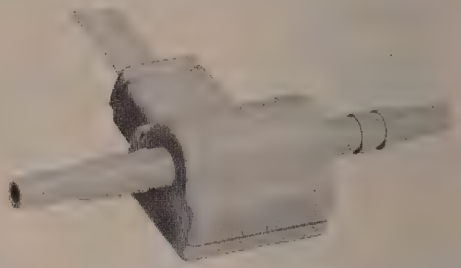
120PC



120PC series are small plastic packages equipped with printed circuit board terminals. 124PC is the basic sensor, and 126PC is trimmed and has limited temperature compensation.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
124PC	0-5	D	115 mV ±35	10 VDC or 2 mA
	0-15	D	250 mV ±75	
	0-30	D	195 mV ±85	
126PC	0-5	D	50 mV ±1.5	16 VDC max.
	0-15	D	100 mV ±1.5	
	0-30	D	79 mV ±4	

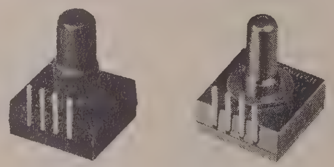
150PC



150PC series are specifically designed to measure flow-thru pressure media. The remote pressure reference is inside the termination cable. 154PC is the basic sensor, while 156PC is trimmed and temperature compensated.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
154PC	0-5	G	115 mV ±35	10 VDC or 2 mA
	0-15	G	99 mV ±41	
	0-30	G	195 mV ±85	
156PC	0-5	G	250 mV ±75	14 VDC max.
	0-15	G	40 mV ±1.5	
	0-30	G	79 mV ±4	

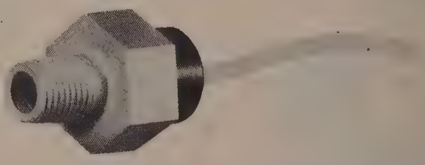
130PC



130PC series are miniature plastic packages, also equipped with printed circuit board terminals. 134PC is the basic sensor version. 136PC and 137PC are trimmed and temperature compensated. 136PC is voltage excited, while 137PC is current excited.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
134PC	0-5	A, G	115 mV ±35	10 VDC or 2 mA
	0-15	A, G	250 mV ±75	
	0-30	A, G	195 mV ±85	
136PC	0-5	A, G	50 mV ±1.5	16 VDC max.
	0-15	A, G	100 mV ±1.5	
	0-30	A, G	79 mV ±4	
137PC	0-5	A, G	50 mV ±1.5	2 mA max.
	0-15	A, G	100 mV ±1.5	
	0-30	A, G	79 mV ±4	

230PC



230PC series are stainless steel housed Gage type sensors, compatible with a wide range of pressure media. The atmospheric pressure reference is inside the termination cable to reduce the chance of contaminants entering the enclosure.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
234PC	0-15	G	250 mV ±75	10 VDC or 2 mA
	0-30	G	195 mV ±85	
	0-60	G	135 mV ±45	
	0-100	G	225 mV ±75	
236PC	0-15	G	100 mV ±1.5	16 VDC max.
	0-30	G	79 mV ±4	
	0-60	G	60 mV ±2	
	0-100	G	100 mV ±2	

* Type: A — Absolute; D — Differential; G — Gage.

** F.S.O. is the algebraic difference between end points (output at minimum and maximum pressure).

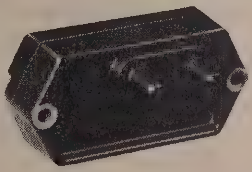
MICRO SWITCH

PRESSURE SENSORS

SIGNAL CONDITIONED SENSORS

The three signal conditioned series provide amplified high-level outputs (5V or ±2.5V). They are hybrid IC devices, with integral temperature compensation circuitry optimized on each unit as part of the calibration procedure. Null and full scale output are similarly controlled.

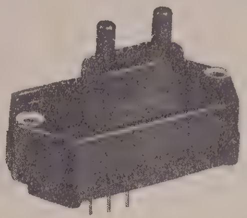
140PC



140PC series are plastic packages, equipped with printed circuit board terminals (color-coded leadwires are optional). They may be used to measure positive pressures, or for positive/negative pressure measurement. This series includes a two-wire pressure-to-current transducer, which senses industry standard 3-15 psi and provides a 4-20 mA output proportional to pressure.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
142PC	0-5	D, G	5 VDC ±.15 1 VDC Null	7-16 VDC
	0-15	A, D, G		
	0-30	A, D, G		
143PC	±2.5	D	±2.5 VDC 3.5 VDC Null	7-16 VDC
	±5	D, G		
	±15	D, G		
149PC	3-15	D	4-20 mA	10-40 VDC

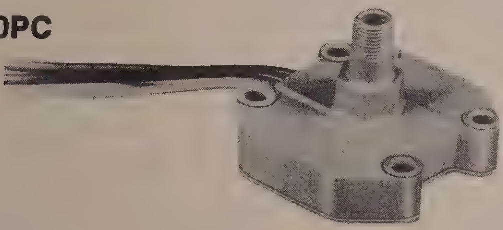
160PC



160PC series pressure sensors measure extremely low pressures, and feature high reliability. The package is similar to the 140PC series.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
162PC	0-1	D, G	5 VDC ±.20 1 VDC Null	4.8-12 VDC
163PC	±5″ H_2O	D, G		
164PC	0-10″ H_2O	D, G		

240PC



240PC series sense positive pressures up to 250 psi, in addition to positive/negative pressures up to ±15 psi. They are protected by die-cast aluminum housings with O-ring sealing for contamination resistance.

Series	Pressure Range (psi)	Type*	Full Scale Output (F.S.O.)**	Electrical Excitation
242PC	0-15	G	5 VDC ±.20 1 VDC Null	7-16 VDC
	0-30	G		
	0-60	G		
	0-100	G		
	0-150	G		
	0-250	G		
243PC	±2.5	G	±2.5 VDC 3.5 VDC Null	7-16 VDC
	±5	G		
	±15	G		

Request MICRO SWITCH PC literature for specifications and Order Guides.

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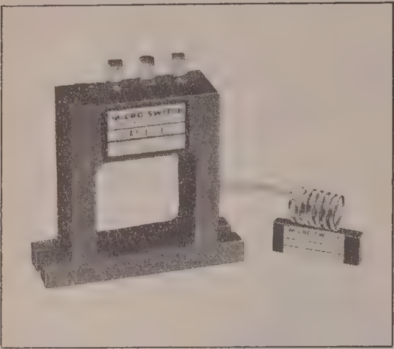
* Type: A — Absolute; D — Differential; G — Gage.

** F.S.O. is the algebraic difference between end points (output at minimum and maximum pressures).

MICRO SWITCH, a Honeywell division

MICRO SWITCH

Current Sensors CS



MICRO SWITCH CS Series solid state current sensors are available with digital or linear output for either alternating or direct current.

Current sensors monitor current flow and in turn produce either a digital or linear output signal. When these signals have reached a predetermined current level, the control system logic is instructed to perform a function. The digital signal, with its simple ON/OFF output, may sound an alarm, start a motor, open a valve, or shut down a pump. The linear signal identifies the degree of current change and in a feedback application increases or decreases the current accordingly. Applications may include motor speed control for regulating the air volume in a heating and air conditioning system, or current regulation in welding equipment.

FEATURES

- *Digital or linear output*
- *AC or DC current sensing*
- *Through-hole design*
- *Fast response time*
- *Output voltage isolation from input*
- *Minimum energy dissipation*
- *Maximum current limited only by conductor size*
- *Built-in voltage regulation and temperature compensation assure reliable operation over a wide supply voltage range of 4.5-16 VDC*

SPECIFICATIONS

LINEAR OUTPUT SENSORS

Characteristics:	80 Amp	100 Amp	300 Amp
Sensing Current	80 amp-turns max.	100 amp-turns max.	300 amp-turns max.
Response Time	8 μsec. typ.	10 μsec. typ.	8 μsec. typ.
Supply Voltage (V_s)	8 to 16 VDC	4.5 to 16 VDC	8 to 16 VDC
Supply Current	22 mA typ. @ $V_s = 12$	$10 + \frac{\text{Sensed I}}{3.333}$ mA typ.	22 mA typ. @ $V_s = 12$
Load On Output	10 mA max. source	3 mA max. source	10 mA max. source
Load On Output	1.0 mA max. sink		1.0 mA max. sink
Operating Temp.	−40° to +85°C (−40° to +185°F)	−20° to +85°C (−4° to +185°F)	−40° to +85°C (−40° to +185°F)
Null Volts	.5 x V_s	.10	.5 x V_s
Sensitivity	Adjustable	Fixed	Adjustable
Output Voltage Max.	$V_s - 2$	2.6 VDC	$V_s - 2$
Output Voltage Min.	1 VDC	0.1 VDC	1 VDC

DIGITAL OUTPUT SENSORS

Characteristics:	½ Amp	5 Amp
Operate Current	.5 amp-turns typ.	5 amp-turns max.
Release Current (current may be in either direction)	.1 amp-turn min.	.5 amp-turn min.
Response Time	100 μsec. max.	100 μsec. max.
Supply Current	12 mA max.	17 mA max.
Supply Voltage	6 to 16 VDC	8 to 16 VDC
Output Load	20 mA max.	100 mA max.
Operating Temp.	−20° to +85°C (−4° to +185°F)	−20° to +85°C (−4° to +185°F)

ORDER GUIDE

Description	Catalog Listing
½ amp digital current sensor, AC/DC	CSDA5N1
5 amp digital current sensor, AC/DC	CSDA5P0
80 amp linear output current sensor, AC/DC	CSLA8P1
100 amp linear output current sensor, DC	CSLA1P2
300 amp linear output current sensor, AC/DC	CSLA3P2

TECHNOLOGY

The ½ and 5 amp digital, and 100 amp linear current sensors described use a magnetically sensitive thin film alloy of nickel-iron on a silicon integrated circuit (permalloy). The 80 and 300 amp linear current sensors described incorporate a MICRO SWITCH LOHET™ (Linear Output Hall Effect Transducer) integrated circuit.

OTHER OPTIONS

MICRO SWITCH will design a current sensor to fit your application. Circuit options include additional compensation, adjustment, and amplification for better performance over different temperatures, output scales, or improved response time. Package customization includes various printed wiring boards or plastic housings. Termination can include screw or quick-connect terminals. Early discussion with a MICRO SWITCH field engineer in the design of your system will result in the best product for your current sensing needs.

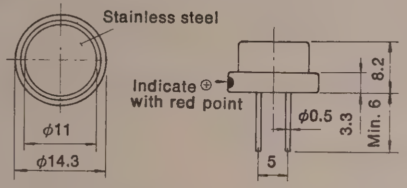
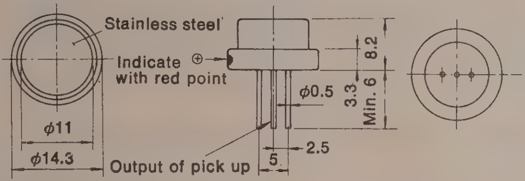
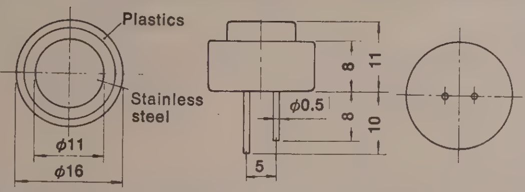
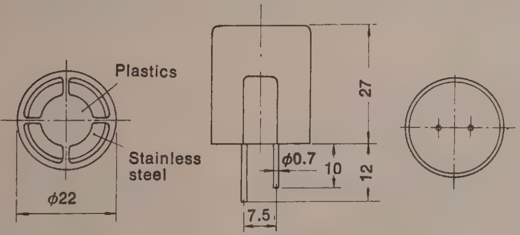
MICRO SWITCH, a Honeywell division

NTK

TECHNICAL CERAMICS
NGK SPARK PLUGS (U.S.A.), INC.
1701 North Greenville Ave., #205 Richardson, TX 75081,
Phone: (214) 235-8332. TELEX: 170547UT

NTK ULTRASONIC SENSOR

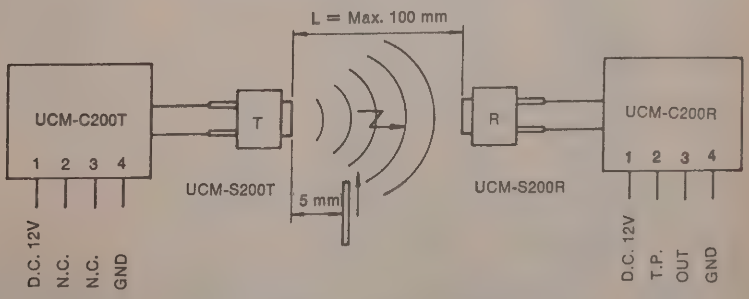
EVERY TYPE IS HERMETIC SEALED AND MOISTURE-PROOFED.

Dimension Unit: mm	Model Number	Center Frequency KHz	Transmit Sound Pressure (dB)	Receiving Sensitivity (dB/V/μbar)	Directional Angle (Deg.)	Input Voltage (Vp-p)	Temperature Range (°C)
EDS-A, EDS-B TYPE  Stainless steel Indicate ⊕ with red point φ11 φ14.3 φ0.5 3.3 Min. 6 8.2 5	A335	33.5 ±0.2	95 Min.	—	40	30	−20 ~ +70
	B335	33.5 ±0.2	—	−72 Min.	40	—	
	C335	33.5 ±0.2	95 Min.	—	40	12	
EDS-C TYPE  Stainless steel Indicate ⊕ with red point φ11 φ14.3 Output of pick up φ0.5 3.3 Min. 6 8.2 5 2.5	A250	25.0 ±0.2	95 Min.	—	45	30	
	B250	25.0 ±0.2	—	−72 Min.	45	—	
	C250	25.0 ±0.2	95 Min.	—	45	12	
UCM-S200  Plastics Stainless steel φ11 φ16 φ0.5 8 11 8 10 5	S200T	220 ±5	—	—	8	40	−10 ~ +60
	S200R	210 ±5	—	—	8	—	
	S300	300 ±10	—	—	10	40	
USP-A 400T  Plastics Stainless steel φ22 φ0.7 27 10 12 7.5	A400T	40 ±0.2	105 Min.	—	15	50	−10 ~ +60
	A400R	40 ±0.2	—	−65 Min.	15	—	
	B400T	40 ±0.2	100 Min.	—	25	40	
	B400R	40 ±0.2	—	−65 Min.	25	—	

APPLICATIONS

- Proximity Sensor
- Burglar Alarm
- Remote Control
- Level Meter

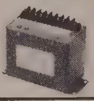
EXAMPLE OF APPLICATION


L = Max. 100 mm
UCM-C200T
1 2 3 4
D.C. 12V
N.C.
N.C.
GND
T
UCM-S200T
5 mm
R
UCM-S200R
UCM-C200R
1 2 3 4
D.C. 12V
T.P.
OUT
GND

OSI AC WATT TRANSDUCER PC5 SERIES

SINGLE PHASE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR



MODEL NUMBER PC5-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR
	VOLTS	AMPS		
1B	0 to 150	0 to 5	500W	Internal
2B	0 to 300	0 to 5	1KW	Internal
3B	0 to 600	0 to 5	2KW	Internal
10B	0 to 150	0 to 10	1KW	Internal
11B	0 to 300	0 to 10	2KW	Internal
12B	0 to 600	0 to 10	4KW	Internal
19B	0 to 150	0 to 15	1.5KW	Internal
20B	0 to 300	0 to 15	3KW	Internal
21B	0 to 600	0 to 15	6KW	Internal
103B	0 to 150	0 to 1	100W	Internal
104B	0 to 300	0 to 1	200W	Internal
105B	0 to 600	0 to 1	500W	Internal
106B	0 to 150	0 to 2.5	250W	Internal
107B	0 to 300	0 to 2.5	500W	Internal
108B	0 to 600	0 to 2.5	1000W	Internal

SUPPLIED WITH CURRENT TRANSDUCERS

28B	0 to 150	0 to 50	5KW	C†
29B	0 to 300	0 to 50	10KW	C†
30B	0 to 600	0 to 50	20KW	C†
31B	0 to 150	0 to 100	10KW	C
32B	0 to 300	0 to 100	20KW	C
33B	0 to 600	0 to 100	40KW	C
34B	0 to 150	0 to 200	20KW	D
35B	0 to 300	0 to 200	40KW	D
36B	0 to 600	0 to 200	80KW	D
37B	0 to 150	0 to 400	40KW	D
38B	0 to 300	0 to 400	80KW	D
39B	0 to 600	0 to 400	160KW	D
40B	0 to 150	0 to 600	60KW	E
41B	0 to 300	0 to 600	120KW	E
42B	0 to 600	0 to 600	240KW	E
43B	0 to 150	0 to 1K	100KW	E
44B	0 to 300	0 to 1K	200KW	E
45B	0 to 600	0 to 1K	400KW	E
46B	0 to 150	0 to 2K	200KW	E
47B	0 to 300	0 to 2K	400KW	E
48B	0 to 600	0 to 2K	800KW	E

SUPPLIED WITH CURRENT TRANSFORMERS

49B	0 to 150	0 to 50	5KW	W†
50B	0 to 300	0 to 50	10KW	W†
51B	0 to 600	0 to 50	20KW	W†
58B	0 to 150	0 to 100	10KW	W
59B	0 to 300	0 to 100	20KW	W
60B	0 to 600	0 to 100	40KW	W
67B	0 to 150	0 to 200	20KW	W
68B	0 to 300	0 to 200	40KW	W
69B	0 to 600	0 to 200	80KW	W
76B	0 to 150	0 to 400	40KW	X
77B	0 to 300	0 to 400	80KW	X
78B	0 to 600	0 to 400	160KW	X
85B	0 to 150	0 to 600	60KW	X
86B	0 to 300	0 to 600	120KW	X
87B	0 to 600	0 to 600	240KW	X
94B	0 to 150	0 to 1K	100KW	Y
95B	0 to 300	0 to 1K	200KW	Y
96B	0 to 600	0 to 1K	400KW	Y

NOTE: † indicates 2 turns thru the external transducer or transformer window.

FOR DIMENSIONS REQUEST CATALOG #983

FEATURES AND APPLICATIONS:

- Accurate measurement of electric power consumed by equipment
- Accurate for any conditions of phase, voltage unbalance, current unbalance and power factor
- Output is proportional to true power delivered to the load
- Transducers using internal sensors or sensors C, D, or E provide excellent current transient response for measuring SCR controls, chopped waveforms or application where harmonics are present
- Highly-accurate, without worrying about the inaccuracies of current transformers and potential transformers
- Split sensors available
- Current sensors are included and are calibrated with the watt transducer (where required)
- For interface with meters, recorders, data loggers, computer or other instrumentation, select options "A" through "E"
- Wide frequency range: 48 to 70 Hz
- Standard 1 mA output, other options available

PC5 SERIES SPECIFICATIONS:

INPUT:

Voltage: See Tables. .

Current: See Tables

Frequency Range: 48 to 70 Hz

Power Factor Range: Any

Response (Transient 90%): <100 microseconds with models using internal sensors or sensors C, D, or E 1 millisecond with models using current sensors W, X, and Y

Burden:
Voltage: 1.25 VA
Current: 1.25 VA
Option Amplifier: 2 Watts

Current Overload:
1 thru 15 Ampere models and those using current sensors W, X, and Y
2 times rating (continuous)
6 times rating (10 sec)
Models using external current sensors C, D and E
50 times rating (continuous)

Dielectric Test: (Input/Output/Case): 1500 VAC (RMS)

Surge: Withstands IEEE SWC Test

Specifications continued on next page

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PHONE (614) 486-9561 • TWX 810-482-1630

SPECIFICATIONS (cont.):

OUTPUT:

Output is proportional to real power delivered to the load. P = EI cos ϕ

Standard B: 1 mA DC at Rated Output (Requires 115 VAC instrument power)

Option A: 1 mA DC at Rated Output (See Note 1)

Option C: 10 VDC at Rated Output (See Note 1)

Option D: 10 VDC at Rated Output (Requires 115 VAC instrument power)

Option E: 4-20 mA DC. 20 mA DC at Rated Output, 4 mA DC at Zero

Millivolt Options Available Consult Factory

Output Ripple: <1% of R.O.

Response Time: 250 milliseconds to 90%

Output Loading:
  Standard Model B: 0-10K ohms
  Options A: 0-10K ohms
  Options C & D: >2K ohms
  Option E: 0-1500 ohms

Calibration Adjustment Range: ±10% Min.

Temperature Effect (−10°C to +60°C): ±1% of Reading, ±0.1% R.O.

ACCURACY:

±0.5% at Rated Output (including power factor, linearity, repeatability, initial set point, and current sensor).

NOTE (1) Self powered input voltage ranges for models with options A and C are limited as follows: 85 to 135V for 0 to 150V models 200 to 280V for 0 to 300V models, and 380 to 550V for 0 to 600V models.

3 PHASE 3 WIRE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR

MODEL NUMBER PC5-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR*
	VOLTS	AMPS		
4B‡	0 to 150	0 to 5	1KW	Internal
5B	0 to 300	0 to 5	2KW	Internal
6B	0 to 600	0 to 5	4KW	Internal
13B‡	0 to 150	0 to 10	2KW	Internal
14B	0 to 300	0 to 10	4KW	Internal
15B	0 to 600	0 to 10	8KW	Internal
22B‡	0 to 150	0 to 15	3KW	Internal
23B	0 to 300	0 to 15	6KW	Internal
24B	0 to 600	0 to 15	12KW	Internal

SUPPLIED WITH CURRENT TRANSDUCERS

MODEL NUMBER PC5-	VOLTS	AMPS	WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR*
31-2B‡	0 to 150	0 to 100	20KW	C
32-2B	0 to 300	0 to 100	40KW	C
33-2B	0 to 600	0 to 100	80KW	C
34-2B‡	0 to 150	0 to 200	20KW	D
35-2B	0 to 300	0 to 200	40KW	D
36-2B	0 to 600	0 to 200	80KW	D
37-2B‡	0 to 150	0 to 400	40KW	D
38-2B	0 to 300	0 to 400	80KW	D
39-2B	0 to 600	0 to 400	160KW	D

SUPPLIED WITH CURRENT TRANSFORMERS

MODEL NUMBER PC5-	VOLTS	AMPS	WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR*
52B‡	0 to 150	0 to 50	10KW	W†
53B	0 to 300	0 to 50	20KW	W†
54B	0 to 600	0 to 50	40KW	W†
61B‡	0 to 150	0 to 100	20KW	W
62B	0 to 300	0 to 100	40KW	W
63B	0 to 600	0 to 100	80KW	W
70B‡	0 to 150	0 to 200	40KW	W
71B	0 to 300	0 to 200	80KW	W
72B	0 to 600	0 to 200	160KW	W
79B‡	0 to 150	0 to 400	80KW	X
80B	0 to 300	0 to 400	160KW	X
81B	0 to 600	0 to 400	320KW	X
88B‡	0 to 150	0 to 600	120KW	X
89B	0 to 300	0 to 600	240KW	X
90B	0 to 600	0 to 600	480KW	X
97B‡	0 to 150	0 to 1K	200KW	Y
98B	0 to 300	0 to 1K	400KW	Y
99B	0 to 600	0 to 1K	800KW	Y

* 50 Amps and above, 2 External Sensors supplied.
‡ May be used in 120V, 1ϕ, 3 Wire Edison Systems.
† Indicates 2 turns thru the external transducer or transformer window.

3 PHASE 4 WIRE 50/60 Hz MODELS

SUPPLIED WITH INTERNAL SENSOR

MODEL NUMBER PC5-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR**
	VOLTS (Line to Neutral)	AMPS		
7B	0 to 150	0 to 5	1.5KW	Internal
8B	0 to 300	0 to 5	3KW	Internal
16B	0 to 150	0 to 10	3KW	Internal
17B	0 to 300	0 to 10	6KW	Internal
25B	0 to 150	0 to 15	4.5KW	Internal
26B	0 to 300	0 to 15	9KW	Internal

** 50 Amps and above, 3 External Sensors supplied.
† Indicates 2 turns through external transformer window.

SUPPLIED WITH CURRENT TRANSFORMERS

MODEL NUMBER PC5-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT 1mA	CURRENT SENSOR**
	VOLTS (Line to Neutral)	AMPS		
55B	0 to 150	0 to 50	15KW	W†
56B	0 to 300	0 to 50	30KW	W†
64B	0 to 150	0 to 100	30KW	W
65B	0 to 300	0 to 100	60KW	W
73B	0 to 150	0 to 200	60KW	W
74B	0 to 300	0 to 200	120KW	W
82B	0 to 150	0 to 400	120KW	X
83B	0 to 300	0 to 400	240KW	X
91B	0 to 150	0 to 600	180KW	X
92B	0 to 300	0 to 600	360KW	X
100B	0 to 150	0 to 1K	300KW	Y
101B	0 to 300	0 to 1K	600KW	Y

FOR DIMENSIONS REQUEST CATALOG #983

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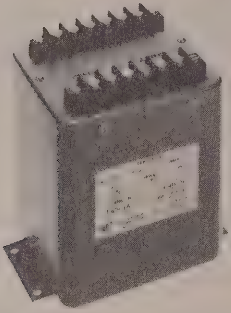
ELECTRONIC PRECISION AC VAR TRANSDUCER EV5 SERIES

ACCURACY ±0.2% OF READING



SINGLE PHASE 60 Hz MODELS

MODEL NO. EV5-	EFFECTIVE RANGE		VARs AT RATED OUTPUT (1 mA)	CONNECTION	ELEMENTS
	VOLTS	AMPS			
1B	0 to 150	0 to 6.25	500	1φ2W	1
2B	0 to 300	0 to 6.25	1K	1φ2W	1
3B	0 to 600	0 to 6.25	2K	1φ2W	1
10B	0 to 150	0 to 10	1K	1φ2W	1
11B	0 to 300	0 to 10	2K	1φ2W	1
12B	0 to 600	0 to 10	4K	1φ2W	1
19B	0 to 150	0 to 20	2K	1φ2W	1
20B	0 to 300	0 to 20	4K	1φ2W	1
21B	0 to 600	0 to 20	8K	1φ2W	1

3 PHASE 3 WIRE 60 Hz MODELS

4B	0 to 150	0 to 6.25	1K	3φ3W	2
5B	0 to 300	0 to 6.25	2K	3φ3W	2
6B	0 to 600	0 to 6.25	4K	3φ3W	2
13B	0 to 150	0 to 10	2K	3φ3W	2
14B	0 to 300	0 to 10	4K	3φ3W	2
15B	0 to 600	0 to 10	8K	3φ3W	2
22B	0 to 150	0 to 20	4K	3φ3W	2
23B	0 to 300	0 to 20	8K	3φ3W	2
24B	0 to 600	0 to 20	16K	3φ3W	2

3 PHASE 4 WIRE 60 Hz MODELS

7B	0 to 150	0 to 6.25	1.5K	3φ4W	3
8B	0 to 300	0 to 6.25	3K	3φ4W	3
16B	0 to 150	0 to 10	3K	3φ4W	3
17B	0 to 300	0 to 10	6K	3φ4W	3
25B	0 to 150	0 to 20	6K	3φ4W	3
26B	0 to 300	0 to 20	12K	3φ4W	3
7½B	0 to 150	0 to 6.25	1.5K	3φ4W	2½

NOTE: On 3 phase 4 wire models, phase to neutral voltage is specified.
Optional for 50 Hz operation add "X-127" to model number.

FEATURES AND APPLICATIONS:

- Provides ±0.2% of reading accuracy and 0 to 1 mA current output proportional to reactive power
- Models available in 1, 2, 2½, and 3 element configurations to meet monitoring and control needs
- Measures forward or reverse reactive power flow
- Each unit is calibrated at the factory to provide 1 mA at the Rated Output (RO) against standards which are traceable to NBS
- Accuracy specifications include influences of variation in voltage, current, power factor and load changes
- Temperature effects are less than ±0.005% per degree C over the range of −20°C to +65°C

EV5 AND EW5 SERIES SPECIFICATIONS:

INPUT:

VOLTAGE

Effective Range: See Tables
Burden: Less than 0.1 VA at 120V, 240V, or 480V
Overload: Max continuous 175V, 350V, or 600V

CURRENT

Effective Range: See Tables
Burden (max.): 0.28 VA per element
Overload: (continuous) 2X rating for 6.25A or 10A, 1X rating for 20A
(Transient) 50A for 10 sec. per hour, 250A for 1 sec. per hour

OUTPUT:

Rated Output (RO): ±1 mA DC
Output Loading: 0 to 10K ohms
Compliance: 12.0 volts DC minimum
Open circuit output voltage limited to ±15 VDC
Response Time (99%): Less than 400 milliseconds

ACCURACY:

(±0.2% of reading, ±0.05% of RO)
Includes the effects of voltage, current, load and power factor within the effective ranges

Specifications continued on next page

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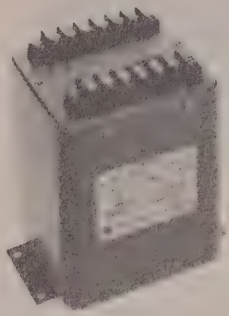
OSI ELECTRONIC PRECISION AC WATT TRANSDUCER EW5 SERIES

ACCURACY ±0.2% OF READING



FEATURES AND APPLICATIONS:

- Provides ±0.2% of reading accuracy and 0 to 1 mA current output proportional to electrical power delivered to a load
- Models available in 1, 2, 2½, and 3 element configurations to meet monitoring and control needs
- Measures forward or reverse power flow
- Each unit is calibrated at the factory to provide 1 mA at the Rated Output (RO) against standards which are traceable to NBS
- Accuracy specifications include influences of variation in voltage, current, power factor and frequency, and load changes
- Temperature effects are less than ±0.005% per degree C over the range of −20°C to +65°C

SPECIFICATONS (cont.):

Frequency, VAR Only: 60 Hz, 50 Hz Models (optional)

Frequency, Watt Only: 58 to 62 Hz, 48 to 52 Hz on 50 Hz Models (optional)

Power Factor: Any

Temperature Range: −20°C to +65°C

Temperature Effect: ±0.005% per degree C

Operating Humidity: 0 to 95% non-condensing

Dielectric Test: Input/Output/Instrument Power/Case — 1500 VAC (RMS)

Surge: Withstands IEEE SWC Test

Calibration Adjustment: ±2% minimum

Instrument Power: 90 to 135 VAC, 50 to 70 Hz Burden less than 2 VA at 115 VAC

Weight: 3.1 lbs. Maximum

FOR DIMENSIONS REQUEST CATALOG #983

SINGLE PHASE 60 Hz MODELS

MODEL NO. EW5	EFFECTIVE RANGE		WATTS AT OUTPUT RATED (1 mA)	CONNECTION	ELEMENTS
	VOLTS	AMPS			
1B	0 to 150	0 to 6.25	500	1φ2W	1
2B	0 to 300	0 to 6.25	1K	1φ2W	1
3B	0 to 600	0 to 6.25	2K	1φ2W	1
10B	0 to 150	0 to 10	1K	1φ2W	1
11B	0 to 300	0 to 10	2K	1φ2W	1
12B	0 to 600	0 to 10	4K	1φ2W	1
19B	0 to 150	0 to 20	2K	1φ2W	1
20B	0 to 300	0 to 20	4K	1φ2W	1
21B	0 to 600	0 to 20	8K	1φ2W	1

3 PHASE 3 WIRE 60 Hz MODELS

4B	0 to 150	0 to 6.25	1K	3φ3W	2
5B	0 to 300	0 to 6.25	2K	3φ3W	2
6B	0 to 600	0 to 6.25	4K	3φ3W	2
13B	0 to 150	0 to 10	2K	3φ3W	2
14B	0 to 300	0 to 10	4K	3φ3W	2
15B	0 to 600	0 to 10	8K	3φ3W	2
22B	0 to 150	0 to 20	4K	3φ3W	2
23B	0 to 300	0 to 20	8K	3φ3W	2
24B	0 to 600	0 to 20	16K	3φ3W	2

3 PHASE 4 WIRE 60 Hz MODELS

7B	0 to 150	0 to 6.25	1.5K	3φ4W	3
8B	0 to 300	0 to 6.25	3K	3φ4W	3
16B	0 to 150	0 to 10	3K	3φ4W	3
17B	0 to 300	0 to 10	6K	3φ4W	3
25B	0 to 150	0 to 20	6K	3φ4W	3
26B	0 to 300	0 to 20	12K	3φ4W	3
7½B	0 to 150	0 to 6.25	1.5K	3φ4W	2½

NOTE: On 3 phase 4 wire models, phase to neutral voltage is specified. Optional for 50 Hz operation add "X-127" to model number.

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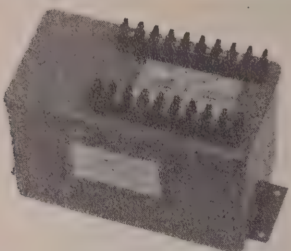
OSI AC POWER FACTOR, AND WATT TRANSDUCER PC11 SERIES



FEATURES:

- True power and power factor measurements for distorted sine wave inputs
- Two separate output signals of 0 to 1 milliampere corresponding to watts and power factor
- Direct reading of power factor, not phase angle for sinusoidal waveforms or distorted waveforms
- Power factor computed by dividing real power by apparent power
- Current sensors are included and are calibrated with the watt transducer (where required)

SPECIFICATIONS:

INPUT:

Voltage: See Tables

Current: See Tables

Frequency Range: 50 to 70 Hz

Power Factor Range: Unity to Lead or Lag 0

Response: 100 microseconds to 90%

Burden: Voltage: 1.25 VA
Current: 1.5 VA

Current Overload:
2 times continuous
6 times for 10 Sec.

Dielectric Test: (Input/Output/Case) 1500 VAC

Instrument Power Required: 115 VAC ±10% 50/60 Hz

OUTPUT:

Watts: 1 mA at Rated Output

Power Factor: +1 mA at Unity PF, 0 mA at Lead or Lag 0

Response Time: 250 mSec. to 90%

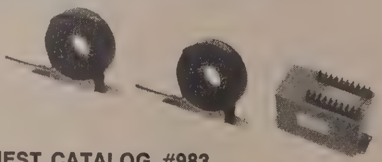
Output Loading: 0 to 10KΩ

Temperature Effects (−10°C to +60°C): ±1%

ACCURACY:

Watts: ±0.5% RO

Power Factor: From 10% to 120% of Rated VA ±0.01 PF



FOR DIMENSIONS REQUEST CATALOG #983

SINGLE PHASE 50/60 Hz

MODEL NO. PC11-	EFFECTIVE RANGE		WATTS AT RATED OUTPUT	CURRENT SENSOR
	VOLTS	AMPS		
1	0 to 150	0 to 5	500	Internal
2	0 to 300	0 to 5	1K	Internal
3	0 to 600	0 to 5	2K	Internal
10	0 to 150	0 to 10	1K	Internal
11	0 to 300	0 to 10	2K	Internal
12	0 to 600	0 to 10	4K	Internal
19	0 to 150	0 to 15	1.5K	Internal
20	0 to 300	0 to 15	3K	Internal
21	0 to 600	0 to 15	6K	Internal
103	0 to 150	0 to 1	100	Internal
104	0 to 300	0 to 1	200	Internal
105	0 to 600	0 to 1	500	Internal
106	0 to 150	0 to 2.5	250	Internal
107	0 to 300	0 to 2.5	500	Internal
108	0 to 600	0 to 2.5	1000	Internal
49	0 to 150	0 to 50	5K	W†
50	0 to 300	0 to 50	10K	W†
51	0 to 600	0 to 50	20K	W†
58	0 to 150	0 to 100	10K	W
59	0 to 300	0 to 100	20K	W
60	0 to 600	0 to 100	40K	W
67	0 to 150	0 to 200	20K	W
68	0 to 300	0 to 200	40K	W
69	0 to 600	0 to 200	80K	W
76	0 to 150	0 to 400	40K	X
77	0 to 300	0 to 400	80K	X
78	0 to 600	0 to 400	160K	X
85	0 to 150	0 to 600	60K	X
86	0 to 300	0 to 600	120K	X
87	0 to 600	0 to 600	240K	X
94	0 to 150	0 to 1K	100K	Y
95	0 to 300	0 to 1K	200K	Y
96	0 to 600	0 to 1K	400K	Y

3 PHASE 3 WIRE

4	0 to 150	0 to 5	1K	Internal
5	0 to 300	0 to 5	2K	Internal
6	0 to 600	0 to 5	4K	Internal
13	0 to 150	0 to 10	2K	Internal
14	0 to 300	0 to 10	4K	Internal
15	0 to 600	0 to 10	8K	Internal
22	0 to 150	0 to 15	3K	Internal
23	0 to 300	0 to 15	6K	Internal
24	0 to 600	0 to 15	12K	Internal
52	0 to 150	0 to 50	10K	W†
53	0 to 300	0 to 50	20K	W†
54	0 to 600	0 to 50	40K	W†
61	0 to 150	0 to 100	20K	W
62	0 to 300	0 to 100	40K	W
63	0 to 600	0 to 100	80K	W
70	0 to 150	0 to 200	40K	W
71	0 to 300	0 to 200	80K	W
72	0 to 600	0 to 200	160K	W
79	0 to 150	0 to 400	80K	X
80	0 to 300	0 to 400	160K	X
81	0 to 600	0 to 400	320K	X
88	0 to 150	0 to 600	120K	X
89	0 to 300	0 to 600	240K	X
90	0 to 600	0 to 600	480K	X
97	0 to 150	0 to 1K	200K	Y
98	0 to 300	0 to 1K	400K	Y
99	0 to 600	0 to 1K	800K	Y

NOTE: 50 Amps and above, External Sensors supplied.
† Indicates 2 turns thru the external transformer window.
Power Factor is determined from the ratio of real power to apparent power, therefore leading or lagging power factor is not indicated.

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OSI DC TO 400 Hz WATT TRANSDUCER PC8 SERIES

FEATURES AND APPLICATIONS:

- DC to 400 Hertz
- Ideal for variable frequency applications
- Accurate monitoring of power that contains dc, AC and non-sinusoidal waveforms
- Response less than 50 microseconds
- Ideal for use in SCR and other AC or dc switching circuits
- Output isolated from input

ORDERING INFORMATION:

The part numbers listed in the selection tables are incomplete. The voltage and current designation code must be added.

Part Number PC8- * — △

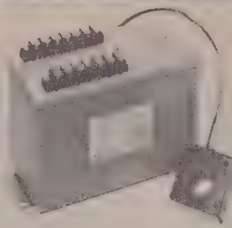
Example: PC8-3-01, which would be a PC8 transducer with 125VDC @ 100 amperes.

"*" Voltage Designation

CODE	FS VOLTS	RANGE
1	25	0 to 30
2	50	0 to 60
3	125	0 to 135
4	250	0 to 275
5	400	0 to 450
6	500	0 to 550
7	600	0 to 650

"△" Current Designation

CODE	FS CURRENT	RANGE	CURRENT SENSOR
01	100	0 to 100	C
02	200	0 to 200	D
03	300	0 to 300	D
04	400	0 to 400	D
05	600	0 to 600	E
06	1000	0 to 1000	E
07	2000	0 to 2000	E



SPECIFICATIONS:

INPUT:

Voltage: Check code designation for FS voltage ranges from 25 to 600 volts (peak AC or dc)

Burden: >1 megohm

Current: Check code designation (specify FS range from 100 ampere to 2000 ampere, lower range uses 100 ampere transducer with ampere turns)

DC Insertion Loss: None

Overrange Without Damage: 10 times rating

Frequency Range: DC to 400 Hz

Response Time: <50 microseconds

OUTPUT:

Full Scale Output: 1 mA dc (0 to 10K ohm)

Response: 250 milliseconds

Ripple: <1% Full Scale at 60 Hz

Accuracy: (FS Voltage X FS Current) ±1.0% FS

Temperature Effect: (0 to 40°C) ±0.1% of FS ±1% of Reading

Isolation: Input/Output/Case 1000 Vdc

Instrument Power: 115 VAC ±10% 50/400 Hz

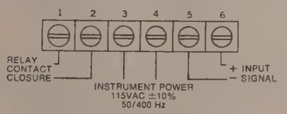
FOR DIMENSIONS REQUEST CATALOG #983

OSI PRECISION INTEGRATOR VFC SERIES ANALOG TO PULSE CONVERTER

FEATURES:

- Output is a switch closure for activating external circuits
- Switch closure can be directly related to a specific integrated quantity
- Output can be preset at the factory

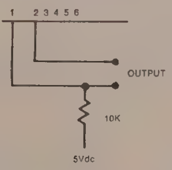
TRANSDUCER CONNECTIONS



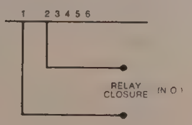
Calibration and zero adjustments are provided through recess holes in the top of the case.

USE WITH ELECTRO MECHANICAL COUNTER

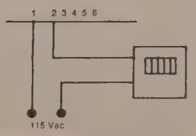
OUTPUT TO TTL CIRCUIT



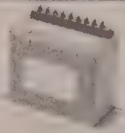
STANDARD OUTPUT



USE WITH ELECTRO MECHANICAL COUNTER



SPECIFICATIONS:
(common to all)



INPUT:

Impedance: >1 megohm except VFC-50, 100 ohms

Usable Range: Up to 1.25 x FS

Frequency: DC with up to 100% ripple at 120 Hz or higher

OUTPUTS:

Linearity: ±0.1% FS Accuracy: ±0.25% FS

Relay: Normally open, SPST

Relay Contact Rating: 10 VA Max., 120V Max., 0.3A Max.

Relay Closed Period: 100 milliseconds, typ.

Temperature Effect: (−10°C to +60°C) ±0.5%

Instrument Power: 115 VAC ±10%, 50/400 Hz

Isolation (Input/Output/Case): 1000 Volts dc

MODEL	INPUT	OUTPUT RELAY CLOSURE RATE*
VFC-10	0 to +50 mV	0 to 10,000 per hour
VFC-20	0 to +100 mV	0 to 10,000 per hour
VFC-30	0 to +150 mV	0 to 10,000 per hour
VFC-50	0 to +1 mA	0 to 10,000 per hour
VFC-60	0 to +10V	0 to 10,000 per hour

* NOTE: Output closure rate can be set between 1K and 12K counts per hour at no charge.

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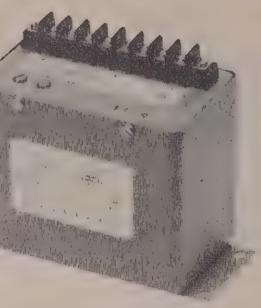
DC & RMS SIGNAL CONDITIONERS CTA SERIES



FEATURES AND APPLICATIONS:

- Designed for use with OSI current transducers
- Suitable for monitoring or control purposes
- CTA113 through CTA215E provide an output directly proportional to the true RMS value
- Calibration and zero adjustments provided

SPECIFICATIONS:

AMPLIFIER:

Linearity: 0.1% RO
Frequency Range: DC to 5 KHz
Output Response: to 90% 40 μsec.
(RMS Models) 200 msec.
Ripple: <0.25% RO
Crest Factor: 3 within rating
7 within 1%
Short Circuit Protected: Yes
Isolation: Input/Output isolated from case

EXCITATION CURRENT:

Regulation: Line/Load ±0.01%
Output Voltage at Full Load: 6 VDC

TEMPERATURE EFFECTS:

(0-70°C) ±0.005%/°C

INSTRUMENT POWER:

115 VAC ±10%, 5W, 50-400 Hz
24/28 VDC ±10%, 8W, DC
(Positive to Terminal 8)

FOR DIMENSIONS REQUEST CATALOG #983

NO CHARGE FOR CALIBRATION OF CTA WITH CT-L SERIES TRANSDUCERS

MODEL	RATED INPUT SIGNAL	RATED OUTPUT SIGNAL	EXCITATION CURRENT OUTPUT	CAL ADJUSTMENT		LOAD ON OUTPUT	INSTR. POWER
				AMPLIFIER GAIN	EXCITATION CURRENT		
ANALOG MODELS, AC IN AC OUT, dc IN dc OUT							
CTA101	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	115VAC
CTA201	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	115VAC
CTA112	±50 mV	4-20 mA	100 mA	±20%	Fixed	0-500Ω	115VAC
CTA212	±50 mV	4-20 mA	200 mA	±20%	Fixed	0-500Ω	115VAC
CTA124	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	24VDC‡
CTA224	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	24VDC‡
CTA128	±50 mV	±10V	100 mA	Fixed	±30%	>2KΩ	28VDC‡
CTA228	±50 mV	±10V	200 mA	Fixed	±10%	>2KΩ	28VDC‡
CTA1173	±50 mV	±4 mA	200 mA	Fixed	±30%	0-2.5K	115VAC
RMS MODELS, AC AND/OR dc OUT							
CTA113	50 mV RMS	+10VDC	100 mA	±20%	Fixed	>2KΩ	115VAC
CTA213	50 mV RMS	+10VDC	200 mA	±20%	Fixed	>2KΩ	115VAC
CTA114	50 mV RMS	+1 mA DC	100 mA	±20%	Fixed	0-10KΩ	115VAC
CTA214	50 mV RMS	+1 mA DC	200 mA	±20%	Fixed	0-10KΩ	115VAC
CTA115E	50 mV RMS	4-20 mA DC	100 mA	±20%	Fixed	0-500Ω	115VAC
CTA215E	50 mV RMS	4-20 mA DC	200 mA	±20%	Fixed	0-500Ω	115VAC

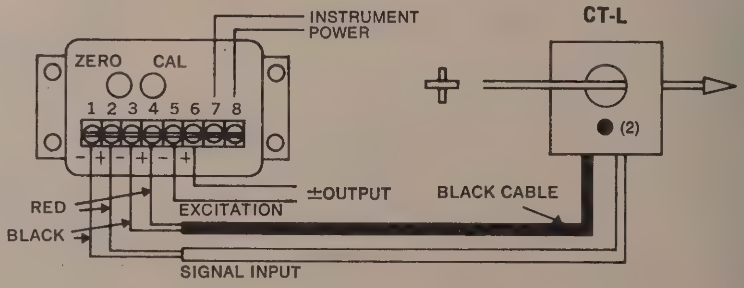
INPUT OPTIONS: (OPTION LETTER INDICATES A NON STANDARD INPUT)

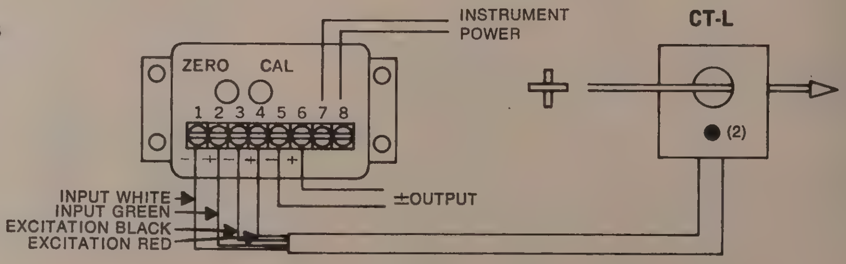
Option (H) 75 mV Input
Option (P) 100 mV Input
Option (K) 150 mV Input

APPLICATION NOTES:

(1) When using an OSI current transducer, the output shield should be tied to terminal 3 on the signal conditioner.
(2) For a positive amplified output, connect the current transducer with the red polarity dot toward the most positive voltage terminal. See connections below.
(3) All RMS models provide a DC output proportional to the true RMS value of the input.
(4) All Analog models provide an output proportional to magnitude and direction.

CONNECTIONS





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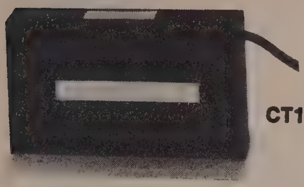
OSI CURRENT TRANSDUCERS CT-L SERIES

DC TO 5 KILOHERTZ RESPONSE



CT1KHT

CT50LT

CT200LT

CT1KLTS SPLIT-CORE OPTION

FEATURES AND APPLICATIONS:

- 5000 Volt line-to-output isolation
- DC to 5 kilohertz response
- Bi-directional operation
- Linearly 0.5%
- ±1% change over temperature range
- Less than 50 microsecond response time
- Output is proportional in direction and magnitude to the current flow through the window
- Sustained overload capability to 50 times rating
- Stable during severe vibration
- Easy installation
- Split-core models available
- Suited for variable frequency AC systems with DC components or chopped waveforms,
- Replace shunts
- No insertion loss

SPECIFICATIONS FOR CIRCULAR WINDOW MODELS

MODEL	ENCLOSED CURRENT AMPS	EXCITATION CURRENT mA (NOM.)	OUTPUT mV (TYP.)	LINEARITY % FS	OUTPUT CHANGE OVER TEMP. RANGE	TEMPERATURE RANGE °C	RESISTANCE TYP. IN Ω	RESISTANCE TYP. OUT Ω	TRANSDUCER DRAWING See Cat. Pg. 27
CT50L	50 RMS	100	30	0.5	−0.15%°/C	−40 +65	4	3	A
CT50LTT	50 RMS	100	20	0.5	±1%	0 +40	4	25	A
CT50LT	50 RMS	100	20	0.5	±1%	−40 +65	4	25	A
CT100L	100 RMS	100	50	0.5	−0.15%°/C	−40 +65	4	3	C
CT100LTT	100 RMS	100	50	0.5	±1%	0 +40	4	25	C
CT100LT	100 RMS	100	50	0.5	±1%	−40 +65	4	25	C
CT200L	200 RMS	100	75	0.5	−0.15%°/C	−40 +65	4	3	D
CT200LTT	200 RMS	100	50	0.5	±1%	0 +40	4	25	D
CT200LT	200 RMS	100	50	0.5	±1%	−40 +65	4	25	D
CT400L	400 RMS	100	50	0.5	−0.15%°/C	−40 +65	4	3	D
CT400LTT	400 RMS	100	50	0.5	±1%	0 +40	4	25	D
CT400LT	400 RMS	100	50	0.5	±1%	−40 +65	4	25	D
CT600L	600 RMS	100	75	0.5	−0.15%°/C	−40 +65	4	3	E
CT600LTT	600 RMS	100	50	0.5	±1%	0 +40	4	25	E
CT600LT	600 RMS	100	50	0.5	±1%	−40 +65	4	25	E
CT1KL	1000 RMS	200	75	0.5	−0.15%°/C	−40 +65	25	6	E
CT1KLTT	1000 RMS	200	50	0.5	±1%	0 +40	25	25	E
CT1KLT	1000 RMS	200	50	0.5	±1%	−40 +65	25	25	E
CT2KL	2000 RMS	200	150	0.5	−0.15%°/C	−40 +65	25	6	E
CT2KLTT	2000 RMS	200	100	0.5	±1%	0 +40	25	25	E
CT2KLT	2000 RMS	200	100	0.5	±1%	−40 +65	25	25	E

TRANSDUCERS FOR BUSS BAR APPLICATIONS (RECTANGULAR WINDOW)

CT4KLT	4000 peak	200	150	1.0	±1%	−40 +65	25	25	G
CT5KLT	5000 peak	200	150	1.0	±1%	−40 +65	25	25	G
CT8KLT	8000 peak	200	75	1.0	±1%	−40 +65	12	25	H
CT1KHT	1KA peak	100	75	1.0	±1%	−40 +65	25	25	Z
CT1.2KHT	1.2KA peak	100	75	1.0	±1%	−40 +65	25	25	Z
CT2KHT	2KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT2.2KHT	2.2KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT3KHT	3KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT4KHT	4KA peak	100	100	1.0	±1%	−40 +65	25	25	Z
CT5KHT	5KA peak	100	75	1.0	±1%	−40 +65	25	25	Z

NOTES: The split core option is available on all Models except the 50 Ampere size. To order, add the letter "S" to the Model Number.
The electrical isolation (line to output) is at least 5000 volts for all Models, except the 50 Ampere size which is rated at 600 volts.

FOR DIMENSIONS REQUEST CATALOG #983

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OSI AC VOLTAGE AND CURRENT TRANSDUCERS VT SERIES CT SERIES

FEATURES AND APPLICATIONS:

- Inexpensive
- Accurate
- Self powered
- Wide frequency range
- Isolated Output
- Reliable

SPECIFICATIONS (common to all):

Accuracy (Calibration, linearity @ 25°C): ±0.5% FS

Frequency Range: 50 to 500 Hz

Response Time: 400 msec.

Temperature Effect (from calibrated value):
−20°C to +60°C ±1% of Reading

Ripple: <1% FS

Full Scale Output: 1 mA dc

Output Loading: 0-10K ohms

Overload (Continuous):
Voltage: Full Scale Rating
Current: 2X Rating except CT10-1 & CT20-1,
1.25 Rating —
1 Second Transients, 50 X Rated Input

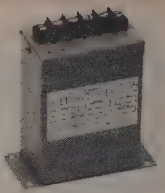
Burden:
Voltage: 2.8 VA FS
Current: 1 VA FS

Operating Range (Extended):
Voltage: Full Scale
Current: 1.2 X Rating

Dielectric Test (Input/Output/Case): 1500 VAC

NOTE: For 2 or 3 Transducers in 1 enclosure add the number required to the front of model number. Typical number 3 CTS-1 or 2 VT 120. Multiple input units have separate isolated 0-1 mA outputs corresponding to each input.

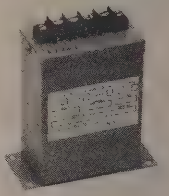
FOR DIMENSIONS REQUEST CATALOG #983



VOLTAGE TRANSDUCERS

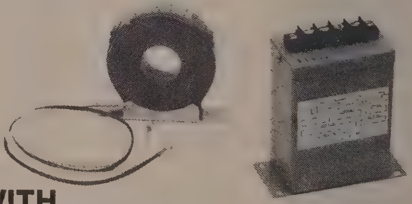
MODEL	VOLTAGE (VAC) RANGE	OUTPUT CAL
VT120	0 to 150	1 mA @ 150V
VT240	0 to 300	1 mA @ 300V
VT480*	0 to 575	1 mA @575V

* Includes OSI 226-145 Potential Transformer



CURRENT TRANSDUCERS DIRECT CONNECTED

MODEL	CURRENT (AMPS AC) RANGE	OUTPUT CAL	CURRENT SENSOR
CT1-1	0 to 1	1 mA @ 1A	Internal
CT5-1	0 to 5	1 mA @ 5A	Internal
CT10-1	0 to 10	1 mA @ 10A	Internal
CT20-1	0 to 20	1 mA @ 20A	Internal

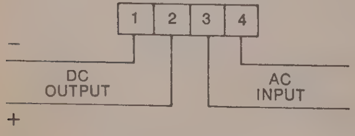


SUPPLIED WITH CURRENT TRANSFORMER

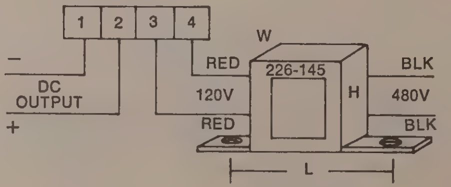
CT5-100	0 to 100	1 mA @ 100A	W
CT5-200	0 to 200	1 mA @ 200A	W
CT5-300	0 to 300	1 mA @ 300A	W
CT5-400	0 to 400	1 mA @ 400A	X
CT5-500	0 to 500	1 mA @ 600A	X
CT5-600	0 to 600	1 mA @ 600A	X
CT5-800	0 to 800	1 mA @ 800A	Y
CT5-1000	0 to 1000	1 mA @1000A	Y

VOLTAGE AND CURRENT TRANSDUCER CONNECTIONS

MODELS
CT1-1 THRU CT20-1
VT120 AND VT240

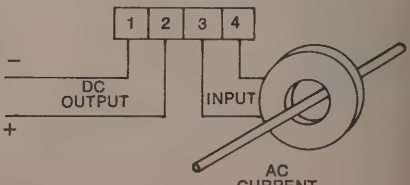


MODEL
VT480



1⅝ x 1½ x 2⅜ HWL

MODELS
CT5-100 THRU CT5-1000



AC
CURRENT

OHIO SEMITRONICS, INC. 1205 CHESAPEAKE AVENUE, COLUMBUS, OHIO 43212-2287
PHONE (614) 486-9561 • TWX 810-482-1630

OSI RMS VOLTAGE & CURRENT TRANSDUCERS CT-R SERIES VT-R & CT-RT SERIES

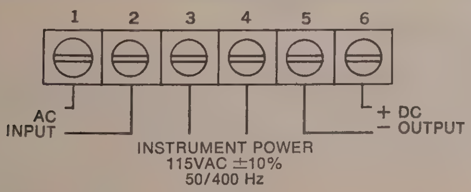
FEATURES AND APPLICATIONS:

- Accuracy 0.25%
- Output directly proportional to the RMS value of input
- Can be overranged 20% with accuracy
- Current Transducers: 20 to 2000 Hertz range
- Voltage Transducers: 50 to 400 Hertz range
- CT1R and CT1RV, DC to 2 KHz

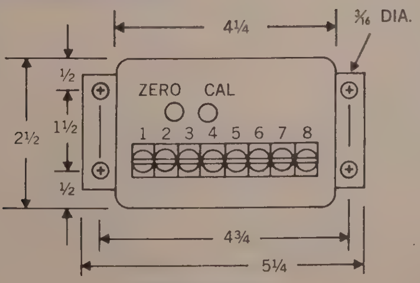
SPECIFICATIONS:

Accuracy and Linearity: ±0.25% FS at 60 Hz
Accuracy & Linearity: ±0.5% over frequency range
Frequency Range: 48 to 420 Hz
  CT1R and CT1RV only DC or 20 to 2 KHz
Inputs:
  Voltage: See Tables
  Current: See Tables
Overload:
  Voltage: See Table
  Current: (Transient) 50A for 10 Sec. Per Hour, 250 A for 1 Sec. Per Hour, excluding CT1R and CT1RV
Input Signal Burden:
  Voltage: 0.12 VA FS
  Current: 0.28 VA FS
  CT1R and CT1RV: 0.5 VA FS
Dielectric Test (Input/Output/Case): 1500 VAC RMS
  Voltage: 1500 VAC RMS
  CT1R and CT1RV only not isolated
Output Response: 200 milliseconds to 90%
Ripple: <1% FS
Output Short Circuit Protected
Temperature Effect: ±0.5% (−10°C to +60°C)
External Power: 115 VAC ±10%, 50 to 400 Hz

VOLTAGE AND CURRENT TRANSDUCER CONNECTIONS



CASE DIMENSIONS



TERMINAL SCREWS =8
OVERALL HEIGHT 4⅜

VOLTAGE TRANSDUCERS

MODEL	INPUT SIGNAL	CALIBRATION OUTPUT	LOAD OHMS
VT1R	0 to 150V	1 mA DC @ 120V	0-10K
VT2R	0 to 300V	1 mA DC @ 240V	0-10K
VT4R	0 to 600V	1 mA DC @ 480V	0-10K
VT1RV	0 to 150V	10 VDC @ 120V	>2K
VT2RV	0 to 300V	10 VDC @ 240V	>2K
VT4RV	0 to 600V	10 VDC @480V	>2K

CURRENT TRANSDUCERS

CT1TR	0 to 1A	1 mA DC @ 1A	0-10K
CT1TRV	0 to 1A	10 VDC @ 1A	>2K
CT5TR	0 to 5A	1 mA DC @ 5A	0-10K
CT5TRV	0 to 5A	10 VDC @ 5A	>2K
CT10TR	0 to 10A	1 mA DC @ 10A	0-10K
CT10TRV	0 to 10A	10 VDC @ 10A	>2K
CT15TR	0 to 15A	1 mA DC @ 15A	0-10K
CT15TRV	0 to 15A	10 VDC @ 15A	>2K
CT20TR	0 to 20A	1 mA DC @ 20A	0-10K
CT20TRV	0 to 20A	10 VDC @ 20A	>2K

CURRENT TRANSDUCERS NOT ISOLATED

CT1R	0 to 5A	1 mA DC @ 5A	0-10K
CT1RV	0 to 5A	10 VDC @ 5A	>2K

* NOTE:

(1) CTR Series output is NOT isolated from input. Use instrumentation which is isolated from source. Caution is advised when making connections.

(2) All models have been calibrated at the factory to give the correct output at the specified input rating. The "CAL" adjustment is set at the factory and should not be adjusted unless recalibration is required. The "ZERO" adjustment is provided to correct for an output offset "at zero input conditions," without affecting the calibration of the unit.

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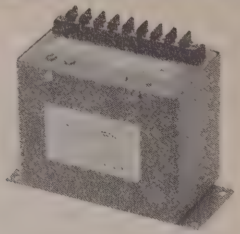
OSI DC & RMS VOLTAGE TRANSDUCERS VT7 & VT8 SERIES



FEATURES AND APPLICATIONS:

VT7 SERIES:

- DC to 5 KHz Frequency Response
- Provides an output isolated signal proportional to DC input voltage
- 50 or 100 millivolt shunt model available
- 1500 V isolation input to output

ORDERING INFORMATION:

Add the "Code Designation" to the Model Number below for the Type, Rated Voltage, and Rated Output desired.

Example: VT7-01B: DC Input of 0 to 50 MVs and output 0 to 1 mA.

MODEL NO.

VT * — O X

*CODE	TYPE
7	DC, Input
8	AC, AC/DC Input

O CODE	RATED VOLTAGE	
(1) 01	50 mV	
(1) 02	100 mV	
1	12V	
2	25V	
3	50V	
4	100V	
5	150V	
6	200V	
7	300V	
8	400V	
9	500V	
10	600V	
11	700V	External multiplier resistance box is supplied.
12	800V	
13	900V	
14	1000V	

X CODE	RATED OUTPUT SIGNAL
B	1 mA
D	10 Volts
E	4-20 mA

NOTES:

(1) 50 or 100 millivolt model is available in the VT7 Series only.

(2) Models with the rated input voltage above 600 volts require an external multiplier resistance box, which will be supplied with the unit.

FOR DIMENSIONS REQUEST CATALOG #983

FEATURES AND APPLICATIONS:

VT8 SERIES:

- DC to 5 KHz frequency response
- Output signal proportional to RMS value of AC, or AC/DC input
- 1500 Volt isolation between the input and output

SPECIFICATIONS:

INPUT:

Voltage: (Check code designation for rated input)

Overvoltage: 2 times rated input or 1500V whichever is smaller

Impedance: >100K ohm

Frequency Range: dc to 5 KHz

Response Time (99%): 50 μsec.

Isolation (Input/Output/Case/Instrument Power): 1500 VAC

Instrument Power Required: 115 VAC ±10%, 50-400 Hz

OUTPUT: (Short Circuit Protected)

Output Signal:

For VT7: 0 to ± mA, 0 to ±10 volts or a 4 to 20 mA signal which is directly proportional to the DC input voltage

For VT8: 0 to +1 mA, 0 to +10 volts or 4 to 20 mA DC signal which is directly proportional to the RMS input voltage

Response Time:

VT7 Models: 50 microseconds

VT8 Models: 200 milliseconds

Load on Output:

1 mA, 0 to 10K ohms

10 Volts, >2K ohms

4-20 mA, 0 to 500 ohms

Temperature Effects on Output (−10°C to +60°C): ±1%

ACCURACY:

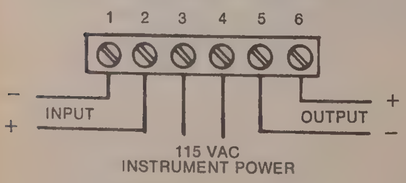
±0.5% RO

(including set point, linearity and repeatability)

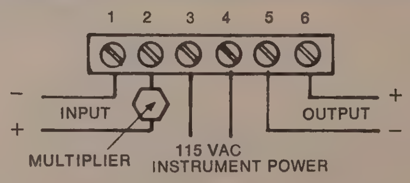
Calibration: Each unit is calibrated at the factory for Rated Input Voltage

CONNECTIONS

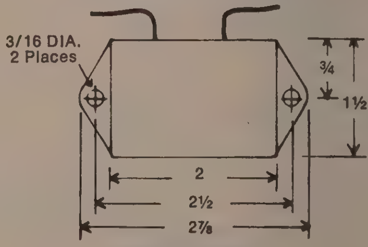
STANDARD MODELS



MODELS REQUIRING MULTIPLIER



MULTIPLIER BOX



OVERALL HEIGHT 1"
LEAD LENGTH 12"

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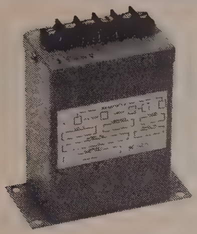
FREQUENCY TRANSDUCERS FT50, FT60 & FT400 SERIES



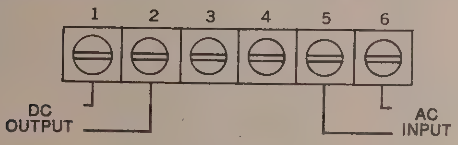
SPECIFICATIONS:

MODEL NUMBER	FT50	FT60	FT400
Input Voltage	95-135V	95-135V	95-135V
Over Voltage	150V	150V	150V
Frequency Range	45-55 Hz	55-65 Hz	375-425 Hz
Output	0-1 mA	0-1 mA	0-1 mA
Load on Output	0-10KΩ	0-10KΩ	0-10KΩ
Accuracy	±0.1 Hz	±0.1 Hz	±0.2 Hz
Temperature Range	−20°C +60°C	−20°C +60°C	−20°C +60°C
Temperature Effect	±0.005% °C	±0.005% °C	±0.005% °C
Response Time	400 mSec.	400 mSec.	400 mSec.
Burden	4 VA	4 VA	4 VA

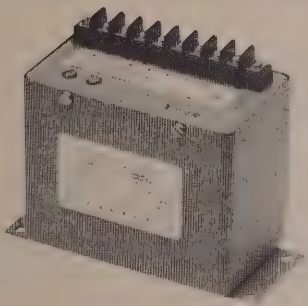
FEATURES AND APPLICATIONS:

- Analog output proportional to narrow frequency range
- Voltage or current output models available
- 50, 60, or 400 Hertz models available
- Rugged for industrial use
- Terminal block connections

TRANSDUCER CONNECTIONS



PRECISION CURRENT CONVERTER SC-E SERIES



SPECIFICATIONS: (common to all):

INPUT:

Range: See Table

Overload (without damage): 10 times input

Isolation: (input is not isolated from output)

OUTPUT:

Range: 4 to 20 mA DC

Load on Output: 0 to 1500 ohms

Response Time 99%: 100 μSec.

Ripple: <1% FS

Accuracy and Linearity: ±0.1% FS

Calibration:

20 mA DC at rated input

4 mA DC at zero input

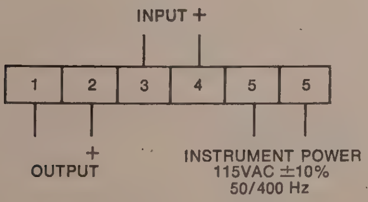
Temperature Effect: −20°C to +65°C, ±1%

Instrument Power: 115 VAC ±10%, 50-400 Hz

MODEL	INPUT SIGNAL	BURDEN ON INPUT
SC-E	0-1 mA DC	1KΩ
SC-E100	0-10VDC	10KΩ
SC-E.5	0-50 mV DC	>100KΩ
SC-E1.0	0-100 mV DC	>100KΩ
SC-E1.5	0-150 mV DC	>100KΩ

FEATURES AND APPLICATIONS:

- Provides 4 to 20 mA process control signal
- Excellent accuracy ±0.1% FS
- Models available for most common analog inputs
- Rugged for industrial application
- Terminal block connections



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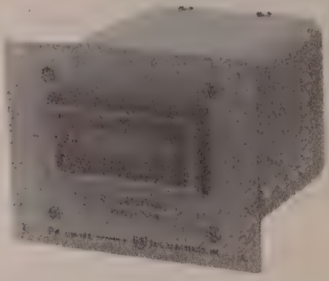
PROCESS ACCUMULATOR PA SERIES



FEATURES AND APPLICATIONS

- Accumulate watt hours, ampere hours, VAR hours volume, weight, or distance
- Readout directly related to the time integral of the analog input signal
- 6 digit 0.35″ LCD readout
- Battery backup
- Current or voltage inputs
- Can be set from 200 to 100,000 counts per hour
- Front panel, remote or combination reset
- Panel or rack mount

SPECIFICATIONS:

INPUT:

Rated: See Table Code*
Over-range: 1.25 X Rating
Burden:
Voltage Units > 100K Ohm
1 mA Units < 1K Ohm
20 mA Units < 100 Ohm

OUTPUT:

Counter: 6 digit 0.35″ LCD
Counter Batteries: (2) MN9100 Mallory
Reset — Front Panel Manual: Remote or Combination
Count Rate: 200 to 100K, Counts Per Hour

ACCURACY:

±0.25% RO
Linearity: ±0.1% RO
Temperature Effect: (−20°C to +60°C) ±0.005%/°C
Instrument Power:
115 VAC ±10%, 50 to 400 Hz
220 VAC, 50 Hz, Add Option X22 to Part Number

ORDERING INFORMATION:

MODEL NO. PA * Y X

* CODE	RATED	INPUT
1	0-50	mV
2	0-100	mV
3	0-150	mV
4	0-250	mV
5	0-1	mA
6	0-10	Vdc
7	0-5	Vdc
8	0-20	mA
9	1-5	Vdc
10	4-20	mA

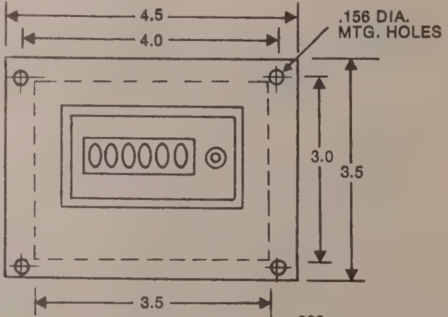
Y CODE RATED COUNTS PER HOUR

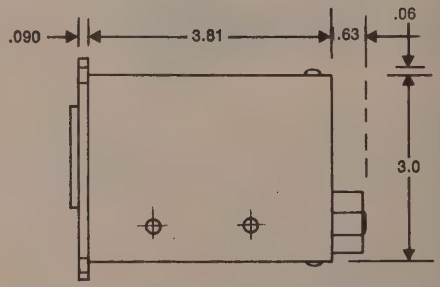
Specify the number of counts per hour required at the rated full scale input, output range is from 200-100K counts per hour. Note: Over 999, use 1K, 2.6K etc.

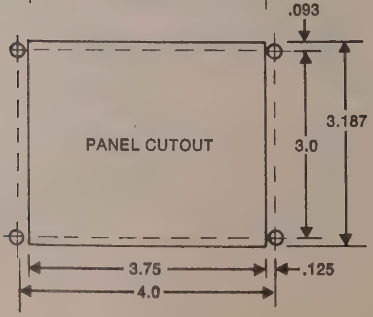
X CODE MOUNTING

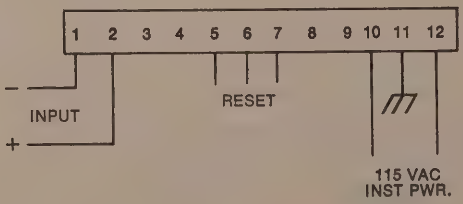
P	PANEL
R	RACK 19″ x 3½″

DIMENSIONS AND CONNECTIONS









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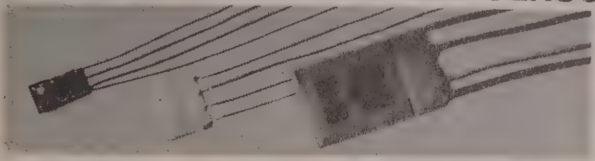
OSI HALL EFFECT SENSORS HR & HP SERIES

HALLTRON, MAGNETIC FIELD SENSORS



FEATURES AND APPLICATIONS:

- For magnetic sensing
- Measuring applications
- High linearity
- Excellent stability
- Rugged and reliable
- Low noise

MODEL NO.	HALL OUTPUT V_H, MILLIVOLTS ±25% B = 10Kg, Ic = (NOMINAL)	NOMINAL CONTROL CURRENT Ic, mA	OHMIC RESIDUAL V_{RO}, MILLIVOLTS		INPUT RESISTANCE R/in, OHMS (NOMINAL)	OUTPUT RESISTANCE R/out, OHMS (NOMINAL)	DIMENSIONS L/W/T INCHES (NOMINAL)	LEAD INSULATION	TEMPERATURE COEFFICIENT OF VH IN %/°C (AVG.)
			(B=0 Ic - 10 mA)	(B=0 Ic - 100 mA)					
HP316*	100	100	—	0.5	2	1	.125 dia. .250 L	PVC	−0.2
HP318*	250	100	—	0.5	5	4	.250 dia. .5 L	Teflon	−0.2
HP325	200	25	0.5	—	15	10	.187 0.75 .020	Enamel	−0.25
HP330	150	25	0.5	—	15	7.5	.040 .040 .012	Enamel	−0.25
HP340	100	25	0.2	—	3	2	.250 .125 .020	Enamel	−0.2
HP374	200	25	0.5	—	15	10	.300 .150 .030	PVC	−0.25
HR36	350	350	—	0.15	1.5	1.5	.625 .375 .028	PVC	−0.1
HR38	200	25	0.2	—	8	8	.625 .375 .028	PVC	−0.25
HR66	500	200	—	0.5	5	4	.200 .250 .028	Enamel	−0.15
HR67	200	25	0.2	—	9	5	.300 .150 .020	Teflon	−0.25
HR70	340	200	—	0.5	2	2	.200 .250 .028	PVC	−0.1
HR72	700	100	0.2	—	9	6	.200 .250 .028	Enamel	−0.25
HR77	550	100	—	1	10	10	.200 .250 .030	Enamel	−0.25
HR78	80	100	—	0.15	2	1.5	.100 .300 .020	Enamel	−0.10
HR88	400	300	—	4	2.5	2	.340 .375 .023	Enamel	−0.15
HR120	75	100	—	0.5	1.5	1.5	.200 .250 .030	Enamel	−0.05
HR125A	100	100	—	0.5	2.5	2.0	.200 .250 .028	Enamel	−0.05
HR170	10	100	—	0.03	0.7	0.6	.200 .250 .025	Enamel	−0.005
HS55	250	100	—	0.5	1.2	1	.500 .375 .025	PVC	—

* Denotes Axial Type Probes. All others are Transverse.

Operation Temperature Range: −65°C to +85°C

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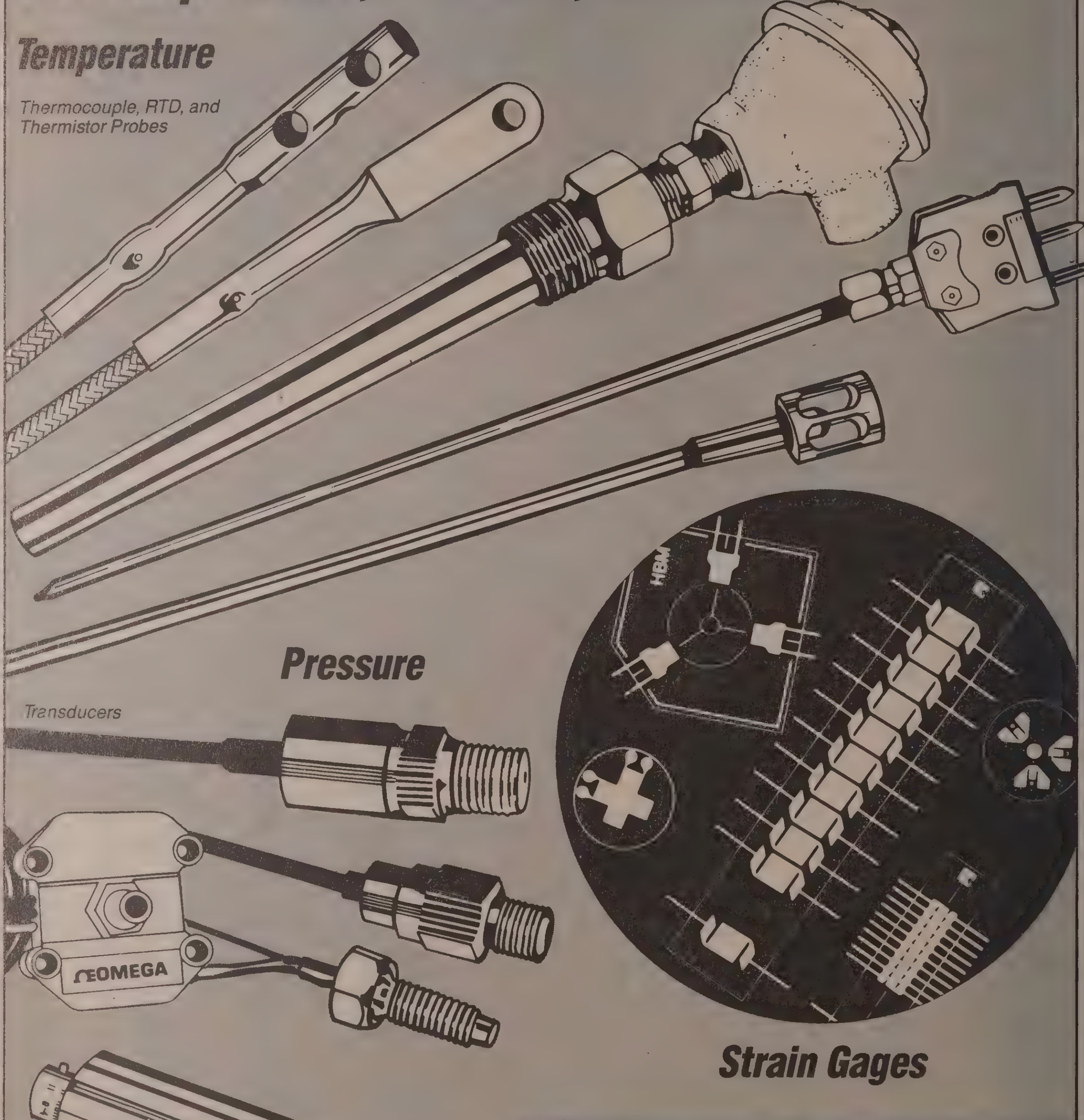
TRANSDUCERS AND ENCODERS

For Temperature, Pressure, and Strain



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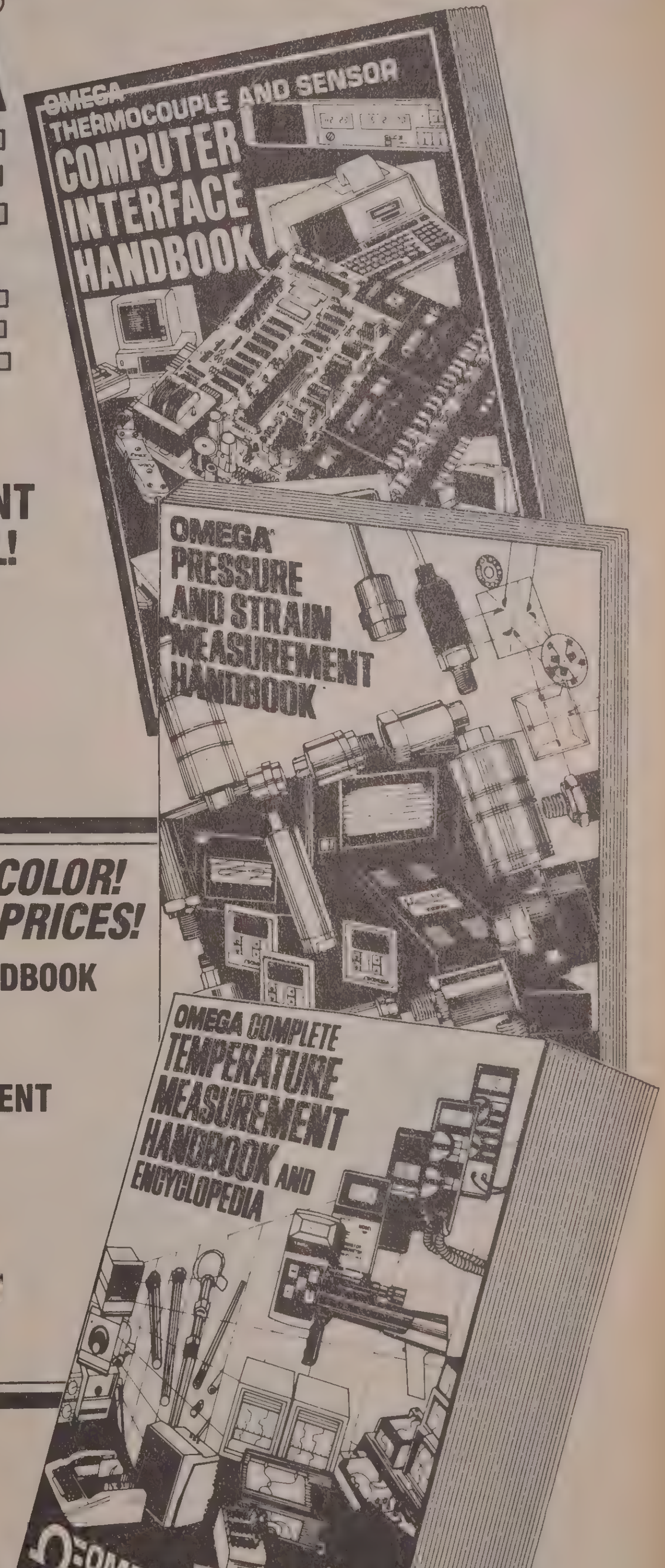
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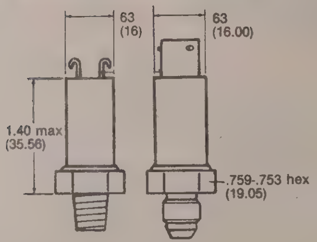
Paine® BONDED STRAIN GAGE PRESSURE TRANSDUCERS FOR INDUSTRY & AEROSPACE

SERIES 210-30

Series 210-30: 0-500 to 0-5000 PSIA and PSIS. When you need a rugged transducer for hydraulic systems with non-corrosive media applications see 210-35.

This series is ideally suited for the rigorous environments found in test stand work and wet industrial applications.

This series is available with either hooked terminals or electrical connectors.

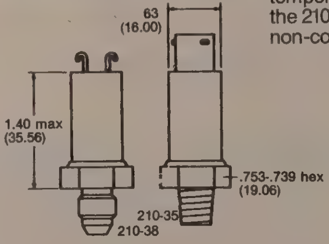


SERIES 210-35 AND 210-38

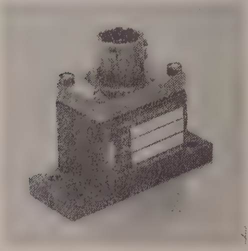
Series 210-35 and 210-38: 0-2000 through 1-10,000 PSI. A very rugged transducer for use in all industrial corrosive materials are present.

This series features all welded, all stainless steel construction to provide a high degree of compatibility and system integrity.

Both series are available with either MS Bayonet lock connectors or hooked terminals. The 210-35 is temperature compensated while the 210-38 is lower in cost and non-compensated.



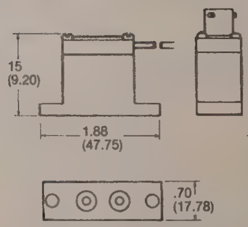
SERIES 210-60 AND 216-65



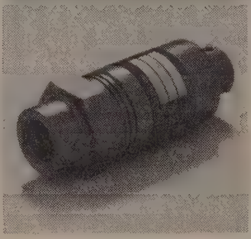
Series 210-60 and 210-65: ±500 to ±10,000 PSI. This is a full line differential pressure transducer designed for hydraulic systems. (Available in an all-welded, all-stainless steel version for corrosive media).

These transducers are unique because of their small size. The units have two separate sensing elements to measure the pressure at the input ports. Each sensor has two strain gage legs. These two sensors are connected to provide a fully balanced bridge. This sensing method provides an output directly proportional to the pressure difference at the two ports.

The series 210-60 is temperature compensated while the lower cost 210-65 is non-compensated. The 210-65 is particularly suited to rate derivation.



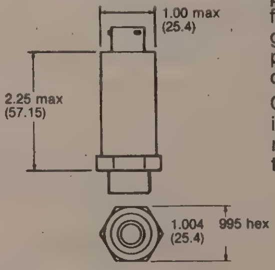
SERIES 212 ISOLATED



Series 212 Isolated: 0-10 through 0-10,000 PSI. When you need input to output isolation for system flexibility.

The Series 212 Isolated is a rugged, lightweight, all stainless steel, welded pressure transducer. It's tough enough to withstand harsh industrial environments. It's an easy transducer to install and features input/output isolation which decouples any interplay between power and signal, allowing flexibility in signal and power grounding connections. This also protects the transducer against output short circuits.

Output is 0 to 5 volts and the series is available in 18 different pressure ranges for incremental coverage of the full pressure spectrum.



Paine®

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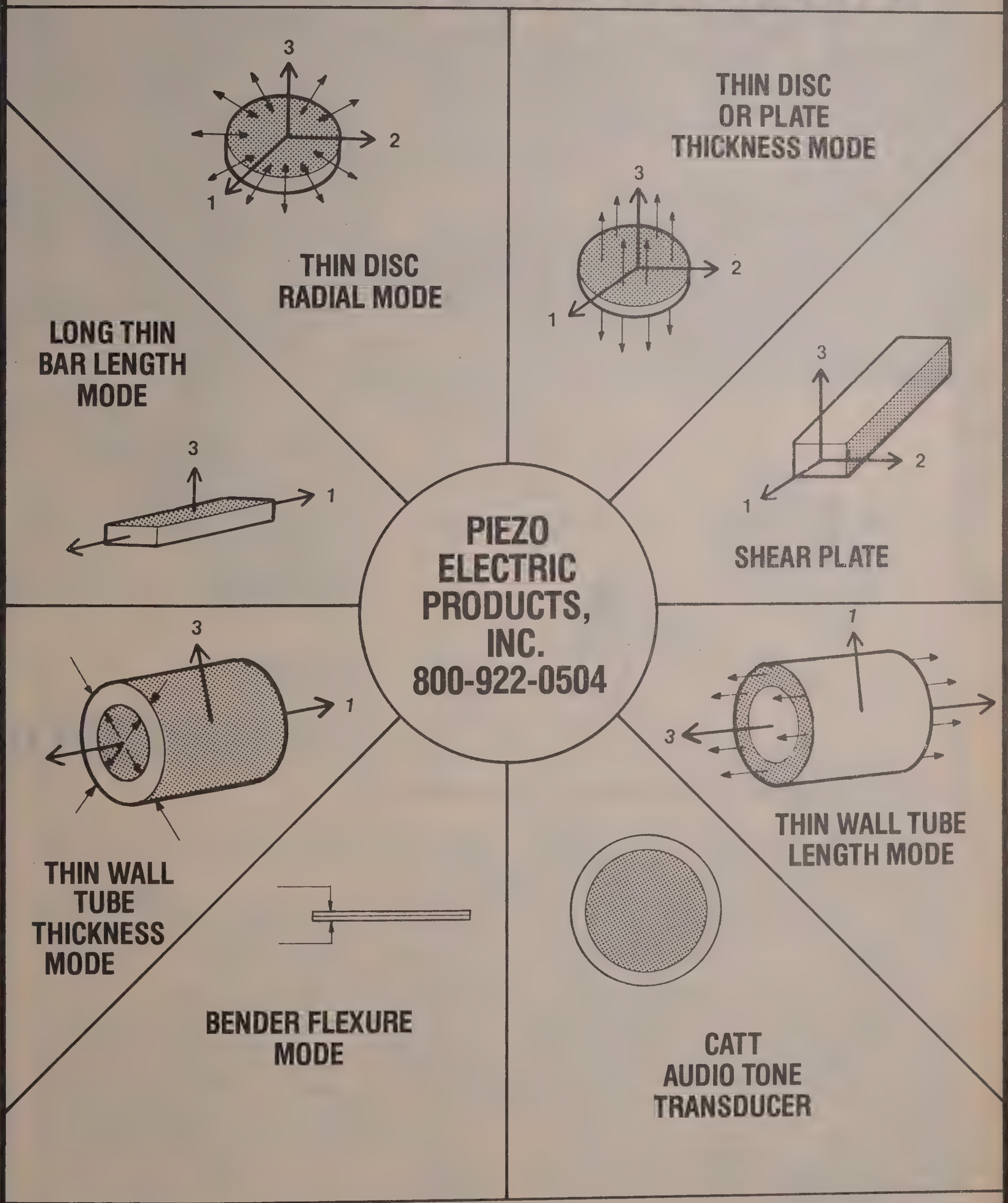
Instruments, Inc. 2401 South Bayview St. Seattle, WA 98144

PIEZO TRANSDUCERS


3
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THIN DISC RADIAL MODE
THIN DISC OR PLATE THICKNESS MODE
3
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LONG THIN BAR LENGTH MODE
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SHEAR PLATE
PIEZO ELECTRIC PRODUCTS, INC.
800-922-0504
3
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THIN WALL TUBE THICKNESS MODE
THIN WALL TUBE LENGTH MODE
BENDER FLEXURE MODE
CATT AUDIO TONE TRANSDUCER

Above are representative configurations currently available from Piezo. We can design and manufacture to your specifications custom quality transducers at competitive prices.

PIEZO ELECTRIC PRODUCTS, INC.

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Are your catalog files organized? Can you find any given catalog in a matter of seconds? If your answer is "Yes," you probably already have the EEM File System. But, if you said "No," you really ought to look into this simple system. It will save hours of time and tons of aggravation.

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645 stewart ave., garden city, ny 11530

Portescap U.S.

escap® rare earth magnet-based components for the creation and control of electronic motion

The source of the technology is also your source for the products!

The business of Portescap U.S. is putting great ideas in motion with great precision. Our escap line represents a wide selection of electronic drive and motion system components for applications ranging from relatively simple incremental motion systems, to such high-tech uses as robotics, computer peripherals, and medical implants. It incorporates steppers and micro-steppers with integrated velocity sensors in quadrature, based on samarium cobalt thin layer disk rotor technology—a technology we developed—plus ironless DC micromotors, and a full line of integral and discrete accessories including optical encoders and torque multipliers. Many models are available for immediate delivery at volume discount. New technology components are available in sample quantities from stock. Come to the source.

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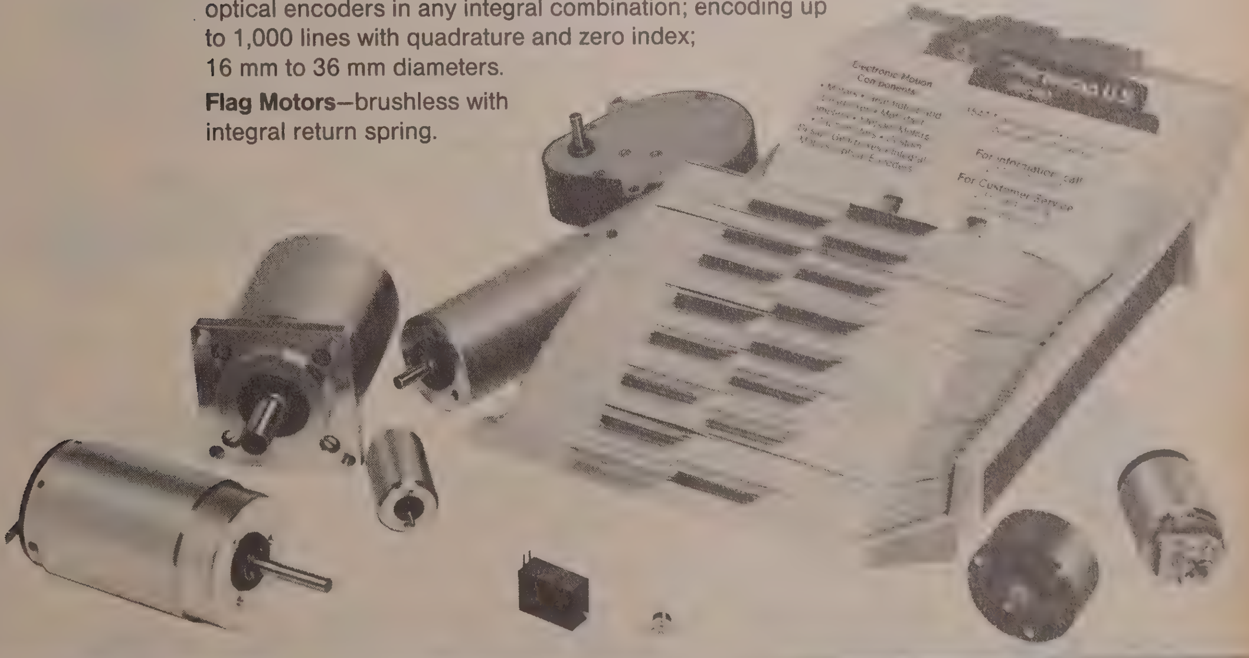
Flag Motors—brushless with integral return spring.



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Worcester, PA 19490
(215) 277-0433

RENCO CORPORATION

DIVISION OF ELECTRO-CRAFT CORPORATION

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RENCO RETURNS TO INDUSTRIAL AUTOMATION.

We have been a major supplier of optical encoders to the machine tool and computer peripheral market since 1968. With the need for cost reductions through industrial automation, Renco supports this emerging industry with its complete line of state-of-the-art encoders.

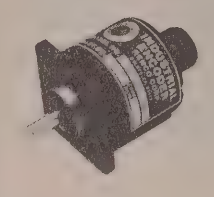
Our research and engineering departments are second to none, and over the years have consistently found and developed innovative ways to apply new technologies to encoder design and manufacturing processes. Today, Renco encoders incorporate solid state electronics, LED light sources, and our own Radial-line sensor array to improve performance and reliability.

Watch us as we expand our product lines to incorporate interface electronics for industrial robotics and other position and velocity control systems to meet the challenges of industrial automation.

CNC + PC COMPATIBLE ENCODERS IMMEDIATE DELIVERY PROGRAM

Renco is meeting the challenge of industrial automation by offering CNC + PC compatible encoders and fast delivery. Various TTL, CMOS, and Line Driver models are available from our 48-hour or maximum of two weeks delivery programs. Consult our order desk or application engineers for availability information or assistance in selecting encoders compatible with your CNC or Programmable Controller.

INCREMENTAL



HEAVY DUTY INDUSTRIAL ENCODER
HDR70

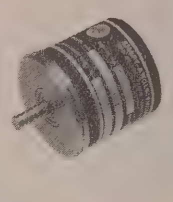
2.5 inch cast aluminum housing
Flange or servo mount
Direction sensing logic
Resolution to 5000 PPR
LED
Radial-line sensor array
Optional gated index
Phase quadrature 90° ± 36°

SPECIFICATIONS

Mechanical
Moment of inertia: 4.0×10^{-4} oz-in-sec^2 maximum
Shaft loading: Radial 35 lbs. max.; axial 40 lbs. max.
Slew speed: 5000 RPM STD. (10,000 special)
Weight: 20 oz.

Electrical
Output: TTL or CMOS
Operating frequency: Data 75 kHz, Index 20 kHz
Input power: 5V, 12V, 15V and 24V @ 125 mA
Light source: LED
Useful life: 100,000 hours min.
MTBF: 41,000 hours

Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −25°C to +90°C
Humidity: 98% relative, noncondensing
Shock: 50 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 20 G's



INCREMENTAL SHAFT ENCODER
R2520

2.5 inch servo housed
LED
Radial-line sensor array
Resolution to 5000 PPR
Phase quadrature 90° ± 36°

SPECIFICATIONS

Mechanical
Shaft size: ¼ or ⅜ inch diameter available
Moment of inertia: 5×10^{-4} oz-in-sec^2 max.
Shaft loading: Radial 15 lbs. max.; axial 15 lbs. max.
Slew speed: 5000 RPM max.
Weight: 7 oz.

Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave
Type 4. CMOS square wave
Operating frequency: Data to 60 kHz, Index 20 kHz
Input power: 5V, 12V, ±15V and 24V @ 125 mA
Useful life: 100,000 hours
MTBF: 41,000 hours

Environmental
Operating temp.: 0°C to +60°C
Storage temp.: −25°C to +90°C
Shock: 20 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 10 G's
Humidity: 95° relative, noncondensing

DUAL RESOLUTION INCREMENTAL SHAFT ENCODER
R2540

2.5 inch servo housed
Dual resolution count to 2540/2500
Phase quadrature 90° ± 45°

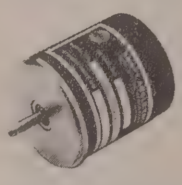
SPECIFICATIONS

Mechanical
Shaft size: ¼ inch O.D.
Moment of inertia: 3.5×10^{-4} oz-in-sec^2
Shaft loading: Radial 15 lbs. max.; axial 15 lbs. max.
Slew speed: 5000 RPM
Weight: 10 oz.

Electrical
Type 1. Differential sine wave
Type 3. TTL square wave
Operating frequency: 50 kHz
Input power: 5V DC ± 5% @ 150 mA
Useful life: 75,000 hours
MTBF: 25,000 hours

Environmental
Operating temp.: 0°C to +55°C
Storage temp.: −30°C to +90°C
Shock: 20 G's for 11 milliseconds
Vibration: 5-2000 Hz @ 10 G's
Humidity: 95° relative, noncondensing

ABSOLUTE



ABSOLUTE POSITION ENCODER
R2553

2.5 inch housed encoder
Available in Natural Binary, BCD, or grey code
Up to 12 bits standard resolution
Accuracy ±½ bit

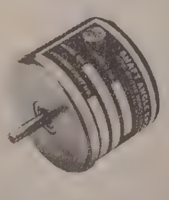
SPECIFICATIONS

Mechanical
Moment of inertia: 4×10^{-4} oz-in-sec^2
Shaft loading: Radial 5 lbs., axial 5 lbs.
Slew speed: 5000 RPM

Electrical
Input voltage: 5V DC ±5% @ 400 mA ±10 mA per bit
Output is TTL compatible
Frequency response: 50 kHz

Environmental
Operating temp.: 0°C to +50°C
Storage temp.: −30°C to +90°C
Humidity: 95% relative, noncondensing

ANALOG



ENCODER/ANALOG TACHOMETER
RENCOTACH I

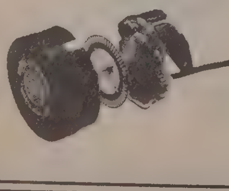
2.5 inch housed encoder
Analog ±10V DC
Up to 1000 count/turn
Bidirectional triangle wave and TTL output

SPECIFICATIONS

Mechanical
Height: 2.5 inches max.
Moment of inertia: 5×10^{-4} oz-in-sec^2

Electrical
Analog output: ±10V DC max.
Output gradient: 1V/1K RPM to 10V/1K RPM
Ripple: <10 mV to 8 kHz
Linearity: ±1%
Input power: +15V @ 150 mA, −15V @ 30 mA
Encoder output: 2 to 5V P/P triangular waveform and TTL

Environmental
Operating temp.: 0°C to +50°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing



ANALOG/DIGITAL TACHOMETER
RENCOTACH II

2 inch modular kit
Analog tach .05 to 10V DC
Digital tach pulse
Speed range of 500 to 10,000 RPM

SPECIFICATIONS

Mechanical
Height: .84 inches maximum
Moment of inertia: 3.2×10^{-5} oz-in-sec^2 minimum

Electrical
Analog output: 1V DC/1K RPM; .05-10V DC
Digital output: 60 PPR, 15V square wave output @ 4.7K Ohms impedance
Ripple: 20 mV @ 1 kHz
Linearity: ±.1%
Input power: +15V @ 15 mA, −15V @ 10 mA

Environmental
Operating temp.: 0°C to +70°C
Storage temp: −30°C to +90°C
Humidity: 95% relative, noncondensing

RENCO

RENCO CORPORATION

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CNC & PC COMPATIBLE ENCODERS
ORDERING INFORMATION

HDR70-D	RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, 2500(2)	F = flange mount S = servo mount	R = rear connector S = side connector	– shaft seal –	5 = TTL 12 = CMOS	LD = line driver(1)	
	Order mating connector separately						
R802	3 = TTL 4 = CMOS	– D –	RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, (2500(2))	HUB SIZE: ¼, ⅜, ½ 6 mm, 8 mm	5 = TTL 12 = CMOS	LD = line driver Blank = standard	
RMC252	3 = TTL 4 = CMOS	– D –	RESOLUTION: 100, 200, 250, 360, 500, 800, 1000, (2500(2))	COUPLING SIZE: ¼, ⅜, ½	5 = TTL 12 = CMOS	LD(1)	
RFP15	RESOLUTION: 100, 256	– 2 – 5					

LEGEND:
(1) = Standard option for quick delivery
(2) = Consult factory

NOTES:
HDR70 = Line driver: DS8830 Type
HDR70 = Maximum Frequency Output: 100 kHz
R80 = Line driver: SN75158 Type
R80 = Standard output device: LM339

MODULAR

MODULAR OPTICAL ENCODER
R60

1.5 inch
Modular kit
LED
Radial-line sensor array
Optional index
Synthetic base material
Phase quadature 90° ± 36°

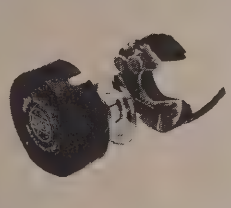
SPECIFICATIONS

Mechanical
Height: .75 inch
Moment of inerla: 1.6 x 10^{-5} oz-in-sec^2
Slew speed: 9000 RPM max.

Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave

Operating frequeny: Data to 50 kHz; Index to 20 kHz
Input power: +5V DC ±5%, ±15V DC @ 125 mA

Environmental
Standard operating temp.: 0°C to +60°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing



MODULAR OPTICAL ENCODER
R80

2 inch
Modular kit
Synthetic base material
LED
Radial-line sensor array
Optional index
Phase quadrature: 90° ± 36°

SPECIFICATIONS

Mechanical
Height: .84 inches
Moment of inertia: 1.5 x 10^{-4} oz-in-sec^2
Resolution: Up to 5000 counts
Slew speed: 9000 RPM max.

Electrical
Type 1. Differential sine wave
Type 2. Amplified sine wave
Type 3. TTL square wave

Type 4. CMOS square wave
Operating frequency: Data 50 kHz; Index 20 kHz
Input power: 5V DC ±5%, ±15V DC; 10 to 24 V DC @ 125 mA

Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing

HIGH PERFORMANCE MODULAR ENCODER
R1500

1.5 inch
Factory aligned modular kit
Metal base
LED
Radial-line sensor array
Phase Quadrature 90° ± 18°; optional ±9° available

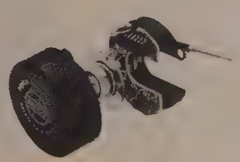
SPECIFICATIONS

Mechanical
Height: .75 inches
Moment of inertia: 3.0 x 10^{-5} oz-in-sec^2
Resolution: Up to 1250 counts per revolution
Slew speed: 9000 RPM max.

Electrical
Type 1. Differential sine wave

Type 3. TTL square wave
Operating frequency: Data to 75 kHz
Input voltage: 5V DC ±5% @ 125 mA

Environmental
Operating temp.: 0°C to +60°C
Storage temp.: −30°C to +90°C
Humidity: 90% relative, noncondensing



HIGH PERFORMANCE MODULAR ENCODER
R2000

2 inch
Factory aligned modular kit
Metal base
Radial-line sensor array
LED
Optional gated index
Phase quadrature: 90° ± 18°

SPECIFICATIONS

Mechanical
Height: .80 inches
Moment of inertia: 1.5 x 10^{-4} oz-in-sec^2
Resolution: Up to 1500 counts per revolution
Slew speed: 9000 RPM max.

Electrical
Type 1. Differential sine wave
Type 2. Amplified zero crossing sine wave
Type 3. TTL square wave

Type 4. CMOS square wave
Operating frequency: Data 50 kHz; Index 25 kHz
Input Power: 5V DC ±5%; ±15V DC; 10 to 24V DC @ 125 mA

Environmental
Operating temp.: 0°C to +60°C
Storage temp: −30°C to +90°C
Humidity: 90% relative, noncondensing

PANEL

FRONT PANEL ENCODER
RFP

1.5 inch
Potentiometric mounting
Built-in shaft tension
Phase Quadrature 90° ± 45°
Card-edge, Cable or PC Board Header Interconnect
Designed to replace Potentiometers and A to D Converters

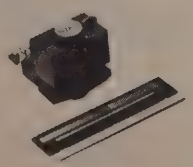
SPECIFICATIONS

Mechanical
Shaft torque: 2 ± 1 oz. in.
Mounting bushing: ⅜ x 32 UNEF

Electrical
Input voltage: 5V, +12V, or +15V @ <40 mA
Output: TTL or CMOS compatible square wave, 2 channel phase quadrature 90° ± 45°

Environmental
Operating temp.: 0°C to +70°C
Storage temp.: −40°C to +70°C
Humidity: 90% relative, noncondensing

LINEAR



LINEAR MODULAR SCALE
RML100

2 x 2 modular kit
Length: 2 to 6 inches
Choice of resolution: 25 LPI to 500 LPI
TTL compatible
Beginning of trend/end of trend marker
Lower power long life miniature incandescent lamp

SPECIFICATIONS

Mechanical
2″ x 2″ cross section
Slew rate: 70 inches/sec. max.
Linear acceleration: 20 G's max.
MTBF: 80,000 hours
Lamp useful life: 50,000 hours min.
Air gap: .005 inch

Electrical
Output: zero crossing sine wave

Input power: 5V DC ± 5% @ 200 mA

Environmental
Operating temp.: +10°C to +40°C
Storage temp.: −30°C to +90°C
Shock: 100 G's max. for 2 milliseconds duration
Vibration: 60 to 500 Hz 2 G's
Relative humidity: 20% to 90% noncondensing

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AN ESTERLINE COMPANY

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DIGILOGIC WATT TRANSDUCERS DL-A2 SERIES

- Utility Tested and Approved
- Current Output
- Long Term Stability
- Measure Forward or Reverse Power Flow

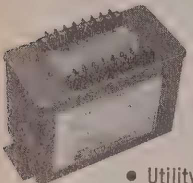
Accuracy ±0.1% of Reading

SPECIFICATIONS

Potential Input Range*: 0-150V. **Current Input Range:** 0-10A. **Watt Input Range:** See table below (Effective Range). **Frequency Input:** 58-62 Hz. **Power Factor:** Any. **Load Resistance, R_L:** 0-10 Kilohms 11 Volt Compliance. **Ambient Temp.:** 25 ±5°C. **Auxiliary Power:** 85 to 135V. **Temperature:** ±0.005%/°C from −20°C to +70°C.

* Signal range when used for auxiliary power is 120V nominal limited to 85 to 135V maximum.

Model	Element	Voltage	Load	Conection	Cal. Watts	Effective Range
DL5C5A2	1	—	—	Single Phase	500	0-1000 Watts
DL5C51½A2	1½	Balanced	Balanced	3 Phase 3 Wire	1000	0-2000 Watts
DL31K5A2	2	Unrestricted	Unrestricted	3 Phase 3 Wire	1000	0-2000 Watts
DL31K52½A2	2½	Balanced	Unrestricted	3 Phase 4 Wire	1500	0-3000 Watts
DL342K5A2	3	Unrestricted	Unrestricted	3 Phase 4 Wire	1500	0-3000 Watts



DIGILOGIC VAR TRANSDUCERS DLV-A2 SERIES

- Utility Tested and Approved
- Current Output
- Long Term Stability
- Minimal Space Requirements
- Measure Forward or Reverse Reactive Power Flow

Accuracy ±0.15 of Reading

SPECIFICATIONS

Potential Input Range*: 0-150V. **Current Input Range:** 0-10A. **VAR Input Range:** See table below (Effective Range). **Frequency Input:** 60 Hz. **Power Factor:** Any. **Load Resistance, R_L:** 0-10 Kilohms, 11 Volt Compliance. **Ambient Temp.:** 25 ±5°C. **Auxiliary Power:** 85 to 135V. **Temperature:** ±0.005%/°C from 0-50°C.

* Signal range when used for auxiliary power is 120V nominal limited to 80 to 135V maximum.

Model	Element	Voltage	Load	Connection	Cal. Vars	Effective Range
DLV5C5A2	1	—	—	Single Phase	500	0-1000 Vars
DLV5C51½A2	1½	Balanced	Balanced	3 Phase 3 Wire	1000	0-2000 Vars
DLV31K5A2	2	Unrestricted	Unrestricted	3 Phase 3 Wire	1000	0-2000 Vars
DLV31K52½A2	2½	Balanced	Unrestricted	3 Phase 4 Wire	1500	0-3000 Vars
DLV342K5A2	3	Unrestricted	Unrestricted	3 Phase 4 Wire	1500	0-3000 Vars

EXCELTRONIC™ WATT TRANSDUCERS XL-A2 SERIES

- Utility Tested and Approved
- Current Output
- Zero Drift
- Minimal Space Requirements
- Measure Forward or Reverse Power Flow
- Long Term Stability

Accuracy ±0.2% of Reading

SPECIFICATIONS

Potential Input Range*: 0-150V. **Current Input Range:** 0-10A. **Watt Input Range:** See table below (Effective Range). **Load Resistance, R_L:** 0-10 Kilohms. **Compliance:** 11.0 Volts Min. (See overrange note). **Output Ripple Peak:** <0.5% of RO. **Frequency Input:** 58-62 Hz. **Power Factor:** Any. **Temperature:** −20°C to +70°C.

Overrange: 500 to 1000 Watts/Element no additional errors within compliance rating. Reduce R_L as required.

Model	Element	Voltage	Load	Connection	Cal. Watts	Effective Range
XL5C5A2	1	—	—	Single Phase	500	0-1000 Watts
XL5C51½A2	1½	Balanced	Balanced	3 Phase 3 wire	1000	0-2000 Watts
XL31K5A2	2	Unrestricted	Unrestricted	3 Phase 3 wire	1000	0-2000 Watts
XL31K52½A2	2½	Balanced	Unrestricted	3 Phase 4 Wire	1500	0-3000 Watts
XL342K5A2	3	Unrestricted	Unrestricted	3 Phase 4 Wire	1500	0-3000 Watts

EXCELTRONIC™ VAR TRANSDUCERS XLV-A2 SERIES

- Utility Tested and Approved
- Current Output
- Zero Drift, Long Term Stability
- Minimal Space Requirements
- Measure Forward or Reverse Reactive Power Flow

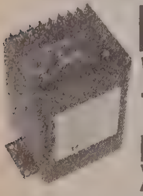
Accuracy 0.2% of Reading

SPECIFICATIONS

Potential Input Range*: 0-150V. **Current Input Range:** 0-10A. **VAR Input Range:** See table below (Effective Range). **Load Resistance, R_L:** 0-10 Kilohm. **Compliance:** 11.0 Volts Min. (See overrange note). **Output Ripple Peak:** <0.5% of RO. **Frequency Input:** 60 Hz. **Power Factor:** Any. **Temperature:** −20°C to +60°C.

Overrange: 500 to 1000 Watts/Element no additional errors within compliance rating. Reduce R_L as required.

Model	Element	Voltage	Load	Connection	Cal. Vars	Effective Range
XLV5C5A2	1	—	—	Single Phase	500	0-1000 Vars
XLV5C51½A2	1½	Balanced	Balanced	3 Phase 3 Wire	1000	0-2000 Vars
XLV31K5A2	2	Unrestricted	Unrestricted	3 Phase 3 Wire	1000	0-2000 Vars
XLV31K52½A2	2½	Balanced	Unrestricted	3 Phase 4 Wire	1500	0-3000 Vars
XLV342K5A2	3	Unrestricted	Unrestricted	3 Phase 4 Wire	1500	0-3000 Vars



EXCELTRONIC™ WATT/VAR TRANSDUCERS packaged in one case XLWV-A2 SERIES

- Utility Tested and Approved
- Current Outputs
- Zero Drift, Long Term Stability
- Minimal Space Requirements
- Measure Forward or Reverse True and Reactive Power Flow

Accuracy ±0.2% of Reading

SPECIFICATIONS

Potential Input Range*: 0-150V. **Current Input Range:** 0-10A. **Watt or VAR Input Range:** See table below (Effective Range). **Load Resistance, R_L:** 0-10 Kilohms. **Compliance:** 11.0 Volts Min. (See overrange note). **Output Ripple Peak:** <0.5% of RO. **Frequency Input:** 60 Hz. **Power Factor:** Any. **Temperature:** −20°C to +60°C.

Overrange: 500 to 1000 Watts/Element no additional errors within compliance rating. Reduce R_L as required.

Model	Element	Voltage	Load	Connection	Cal. Watts or Vars	Effective Range Watts or Vars
XLWV5C5A2	1	—	—	Single Phase	500	0-1000
XLWVC5C51½A2	1½	Balanced	Balanced	3 Phase 3 Wire	1000	0-2000
XLWV31K5A2	2	Unrestricted	Unrestricted	3 Phase 3 Wire	1000	0-2000
XLWV31K52½A2	2½	Balanced	Unrestricted	3 Phase 4 Wire	1500	0-3000
XLWV342K5A2	3	Unrestricted	Unrestricted	3 Phase 4 Wire	1500	0-3000

EXCELTRONIC™ CURRENT AND VOLTAGE TRANSDUCERS

- Average Sensing
- True RMS
- 3 in 1 Packaging

Accuracy 0.1%-0.25%

SPECIFICATIONS FOR MODELS VT110A2, VT110A4, RMS 3567

Model	4044 CT510A2	CT510A4	RMS 4074
Full Scale Current	5a	*	*
Burden	0.25 VA	*	*
Temperature Range	−20°C to +60°C	*	*
Maximum Temperature Effects on Accuracy	±0.5%	*	*
Output Load Required	0-10K ohm	*	*
Dielectric Test	1500 rms	*	*

SPECIFICATIONS FOR MODELS CT510A2, CT510A4, RMS 4074

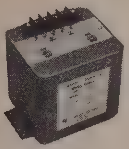
Model	3588 VT110A2	VT110A4	RMS 3567
Full Scale Voltage	150V	*	*
Burden @ 120V	2.5 VA	*	*
Temperature Range	−20°C to +60°C	*	*
Maximum Temperature Effects on Accuracy	±0.5%	*	*
Output Load Required	0-10K ohm	*	*
Dielectric Test	1500 Vrms	*	*

* Specification shown in first column is the same for all models in this series.

SCIENTIFIC COLUMBUS
AN ESTERLINE COMPANY

SCIENTIFIC COLUMBUS, INC.
1900 ARLINGATE LANE, COLUMBUS, OHIO 43228 TEL. (614) 274-7160 TELEX 245-426

EXCELTRONIC™ PHASE ANGLE TRANSDUCER



DESCRIPTION

These transducers measure the phase angle between two voltage inputs (6314) or between one voltage and one current input (6330). All models have a ±180° phase detector preventing ambiguous readings when the input goes beyond full scale. The unique circuits use both zero-crossing times to measure the angle. They use phase locked loops to reduce the effects of noise interference and harmonics on the inputs.

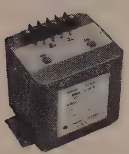
The units can be supplied for full scale ranges of ±45° up to ±180° and with outputs of ±1 mA, 0-1 mA, 1-5 mA or 4-20 mA.

SPECIFICATIONS

Full Scale Range: ±45° to ±180°. **Phase Angle Range without Ambiguous Readings:** ±180°. **Accuracy at 25°C, Normal Condition:** ±1%. **Additional Error Between −20°C and +60°C:** ±0.5°. **Potential Input(s):** 95-1135 VAC (nominal). **Overload, continuous:** 150V at 120V. **Burden:** 4 VA at 120V. **Current Input:** 0.5 to 5A (nominal). **Overload, continuous:** 10A. **Overload, 1/2 sec./hr:** 400A. **Frequency Range:** 60 Hz. **Adjustment (non-interacting), Zero:** ±3°. **Span:** ±5°. **Ripple:** 1% of maximum output (Peak). **Response Time:** 0.4 seconds to 99% of final value. **Protection Isolation:** Input/Output/Case. **Dielectric Test:** 1500V rms for 1 minute. **Surge Withstand:** Proposed IEEE SWC Test. **Outputs:** 0- ±1.0 mA into 0-10 kilohms. **Option — PA6:** 1-5 mA into 0-2.4 kilohms. **Option — PA7:** 4-20 mA into 0-1.2 kilohms. **For Model 6314 or 6330 add following suffix to complete model number:**

— 45	±45°, PF 1 to 0.7071
— 60	±60°, PF 1 to 0.5
— 75	±75°, PF 1 to 0.2588
— 180	±180°

EXCELTRONIC™ FREQUENCY TRANSDUCERS MODELS 6281B, 6283B, 6284B



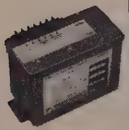
DESCRIPTION

These transducers develop a DC output signal which is proportional to input frequency, have an expanded scale output, and feature constant current output. This means, for a given input, no adjustment is necessary to compensate for various output signal loop characteristics.

SPECIFICATIONS

	6281B	6283B	6284B
Input Voltage	120V	120V	120V
Overload	150V	150V	150V
Frequency Range	45-55 Hz	375-425 Hz	55-65 Hz
Output	0-1 ma into 0-10K ohms	0-1 ma into 0-10K ohms	0-1 ma into 0-10K ohms
Accuracy	±0.02% of Center frequency at 25°C	±0.02% of Center frequency at 25°C	±0.02% of Center frequency at 25°C
Ambient Temperature Effect on Accuracy	±0.0025%/°C Max.	±0.0025%/°C Max.	±0.0025%/°C Max.
Adjustments	Zero, Span	Zero, Span	Zero, Span
Burden	4 VA	4 VA	4 VA
Ripple	1% maximum output peak	1% maximum output peak	1% maximum output peak
Temperature Range	−20°C to +60°C	−20°C to +60°C	−20°C to +60°C
Response	0.4 sec. to 99% of final value	0.4 sec. to 99% of final value	0.4 sec. to 99% of final value

EXCELTRONIC™ POWER TRANSDUCER "P SERIES" A6 1-5 ma, A7 4-20 ma, A8 10-50 ma



DESCRIPTION

Scientific Columbus has over 60 high output constant current transducers available for your selection. These transducers measure voltage, current, watts, vars, frequency and power factor with the popular outputs compatible with control equipment.

SPECIFICATIONS COMMON TO WATT AND VAR MODELS

Nominal Voltage Input: 120V. **Voltage Range:** 0-135V. **Permissible Voltage Overload:** 150V. **Voltage Burden (per Element):** 0.05 VA at 120V. **Nominal Current Input:** 5A. **Permissible Current Overload:** 10A cont., 250A for 1 sec. **Current Burden (per Element):** 0.10 VA at 5A. **External Power Required:** 100-130V, 50 Hz-500 Hz 12 VA. **Dielectric Test:** 1500 VRMS. **Frequency Range Watts:** 50-60 Hz. **Frequency Range Vars:** 60 Hz. **Power Factor Range:** Any. **Temperature Range:** 0-50°C. **Temp. Effects in Accuracy:** ±0.0075%/°C. **Accuracy/Linearity @ 25°C:** ±0.25%. **AC Component P to P:** 0.5% max. **Response Time:** 1 sec. max.

SPECIFICATIONS COMMON TO VOLT, CURRENT, POWER FACTOR, FREQUENCY, AND ISOLATION TRANSDUCERS

Nominal Voltage Input: 120V. **Permissible Voltage Overload:** 150V. **Voltage Burdens:** 3 VA max. **Current Circuits Nominal Input:** 5A. **Permissible Current Overload:** 10A Cont., 250 for 1 sec. **Current Circuit Burdens:** 3 VA max. **External Power Required:** 100-130V, 50 Hz-500 Hz 12 VA. **Dielectric Tests (Isolation unit):** 1500 VRMS. **Input Terminals:** 4000 VDC. **Temperature Range:** 0-50°C. **Temp. Effects on Accuracy:** ±1%. **Accuracy/Linearity @ 25°C:** ±0.5%. **AC Compinent P to P:** 0.5% max. **Response Time:** 1 sec. max.

EXCELTRONIC™ TEMPERATURE TRANSDUCER SERIES 9015N, 9016P, 9019C

DESCRIPTION

These transducers have true constant current output of 0-1 MA that will simplify your own calibrating or scaling networks, as well as allowinging telemetering over long distances without line drop error.

SPECIFICATIONS

Constant Current Output: 0-1 mA for Full Range Input. **Load Resistance Range:** Any Load Between 0-10K Ohms. **Temperature Range:** −4°F to 140°F. **Ripple:** 1% RO (Peak). **Connections:** See Model 9015- 49F, Model 9016 & 9019 - 49G. **Adjustments Span:** ±10%. **Zero:** ±3%. **Response Time:** <50 Milliseconds. **Dielectric:** 1500 VRMS @ 60 Hz for 1 Min. **Power Requirement:** 110 VAC ±20 VAC, 50 to 450 Hz, 3.5 Watts Max. **Temperature Influence on Accuracy (−4°F to +140°F):** ±.015%/°F (from 77°F). **Open Circuit Voltage:** 16 VDC. **Dimensions:** See Style II-Models 9016 & 9019, Style III-Model 9015.

Basic Model	RTD Type	Suggested Sensor Resistance	Temp. Span	Temp. Range	Max. Sensor Current
9015N	Nickel-Iron	676Ω @ 77°F	50°F or 150°F	−200°F to 500°F	< 3 Milliamps
9016P	Platinum	100Ω @ 32°F	150°F or 300°F	−320°F to 1000°F	< 5 Milliamps
9019C	Copper	10.0Ω @ 77°F	150°F or 300°F	−100°F to 300°F	<50 Milliamps

CALIBRATOR

PORTABLE TRANSDUCER MODEL 6444

- 40% Lighter • 40% Smaller • All Digital
- Replaces the 1369C • Watts • Vars • Amps
- Volts

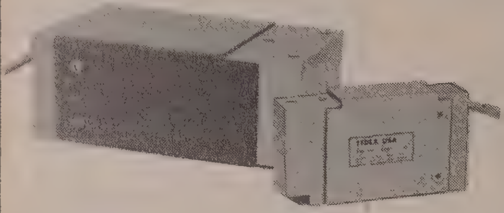
SPECIFICATIONS

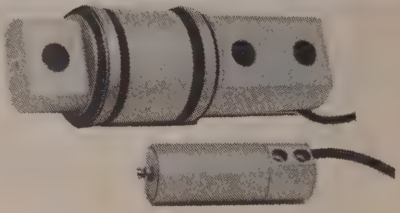
Function: AC watt, var, current and voltage transducer tester and calibrator. **Ranges:** 0-150 VRMS, 0-5A, 0-10 ARMS, Avg. Sensing. 0-750/0-1500W, 0-750/0-1500 Var. **Voltage Output:** VA rating 15 VA. **Current Output:** VA rating. Hi Range: Hi-24 VA @ 1. PF, 22V @ 0.5 PF. **Lo Range:** Lo-6 VA @ 1.0 PF., 2.4 VA @ 0.5 PF. **Load Power Factor:** Unity and 0.5 lag (approx.) **Transducer Signal Load:** 1 ohm to 100K ohms and infinity, selected by thumbwheel digital readout switches. **Standard Output Signal:** 0-10 volts dc for zero to full scale of test quantity (V, A, W, var). **Meters, all meters are 3½ digit liquid crystal display (LCD):** Volts 0-150, Amperes 0-5/0-10, Watts/Vars 0-750/0-1500, Error −20% - 0 - +20%. **Accuracy of Internal Std. Transducers:** ±0.1%. **Accuracy (Digital Indicating Meters):** Volt, Amp & Watt/Var indicators, ±0.15% of f.s. ±1 digit. **Accuracy (Standard Output):** ±0.1% (maximum). **Temperature Range:** +25°C ±10°. **Power to Operate Unit:** 120V ±10%, 60 Hz, Approx. 130 VA. **Terminations:** Five-way binding posts are mounted on the front panel of the instrument. Power receptacle is on the rear of the case. **Accessories:** No accessories are required for complete functional testing of transducer being checked. **Packaging:** Wood-formica portable instrument case with carrying handle. **Dimensions:** 13″ high x 22″ wide x 9″ high (330 x 560 x 230 mm). **Weight:** 45 lbs. (20.4 kg).

TEDEA USA Load Cells

.02% TOTAL ERROR • 100% TESTING • OIML COMPATIBLE

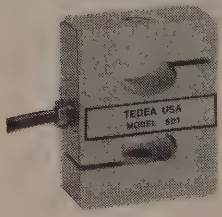
Series 1000
Off-Center-Loading Weigh Cells
- Capacities 4 to 500 lbs.
- Simple single-point mounting
- Insensitive to off-center moments
- Integral overload protection



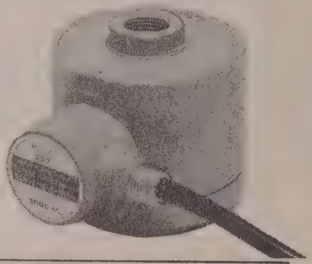


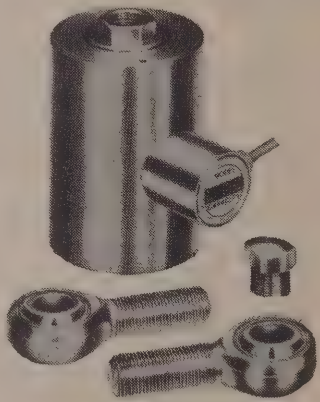
Series 300
Bending-Beam Weigh Cells
- Capacities 10 to 2,000 lbs.
- Low sensitivity to side loads
- Built-in overload protection (Model 300)

Series 600
S-Type Tension Weigh Cells
- Capacities 200 to 1,000 lbs.



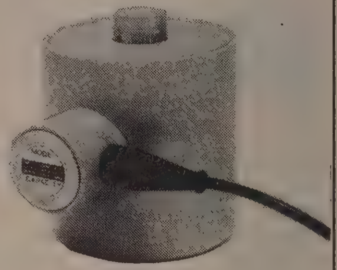
Series 700
Tension-Compression Weigh Cells
- Capacities 2,000 to 10,000 lbs.
- Welded, hermetically sealed configuration
- 400% F.S. Safe compression overload



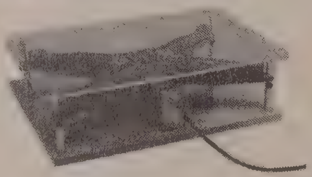


Series 400
Tension-Compression Weigh Cells
- Capacities 100 to 2,000 lbs.
- Splash-proof sealed configuration
- Rugged design

Series 100
Heavy Duty Compression Weigh Cells
- Capacities 20,000 to 100,000 lbs.
- Total error .15%



ACCESSORIES

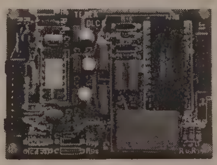


MODEL SM 1010
Shock Mount Assembly

Provides the basis for an extremely rugged high performance scale base. Available in varied configurations in ranges from 10 lbs. through 200 lbs.

MODEL BCR-50
Digital Transducer Indicator

Complete electronics package that provides excitation voltage, output signal conditioning and adjustable digital display for strain gauge load cells. 0-5 VDC analog or buffered BCD output available.



NEW!
TEDEA's DLCC-LSI...
- Serial and parallel outputs
- 32,000 count resolution
- Single power supply only

GENERAL SPECIFICATIONS:

Rated Output	2 mV/V
Total Error	.02% rated output
Safe Overload	150% rated output
Excitation	10-20 V AC or DC

TEDEA USA

Subsidiary of hcc Industries

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On-target sensors for position and speed control.

Choosing the right up-front sensor can make a big difference in position- and speed-control system requirements.

At TSI, if you need a non-contact pickup, with or without logic signal conditioning, with or without zero-speed and/or direction output, its performance will be strictly as specified, and its cost-saving advantages will be welcome news.

Pickups, proximity sensors and switches, LVDTs, and velocity transducers—all are manufactured in their entirety at TSI. Select from hundreds of standard models and custom designs.

Sensor Type	Variable-Reluctance Magnetic Pickups	DIGIMAG	DIGITRAC®	BITRAC™
Features	Non-contact, high frequency output capability, several output/resolution packages. High environmental adaptability.	Digital output, insensitive over a range of, and to variations in supply voltage and air-gap distance. Non-contact.	Zero-speed output, digital, good noise immunity, magnetoresistive sensing, non-contact.	Directional and zero-speed digital output from one differential magnetoresistive sensor. High noise immunity, easy installation, non-contact.
Output, General	Analog, logic signal conditioning available	TTL- and CMOS-compatible	TTL- and CMOS-compatible	TTL- and CMOS-compatible
Output Range	250 mV p-p to 300 V p-p	**at 5 Vdc supply*** 0.2 V low; 4.75 V high. **at 15 Vdc supply*** 0.2 V low; 14.25 V high *operates at 5-to-15 Vdc supply.	**at 5 Vdc supply** 0.2 V low; 4.75 V high. **at 12 Vdc supply** 0.2 V low; 11.4 V high	**at 10-14 Vdc supply** zero-speed and position output: 0.4 V low; 4.75 V high direction output: clockwise - 0.2 Vdc counterclockwise - 3.0 Vdc
Air-gap Range	0.2" max.	0.080" max.	0.060" max.	0.025" max.
Cut-off Frequency	1 MHz	20 kHz	20 kHz	20 kHz
Target Material	Ferromagnetic	Ferromagnetic	Ferromagnetic	Ferromagnetic

*Contact TSI for specifications on proximity transducers, proximity switches, LVDTs, and velocity transducers

tsi TRANSDUCER SYSTEMS, INC.
1510 Delp Drive, P.O. Box 341 • Kulpsville, PA 19443 • 215-256-4611 • Telex 846078

1B•1879

OUR PRECISION PRODUCTS INCLUDE:

LINEAR VARIABLE DIFFERENTIAL TRANSDUCERS

- *DC in/DC out or AC in/AC out*
- *High accuracy and stability*
- *Low input power:<300mWDC*
- *±0.02" to ±10.00" full scale*

MDP/SD LVDTs provide self-contained signal conditioning. MA/MDP models offer small size, high accuracy, and high sensitivity. SA/SD models allow higher ranges and ruggedized design.

LOW RANGE FORCE/WEIGHT TRANSDUCERS

- *AC and DC models*
- *Tension/compression from ±5 gms full range*
- *20ms full load response*

Applications include laboratory use, biomedical and pharmaceutical measurements, high speed weighing, aero/hydrodynamic modeling, and others where precise determination of low range forces is necessary.

LINEAR VELOCITY TRANSDUCERS

- *0.5" to 20.0" ranges*
- *Single-piece high fluxdensity magnetic core*
- *High Sensitivity*
- *Non-contact measuring*

These LVTs provide outputs directly proportional to the rate of change of an object's position. The output also indicates the direction of motion. Rugged construction assures high tolerance to shock and vibration.

ROTARY VARIABLE DIFFERENTIAL TRANSFORMERS

- *AC and DC models*
- *Unlimited rotation*
- *±60° linear range*
- *Infinite resolution*

These angular position LVDTs offer unlimited rotation and non-contact measuring. They are available in two styles — completely self-contained or with an independent stator and core.

INCLINOMETERS

- *±5° to ±90° full scale*
- *Resolution to 0.1 second of arc*
- *Linearity to ±0.025%*
- *AC and DC models available*

These inclinometers provide an output proportional to the sine of the angle of tilt, resolving changes in angle as small as 0.1 second of arc, and changes in tilt as low as 0.000006 inch/foot.

LOW COST MEASURING SYSTEM

- *±0.1" range*
- *0.25% linearity*
- *High sensitivity*
- *High resolution*
- *LVDT reliability*

Convert ANY mechanical output to an electronic output — for measuring displacement, force, weight, pressure, velocity, acceleration, slope, tilt — anything that moves mechanically can be measured electronically. You add only a fixture for your particular application.

SIGNAL CONDITIONING MODULES & CONTROL BOXES

Signal conditioning modules for our AC-LVDTs, and all of our AC transducers, are available for AC or DC inputs/outputs, with options such as zero adjustment ranges to 100%, output currents to 500mA, preset limits, frequency outputs, and a choice of several methods of interconnection. Control boxes, including digital displays, printers, and other output instrumentation are also available.

TRANSDUCERS and SYSTEMS

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North Branford, CT 06471
(203) 481-5721 • TWX 710-452-3092

A PRIME TECHNOLOGY COMPANY

DIGITAL
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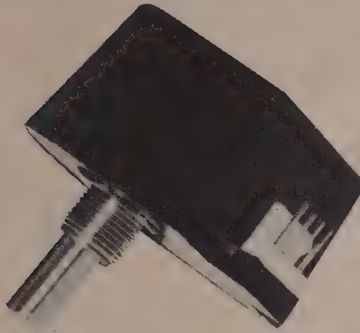
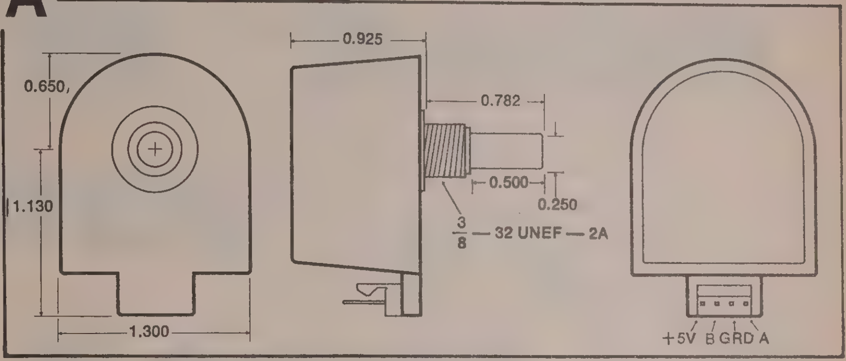
SOFTPOT DATA





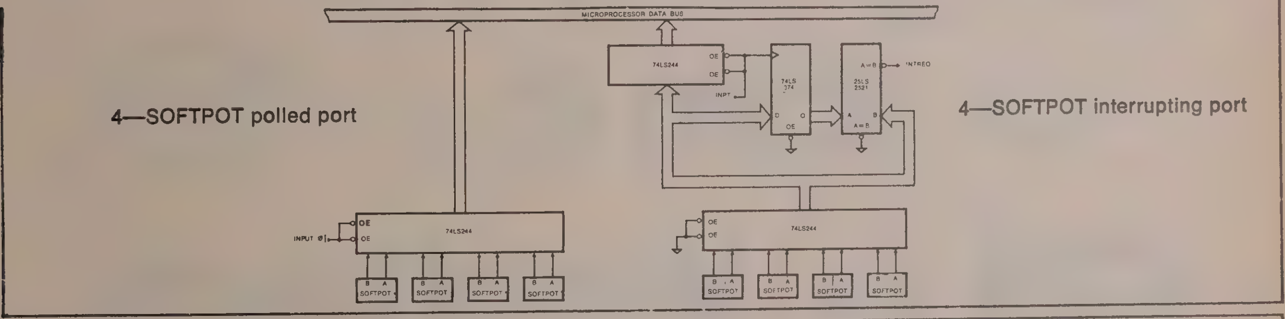
DESCRIPTION

The SOFTPOT is a front panel optical incremental encoder which converts mechanical action directly to digital output. Its low cost has made software programmable performance practical for new applications. Shaft tension provides the feel of a potentiometer but there are no stops. Since the SOFTPOT is an incremental device the absolute value of the controlled parameter may be maintained in memory by your microprocessor providing:

- Software presetable parameters
- Software definable limits
- Software programmable interaction

The two channel outputs are quadrature phase encoded to provide a resolution of 4 quadrants per cycle and 16 cycles per revolution yielding a code change every 5.6 degrees or 64 quadrants per turn. LED light sources assure low power consumption and a long reliable life. One external 74LS244 will interface four SOFTPOTS to standard TTL.

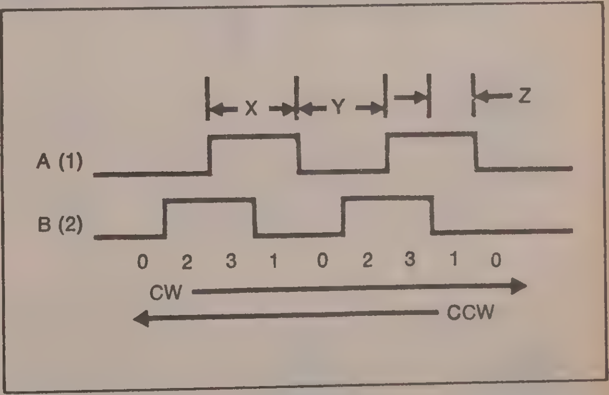
INTERFACE



ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	NOM	MAX	UNITS	NOTE
Supply Voltage	4.75	5.0	5.25	Volts	
Supply Current		22	30	MA	
VoutH	3.5	5.0	5.25	Volts	2
VoutL		0.15	0.4	Volts	2
Iout (Vout=.5v)	0.5	2.0		MA	
Iout Short		8	18	MA	
Symmetry	150	180	210	Degrees	3, 4
Quadrature	60	90	120	Degrees	3, 5

NOTES:
1. A 74LS244 is recommended as the interface to TTL.
2. At 74LS244 input
3. At 74LS244 output
4. Symmetry is a measure of the relationship between (X) and (Y) in electrical degrees.
5. Quadrature is specified by (Z) and is the phase lag or lead between channels A and B in electrical degrees.
6. Channel B leads channel A for clockwise rotation.



MECHANICAL SPECIFICATIONS

Dimensions:		See above
Connectors:	Unit	AMP—640456—4
	Mate	AMP—640441—4
Materials:	Housing	ABS# KJB4051 (fire retardant)
	Shaft	Brass
	Bushing	Brass
	Torque	0.5 in. oz. +/−0.20 in. oz.
	Weight	1.0 ounces
	Operating Temperature	−20 to 85 degrees C
	Storage Temperature	−40 to 85 degrees C
	Mounting Hole Size	.380 inch
	Panel Thickness	.125 inch max.

ORDERING INFORMATION

PRICING:		
	$16.00/1000's	$20.00/50's
	$17.00/500's	$22.00/10's
	$18.00/100's	$25.00/1's

MATING CONNECTORS: $.50

PART NUMBER : SP-16
F.O.B. : Los Alamitos, CA via U.P.S.
AVAILABILITY : Normal Shipment is Next Day
TERMS : 30 Days Upon Approval

If you want to move it

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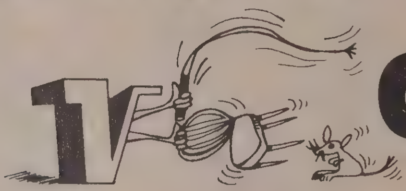
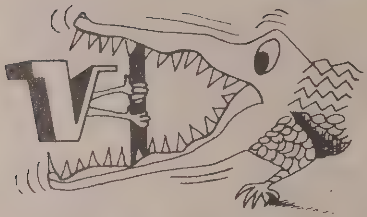


control it,

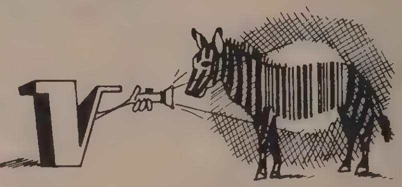
sense it

,



stop it,

or scan it



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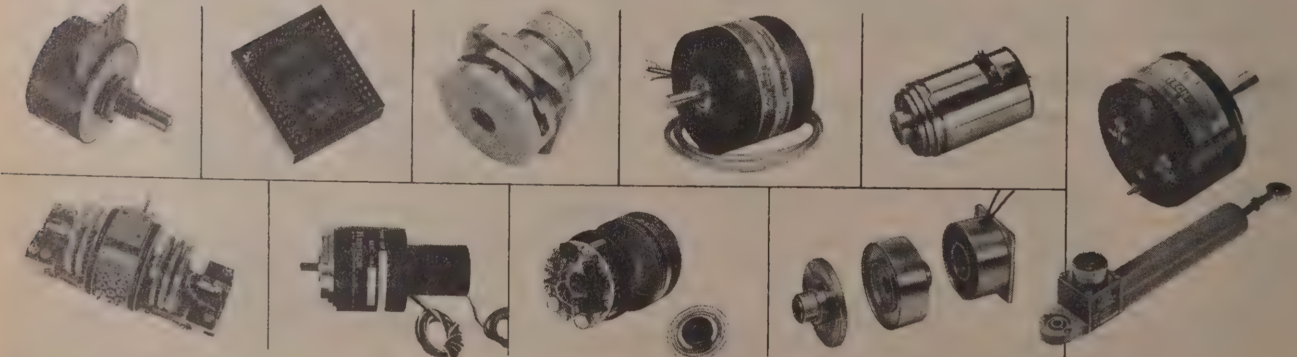
call Vernitech.

That is, if you're looking for instrument motors, optical and contacting shaft angle encoders, rotary and linear potentiometers, potentiometric pressure transducers, industrial precision brakes or clutches, or laser scanning motors, we'll probably have just what you're looking for. Just look on the opposite page. And if you *don't* find what you want, call Vernitech, give us the particulars, and we'll make it for you.

VERNITECH



VERNITECH, a division of Vernitron Corp., 300 Marcus Blvd., Deer Park, NY 11729 • 516-586-5100 • TWX 510-227-6089

POTENTIOMETERS

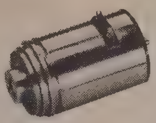
employing Vernitech's unique conductive film and precious metal wipers... respond to wiper motions as small as .000005".

Rotary Single Turn
Linear, non-linear, sine/cosine available.
Sizes 0.5", L 0.5" to Dia 5.0", L 1.880".
Linearity or conformity ±2% to 0.025%.
Resistance range 1KΩ to −250KΩ.

Rotary Multi-Turn
10 to 100 turns available.
Sizes Dia 0.5", L 1.5" to Dia 2.0", L 2.625".
Linearity or conformity ±0.5% to 0.015%.
Resistance range 1KΩ to 500KΩ.

Linear Motion
Electrical stroke lengths 1" to 60".
Linearity or conformity ±0.2% to 0.01%.
Resistance range 250Ω/in to 250KΩ/in.

CLUTCHES AND BRAKES



(electromagnetic)

hundreds of models and sizes available from stock.

Precision Instrument Type
Sizes 5, 8, 11, 13, 15, and 18.
Standard length and wafer types. Spring and magnetic.
Meet MIL-E-5272C. Zero backlash.
Torque 5 to 150 oz. in. Response time 5 to 142 ms.

Industrial Types — open frame
Sizes 8, 12, 17, 22, 26. Torque to 75 in. lb.
Response time 6-30 ms at rated voltage.

Industrial Types — enclosed frame
Hybrid or special units designed for particular applications when MIL-SPECS and close tolerances are not essential, but where having a complete "self-contained" unit is desirable: cassette tape decks, analog devices actuators, etc.

Fail Safe
Braking action occurs 10 ms after coil is de-energized or power fails. Sizes 8, 17, 30, and 45.
Torque up to 50 in. lb. Zero backlash. Adjustable to compensate for wear.

PRESSURE TRANSDUCERS

potentiometer type,

featuring infinite resolution, long life, and high reliability through the use of conductive film resistance elements, multiple wipers, and direct coupling of pressure sensing element to potentiometer wipers.

Pressure ranges from 0.1 to 10,000 psi in gage, absolute and differential types. Also available with high overpressure capability.

Linearity to ±0.3%. Air speed, altitude and low cost types available.

VERNITECH

MOTORS

Over 1500 Standard Designs or Custom Designed to your requirements.

Synchronous — for laser scanning
Sizes 5, 8, 11, 15, 18, 20, 25, 35.
Speeds 100 to 48,000 rpm.
5 through 1600 Hz. 2, 4, 8, 12 poles.

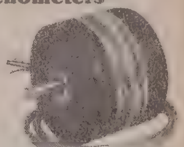
Servo
Viscous damped — sizes 8, 10, 11, 15, 18.
Speeds 3000 to 10,000 rpm.
Inertially damped — sizes 8, 11, 15, 18.
Speeds 3000 to 9500 rpm.

Stepper
Sizes 5, 8, 11, 15. Stepping angles 7.5°, 15°, 45°, 90°.
Stepping rates 100, 110, 125, 130, 175, 180, 225, 240, 260, 400, 725, 800, 1000 pps.

Precision Motor Generators Sizes 8, 10, 11, 15, 18, 23.

Integrating and Computer Motor Tachometers
Sizes 8, 10, 11, 15, 18, 23.

SHAFT ANGLE ENCODERS



featuring precision chrome on glass discs for highest accuracy.

Optical Incremental
VOE 005 — Dia. 0.500", 0.510" L. To 256 pulses (modular)
VOE 05 — Dia. 0.500", 0.820" L. To 256 pulses
VOE 11 — Dia. 1.062", L. 1.80". To 1024 pulses
VOE 015 — Dia. 1.510", L. 0.88". To 1024 pulses (modular)
VOE M15 "Dial Coder" — panel mounted, 1.500" dia., L. 1.08" 127-256 pulses
VOE 023 — Dia. 2.25", L. 80". To 1250 pulses (modular)
VOE 23 — Dia. 2.250", L. 1.875". To 1250 pulses (available sealed)
VOE L23 "Thrift-Line" Dia. 2.250" L. 1.875". To 600 pulses
VOE 25 — Dia. 2.500", L. 2.500". To 3000 pulses (available sealed)

Optical Absolute
VOE 23: Binary, Gray or BCD to 512 counts per turn. Counting speed: 3000 rpm.
VOE 30: Single or multi-turn; Binary, Gray or BCD. To 1024 counts per turn. Max count (2^{19}) in 512 turns. Counting Speed: 30KHz.

Contacting Absolute
Sizes 11, 18, 23, & 31. Binary, Gray, and BCD. Single or multi-turn. Max count (2^{19}) in 2048 turns. 64 to 1024 counts per turn. Operating speed 200 rpm max.

SYNCHRO CONVERTER MODULES

Tracking Synchro-to-Digital and Resolver-to-Digital Converters
Economy Series VSD/VRD. Precision Series VSDH/VRDH Compact, solid state, high performance converters employing type 11 servo loops for lag free tracking at rates to 3600°/sec. Resolution 10 bits, 12 bits, or 14 bits.

Digital-to-Synchro and Digital-to-Resolver Converters Series VDS/VDR: Accept shaft angle data in digital form for conversion to analog at accuracies up to ±4'.

Tracking Synchro-to-Linear DC Converter Module
Series VSDCH/VRDCH: Accept 3-wire synchro or 4-wire resolver input data, convert it to DC analog voltage proportional to synchro angle of input. Accuracy ±6' (typ.).

Tracking Angle Position Indicator
VNST-104: Tracking Synchro-to-Digital Converter, can also be used as a control element. Four decade 0.8" red LED display. Display accuracy ±6' arc (typical). Tracking rate 3600°/sec max. Parallel binary or BDC output. Self contained line operated power supply.

Custom designs available to your specifications.

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EEM PRODUCT SELECTION GUIDES

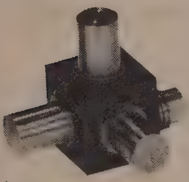
There are 33 Guides in this edition of EEM. See page 2 (1A•2, 1B•2, 2•2, 3•2) of each volume to locate the Product Selection Guides that pertain to your needs.

CALL VIBRO-METER for all your vibration sensor needs.

Vibro-Meter manufactures the broadest line of custom and off-the-shelf vibration sensors. We will meet your needs in the most extreme environments and in your most unique applications. We're known for our cost performance, meeting stringent delivery schedules, and for our technical expertise. We also are known for our extensive product line which now includes dynamic pressure sensors, torque transducers and dynamometers. We maintain a complete inventory of standard products, and for custom sensors, we can meet your specifications and deliver in 90 days...Guaranteed.

617-663-7322.

Model Number	Sensitivity	Frequency Response ±5%	Operating Dynamic Range	Dimensions	Weight
CE 501 M101	10 mV/g	7 Hz to 20 kHz	485 g	0.31″ Dia. x 0.42″H.	1.8 grams
CE 501 M201	2 mV/g	1.5 Hz to 25 kHz	2300 g	0.31″ Dia. x 0.42″H.	1.8 grams
CE 501 M701	0.7 mV/g	1.5 Hz to 25 kHz	6900 g	0.31″ Dia. x 0.42″H.	1.8 grams
CE 505 M101	10 mV/g	7 Hz to 12 kHz	485 g	.84″H. x .84″W. x .84″L.	10 grams
CE 506 M101	10 mV/g	7 Hz to 20 kHz	485 g	0.31″ Dia. x 0.42″H.	2 grams
CE 507 M101	100 mV/g	6 Hz to 7 kHz	48 g	0.75″ Hex. x 1.27″H.	40 grams
CE 507 M301	200 mV/g	0.6 Hz to 7 kHz	48 g	0.75″ Hex. x 1.27″H.	40 grams
CE 507 M501	10 mV/g	0.6 Hz to 7 kHz	485 g	0.75″ Hex. x 1.27″H.	40 grams
CE 508 M101	10 mV/g	6 Hz to 15 kHz	485 g	0.5″ Hex. x 0.92″H.	12 grams
CE 508 M401	0.12 mV/g	9 Hz to 12 kHz	23,000 g	0.5″ Hex. x 0.92″H.	12 grams
CE 510 M101	8 V/g	0.1 Hz to .25 kHz	0.57 g	2.00″ Dia. x 2.17″H.	485 grams
CE 510 M201	2 V/g	0.1 Hz to .25 kHz	2.3 g	2.00″ Dia. x 2.17″H.	485 grams
CE 524 M301	100 mV/g	0.6 Hz to 5 kHz	21 g	1.0″ Hex. x 2.1″H.	100 grams
CE 525 M201	25 mV/g	5 Hz to 8 kHz	190 g	0.75″ Hex. x 1.5″H.	40 grams
CE 528 M101	500 mV/g	200 Hz to 2 kHz	9 g	1.0″ Hex. x 2.8″H.	150 grams
CE 529 M101	10 mV/g	3 Hz to 8 kHz	485 g	0.394″ Hex. x 0.65″H.	6 grams
CE 557 M101	10 mV/g	1 Hz to 3 kHz	485 g	1.5″ Dia. x 1.6″H.	75 grams



Piezoelectric accelerometers with built in electronics. CE 500 Series.

- operating temperature range: −65°F to +250°F (54C to 121C)
- eliminate cable length limitations: allow varying cable lengths between sensor and power supply with no degradation in sensitivity or performance
- eliminate cable motion effects
- standard accessories available: extension cables, magnetic mounts, isolation studs, constant current single and multi channel power supplies
- other operational characteristics and mechanical configurations are available

Model Number	Sensitivity	Frequency Response ±5%	Operating Dynamic Range	Dimensions	Weight
CA 424 M201	100 pC/g	2 Hz to 6 kHz	25 g	1.0″ Hex. x 2.2″H.	100 grams
CA 426 M101	10 pC/g	1 Hz to 12 kHz	100 g	0.5″ Hex. x 1.45″H.	15 grams
CA 431 M201	70 pC/g	1 Hz to 2 kHz	200 g	1.0″ Hex. x 1.65″H.	180 grams

Charge coupled accelerometers. CE 400 Series.

- operating temperatures in excess of 700°F (375C)
- highly stable to temperature changes
- integral cabling available
- hermetically sealed
- other operational and mechanical configurations available

vibro-meter corp.

1 Progress Road, Billerica, MA 01821
Telephone: 617-663-7322 Facsimile: 617-667-1944
Telex: 948145—TWX: 710-320-1872

WR VIBRATION TRANSDUCERS

Wilcoxon Research specializes in the development and manufacturing of high quality instrumentation for use in the vibration test and monitoring field. A wide range of vibration transducers and related accessories are offered to fulfill most laboratory and industrial applications. Electromagnetic and high frequency piezoelectric shakers are offered to excite structures for vibrational analysis. Experienced technical assistance is available to aid in instrument selection and application.

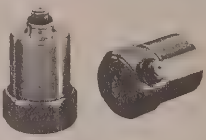
Internally Amplified Accelerometers

700 Series Accelerometer System

NEW

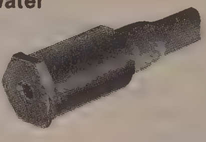
The New 700 Series Accelerometer System offers an array of internally amplified accelerometers, power supplies, post-amplifiers and vibration measurement kits. These are designed as interchangeable systems featuring ruggedness, ease of operation, virtually free from erroneous signals caused by conditions such as mechanical strain, mounting torque, thermal transients and cable motion. The extremely low noise floor and very wide measuring range are unparalleled features of the 700 Series.

720 Series



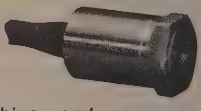
For general purpose vibration testing and monitoring. Low sensitivity to strain, torque, and thermal transients. Very low noise floor allows external velocity or displacement integration to low levels and low frequencies. Internal PIEZOFET® amplifier drives long cables. 10, 25 or 100 mV/g 1 to 10,000 Hz

740 Series Underwater Accelerometers



Designed for testing and monitoring of underwater structures. Geophysical cable is sealed into the transducer for operation to pressures greater than 1000 psi. Ultra low noise amplifier allows measurement to extremely low vibration levels. 10, 25 or 100 mV/g 1 to 10,000 Hz

760 Series Industrial Accelerometers

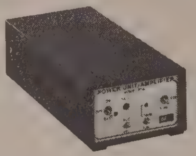


Designed to withstand the harsh environments found in industrial applications such as bearing, pump, turbine, and gear case monitoring. Rugged and shock protected for long term reliability. Special environmental and electrical isolation. 10, 25 or 100 mV/g 2 to 10,000 Hz

P700 Series Power Supplies & Amplifiers

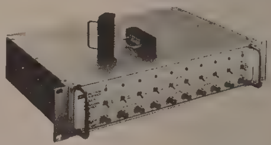
These units supply power to any of the 700 Series Accelerometers with integral amplifiers and allow operation directly into standard readout equipment. The new "smart" power supplies provide gain and monitor and signal to insure proper operation for increased measurement confidence.

Single Channel



- P702 Power Unit/Amplifier
- Power any 700 Series Accelerometer
- Gain trim to standardized sensitivity
- Overload/fault alarm — audible and visible
- Wide dynamic range
- Battery test light
- Amplifier gain of 1, 10, and 100
- Acceleration or velocity output
- Ultra low noise
- Powered by 9V transistor batteries

Multichannel Power Unit Racks

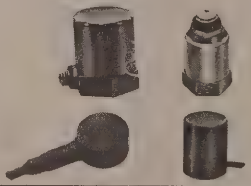


PR710 — Supplies power to ten 700 Series Accelerometers with low noise amplification of X1, X10 or X100. Fault indication warns of defective accelerometer or cabling.

PR712 — Supplies power to twelve accelerometers and provides fault indication with no additional amplification.

High Impedance Accelerometers

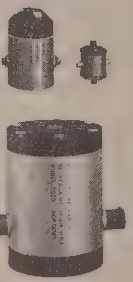
A variety of charge type (non-amplified) accelerometers are offered for use with external charge amplifiers. Charge type accelerometers have a wide dynamic range and high temperature capability. Low noise cables must be used. Modifications and special OEM units can be provided by our Custom Design Section. 1 pC/g to 10 V/g sensitivities



Force Gages

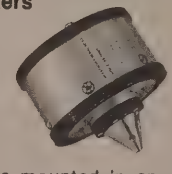
Piezoelectric force gages measure dynamic forces with high gage stiffness. Miniature and general purpose units are available. Low weight.

Impedance Heads



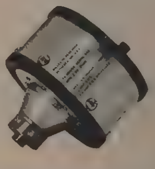
An impedance head combines a force gage and an accelerometer in a single unit. When driven by a shaker, this allows the measurement of force applied to the structure and the resulting motions.

Electromagnetic Shakers



These small electromagnetic shakers are designed to attach to (or push against) a structure and generate a vibratory force. The mass reaction principle of operation allows the shakers to be mounted in any orientation. Available with built-in force gage and accelerometer (impedance head) for complete measurement capability.

Electromagnetic/Piezoelectric Shaker Combinations



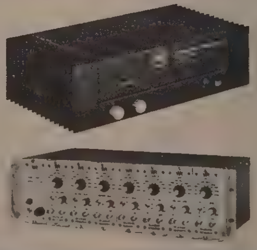
This new approach to structural excitation combines an electromagnetic shaker which drives at the lower frequencies and a piezoelectric (crystal) shaker which drives at high frequencies. The combinations are selected so that both shakers can be driven at the same time to cover a very wide frequency range.

Piezoelectric Shakers

Piezoelectric shakers are designed for high frequency structural excitation. A variety of models are available as mass-reaction force generators (F7, F8, F9) or in shake table configurations (D60, D125). Extremely high vibration levels may be attained with very low stray electromagnetic fields.

Signal Conditioners, Power Amplifiers & Accessories

Wilcoxon Research offers a selection of signal conditioners, shaker power amplifiers and accelerometer accessories to fully support our lines of transducers and shakers. This ensures system component compatibility from a single supplier.



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MINIGLOSSARIES
FORMULAS • CHARTS
PRODUCT SELECTION GUIDES
FORMS
CODES

TECHNICAL INFORMATION

WHERE TO FIND THEM IN THE 84/85 EDITION OF EEM

Abbreviations/Acronyms **1A**•1137, **1B**•1035, **2**•1014, **3**•1014
ASCII Code **3**•1103
Batteries, Product Selection Guide **3**•1399
Cabinets, Enclosures, Racks, & Chassis, Product Selection Guide **2**•1003
Capacitors, Basic Formulas **1A**•1093
Capacitors, Miniglossary **1A**•1069
Capacitors, Product Selection Guide **1A**•1003
Circuit Boards (Printed), Product Selection Guide **2**•1089
Coils, Chokes, & Inductors, Product Selection Guide **1A**•1219
Connectors, Miniglossary **2**•1264
Connectors, Terminals, & Sockets, Product Selection Guide **2**•1097
Crystals, Oscillators, Crystal & Piezoelectric Filters, Product Selection Guide **1A**•1309
Delay Lines, Product Selection Guide **1A**•1445
Discrete Semiconductors, Product Selection Guide **1A**•2087
Displays, Readouts, Lamps, & Lights, Product Selection Guide **1B**•1021
EBCDIC Code **3**•1153
Encapsulation, Miniglossary **2**•1082
Fans, Blowers, Cooling Equipment, & Heat Exchangers, Product Selection Guide **2**•1801
Filters, Product Selection Guide **1A**•1577
Instruments, Graphic Recording, Product Selection Guide **3**•1381
Instruments, Panel Meters, Product Selection Guide **3**•1321
Instruments, Test & Measuring, Product Selection Guide **3**•1182
Interconnection Systems, Product Selection Guide **2**•1873
Keyboards & Keypads, Product Selection Guide **1B**•1759
Microwave Components, Product Selection Guide **1A**•1685
Military Qualified Products Lists **1B**•1003
Motors, Drives, & Rotating Components, Product Selection Guide **1B**•1121
Opto Semiconductors, Miniglossary **1B**•1218
Oscilloscopes, Product Selection Guide **3**•1361
Panel Hardware, Product Selection Guide **2**•1757
Potentiometers, Trimmers, Controls, & Rheostats, Product Selection Guide **1A**•2017
Power Supplies, Miniglossary **3**•1455
Power Supplies, AC, Product Selection Guide **3**•1815
Power Supplies, DC, Product Selection Guide **3**•1439
Protective Components (Fuses, Circuit Breakers, etc.), Product Selection Guide **1B**•1255
Relay Contact Forms **1B**•1317
Relays, Electromechanical, Miniglossary **1•B**1292
Relays, Product Selection Guide **1B**•1289
Resistor Color Codes **1A**•1791
Resistors, Product Selection Guide **1A**•1789
Servo Components, Miniglossary **3**•1935
Solenoids, Product Selection Guide **1B**•1481
Switches, Product Selection Guide **1B**•1499
Thyristors/High Power Diodes, Miniglossary **1A**•1652
Transducers & Encoders, Product Selection Guide **1B**•1827
Transformers, Product Selection Guide **1A**•2115
Wire & Cable, Product Selection Guide **2**•1935

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USE ONE OF THE NEW

EEMEDIATE ACTION CARDS

INSIDE THE BACK COVER OF
VOLUMES 1A, 1B & 2

SPECS?
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LIFE TEST?
QUOTES?
AVAILABILITY?
LOCAL SOURCE?
MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?
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MIL SPECS?
CUSTOM?
COMPATIBILITY?
SPECS?
DRAWINGS?
LIFE TEST?
QUOTES?

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you have seen in EEM. Fill out the card completely and, PLEASE!, print everything. Give the computer operator a break.

EEM will forward the card to the appropriate manufacturer and send you a replacement card.

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From: (Your Name) ____________
Title ____________
Company ____________
Div. of ____________
Address ____________ Mail stop ____________
City ____________ State ________ Zip ____________
Phone: Area code (______) ______-________ Exten. ____________
I need more information about:
Mfr. ____________ EEM Pg. ________
Here's what I need ____________

EEMEDIATE ACTION CARDS

Use one of these cards to request more information about something you have seen in EEM. Fill out the card completely and, PLEASE!, print everything. Give the computer operator a break.

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EEMEDIATE ACTION CARD.....Use this card for more data!

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Company ____________
Div. of ____________
Address ____________ Mail stop ____________
City ____________ State ________ Zip ____________
Phone: Area code (______) ______-________ Exten. ____________
I need more information about:
Mfr. ____________ EEM Pg. ________
Here's what I need ____________

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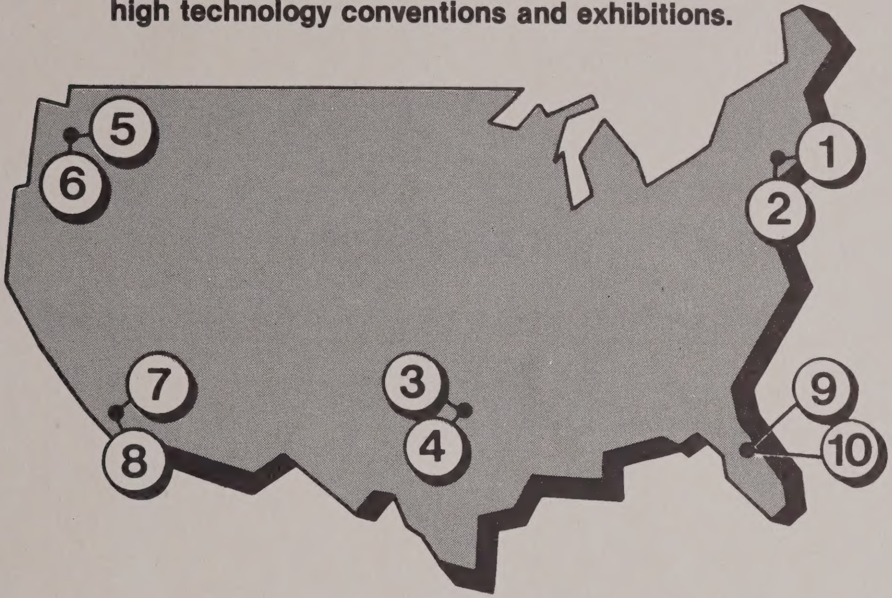

1 Electro
May 15, 16, 17
Bayside Exposition Center
Hynes Veterans Auditorium
Boston, Massachusetts

2 Mini/Micro Northeast
May 15, 16, 17
Hynes Veterans Auditorium
Boston, Massachusetts

3 Midcon
September 11, 12, 13
Dallas Convention Center
Dallas, Texas

4 Mini/Micro Southwest
September 11, 12, 13
Dallas Convention Center
Dallas, Texas

5 Northcon
October 2, 3, 4
Seattle Coliseum
Seattle Center
Seattle, Washington

6 Mini/Micro Northwest
October 2, 3, 4
Seattle Coliseum
Seattle Center
Seattle, Washington

7 Wescon
October 30, 31, November 1, 2
Anaheim Convention Center
Anaheim, California

8 Mini/Micro West
February 5, 6, 7, 1985
Anaheim Convention Center
Anaheim, California

9 Southcon
March 5, 6, 7, 1985
Georgia World Congress Center
Atlanta, Georgia

10 Mini/Micro Southeast
March 5, 6, 7, 1985
Georgia World Congress Center
Atlanta, Georgia

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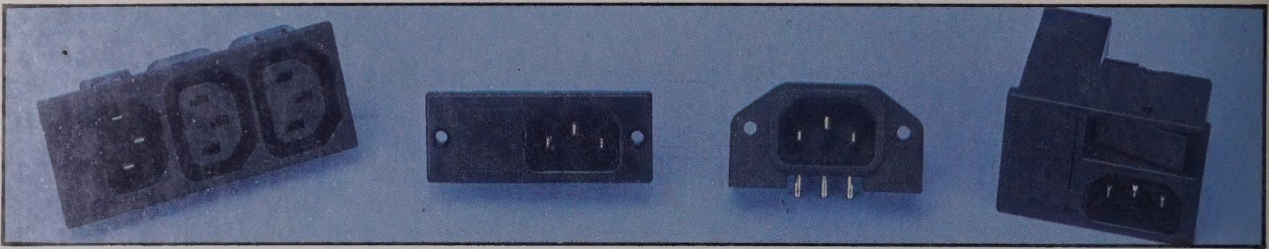
Subsidiary of Electronic Conventions, Inc.
P.O. Box 92275, Worldway Postal Center, Los Angeles, CA 90009
Telephone: 213/772-2965 • Telex: 181350

IEC CONNECTORS
Standard and Power Entry Modules



COMBINATION
Input/Output Module

Single male outlet may be combined with 1 to 6 female outlets. Rated 6 amp. Simple snap-in mounting. Solder or faston terminals.

Approvals: UL, CSA

POWER ENTRY MODULES
(Fused, with On/Off, Snap Action Power Switches)

Single and double pole switch configurations. Accepts American 3AG or European 5 x 20mm fuses for max. flexibility. Single or double Fuse holders. Integral voltage selector. Solder or faston terminals.

Approvals: UL, CSA, VDE, SEV

PRINTED CIRCUIT

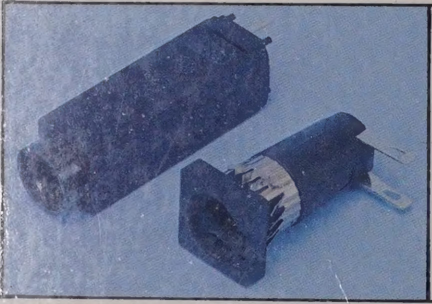
General purpose Power Cord Connector with PRINTED CIRCUIT TERMINALS. Rated 6 amp. Designed for automated assembly operation. Four color options. Conforms with all International safety requirements.

Approvals: UL, CSA, VDE

FUSED
(With Voltage Selector Switch)

Switch voltages changed by rotating snap-in cartridge (100/120/220/240V). Accepts American 3AG or European 5x20mm fuses for max. flexibility. Rated 6 amp. Screw or Snap-in mount configurations. Four color options.

Approvals: UL, CSA, VDE

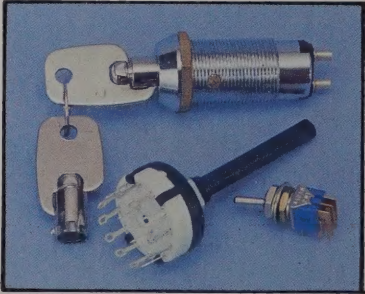


FUSE HOLDERS & FUSES

- Combination Fuse Holders accept Domestic and European Fuses for maximum versatility.
- Printed circuit and Solder terminations.
- Shock-safe Fuse Holders.
- TR3 and Microfuse Holders.
- Fuse Blocks.
- Standard and Sub-Miniature Fuses.
- Approvals: UL, CSA, VDE

KNOBS
(COLLET, SET SCREW, & PUSH-ON)

Designed for function, styling and labor saving assembly. The most complete line of Knobs and Accessories. Also available with aluminum or matte finishes. 70 different color options.



MINIATURE and SUB-MINIATURE SWITCHES

PRINTED CIRCUIT
ROTARY
KEYLOCK
TOGGLE
SLIDE

LCD CONNECTORS

Triple supports provide minimum plug-in pressure and positive contact at top and bottom of LCD. Four pin lengths. Molded shoulders prevent longitudinal movement under the most severe shock and vibration conditions. (No epoxy or bezel required for LCD retention).

.05 and .10 PIN SPACING

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